

SELF- ASSESSMENT OF HAND HYGIENE COMPLIANCE BY HEALTH PROFESSIONALS IN NEONATAL INTENSIVE CARE UNIT IN SAUDI ARABIA

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Declaration

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Abstract

Background: Healthcare associated infections (HAIs) pose a significant threat to patients' safety and have proven to be the leading cause of infant mortality and morbidity which contributes to a tremendous burden in healthcare organizations. However, these infections may be preventable through hand hygiene (HH) since most outbreaks of infections in Neonatal Intensive Care Units (NICUs) are closely related to lack of hand hygiene compliance culture among Healthcare workers.

Methods: The researcher conducted a descriptive quantitative, cross sectional study on self-assessment of hand hygiene compliance by health professionals in a tertiary-level, neonatal intensive-care unit in Saudi Arabia. A self-administrative questionnaire was used in this study in order to gain in-depth information about hand hygiene compliance among 172 Health professionals (HPs) working in NICU. This was the total population therefore no sampling was done. All HPs working in NICU were requested to voluntarily to take part in the study. The researcher obtained a consent for conducting the study through Health Research Ethics Committee of Stellenbosch University and from the Institutional Review Board of the organisation.

Results: The theory of planned behaviour was used as a lens for analysis in this study. The findings indicated that there was an identified deficit perceived in self-assessment of HPs working in NICU about their non-compliance to hand hygiene as a method to reduce HAIs. The attitude and perceptions of hand hygiene practices influenced the outcomes of hand hygiene practices. It is therefore suggested that there should be increased awareness about the importance of hand hygiene in reducing HAIs among patients in NICU and to increase patients' safety.

Conclusion: There should be continuous reinforcement of hand hygiene compliance culture to all HPs in NICU so as to reduce infant mortality and morbidity and to enhance patients' safety. There should be zero tolerance for not adhering to recommendations of five moments of hand hygiene and principles that enhance hand hygiene compliance culture. Since deviation from the recommended practice may result in a compromised patient safety position. Healthcare organisations should implement a periodic review of guidelines related to hand hygiene compliance culture and should introduce innovative methods that may enhance hand hygiene compliance by all HPs.

Key words : Hand hygiene compliance, Healthcare associated infections in Neonatal intensive care units, World Health Organization'

Opsomming

Agtergrond: Gesondheidsorgverwante infeksies (HAI's) vorm 'n groot beduidende bedreiging vir die pasiënt se veiligheid en het bewys dat dit die belangrikste oorsaak is wat lei tot die sterftes en morbiditeit van die kind. Dit lei tot groot las vir gesondheidsorg organisasies. Dit kan egter voorkom word deur handhigiëne (HH) sedert die meeste uitbrake van infeksies in Neonatale Intensiewe Sorg Eenhede (NICU's) nou verband hou met die gebrek aan handhigiëne-nakomingskultuur onder Gesondheidsorg.

Metodes: Die navorser het 'n beskrywende studie gedoen oor die selfevaluering van handhigiëne-nakoming deur gesondheidspersoneel in 'n neonatale intensiewe sorgseenheid in Saoedi-Arabië. 'N Kwantitatiewe benadering is aangewend. 'N Self-administratiewe vraelys is in hierdie studie gebruik om in-diepte inligting oor handhigiëne-nakoming onder gesondheidswerkers (HP's) in NICU te verkry. Alle HP's wat in NICU gewerk het, is genooi om aan die studie deel te neem. Die navorser het toestemming gekry om die studie uit die Gesondheidsnavorsingsetiekkomitee van die Universiteit Stellenbosch en van die Institusionele Hersieningsraad van die organisasie te doen.

Resultate: Navorsingsbevindings het aangedui dat daar 'n tekort is wat in die selfevaluering van HP's waargeneem word, geïdentifiseer word in die NICU oor hul nie-nakoming van higiëne as 'n metode om HAI's te verminder. Daar word derhalwe voorgestel dat bewustheid oor die belangrikheid van handhigiëne in die vermindering van HAI's onder pasiënte in NICU verhoog word ten einde die veiligheid van pasiënte te verhoog.

Gevolgtrekking: Daar moet deurlopend versterk word van die handhigiëne-nakomingskultuur aan alle HP's in NICU om die sterftes en morbiditeit van die baba te verminder en om die veiligheid van pasiënte te verbeter. Daar moet zero tolerance wees vir die nakoming van die se aanbevelings van vyf oomblikke van handhigiëne en beginsels wat handhigiëne-nakomingskultuur verbeter. Aangesien afwyking van die aanbevole praktyk kan lei tot die veiligheidsposisie van 'n gekompromitteerde pasiënt. Gesondheidsorgorganisasies moet periodieke hersiening van riglyne wat verband hou met handhigiëne-nakomingskultuur, implementeer en innoverende metodes bekendstel wat handhigiëne-nakoming deur al die HP's kan verbeter.

Sleutelwoorde: Handhigiëne-nakoming, Gesondheidsorgverwante infeksies in Neonatale intensiewe sorgseenhede, Wêreldgesondheidsorganisasie.

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ABBREVIATIONS

CLABSI	Central line associated blood stream infections
CDC	Centres for Disease Control and prevention
HH	Hand hygiene
HHCC	Hand hygiene compliance culture
HHMP	Hand hygiene monitoring program
HAIs	Healthcare associated infections
HPs	Health professionals
HREC	Health Research Ethics Committee
IRB	Institutional Review Board
NICU	Neonatal intensive care unit
OR	Operating room
PICU	Paediatric intensive care unit
TPB	Theory of planned behaviour
WHO	World health organization
U.S.	United States
VAP	Ventilator associated pneumonia

1. CHAPTER ONE

FOUNDATION OF THE STUDY

1.1. Introduction

Healthcare associated infections (HAIs) are infections that the patient may transmit while receiving treatment for other health-related conditions in healthcare settings (Hoovena & Polin 2014:10). Polacco, Shinkunas, Perencevich, Kaldjian and Reisinger (2015:159) believe that HAIs are worldwide problem regarded mainly as sources of increasing mortality and morbidity in Neonatal intensive care units (NICUs).

They are a threat to patients' safety (Smiddy, O' Connell & Creedon, 2015:270). HAIs pose major significant threats to the patients and cause death, (Morioka, Yahata, Shibata, Miwa, Yokota, Jikimoto, Nakamura, Lee, Yoshida, Yamada, Arakawa & Lijima, (2013:68e). Hoovena and Polin, (2014:11), concur with them by affirming that HAIs have been identified as the main threat and source of death among patients. They further mentioned that the most effective strategy to combat HAIs in NICUs is deployment of collective action supporting commitment to change towards appropriate hand hygiene (HH) practices.

1.2. Significance of the problem

Hessels & Larson, (2016:08) cited that key factor in preventing HAIs within healthcare institutions and among Healthcare Professionals (HPs) is having a collaborated effort towards HAIs and HH. They mentioned further that changing attitude and commitment to comply with all efforts undertaken to reduce HAIs have a positive impact in reducing HAIs and enhancing compliance in HH. That indicates that should healthcare organisations embrace commitment in embarking appropriate HH efforts and dealing with non-compliant staff that may have a positive impact on establishment of good compliance results on HH compliance.

Hale, Powell, Drey and Gould, (2015:05) mentioned that one of the major strategies in reduction of HAIs is through solicitation of vigilant HH compliance practices. All HPs should recognise the importance of hand hygiene. The reduction of HAIs could

be achieved through implementing best strategies by all HPs and for them to have committed to those strategies of World Health Organisation (WHO) (Mazi, Senok, Al-Kahldys & Abdullah (2013:07).

HAIs are preventable through the implementation of effective strategies by all Health professionals (HPs). Gould & Drey, (2013:05). Several change management strategies have been implemented in Neonatal Intensive Care Units (NICUs) to reduce patients' risk of HAIs, despite that its existence is still prevalent. Some of the strategies that have been implemented are for instance, developing and revising policies and protocols on reduction of HAIs; training of all HPs concerning several reduction strategies assisting in preventing HAIs; provision of communication and feedback to all HPs about HAIs in the unit ensured; strengthening methods of change in compliance culture that prevent HAIs were established and implemented; information about commitment by HPs regarding ensuring prevention of HAIs were rendered; and, hand hygiene awareness campaigns were embarked upon. Despite all these implemented efforts, HAIs are still common in NICU.

All these are indications that there is a need to develop or modify change management strategies aiding in preventing HAIs in NICUs. For a reduction of HAIs in healthcare institutions to exist, collaborated commitment to change in culture among of HPs is required (Smiddy, et al., 2015:271).

The drive for this was identifying main elements contributing towards lack of hand hygiene compliance culture (HHCC) and consequently accelerating the rate of HAIs in NICU. Therefore, this study could add value to the institution by bringing about the best evidence-based methods enhancing the reduction of HAIs and increasing hand hygiene (HH) compliance culture among all HPs. That could have positive impact on reducing the average duration of admission of patients thus decreasing the costs that are associated with contracting HAIs.

1.3. Rationale

The rationale for this study was that the researcher managing NICU in the institution identified an increase in HAIs despite the measures put in place to reduce them. In

addition, HAI increases patients' length of stay and causes a tremendous burden to healthcare services (Resendea, Peppeb, Reisc, Abdallahc, Ribasa, Pinto and Filhoa, 2015:34). The greatest approach by HPs in contributing towards reduction of length of stay of patients, is through implementing appropriate compliance in hand hygiene practices.

Djordjevic, Markovic-Denic, Folic, Igrutinovic and Jankovic, (2015:86) mention that studies completed in different types of environments with sophisticated types of medical equipment in developed countries, regardless of that HAIs are prevailing and being viewed as a major challenge. Meaning even though NICUs having state-of-the-art equipment, as long as the staff are not compliant with hand hygiene principles HAIs may still be prevalent and may increase.

About 10% to 70% of HAIs could be preventable by HPs (Hessels & Larson 2016:350). HPs have a remarkable role in preventing HAIs through commitment to compliance culture towards hand hygiene. Should healthcare workers commit in accepting effective change strategies that reduce HAIs, patients would not be at risk of HAIs (Smiddy, et al, 2015:269). HPs have vital role to play in preventing HAIs. The core component of preventing HAIs in healthcare institutions and among HPs is to have collaborated effort in changing attitude and having commitment towards compliance in HH and reduction of HAIs (Hessels & Larson 2016:08). Meaning should healthcare organisations commit themselves in embarking on effective methods of dealing with non-compliant staff, which could aid with positive impact on results of HH compliance.

Hale, Powell, Drey and Gould, (2015:77) mention that one of the major strategies in reduction of HAIs it is through applicable hand hygiene compliance practices. Therefore, all HPs should recognise the significance of proper HH developments. The reduction of HAIs could be achieved through implementing best strategies by all HPs and for all to be committed to those strategies as per recommendations of World Health Organisation (WHO) (Mazi, Senok, Al-Kahldys & Abdullah (2013: 07).

1.4. Research problem

NICUs are regarded high-risk area with potential for contracting infections due to the fact that neonates are at risk of being infected by different types of infections. That could be related to their suppressed, undeveloped immune system (Morioka, et al., 2013:66e). There is a dire need for patients admitted in NICU to be nurtured with caution in order to be protected from risk of infections. That could be due to the fact that HAIs are regarded as major problem worldwide and appear to be the main contributing factor that increase mortality and morbidity (Polacco, et al., 2015:160).

Smiddy, et al., (2015:273) concur with them by mentioning that the greatest cause of morbidity and mortality world-wide are associated to HAIs, and consequently affects healthcare organisations and families. HAIs affects healthcare organisations due to the fact that the more the severity of the infection in patients the longer their period of admission. Smiddy, et al., (2015:270) outline that HAIs are infections which patients get infected with while they are admitted in hospital and receiving treatment for other health-related conditions. Estimations of deaths associated with HAIs are approximately 90 000 and their cost is at least \$28 to \$45 billion annually in the United States. That implies that it is through safe and clean hands of HPs that most healthcare costs of numerous healthcare organisations could be reduced. As a result of that average length of stay (LOS) of patients may furthermore be reduced.

Resendea, et al., (2015:39) state that there is an unswerving relationship between HAIs and LOS amongst many healthcare organisations. They further mention that HAIs have been regarded as a world-wide concern which contributes significantly to mortality and morbidity. It is stated from WHO on HAIs fact sheet, (2015:03) that at any given time HAIs fluctuate between 3.5 % to 12 % in developed countries and 5.7 % to 19 % in developing countries. It is mentioned further that the suitable solution to prevent HAIs should aim at executing effective and low-cost strategies. It is cited further that part of those strategies should include HPs commitment in targeting for profuse obligation towards the appropriate HH practices, levelling at enhancing HPs' accountability and a change in their behaviour.

Several strategies to reduce HAIs have been employed in NICU, despite that HAIs are still apparent. Part of those strategies include: appointing the link nurses for managing and monitoring HAIs in the department, providing in-service education and

awareness about the importance of hand hygiene and HAIs prevention, displaying posters of hand hygiene and HAIs thus enhancing their visibility for every HPs in the unit, and providing presentations, auditing and feedback to all HPs in the unit about HH and HAIs. Regardless of these efforts, HAIs are still prevalent at an average rate of 11% during the first two quarters of 2015, 12.5 % during the last two quarters of 2015 and 11.3% in the beginning of the first two quarters of 2016.

It is mentioned in the fact sheet of WHO regarding HAIs (2015:02) that developing countries have approximately 30% of patients admitted in NICUs and affected by at least one type of HAI, while in developed countries are two to three times higher than developed countries. Despite all the interventions that have been executed, rate of HAIs is still increasing. That has raised a concern and question to the researcher and provided a platform to explore other possible factors that impede reduction of HAIs by HPs working in NICU. Hooven and Polin, (2014: S4) discover in their study, that HAIs among NICU patient is common and that associated with their compromised immune system.

However, they further substantiated that lack of compliance in HH being main the source of HAIs in NICUs. In addition, they mention that some contributory factors may be underlying critical illnesses, immature mucus membranes, adaptive immune responses, thinner and more permeable skin, prolonged use of central venous umbilical catheters, overcrowding and the use of parenteral nutrition. Regardless of those identified risks, the researcher perceives that the inadequacy or the lack of a compliance culture in hand hygiene has led to increase in HAIs in NICUs.

1.5. Research question

The research question which guided the study was; what are the self-assessed factors and that may impede hand hygiene compliance based on perceptions and attitudes influencing the reduction of healthcare associated infections (HAIs) among the staff in a NICU at the tertiary level hospital in Riyadh in Saudi Arabia?

1.5.1. Research Sub-questions

The research sub-questions included;

RSQ 1 What are the self-assessed hand hygiene factors that may impede the reduction of HAIs among NICU staff?

- RSQ 2 What are the perceptions of the health professionals towards hand hygiene in the NICU in order to reduce HAIs?
- RSQ 3 What are the attitudes of health professionals towards hand hygiene in the NICU in order to reduce HAIs?

1.6. Research aim

This research aimed at examining self-assessment, perceptions and attitudes of health workers towards hand hygiene which influenced the reduction of HAIs among staff in the NICU at a tertiary hospital in Riyadh in Saudi Arabia.

1.6.1. Research objectives

- RO 1 To describe the self-assessment of hand hygiene compliance of Health professionals in order to reduce HAIs in the NICU.
- RQ 2 To describe the perceptions of the Health professionals towards hand hygiene in the NICU in order to reduce HAIs.
- RQ 3 To describe the attitudes of Health professionals towards hand hygiene in the NICU in order to reduce HAIs.

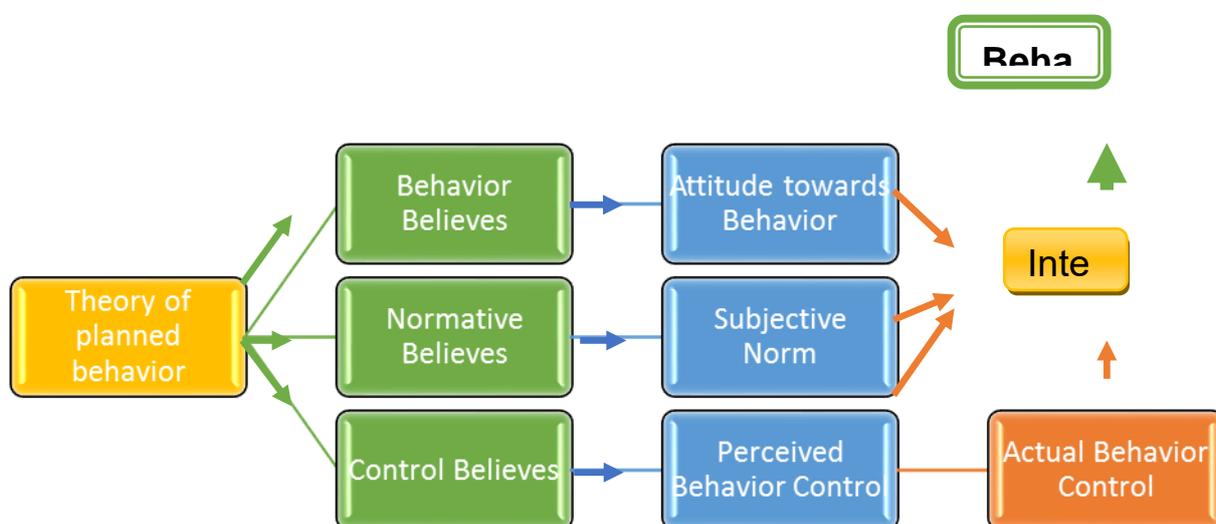
1.7. Theoretical framework

The researcher explored the available models and theories which could be relevant to the study. Hence several models and theories were that could partially address the study for an example Health Promotion Model, Masters, (2014:572) and Leininger's theory, Masters, (2014:430) however all mentioned theories address the theory of culture care diversity and universality.

Therefore, the researcher opted to utilise Theory of Planned Behaviour (TPB) as a lens for analysis of the study. Conner and Armitage, (1998:1429) mention that, the TPB is guided by the following considerations: beliefs about the likely outcomes on the behaviour (behavioural beliefs), and beliefs about the normative expectations (normative beliefs) of other individuals and motivation to comply with these expectations. Consequently, the manifestation of those factors may enhance or impede the enactment of the behaviour together with perceived power of these factors (control beliefs). In simpler terms, behaviour beliefs may result in a positive or adverse outlook toward the behaviour.

Normative beliefs may result from perceived social pressure or subjective norm, while control beliefs may give rise to perceived behavioural control. Theory emphasises on combination of attitude toward the behaviour, subjective norm and perception of behavioural control, yielding to formation of behavioural intentions. The more favourable the attitude and the subjective norm, and the greater the perceived control, the more the individual's intention in distinguishing behaviour or performing the task. In this theory intentions are thus assumed to be the immediate antecedent of the intended behaviour. The schematic representation of this theory is shown on figure one below.

Figure 1.7:1: Theory of planned behaviour



Adapted from (Conner and Armitage: 1998)

Ajzen and Madden, (1986) mentioned in (Conner and Armitage, 1998:1430) that not all people assume that an individual's attitude determines their behaviour. However, as cited in Theory of planned behaviour there may be other elements related to preceding behaviour more than the knowledge of ones' attitude. They mentioned further that this theory is useful in predicting an individual's behaviour. Theory states that there are different ways to influence or change the other individual's behaviour, with the assumption that to change or influence the attitude. As a result, may lead to change in behaviour.

For example, if the physician would like to influence behaviour of treatment compliance by the patient, he/she may have to influence or change the attitude first.

Meaning that an attitude is a good determinant to predict planned or spontaneous behaviour even though it is not always the case. Theory states that attitudes, together with perceived control and subjective norms, may therefore predict intentions. That is the basis of the Theory of planned behaviour which is utilised to predict deliberate or planned behaviour.

Further, the theory states that individuals have enough time to plan how they are intending to behave towards certain situations, and that means the best predictor of that behaviour is intention. Therefore, for individuals to predict what others are going to do, they need to know ahead what their intentions are (Ajzen and Madden: 1986:455). However, the intention does not always accurately predict the behaviour if some conditioned responses are involved.

As shown in figure one, behaviour is the result of intention, while the intention is believed to be determined by attitude and behavioural beliefs, subjective norms and normative beliefs as well as perceived behavioural control and control beliefs, attitude may be defined as evaluation of ideas, events or objects and attitude may either be positive or negative (Ajzen and Madden: 1986:460).

Subjective norms may be the normative beliefs which may be considered normal or average or typical. Perceived behaviour control in this theory refers to the belief of the amount of the direction which an individual has over the environment, which may be for example, the control of situation, place or resources. Conner and Armitage, (1998:1431) mention that Icek Ajzen first came up with the theory as an extension of theory of reasoned action.

This theory suggests that, the more the favourable the attitude toward a specific act, the more the favourable subjective norms and greater perceived behavioural control, and the strengthened the intention to perform the behaviour. This basically means that, the more favourable attitude towards the behaviour, it is accepted socially, and the individual has more control over that specific behaviour, the more likely they are to perform that behaviour. For example, the person can join the cheering team in soccer stadium even if one is not a huge fan of soccer or has a loud voice.

However, there may be some obstacles that may prevent someone from performing the task or behaviour. One may have the best of intentions to finish the task or

project two weeks in advance, but other external factors may distract the person. For example, a lack of resources or time. Theory of planned behaviour is used by several organisations like Mass.com, Interpersonal marketers and so on. Those companies apply the theory to predict marketing strategies on how the public will react to changes in the business. This theory has been highly applied in explaining attitudes, intentions and behavioural relations. The theory has also been effective in predicting health-related behaviour like quitting smoking, and performing exercises. Through this model researcher have been able to predict how people will react to these issues or change their lifestyles, which may also help in finding ways to improve health.

However, some critics have doubted the accuracy and sufficiency of the subjective norm component of the model. The other arguments are that attitudes, subjective norms and perceived behaviour should interact with each other instead of functioning as separate models. The development of Theory of planned behaviour as the extension of theory of reasoned action is regarded as a good example of new theories emerging from expanding existing theories while adding more new information in the world of communication.

Theory of planned behaviour is relevant for the study as recommended in guidelines of critiquing theoretical and conceptual frameworks (Grove, Grey & Burns, and 2015:199). Their recommended guidelines state that the chosen model, should be appropriate for the research study and should be clearly unambiguous. Grove, et al., (2015:199) explain the foremost structures of the model to provide clear details and be understood by the readers on conceptual basis of the study. This theory is used on the origin of producing the hypothesis. It further guides researchers' study techniques, study outcomes and theory. Research problems run naturally from the model and appear to be logical.

TPB affords information about factors that may contribute to individuals and groups towards change. The theory supports this study and assists researcher in identifying the need for HPs in NICU to change in their behaviour and commit to prevent HAIs and to comply with hand hygiene performance, which has shown to be an effective strategy for prevention. Hale, et al., (2015:80) applaud the need for empowerment of all HPs concerning the importance of commitment to culture of safety by all staff

towards protecting patients from being infected by HAIs. Therefore, researcher agrees that learning requires both internal and external readiness to absorb information. Smiddy, et al., (2015:271) identify furthermore that empowerment, readiness to learn, together with peer group influence, enrich positive influence on change in behaviour.

It is further stated that all those subsystems create some adaptive approaches that provide mechanisms for coping with environmental stimuli and transformation (Polit and Beck, 2012:133). TPB is appropriate for this study as it addresses aspects of adaptation to change for an individual or group. It provides an opportunity for analysing and understanding multiple phases of human's adaptive system and whole structure (Masters, 2015:343). For that reason, it is vitally important that all HPs working NICU embrace commitment to change. That might contribute in yielding positive outcomes for reduction and prevention of HAIs. In the model of planned theory, human structure is observed further from the outlook of purposefulness surrounded by creative universe reasonably than as a stagnant system with limited capacities (Polit & Beck, 2012:132).

All steps in that theory are integrated with the existing researched problem that is being examined. The relevance for using this theory is that it provides appropriate methods for solving problem and bringing about change. Consequently, the study problem that is being addressed by the researcher regarding the culture of commitment to compliance in preventing HAIs by HPs. The theory is valid for the research topic since it systematically focuses on examining the participants' conduct.

1.8. Research methodology

The aim of this research study was to describe factors and to investigate self-assessment, perceptions and attitudes of HPs towards hand hygiene which influences reduction of HAIs among staff in the NICU at a tertiary hospital in Riyadh in Saudi Arabia. A quantitative study was done to describe the variables and that was done through the use of statistical data. This research utilised quantitative methods which are objective in its measurements and statistically analysing it with post positivist paradigm by nature since in this approach the understanding of reality is being recognised with understanding some degree of impossibility of total objectivity (Polit and Beck, 2012:12). Research study uses organised process to

gather data (Polit & Beck, 2012:14). The research design used for this study was descriptive quantitative cross sectional design in order to determine the factors that impede hand hygiene compliance and reduction of HAIs among staff in NICU. This research design was chosen in relation to the researcher's study objectives. More discussion regarding the research methodology used is outlined in chapter three.

1.9. Ethical considerations

Ethical considerations in this study were done according to framework guidelines mentioned by Polit & Beck, (2012:13). Permission to embark upon the study was achieved thru approval of Health Research Ethics Committee (HREC) of Stellenbosch University. Protocol number S17/02/032. Further permission was sought from the Institutional Review Board of the organisation for approval for research to be conducted in the institution.

Rights of partakers were sufficiently protected, and they were not deceived in whichever manner nor subjected to harm during the study. They were fully aware and understood the determination and process of the study (Polit & Beck, 2012:14). An appropriate, informed consent procedure was followed, and was established by participants following the whole process been explained to them. Participants were educated about their privilege to terminate their involvement in research at any assumed phase. It was emphasized to the participants that the right to withdraw from participating in this research holds no negative consequences to the participants. Sufficient procedure was applied and ensured that participants' privacy and confidentiality maintained. Certificate of confidentiality was granted to the participants. Nonresponse percentage and nonresponse prejudice was affirmed by the researcher.

1.10. Operational definitions

Nurse: An individual listed in a classification under section 31(1) so as to practise nursing or midwifery in terms of the Nursing Act 2005(c. 33). In this study, 'nurse' is used as professional nurse.

Healthcare-associated infections (HAIS): An infection that develops to the patients who are being cared for in any form of setting where healthcare is delivered (e.g.,

acute care hospital) and is related to receiving healthcare (i.e., was not incubating or present at the time healthcare was provided)

Neonatal intensive care unit (NICU): it is a place where critically ill, new-born babies or premature babies are admitted and they may stay for days, weeks, or possibly longer, depending on the baby's degree of prematurity.

Level III NICU: Is an intensive care unit that offers advanced care for premature, low birth-weight and critically ill infants.

NICUs are categorized into **Level I** (regular new-born infants needing additional nursing care), **Level II** (moderately ill infants) and **Level III**, for the most complex and severely ill babies.

Doctors are described in this study is the person licenced to practice medicine in Saudi Arabia and works in the NICU

1.11. Duration of the study

Data collection was done within the period of three months, ranging from 30 April 2017 to June 2017. The research proposal was presented in February 2017 and approval from Stellenbosch University Health Research Ethics Committee (HREC) was received in 24.04.2017. Institutional Review Board (IRB) approval from the institution where the research was conducted was granted on 30.04.2017. The researcher conducted a pilot study on 30.04.2017 which is discussed further in chapter three. Data analysis for pilot study was done from 01 May 2017. The final thesis was submitted for examination in November, 2017.

1.12. Chapter outline

Chapter One: Basis of the study

Chapter one provides an outline on the topic of interest and it elaborates the reasons importance of the study towards the researcher. It designates the implication of the topic related to recent practices. It expands on the study question, aim and intentions.

Chapter Two: Literature appraisal

Chapter two provides information and in-depth review on factors that impede hand hygiene compliance and HAIs reduction among staff in NICUs.

Chapter Three: Research methods

Chapter three debates about study design, how the study process was conducted, who the population was, and the progression of research.

Chapter Four: Findings

Data synthesis and findings, interpretation and presentation of the results in the form of frequencies, tables, and figures are described in this chapter

Chapter Five: Discussion, inferences and endorsements

Chapter five encapsulates and debates about outcomes of the discoveries; the connotation and implication to contemporary practices. Consequently, researcher made recommendations for forthcoming practices or studies.

1.13. Significance of the study

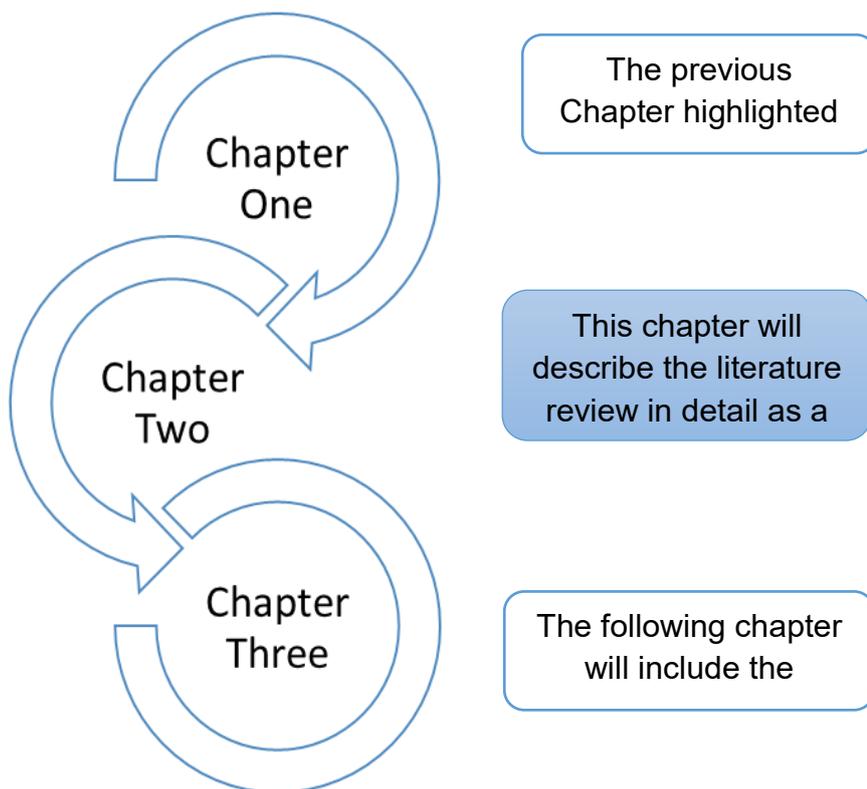
The implication of a study is to produce a body of evidence in nursing which is in-line with evidence based practice. In addition, it will bring about effective and efficient strategies that could be appropriate in all form of healthcare settings towards preventing HAIs.

1.14. Summary

HAIs are acknowledged as the key source of mortality and morbidity in NICUs since premature infants are more at threat of infections. Several strategies have been applied to prevent HAIs, however, its prevalence is still evident. Literature has proven that HAIs could be avoidable through the noble commitment of all HPs. Additional feature that may contribute immensely towards reducing of HAIs is readiness by all HPs to accept change in their practices of prevention and reduction of HAIs. This is in accordance with literature that was reviewed Theoretical model that was utilised in the study is Theory of planned behaviour. Literature review was debated in the subsequent chapter. Commendations were prepared as a result of findings of the study.

1.15. Conclusions

It has been demonstrated through reviewing of several literatures that HAIs are the major challenge worldwide and are the main source of mortality and morbidity in many healthcare organisations. The researcher identified further through literature review that HAIs could be preventable. And that could materialise as result of HPs' commitment and readiness to change their behaviour as a way forward in preventing and reducing HAIs. Therefore, researcher conducted this study to explore the self-assessment of hand hygiene compliance by health professionals in Neonatal intensive care units.



2. CHAPTER TWO LITERATURE REVIEW

2.1. Introduction

The literature was reviewed from various databases which included EMBASE, PUBMED, EBSCO and Google scholar. Further themes were created based on the researcher's title. Literature reviewed has identified several factors that may contribute to non-compliance to hand hygiene and reduction of healthcare associated infections.

Morioka, et al., (2013:67e) assert that there have been numerous recent advancements in perinatal management. Despite that, neonatal infections remain the main cause of morbidity, poor neurodevelopmental outcomes, as well as deaths among infants. Healthcare associated infections remain the major cause of complications that increase the average length of stay amongst NICU patients, since they need to be treated for such infections, and that may also increase the organisational costs.

According to a study conducted by Morioka, et al., (2013:68e) in NICU in Japan, Methicillin-resistant staphylococcus aureus (MRSA) was found to be mainly transmitted through the hands of transiently colonised healthcare workers. Therefore, that shows that lack of proper hand hygiene by NICU healthcare workers may facilitate transmission of bacteria through their hands from one patient to another.

Further, Song, Stockwell, Floyd, Short, Singh, (2013: e101) conduct retrospective cohort study about strategies for improving compliance in HH discovered that lack of innovative strategies enhancing hand hygiene compliance by NICU staff may contribute to staff being demotivated to perform proper HH. That indicates that management, in collaboration with the infection control department, should develop innovative ways that promote hand hygiene compliance. These innovative ways should be motivating to the HPs and encouraging them performing HH in a proper way.

Mazi, Senok, Al-Kahldy, Abdullah, (2013: 02) conduct a study in Saudi Arabia about implementation of strategies World Health Organization (WHO) in enhancing hand hygiene compliance. The study found that lack of commitment by all HPs in

complying with proper hand hygiene processes to be the main cause of non-compliance.

Decembrino, Maini, Decembrino, Maggia, Lacerenza, (2014: S54) state that there are other several risk factors among NICU patients that are associated with HAIs, and that includes birth weight of less than 1 500 grams, prematurity, prolonged length of stay, low Apgar score during the fifth minutes after birth, gestational age of 32 weeks and below. They further mention that other contributory factors such as ventilator associated pneumonia (VAP), and some antibiotic-resistant gram-negative bacteria such as *Pseudomonas aeruginosa*, could serve as contributing risk of HAIs to patients in NICUs.

However, since the infants in NICU are already at risk of HAIs, there is a need for stringent compliance rules in preventing HAIs. This could be modelled through correct performance of hand hygiene. According to Buford, Kumar, Kennedy, (2016:382) in their study conducted in Minneapolis in the U.S., some common forms of HAI in NICU were identified that include urinary tract infections, wound infections, central nervous system infections, conditions that are blood-related infections, as well as eye infections, which are not closely tracked as Central line associated blood stream infections (CLABSI) or Healthcare associated Pneumonia.

Retrospective studies done in several organisations in U.S. proposed that it is vital to reduce the rate of these forms of HAIs in NICUs, since they are closely related to non-compliance to standard precautions and HH. Hence patients in NICU at risk of HAIs as a result of the before-mentioned factors as according to their inferences. That denotes that there is an absolute need for NICU patients to be protected from HAIs by all HPs. They need to be consistent with compliance to HH.

Kawanishi, et al., (2014:629) concur about the importance of strict adherence to hand hygiene compliance culture (HHCC) in prevention of HAIs, however it is still the responsibility of HPs to prevent HAIs through hand hygiene compliance culture.

Decembrino, et al., (2014: S54) concur with, Mernelius, et al., (2013:586) and mention that transmission of infection from one patient to another patient is through the hands of HPs, and that clearly shows that should all HPs be appropriately

performing hand hygiene according to the recommendations of the World Health Organisation (WHO), the rate of cross-infection could be prevented.

2.2. Factors contributing to the lack of reduction in HAIs

Offiner, Strub, Rebert and Musset, (2016:668) identify in their study and reveal several factors that could contribute to the lack of reduction of HAIs and that include commitment by all HPs, cultural influences and organizational factors that may have negative impact on the reduction of HAIs.

2.2.1. Lack of commitment to comply with reduction of infections.

Morioka, et al., (2013:67e) state that despite the fact that there have been so many recent advancements in perinatal management, neonatal infections remain the major cause of morbidity, poor neurodevelopmental outcome in infants, contributing to death of infants in NICUs. They further mentioned that a lack of commitment by all healthcare workers to reduce HAIs could be key source of these complications. However, it is imperative that all HPs recognise the commitment to comply with a reduction of infection as the crucial measure to reduce HAIs in NICUs.

Hosseinalhashemi, Kermani, Palenik, Poursaghan and Askarian, (2015: 1009) conducted a study on knowledge, attitude and practice of healthcare personnel concerning hand hygiene in Iran. In their study, they recognise how lack of commitment and negative attitudes towards hand hygiene and reduction of HAIs may contribute to infections in all healthcare settings. That clearly indicates that should HPs have lack of collaborative commitment to reduce HAIs that could have a negative impact to patients and causing risks of infections.

Offiner, et al., (2016:667) conducted a study in France and identified that lack of leadership commitment to reduce HAIs in healthcare settings may have a negative impact in reduction of HAIs. They further mentioned that HHCC should be tallied with all leadership's ethical principles in organisation to save lives of patients and to reduce HAIs and promoting compliance in HH. It was mentioned further that HAIs occur in approximately 5% of hospitalised patients and that contributes tremendously to an increase in mortality and morbidity. More than 1.7 million HAIs as well as

99 000 million HAIs associated deaths occurred in hospital settings, meaning that it is important for hospital management to ensure the commitment by all HPs in reducing infections by all methods (Hosseinalhashemi, et al., 2015:1009).

2.2.2. Lack of hand hygiene compliance culture

A study conducted in Japan in NICU by Morioka, et al., (2013: 68e) provides clear evidence that deficiency in prevention of HAIs in NICU is directly related to lack of proper hand hygiene and standard precaution by all HPs in NICU. They identified that HAIs and MRSA's reduced tremendously among patients in NICU while the rate of hand hygiene compliance rate increasing from 50% pre-hand hygiene compliance strategies to 75% post-hand hygiene strategies that were implemented during that period. Meaning should HPs adhere to hand hygiene compliance culture at any time while taking care of patients in NICUs, HAIs may possibly be reduced.

Song, Stockwell, Floyd, Short, Singh, (2013: e101) concur with them through the retrospective cohort study which they conducted on strategies to improve hand hygiene. In their study, commitment towards HHCC by HPs in NICU, contributed tremendously to a reduction of HAIs. That further reduced mortality and morbidity among NICU patients. They further mentioned in their study that most effective strategy in reducing HAIs in all settings of NICU is through an embedded culture of hand hygiene (HH) compliance. That illustrates should HPs in NICU have embedded culture towards appropriate HH practices during their daily practice while taking care of the infants, HAIs rate may reduce tremendously. Consequently, that may positive impact in saving lives of many infants admitted in NICU.

Song, et al., (2013: e102) advocate for World Health Organisation's five moments of hand hygiene, which stipulate instants for HPs in performing HH. Those moments are: prior touching the patient, before performing a sterile procedure, after being in contact with body fluids, after touching the patient, post touching the patient's environment. These five moments of hand hygiene have been regarded as the most effective method of hand hygiene globally. Therefore, all HPs should always remind themselves about significance of compliance in HH being imperative in saving patient's lives. Decembrino, et al., (2014: S54) conducted their study in NICU in Italy, and identify that an outbreak of gram negative bacteria (GNB) and systemic infection with an extended spectrum beta-lactamase (ESBL) was mainly acknowledged from

the hands of HPs in NICU. Meaning hands of the HPs may serve as a mode of transmitting infections from one patient to another through touching patients without performing proper HH.

Rodriguez, et al., (2015:405) mention that HAIs affect 5% to 10% of patients admitted in hospitals and contributing to mortality by 40%, and are closely related to lack of proper hand hygiene compliance among HPs. Meaning hand hygiene should be regarded as the most effective way to reduce HAIs and mortality in NICUs.

They mention further that the main strategy for reducing HAIs in NICUs is through effective hand hygiene compliance. Hosseinialhashemi, et al., (2015:1009) mention that, apart from deaths that occur in hospitals, HAIs pose tremendous financial burdens to the healthcare systems. That may also be directly related to increase the average length of stay due to prolonged treatment caused by HAIs. They mentioned further that most recent studies suggest that there should there be availability of proper compliance to hand hygiene and consistent application of existing infection control practices followed would possibility be 70% reduction of HAIs. Morioka, et al., (2013:68e) identify in their study that was conducted in NICU in Japan that methicillin-resistant *staphylococcus aureus* (MRSA) found to be mainly transmitted through the hands of transiently HPs.

Evidently lack of proper hand hygiene by NICU healthcare workers could facilitate transmission of bacteria through the hands, from one patient to the other. Song, et al., (2013: e101) identify in their retrospective cohort study about strategies to improve compliance in HH, that should there be availability of innovative strategies that enhance hand hygiene being accessible and promoted in healthcare settings, that would easily encourage HPs in complying with hand hygiene practices. Meaning innovative strategies, could effectively be applied and that may have positive impact to HPs in performing HH properly.

Hand hygiene compliance culture amongst the HPs that work in NICU more fundamental, and always has to be safeguarded. Chen, et al., (2015:1324) conducted a retrospective study in China, in a Level III NICU about the consequence of commitment to improve compliance in HH and guidelines in reducing transmission of *Staphylococcus aureus* to new-born infants. They identified reduced hand hygiene adherence among HPs is linked to insufficient information and remoteness of all the

hand hygiene amenities. Then they endorsed that healthcare organisations should stress the awareness of HPs regarding five instants for hand hygiene. They further mentioned that that could enrich patient's protection and expedite decrease of HAIs.

Hooven and Polin, (2014: S4) conducted a study about healthcare-associated infections in the hospitalized neonate and found that the other causes related to HAIs and hand hygiene non-compliance are related to inconsistency and inadequate scope of reporting HAIs in numerous healthcare organisations. It is therefore very important for the auditors and reporters of HAIs and hand hygiene rates in all healthcare organisations to fairly, consistently and correctly report their findings. They state further that it is difficult to estimate financial impact caused by HAIs in NICUs of United States. Moreover, comprehensive statistics are identified as being more undefined. That denotes the significance of specificity and accuracy while reporting the rate of HH in NICU. This could develop appropriate strategies in preventing HAIs to NICU patients.

Offner, Strub, Rebert, Musset, (2016:666) conducted a study about evaluating ethical method which aimed at improving hygiene rules in New York and identified the cause of HAI as being related to inadequate hand hygiene compliance. They further mentioned that the management of healthcare organisations should be very strict in ensuring that hand hygiene rules are applied by all HPSs, which may also enhance the safety of the patients from HAIs.

Larson, Cohen and Baxter, (2012:807) in their study conducted in New York about the importance of hand hygiene, stated that hand hygiene compliance is the major, leading, effective strategy to eliminate the viability of many HAIs. Wetzeker, et al. (2016: 331) state the cause of HAIs is multifactorial, however, lack of hand hygiene compliance has been discovered as the main source of HAIs in many intensive care unit settings. They further mention in their observational study, which was conducted in Germany, that hand hygiene compliance is higher among nurses at 59% when compared to the physicians at 41%.

2.3. Lack of organizational support and organizational culture.

Hosseinalhashemi, et al. (2015:1009) mention that the best strategies to combat HAIs require a change in culture of compliance in hand hygiene among all healthcare teams as well as facility leadership support. Should there be an absence of organisational support to reduce HAIs and to enhance hand hygiene compliance, the chances are that it may have a negative impact on healthcare workers to comply with hand hygiene. That may also be related to unavailability of resources from organisational leadership.

Therefore, organisational leadership should support compliance of hand hygiene by making sure that all necessary resources that enhance correct performance of hand hygiene are accessible to all healthcare workers in NICU. Hosseinalhashemi, et al. (2015:1010) recommend a periodic review of hand hygiene compliance guidelines to reinforce compliance among all healthcare workers and to prevent HAIs. Therefore, it is important for management of healthcare institutions to support and encourage hand hygiene by continuously reviewing their guidelines that are related to hand hygiene. By so doing it will alert all healthcare workers about the importance of hand hygiene.

Walker, et al., (2014:1074) conducted a study about HAIs reduction strategy among NICU patients and discovered that lack of organisational support and lack of an embedded culture of safety among the healthcare workers in the aspects of HAIs reduction and hand hygiene compliance had a negative impact on patients' safety. In their study, they recommended a new hand hygiene monitoring program (HHMP) to be implemented in all healthcare organisations to enhance sustainability in hand compliance culture among all the HPs. It is therefore very important for healthcare leaders to reinforce the culture of patients' safety among all HPs and to continuously strive for the improvement of hand hygiene compliance culture through the healthcare organisation.

Hessels and Larson, (2016:350) mentioned should all healthcare organisations regard HHCC as an essential component that could prevent HAIs and encouraging adherence towards hand hygiene (HH) compliance culture by all staff, most patients would be protected from most kinds of infections. Therefore, it is very vital for

organisational leadership to support and encourage hand HHCC and to recognise hand hygiene as the standard precaution method that has a principal component of inhibiting HAIs. They further mention the necessity healthcare organisations in modelling embedded culture of patient' safety to prevent HAIs. These could be achieved through the process of underpinning of compliance concerning HH. Rallis, Karagianni, Papakotoula, Nikolaidis, Tsakalidis (2016:486) concur and cited that hand hygiene shall remain the cornerstone and the best approach in reducing different kinds of HAIs in NICUs.

Hessels and Larson, (2016:350) mention further that organisational culture and climate are regarded as the greatest variable aspects that ensures embedded patient safety culture. It is therefore significant for organisational leadership to safeguard the organisational culture and climate that develops hand hygiene compliance by all staff. Smiddy, et al. (2015:271) comprehend in their study about the effect of organisational culture on the adherence of hand hygiene regardless of place in an organisation where HPs are working. Therefore, it is paramount important for healthcare organisation management to spread the values of safety throughout the healthcare organisation, by reinforcing HAIs prevention and hand hygiene compliance.

Decembrino, et al. (2014: S55) mention in their study about management of outbreaks in NICU that the key of preventing most outbreaks in NICUs is the application of stricter actions in the HH performance and that could inhibit HAIs. It is therefore vital that strict HHCC is reinforced to all HPs. Hoovena and Polin, (2014: S6) concur with them by mentioning the successful deterrence of HAIs in NICUs requires employment of attentive and strict HHCC by all HPs during all the times while directly being involved with the patient. Patients' safety should always be ensured. Offner, et al. (2016:667) state that the efficacy of adherence to HH and availability of firm ethical procedures could bind all HPs to adhere to the guidelines of hand hygiene at all times.

2.3.1. Lack of collaborated efforts to reduce HAIs.

Cantey, Sreeramoju, Jaleel, Trevino, Gander, Hynan, Hill, Brown, Chung, Siegel, Sanchez, (2013:668) identify in their study that a lack of multidisciplinary team approach may lead to the spread of HAIs, since each individual might perceive

reduction of HAIs differently and may not comply as required. In their study, they demonstrated reductions of HAIs in NICU to be directly related to collaborated team effort and that included reinforcement of hand hygiene to all teams in NICU. Hosseinialhashemi, et al. (2015:1009) concur by mentioning that HAIs prevention is a collaborative effort since HAIs are easily spread through the hands of HPs. Therefore, joined commitment to prevent HAIs may enhance healthcare teams to remind each other about the importance of hand hygiene compliance in reduction of HAIs.

Smiddy, et al. (2015:272) identify that teamwork approach methods to prevent HAIs have been recommended in several studies and also showed some effects in ensuring hand hygiene compliance culture among HPs. That confirms that there is a need for collaborated strength to ensure HAIs reduction in healthcare organisations. Smiddy, et al. (2015:273) recognise further in their study that the challenge of non-compliance in HH to be regarded as a shared challenge that compromise patients' safety and that needs to be addressed by all HPSs at all levels.

Hoovena and Polin, (2014: S4) mention in their study that there is availability of several successful strategies that aid in preventing HAIs in NICU but the greatest method is the attitude of teamwork. According to their findings teamwork found to be effective and produced good results in reducing HAIs in NICUs. Furthermore, teamwork is still regarded as the best practice at all times in ensuring compliance by all HPs. Offner, et al. (2016:668) concur with them by mentioning that the most effective strategy to combat HAIs in NICU is to have a collective action that enhance commitment to hand hygiene compliance in the entire healthcare organisations. That indicates the significance for all HPs to work together as a team to reinforce HHCC all through the organisation.

Chen, et al. (2015: 1324) mention in their study that most successful and sustainable process of preventing HAI is when all the senior management, together with the staff, work and aiming at safeguarding HHCC by all HPs. As a result, team work attitude plays a significant part in ensuring reduction of HAIs in healthcare organisations. Smiddy, et al. (2015:273), applaud that for HHCC to be effective among all HPs, multidisciplinary teams should be dedicated to reduce HAIs by all means. Commitment and support reducing HAIs may be enhanced by modelling of

appropriate practice of hand hygiene. They mention further that lack of organisational support may have negative impact in reducing HAIs.

2.4. Lack of staff empowerment

Hosseinalhashemi, et al. (2015:1009) conducted a study about the assessment of knowledge and attitude of HPs in Iran. In their study they mentioned that participants who attended hand hygiene courses scored well in hand hygiene compliance. According to the report in their study, only one third of healthcare practitioners who participated in their study had moderate self-reported hand hygiene compliance. They further reported that poor hand hygiene compliance was self-reported by other healthcare workers in Iranian, Egyptian, and Greek studies.

Cantey, et al., (2013:676) conduct a study about outbreak of Klebsiella Pneumonia in NICU and they discovered that outbreaks were closely related to the lack of staff re-education regarding proper hand hygiene and HAIs reduction, apart from other factors. That means it is important for HPS in NICU to be frequently be re- educated about hand hygiene so as to reinforce compliance. Decembrino, et al. (2014: S55) mention that one of the strategies to combat outbreak of infections in NICUs is through education of HPs about HAIs, importance of HHCC and review of existing infection control policies. Meaning it is vital for HPs to be educated about matters related to HAIs prevention and the importance of HHCC.

Mazi, Senok, Al- kahldy, Abdullah (2013:01) conduct a study in Saudi Arabia on implementation of WHO's strategy in enhancing HHCC and comment further that should WHO's five moments of hand hygiene being effectively taught and encouraged to be practiced by all HPSs, the chances of HAIs being reduced may be enhanced. They also cite that hands have been proven in many studies to be the main source of transferring HAIs from one patient to another. Hosseinalhashemi, et al. (2015:1009) mention that continuous education to all healthcare workers regarding the importance of hand hygiene in HAIs reduction should be emphasised, since lack of knowledge may have a negative effect in HAIs reduction.

Smiddy, et al. (2015:271) mention that proper hand hygiene is regarded as the simplest and the most effective measure to prevent HAIs. Their studies show that lack of knowledge and understanding about the importance of hand hygiene

compliance culture is the main factor that impedes HAIs prevention. Hosseinialhashemi, et al. (2015:1010) concur with them about the fact of lack of knowledge and understanding has a negative impact to HAIs prevention. It is therefore imperative for organisational leadership to ensure that all HPSs in healthcare organisations have adequate information and understanding of the importance of hand hygiene compliance.

Walker, et al., (2014:1074) identified in their studies about HAIs reduction in NICU and mentioned that hand hygiene improves with proper training, increased monitoring and immediate feedback to HPSs regarding their hand hygiene compliance. In their studies, they discovered that HAIs contribute to complications leading to 100 000 deaths per year in the U.S. (United States). That also serves as evidence that lack of adequate training about hand hygiene compliance may have a tremendous negative impact on patients' health. Rodriguez, et al. (2015:410) mention in their study that lack of training about hand hygiene and its importance as the main contributory factor to many bacterial infections which was evidenced in the study that was conducted in Argentina, and which showed a tremendous improvement of hand hygiene compliance by many HPSs after attending training about hand hygiene and HAIs.

2.4.1. Lack of provision of feedback about HAIs and hand hygiene

Parriott, Saint, Olmsted, Krein (2015: S3) conducted a study in Michigan and found that lack of provision of data and feedback to all healthcare workers is the main cause of non-compliance in hand hygiene. In their self-reported compliance study on hand hygiene, it was also evident that lack of provision of adequate training about hand hygiene is the main contribution to non-compliance by healthcare workers. That clearly shows that the more informed the healthcare workers are about HAIs prevention and hand hygiene compliance, the more effective the HHCC will be.

2.5. Factors Contributing to reduction of HAIs

On the other hand, literature has revealed that there are several factors that may contribute to the reduction of healthcare associated infections as follows:

2.5.1. Commitment to comply by all healthcare workers

Commitment of HPs to change towards appropriate HH practices could be enhanced by deploying effective strategies fostering transformation in organisations. Hence, the researcher explored the self-assessment factors that may contribute in impeding readiness of change reduction of HAIs in NICUs. HAIs could be reduced through culture change by all healthcare workers. (Milano, 2015:1010). They are the main role players in reduction of HAIs.

Non-Compliance in hand hygiene has a negative impact on patient's safety (Smiddy, et al., 2015:20). Therefore, it is of vital importance for all HPSs to commit to HHCC. The hands of healthcare workers have been identified as the main source of transmitting HAIs (Smiddy, et al., 2015:269).

Mazi, et al. (2013:05) mention that the involvement and commitment of the leadership team in activities of HH compliance is found to have a tremendous positive effect in enhancing HHCC. Commitment and involvement by organisational leadership may be identified by other HPs and they may copy that good attitude and apply it in their daily activities to reduce HAIs.

Hosseinalhashemi, et al. (2015:1009) mention that commitment by all Health professionals to HAIs reduction may have a financial benefit to healthcare organisations, and estimate that \$25 to \$31.5 billion in medical costs per annum could be saved. Therefore, it is important for all healthcare workers in NICU to be committed to the reduction of HAIs in order to save the costs related to hospitalisation as a result of HAIs.

2.5.2. Hand hygiene

(Smiddy, et al., 2015:269) cited that contaminated hands were found to be the main source of transferring infections from one patient to another while touching the patients and their environment during point of care. Therefore, HHCC could serve as an effective strategy that can prevent HAIs to be transmitted from one patient to another. Hessels & Larson (2016:16) state that all healthcare workers need to regard hand hygiene as a standard precaution as the core component of prevention of HAIs. The researcher is of the view that, should all HPSs comply with the correct standard principles of hand hygiene, it can enhance the reduction of HAIs

tremendously. Hosseinialhashemi et al. (2015:1009) further recommend that the key element in the prevention of HAIs is universal HHCC among HPs.

Hessels and Larson (2016:351) mention that patients could be protected from HAIs should all HPs regard HH to be the core component in preventing HAIs. The further cited that that could enable safer and cheaper strategy for protecting patients from HAIs. That means it is significant for all HPs to have a culture of patient 'safety be embedded through the commitment to comply in HH. Rallis, Karagianni, Papakotoula, Nikolaidis and Tsakalidis (2016:486) mention that HH remains the cornerstone and best strategy to eliminate HAIs in all types of NICUs.

Wetzker, Bunte-Schoberger, Walter, Pilarski, Gastmeier, Reichardt (2016:330) conducted an observational study in Germany about compliance with hand hygiene and discovered that hand hygiene compliance is mostly performed by HPSs after the contacts with patients as compared to before contact with the patients. That means the HPSs concern is mainly about the removal of the infection after touching the patients rather than before. In their study, the median hand hygiene recorded before contact with patients is 67% before touching, 73% before performing aseptic technique whereas after touching the patient is 84% and after performing a procedure 79%; and, after touching body fluids 81%. That is evidence that HPs' concern is to avoid self-infection after being in touch with the patient rather than before touching the patient, which is also very risky. This shows the tendency of HPs is to protect themselves from risks associated contaminated and infections. That has been apparent in many studies

2.5.3. Organizational support and culture

Hessels and Larson (2016:13) mention that organisational culture and climate are the most important aspects in ensuring embedded patient safety. Smiddy et al (2015:15) realise that organisational culture has a direct influence on the performance in relation to compliance despite where the healthcare workers are placed within the organisation. However, it is of vital importance for management of healthcare organisations to ensure that the culture of safety is embedded throughout that organisation through reinforcement. Decembrino, Maini, Decembrino, Maggia, Lacerenza, (2014:30) mention that it is important for management to reinforce strict HHCC to all HPs.

It is clear that the key to prevent most outbreaks in NICUs through applying stricter measures of HH principles. Hoovena and Polin (2014: 36) concur with Decembrino et al. (2014:33) by mentioning that successful implementation of HAIs prevention in NICUs requires vigilance and strict HHCC by all HPs at all times. Offner, Strub, Rebert, and Musset, (2016:669) stated that for efficiency in hand hygiene compliance, firm methods and rules reinforcing devotion to hand hygiene compliance should always be implemented. Hosseinialhashemi et al. (2015:1009) recommend that the key element in the prevention of HAIs is a culture of universal hand hygiene compliance among healthcare workers.

If the culture of hand hygiene compliance is embedded in all healthcare workers, more patients may be saved from all kinds of HAIs that are being transferred through the hands of the healthcare workers. Walker et al. (2014; 1075) emphasise in their study about real-time data provision to organisational leadership and ensuring leadership support to all staff. Therefore, should organisational leadership constantly be aware about the current situations pertaining to HAIs and compliance to HH by all HPs, their support may have positive impact in reducing HAIs.

2.5.4. Teamwork

Smiddy, et al. (2015:270) recognise the challenge of non-compliance in hand hygiene to be a collective challenge which needs to be addressed by all healthcare workers, since that compromises patient's safety. Facts sheet of the WHO, (2003:02) recommended the approach of teamwork as the best method of implementing hand hygiene compliance in organisations that have showed some positive effects in ensuring hand hygiene compliance among HPs.

Hoovena & Polin, (2014:28) mention that there are several successful strategies existing to prevent HAIs in NICU and the best approach is teamwork since it has proven to yield good results in the reduction of HAIs in NICU and is still regarded as the best practice at all times. Offner, et al., (2016:269) concur with Hoovena and Polin, (2014:22) and record that the most effective best strategy to combat HAIs in NICU is a collective action through commitment to hand hygiene compliance by all teams in healthcare organisations. That means all the HPSs should work together as a team to reinforce hand hygiene compliance throughout the whole organisation.

Chen, et al. (2015:1322) mention that the most successful and sustainable prevention of HAI is when all the senior management work together with the all the staff and aim at ensuring compliance in hand hygiene.

Therefore, a teamwork approach plays a substantial role in reducing HAIs in healthcare organisations. Smiddy, et al., (2015:272) recommend that the process of ensuring prevention HAIs include the support of multidisciplinary teams towards the support for suitable hand hygiene practices. It is imperative for all the multidisciplinary teams to have commitment and support towards compliance in HH. Hence teamwork proven to yield good results in reducing HAIs. Mazi, et al., (2013:05) mention that a multidisciplinary approach with the guidance of a team leader may enhance modality for behavioural management with regard to hand hygiene and the sustainability of HHCC by all healthcare workers. That shows that HHCC is a team effort as compared to an individual effort.

2.5.5. Staff empowerment

It is of importance that the NICU management team ensures that all HPs working in NICU are empowered on HAIs prevention strategies in a frequent manner (Offiner et al., 2016:14). Training of all healthcare workers on HAIs prevention strategies enhances the reduction of HAIs. Offiner, et al., (2016:666) emphasise that all healthcare workers should be empowered from the beginning of their orientation phase in NICUs regarding hand hygiene and the importance in prevention and reduction of HAIs. Hale, Powell, Drey & Gould, (2015:34) recommend that the empowerment of all staff and healthcare students regarding prevention of HAIs should start at the initial phase of induction while HPs are being prepared for practice. That may enable that by the time they directly being in contact with the patients the culture of safety and compliance in HH would be already embedded.

Hale, et al., (2015:35) recommend that senior management should empower the staff through acting as role models by ensuring correct hand hygiene compliance at all times. That indicates that HPs could copy good behaviour of performing HH appropriately from their leaders. Hale, et al., (2015:45) conduct a cross sectional study and their results showed positive influence of knowledge, training and attitude of the HPs in facilitating the reduction of HAIs. Resendea, et al., (2015:53) concur

about the importance of training and mentioned that staff empowerment has a positive impact to the HPSs' ability to adhere to hand hygiene compliance.

Therefore, staff empowerment may serve as an effective strategy to enhance reduction of HAIs among NICU patients. Smiddy, et al., (2015:38) identify that empowerment of staff may be regarded as strategy enhancing peer group role-modelling through influencing each other on compliance with HAIs reduction. As a result, non-complying healthcare workers may learn and gain knowledge and experience from HPs performing HH correctly.

Smiddy, et al., (2015:270) recommend that the provision of a hand hygiene training program to all HPs and that should be the top priority for all healthcare organisation management teams. Should management address and regard hand hygiene as a top priority in reducing HAIs, all HPs would comply with hand hygiene practices. Hosseinialhashemi, et al., (2015:1010) emphasise further about the importance of raising awareness to all HPs about hand hygiene and the provision of significant training and incentives to compliant healthcare workers. Consequently, that might motivate all the staff performing HH as required in enhancing patients' safety.

Smiddy, et al., (2015:271) state that staff empowerment should be regarded as a part of a multifaceted approach or as a stand-alone intervention that enhances hand hygiene among all the HPs. Offiner, et al., (2016:667) discuss the importance of NICU management teams in ensuring HPs working in NICU be more frequently empowered about the importance of HHCC. They further highlight that empowerment of all healthcare workers regarding hand hygiene and its importance to reduce HAIs should be introduced from their orientation phase in NICUs.

Hale, Powell, Drey and Gould, (2015:80) concur with them by stating that the empowerment of all staff and healthcare students about hand hygiene and HAIs should be stressed during the process of preparation for practice. That will ensure that by the time they are in direct contact with the patients the culture of safety about HHCC is already embedded. Hale, et al., (2015:80) recommend further that senior management should empower the staff through acting as role models by practicing and ensuring HHCC at all times.

Resendea, et al., (2015:54) agree about the importance of training as they mention that, empowerment has a positive impact in enabling HPs to adhere to hand hygiene compliance culture and reduction of HAIs. They stated in their study that staff empowerment has been proven to yield good results in the reduction of HAIs among NICU patients. Hale, et al., (2015:79), during their cross-sectional study, identified that adherence to HHCC may yield reduction of HAIs. Their results displayed how sufficient knowledge, training and attitude of the HPSs may positively influence HHCC and yield a reduction in HAIs.

Smiddy, et al., (2015:272) identify empowerment and peer group influence as having positive impact on HHCC. That may be due to the fact that when hand hygiene is performed correctly by those role models, the non-complying HPs might learn and copy the correct ways to perform hand hygiene. They further mention that health workers' knowledge on how to perform hand hygiene properly has a positive relationship to the reduction of HAI and increasing of HHCC. Meaning that if all HPSs are competent in performing hand hygiene and understanding its importance, HAIs in NICU may be reduced immensely.

Smiddy, et al., (2015:273) endorse further that the provision of hand hygiene training program to all healthcare workers should be the top priority for healthcare organisational management teams. They also mentioned the importance of regarding it as a part of multifaceted approach and not as a stand-alone intervention that can enhance HHCC among all HPs.

Walker, et al., (2014; 1076), cited in their study about the norm of extensive education which includes participation of HPs in HH campaign. They further applaud the reinforcement of HH compliance and teaching about the risks that are associated with non-compliance to hand hygiene. Being educated about the risk of non-compliance to hand hygiene and understanding all the risks may enhance the sense of patient safety and HHCC to HPs. They report further in the study that during the process of facilitating operational learning, all HPs were assigned to an electronic learning module describing four key components of hand hygiene compliance and its importance in reinforcing accountability to HPs and fostering HHCC. They also mentioned the importance of providing additional learning materials such as posters and pamphlets of information about the prevention of HAIs, demonstration of proper

hand hygiene in prevention of HAIs. Therefore, each department leader should strengthen mandatory education about HH and its significance.

2.5.6. The use of multimodal hand hygiene intervention

Rodriguez, Giuffre, Villa, Almada, Prasopa, Plaizier, Gogna, Gibbons, Elorrio, (2015: 405) conduct a stepped, wedged-cluster, randomised trial about the utilisation of multimodal intervention in improving hand hygiene in the intensive care units of Buenos Aires in Argentina. Their study showed the effectiveness in application of the use of a multimodal strategy in enhancing HH. They further mentioned that hand hygiene should be regarded as a cost-effective measure that reduces transmissions microbes HPs' hands. Therefore, hands of HPs have been recognised as being the fastest modes of transferring infections from one patient to another.

Mernelius, et al. (2013:586) mention that multimodal hand hygiene intervention is regarded as the most suitable method that has substantial and consistent improvement in HHCC for longer period. Rodriguez, et al., (2015: 406) mention that multimodal interventions were designed based on evidence-based practices and low-cost strategies to reduce HAIs. They further report that some of the low-cost strategies that were suggested by qualitative researchers were as follows: leadership commitment, surveillance of the materials needed to comply with appropriate HH practices and alcohol consumption. They cited further effective utilisation displaying reminding strategies, showing the storyboards of the HAIs and hand hygiene projects, and the provision of feedback regarding hand hygiene compliance rate

The application of multimodal hand hygiene intervention revealed some positive impact on ensuring HHCC among the HPs taking care of the NICU patients. Mernelius, et al., (2013:586) advocate for utilisation of multimodal hand hygiene intervention approach. They mention further that that should be considered as best method in enhancing HHCC among healthcare workers.

Rodriguez, et al., (2015:405) concur with them by stating in their study that the effects of multimodal hand hygiene intervention may yield good outcomes in the prevention of HAIs. They cited further that that has been established as being best method to ensure HHCC among the HPs in Intensive care units. They also recognise that proper hand hygiene be regarded as a crucial strategy that eliminates HAIs in NICUs. Wetzker, Bunte-Schönberger, Walter, Pilarski, Gastmeier, & Reichardt,

(2016) indicate in their study done in Germany, and identify HH as the greatest method in providing positive results for preventing HAIs. Their study showed some positive correlation between HHCC and reduction of HAIs in all types of patients.

Rodriguez, et al., (2015: 407) mention that the most cost-effective measure to reduce HAIs in hospitals is hand hygiene and the implementation of multimodal hand hygiene intervention. They mention further that in 2005, the World Health Organization (WHO) embarked in a global initiative campaign that aimed at improving HHCC in healthcare organisations. That initiative campaign was called “clean care is safe care” meaning should patients be taken care of with clean hands their care shall be regarded as safest. They further state that the initiative emphasised five points addressing the impact of structural facilities ‘accessibility. For instance, alcohol hand rubs need to be placed at the point of care; training and education regarding HH should be provided to all HPs; monitoring and giving feedback about results should be ensured; reminders about HH at the workplace among healthcare workers should be noticeable; and creating a safety climate. Their studies showed how effective and efficiently the application of multimodal hand hygiene intervention in yielding positive results.

Rodriguez, et al., (2015: 408) reveal that two, recent, systematic reviews were conducted on the five points of the WHO and that yielded an evidence-based improvement of hand hygiene compliance from 50% to 85% during the six months’ period of implementation. That demonstrated the impact of utilisation of WHO’s five points in improving hand hygiene compliance if applied in all healthcare settings. Their study revealed possibility of tremendous improvement in hand HHCC among HPs.

2.5.7. The provision of immediate feedback

Establishment of immediate feedback just-in-time about the positive or negative behaviour regarding hand hygiene compliance by auditors has a positive impact on HAI reduction by HPs.

Walker, Sistrunk, Higginbotham, Burks, Halford, Goddard, Thombs, Austin, Finley (2014:1075) conducted a study about the importance of providing immediate feedback to HPSs about HAIs and hand hygiene compliance. They also mention the impact of continuous monitoring on the reduction of HAI through adherence to

HHCC. It is of vital importance for auditors of hand hygiene and HAIs to continue giving feedback to all the healthcare workers. They should be transparent and honest when giving the results, regardless whether the report is positive or negative. By so doing it may serve as a reminder to healthcare workers in NICUs to ensure adherence to proper hand hygiene while dealing with all the patients in NICUs.

Hale, et al., (2015:79) concur about the importance of ensuring continuous feedback, monitoring and adherence to principles of hand hygiene compliance. Smiddy, et al., (2015:33) applaud the provision of feedback about hand hygiene compliance to HPs and its importance and impact in ensuring patient safety by healthcare workers. They further indicate importance of giving feedback to HPs regarding their hand hygiene compliance. They further mention that provision of feedback about compliance in HH and reduction of HAIs should be recognised as the most vital component related to the patient safety framework by all healthcare workers.

Walker, et al., (2014; 1075) state that providing immediate feedback for non-compliance to all healthcare workers regarding hand hygiene is very important and should be regarded as a teaching opportunity rather than as a punishment. They further cited the significance of giving feedback regarding HPs' performance in hand hygiene. That should be done in a way that will make them realise the importance of compliance. Hagel, et al., (2014:03) quoted by Wetzker, et al., (2016:331) discovered that HPs have a tendency of developing Hawthorne effect in hand hygiene compliance, particularly when they are aware that they are being observed. However, the best strategy to observe compliance in hand hygiene is while the HPs are not aware. That may yield honest and non-biased feedback about their performance and their HHCC.

Walker, et al., (2014:1075) state in their study and emphasised provision of feedback to both hand hygiene compliant HPs as well as the non-compliant ones. They further cited that one of the strategies of giving feedback to non-compliant HPs is distribution of written feedback cards "reminding them to do hand hygiene before and after" patients' care. They discussed further that feedback cards be given to compliant staff and may be written "thank you for complying with proper hand hygiene". That may serve as encouragement complying with hand hygiene

processes. Mernelius, et al., (2013: 586) concur with them about significance of providing feedback to all HPs in enhancing HHCC and reducing HAIs.

2.5.8. Self-assessment

Sedikides and Strube, (1997:210) explain self-assessment as the process of evaluating oneself so as to measure some elements which are vital to an individual's identity. In this aspect, participants are more likely to provide accurate information about themselves since the participants would be more active and honest in their characteristics. They further state that self-assessment forms part of self-verification and self enhancement. However, Sedikides and Strube, (1997:215) state further that the self-assessment motive may speed up the process for individuals to seek more information in order to endorse their unclear self-concept than their definite self-concept.

On the same note Sedikides and Strube, (1997:215) mention that individuals utilizing a self-assessment drive may be seen to be absolutely different from others' self-evaluation motives. They also indicate that there is a likelihood of tremendous reflection from the participants who are engaged in self-assessment than those who do not participate. In their review, they further mention that individuals are more inclined to participate in aspects that are more accurate about them than those that are not. Therefore, the characters of those individuals would be explained in a manner that portrays honesty with regard to their opinion in self-assessments and would be higher than those who are not.

Thus in self-assessment, more insight about a participant may be gained and the participants may be more disposed to divulge more information about their behaviour or character. Sedikides and Strube, (1997:230) mention further that in self-assessment, deeper traits about individuals may be identified than if individuals are not participating in a self-assessment process. On that aspect individuals may show more commitment to improve themselves after the reports are given to them about self-assessment results.

2.5.9. Perception

Weiten, (2008:171) states that perception is the assessment, identification and analysis of sensory information so as to denote and understand the environment. The manner in which the environment may be analysed may be directly linked with the manner in which it may be interpreted by an individual. He further mentions that all perceptions are derived signals occurring in the nervous system, resulting from physical and chemical stimulation of the sense organs.

Therefore, perception may be enhanced by learning, memory expectation and attention. He also stated that perception may split into two portions, the first one is through processing inputs which convert these low-level data to higher level data, for example, excerpts and shapes for object identification. The second one is with the processing that is attached to an individual's concept and expectations - or knowledge and selective mechanism and attitude - that guides perception. Since perception relies on complex functions of the nervous system, it means subjectivity is mostly effortless due to the processing that happens outside conscious awareness.

He stated further that the perception systems of the brain may enhance the individuals to view the world around them as a steady environment even though the sensory data may be incomplete and rapidly varying. Perception varies according to each individual's paradigm shift or world view. For example, other individuals may perceive the picture of a component or phenomenon in a different view than others. A common finding may diversify the perceived qualities of a phenomenon or object.

2.5.10. Attitude

Minton and Khale, (2014:03) describe attitude as the psychological constituent which involves mental and emotional phenomenon that characterizes an individual. They further mention that attitude is acquired through experience. Therefore, it is the individual's prone state of mind about a value that is triggered through a response manifestation towards an individual, place, thing or an occurrence which influences the individual's thoughts or actions. On that note attitude may be influenced from an individual's past or present behaviour.

However, one's attitude may change for better or for worse depending on the particular situation. That means attitude may range from an extreme negative to an extremely positive behaviour. Other individuals may hold a negative attitude towards certain phenomenon while others may hold a positive attitude towards the same phenomenon depending on different scenarios. They further stated that attitude is a psychological aspect that is expressed by evaluating an individual in a particular entity with certain degree of favour or disfavour.

Therefore, attitude may influence attention, action and encoding automatically, despite the individual's ability to pursue distinct objectives. They also further mention that an individual's attitude is determined by like ideas, values, beliefs and perception. All those complex characteristics contribute in determining an individual's attitude, values, and principles of their life. However, an individual's attitude about certain phenomena may lead to certain actions resulting in certain outcomes about that particular phenomenon.

Perloff, (2016:25) mentioned that attitude can be changed through persuasion and that the most vital aspect of enhancing it is true communication and training of individuals. When individuals receive proper training and communication it may change their way of viewing things as well as their attitude towards certain aspects of life. Wood, (2000:540) describes the attitude component models as, a cognitive component, an affective component and a behavioural component, Details of each follows:

2.5.11. Attitude component models

Multicomponent model is the greatest significant model of attitude. Where attitudes are assessments of an aspect that have cognitive, affective, and behavioural components. These components are also known as taxi CAB to provide destination for individuals Wood, (2000:541).

2.5.11.1. Cognitive component:

The cognitive component of attitudes denotes to the beliefs, thoughts, and attributes that we would connect with an object. Wood, (2000:542) mentions that many times a

person's attitude might be based on the negative and positive attributes they associate with an object.

2.5.11.2. Affective component

The affective component of attitudes denotes one's state of mind or emotions linked to an attitude item. Affective responses influence attitudes in many ways. For example, many people are afraid/scared of spiders, Wood, (2000:543). So this negative affective response may lead to some individuals to have a negative attitude towards spiders.

2.5.11.3. Behavioral component

The behavioural component of attitudes denotes to past behaviour or experiences regarding an attitude object. The idea is that people might deduce their attitudes from their previous actions. Minton and Khale, (2014:50) mention that more often individual's attitude is directly linked with previous or current experience about something.

2.6. Summary

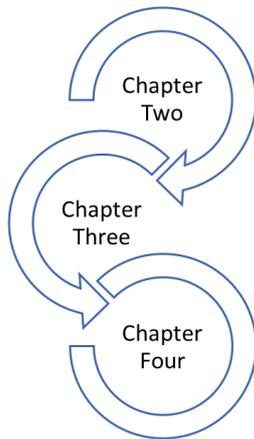
There are several factors identified during review of literature. Those factors that may impede the reduction of HAIs, for instance lack of commitment to comply with reduction of HAIs; lack of hand hygiene compliance culture; lack of organisational support and organisational culture; lack of teamwork; lack of staff empowerment; and, lack of provision of feedback to all HPs.

Nonetheless, on the other hand, availability of HHCC, support from management, staff empowerment, provision of feedback, the use of multimodal hand hygiene intervention has been identified as factors that could uphold reduction of HAIs and HH compliance among NICU staff. Research methodology discussed in the next chapter.

2.7. Conclusion

In conclusion, it has been evidenced through literature reviewed that HAIs are a major challenge worldwide and are the main source of mortality and morbidity in many healthcare organisations. It was further identified by the researcher through

the literature reviewed that HAIs could be preventable by means of enhanced commitment and readiness to change compliance behaviour in preventing and reducing HAIs.



The previous chapter described in detail about literature review

This chapter describes the research methodology utilized

The following Chapter focuses on the research findings

3. CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

Previous chapter highlighted the relevant literature which informed this study. Furthermore, factors influencing the reduction of HAIs and possible solutions were identified. This chapter focused on the methodology utilised in the study to explore the factors self- assessment of hand hygiene compliance by health professionals in NICU in a tertiary hospital NICU in Saudi Arabia.

3.2. Study setting

Study setting described as environment within which the researcher collects data pertaining to the problem under observation (Polit and Beck, 2014 :30). Study was conducted in Level III NICU in a tertiary hospital. The hospital is in the central city of Riyadh in Saudi Arabia. The hospital has 884 beds, and NICU has a total bed capacity of 44 beds, with bed occupancy of 90% with 27 Critical area beds and 17 high dependency beds. The unit belongs to leadership of the Children's Specialised hospital and it is adjacent to labour and delivery rooms. Classification of NICU is a Level III facility that provides outstanding care to new-borns.

Unit provide treatment and services for all neonatal medical and surgical illnesses. The unit is more specialized in the comprehensive care of critically ill neonates with genetic and /or congenital abnormalities, premature neonates, and new-borns with respiratory distress syndrome, broncho-pulmonary dysplasia, meconium aspiration, shock, withdrawal symptoms, pre-and post-surgical neonates. The total number of annual admissions varies between 600-650 infants.

For the last two years, the unit had total of 1,246 admissions (2014=600; 2015=646) Scope of service, NICU (Scope of service manual 2016:01). The hospital is accredited with Joint Commission International Accreditation (JCIA) Standards for hospitals and academic medical centre hospitals. Section II of patient-centred standard is about International patient safety goal, whereby goal number five is about reduction of risk (HAIs Manual of JCIA 2014:27). The hospital which the research was conducted has an Infection control department with Infection control practitioners allocated to each unit. In NICU under study there are designated,

assigned Infection control practitioner available 24-hours around the clock. There is availability of Link nurses assigned for central line catheter monitoring and evaluation and data collection as well as for hand hygiene auditing and management.

3.3. Research design

The research design is defined as a “blueprint” designed specifically to conduct the study that maximises control over dynamics that could interfere with the study’s desired outcome (Grove, Grey and Burns, 2015:45). In this study, the researcher opted selecting quantitative descriptive approach, to collect the data. Research designs were developed to address research needs as they emerge, and that is applicable on a descriptive study.

Descriptive designs, are utilized in identifying realities of interest and could define variables within a fact (Grove, et al., 2015:502). Descriptive research offers an exact portrayal or account of the characteristics of a person, event, or group in real life situations. The researcher utilised the descriptive design in this study in order to engage with the self-assessment of the HCPs on hand hygiene practices and their attitudes and perceptions which influence the HAIs within the NICU. Based on the literature presented. The descriptive design was best suited to give an account of the situation within the NICU in order to recommend better practices.

3.4. Population and sampling

Kerlinger and Lee (2000) mentioned in Grove, Grey & Burns (2016:46) that a population is the element which could be involved in meeting criteria for the study. For instance, individual, substances or objects. In this study the total population was all medical doctors and nursing staffs working in NICU required to engage in hand hygiene practices (N=172).

The population is all nursing staff (N=160) and doctors (N=12) staff that are working in NICU. Total population was used and that included all nurses and doctors who are employed fulltime in NICU and who have worked in the NICU department for a period of one year and above. Due to the fact that the population was small the researcher decided to use the total population in the study.

3.4.1. Sampling method

Polit and Beck, (2012:24) define sampling as a process of selecting cases to represent an entire population so that inference about the population can be made. In this study, no sampling method will be applied since the total target population will be utilised for the survey, and that includes all nursing and medical staff working in the NICU.

Banerjee and Chaudhury, (2015:02) mention that target population is a group of elements to which the researcher intends to make the interference about and they further state that theoretically population is finite and therefore possible to be counted. In a nutshell, a group of population is the entire number of individuals or objects which the researcher is interested to study and generalize the findings.

Ross, (2013:210) states that the target population are precise elements that are described that are to form the focus of the study. The author further mentioned that in most studies, population is finite, an aspect that consists of elements that conform to some designated set of specification. These specifications are relevant to provide clear guidance regarding which elements are to be included in the population. The target population solicits an operational definition that may be utilized to guide the establishment of a list of population elements or sampling frame, from which the sample may be obtained.

The elements that are being excluded from the desired target population in order to construct a defined target population are referred to as the excluded population. In this study the researcher is intending to use all medical and nursing staff who are full time employees in NICU as the target population to be included in the study.

The participants' names were picked electronically through organisation data scheduling which is centralised and that was performed so as to ensure appropriate identification of all the staff who are working in NICU from other departments. Each respondent was given a structured questionnaire. This was completed in their own time without interfering with their work activities. The researcher explained the purpose to the respondents, and reassured them about their privacy and anonymity. An informed consent was obtained, and the respondent was issued with envelopes in which to place the answered questionnaires and afterwards to seal them.

3.5. Sample representativeness:

The total population was included in the study which ensured representativeness. All the nurses and medical doctors working in the NICU who are involved in the care of the neonates were included in the study (N= 172) respondents, which is 100% of population. This was the target population in this NICU.

3.5.1. Inclusion criteria

The inclusion was all medical and nursing staff who are full-time employees of King Fahad Medical City, Children's hospital and who had worked in NICU for a period of one year and above. No medical and nursing staff were excluded.

3.6. Instrumentation

Grove, Grey & Burns, (2015:310) defined data collection as "the method of acquiring subjects and collecting data for the study". In this study the data was collected by using a self-administered questionnaire (see appendix 6). An existing self-administered questionnaire was used. The researcher identified the questionnaire during the review of literature and decided to utilise it based on relevancy to achieve the research objectives through data collection. The questionnaire had nineteen questions and three sections with multiple choice questions. The sections on questionnaire are as follows:

- Section A contains general information about the participant
- Section B contains statements about absolute and relative frequencies of answers with hand hygiene of self-assessment
- Section C contains statements about attitude, beliefs and perceptions related to hand hygiene

The questionnaire was extracted from the study which was published in *Journal of Pharmacy and Pharmacology* in Jessenius faculty of medicine, Department of nursing in Comenius University in Bratislava, Slovakia. The study was conducted in five hospitals in the Slovak republic and in three hospitals in the Czech Republic. The study was conducted to assess the perception of doctors and nurses towards hand hygiene and data was collected from April 2014 to July 2014 (Kekikova,

Dusenka, Mazuchova and Kucmova, 2016:164). No modification was done on that questionnaire about which the study was conducted.

3.7. Pilot test

Burns, Gray and Grove, (2015:45) described a pilot test as the small scale version that tests methods to be utilised to a larger more rigorous study. The questionnaire was distributed to 17 staff which composed of 12 Registered nurses and 5 Physicians who were fulltime employees in NICU ,however those participants represented about 10% of the target population and the data was included in the main findings. The reliability of the questionnaire was 0.80 from the authors and the researcher did not find any differences with the current study therefore decided to include the pilot data in the analysis as the study sample was small and the inclusion would not affect the study. Pilot testing of the questionnaire was appropriate, the respondents understood the questionnaire and the questionnaire was suitable to achieve the study objectives. The analysis of the data was used to ensure reliability of the questionnaire and the results were used in the main study.

3.8. Validity and reliability

The validity of a research instrument is the determination of how good the instrument is, how accurate and whether it reflects the abstract concept under study (Burns, Gray and Grove, 2015:290). The research instrument was used in the study in the University Hospital Martin in Slovakia in the Faculty of Medicine. The researcher contacted the researchers through mail for permission to use the questionnaire. The research instrument was accepted by the infection control department of the organization and Research Ethics Committee and the supervisor. The researcher met with the organisational statistician who made recommendations on how to go about the criteria for sampling, data collection instruments and data analysis.

Pre-testing the instrument also served to contribute to the reliability of the instrument with the statistician assisting to calculate Cronbach Alpha for reliability. The Author of the questionnaire had indicated that the reliability of the questionnaire was determined by Cronbach's alpha with the value of 0.80 (Appendix 9). This was satisfactory to use for the study as it was acceptable reliability (Burns, Gray and Grove 2015:45).

3.9. Data collection

Data was collected by using self-administered questionnaires (Appendix 1). Data was collected over a period of three months. Data was collected at the respondents' workplace, by recruiting the participants during their breaks. Participants were given informed consent forms to complete and place in sealed envelopes which were marked "completed informed consent form".

After completing the informed consent form they were issued with self-administered questionnaires to complete, place in an envelope and drop in a marked box labeled "*completed self-self-administered questionnaire*". The respondents were requested not to write their names or identifiers in the questionnaires. The researcher placed the envelopes under lock and key. Throughout data collection the researcher ensured adherence to ethical principles by ensuring that confidentiality, privacy and anonymity was maintained.

3.10. Data analysis

Data was analysed, and descriptive statistics were used to describe the ability of the medical and nursing staff to effectively understand the importance and readiness to reduce HAIs in NICU. Data was entered in on Excel sheets and then analysed by the researcher using SPSS (Statistical Package for Social Sciences) version 22.0 2016.

Descriptive analysis was used to examine all data. Grove, et al., (2015:319) explained that descriptive statistics are summary statistics that help the researcher to be able to organise the data in a meaningful way that facilitates insight. Data will be presented in frequencies, mean, standard deviation, and ranges. Quantitative data analysis technique was applied, and descriptive statistics were used to explain data tables, graphs and charts which were used to illustrate and summarise the findings. A further analysis was applied to determine the statistical difference between variables.

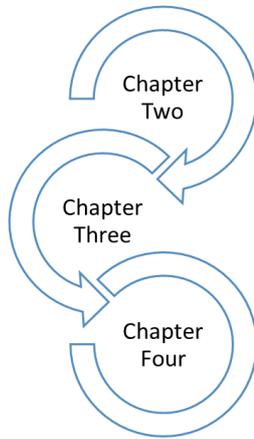
3.11. Summary

Research methodology that was applied in this research was discussed in this chapter. Descriptive design was used in this study since it was relevant to the researcher's study objective. Target population was used in this study, and that

included all medical and nursing staff working in NICU. The next chapter will discuss about the findings, interpretation and presentation of the results.

3.12. Conclusion

Various steps of research methodology were discussed. The research design and research process and data collection and data analysis were highlighted.



The previous chapter described in detail the literature review done

This chapter describes the research methodology utilized

The following Chapter focuses on the data findings described in

4. CHAPTER FOUR

FINDINGS/RESULTS

4.1. Introduction

Research methodology was discussed in chapter three. Data was collected, interpreted and outlined in this chapter. Data was analysed and interpreted according to the researcher's objectives for the study. In this chapter results for socio-demographic characteristics will be presented, as well as absolute and realistic frequencies of self-assessment answers of hand hygiene among all the respondents, as a group comparison in relation to hand hygiene compliance culture.

4.2. Data analysis

Data analysis is the method in which raw data is organised and is presented in order to provide meaning to the data (Grove, Gray and Burns, 2015:47). Quantitative data was analysed in this research study. Grove, Gray and Burns, (2015:45) mention that the analysis technique that is utilised in conducting quantitative research study includes descriptive and inferential data analysis. They mention further that during data analysis the research investigation relies primarily on the research objectives, questions and measurements achieved through measurement methods.

4.3. Data preparation

Each respondent's response was assigned a number in order to facilitate the capturing process of raw data to an Excel spreadsheet. Each raw value on the spreadsheet represented each respondent and the columns contained variables that were pre-coded on the questionnaire (Grove, Gray and Burns, 2015:47). After capturing the data, it was submitted to the institutional statistician who assisted the researcher in data analysis.

4.4. Descriptive statistics

Descriptive statistics refers to summary of statistics which enables the researcher to organise data in a manner that gives meaning and enhances insight (Grove, Gray and Burns, 2015:319). They mention further that descriptive statistics are calculated in order to describe the sample and key variables. The descriptive measures that were used were means and standard deviations for enhancing continuous data and

frequency distribution for categorical and ordinal data. The mean as it is used for central tendency is defined as “the sum of all the scores divided by number of scores being summed ” (Grove, Gray and Burns, 2015:333).

The standard deviation is the square root of the variance, in such that it provides a measure of average deviation of a value from a mean of a particular sample. The standard deviation indicates the degree of error which would result if mean alone was utilised to interpret the data (Grove, Gray and Burns, 2015:334).

In describing the data in this study, it was presented in the form of percentages, frequency distributions, histogram, graphs, pie charts and bar charts. Further, the percentage distribution will indicate the percentage of subjects within a sample in such that their scores may fall into a particular group and the total number of the scores in that group. The frequency distribution in this analysis will describe the occurrence of scores or categories in the study, for example frequency distribution for gender might be 44 males and 56 females, therefore frequency distribution will be the initial method that may be utilised to organise data for examination (Grove, Gray and Burns 2015:331).

Table 4-4.4-1: Socio- demographic characteristics

Category	Criteria	Frequency (%)
Profession	Nurse	148 (93.1)
	Doctor	11 (6.9)
Age	19 - 30	52 (32.7)
	31 - 40	98 (61.6)
	41 - 60	9 (5.7)
	Female	152 (95.6)
Gender	Male	7 (4.4)
	Nationality	9 (5.7)
Nationality	Saudi	9 (5.7)
	Non-Saudi	150 (94.3)
Area of work assignment	NICU	159 (100.0)
Years of employment in this current job	≤5	63 (39.9)
	6 - 10	86 (54.4)
	11 - 15	9 (5.7)
	Have you attended infection control course in this institution	Yes
	No	5 (3.1)

Group comparison of work experience according to Mann-Whitney test.

4.4.1. Inferential statistics

Inferential statistics were applied to the data to determine statistical differences between groups and relationships between variables (Grove, Gray and Burns, 2015:319). They mention further that inferential statistics are mainly for addressing objectives, questions and hypothesis in studies to allow inferences from the study sample to the target population. Therefore, inferential statistics analysis is done to identify relationships, examine predictions or determine group differences in the studies. Polit and Beck, (2012:730) mention that inferential statistics allow inferences about whether results observed in a sample are likely to be found in a larger population. Therefore, it provides the researcher a means of drawing conclusions about the particular population based on laws of probability.

The comparison of responses was analysed with likelihood ratio by using Chi-square test of independence. Grove, Gray and Burns (2015:347) mention that Chi-square assessment of independence determines whether two variables are independent or related in that regard, and the test may be used with either nominal or ordinal data. In this study Pearson Chi-square test was utilised to examine the differences between medical and nursing categories (nominal data) and responses to hand hygiene and HAIs' variables. The researcher used The Mann-Whitney U test to conduct non-parametric test to determine the differences between groups of ordinal data. Grove, Gray and Burns (2015:338) state that non-parametric analyses are conducted if variables are measured at ordinal or nominal levels. Therefore, in this study The Mann Whitney U test (SPSS software version 15.0) compared the years of experience (ordinal data) of the respondents with their responses to the knowledge, skills and attitude for the variables of hand hygiene compliance and HAIs prevention.

The Analysis of variance (ANOVA) refers to the parametric statistical technique that is utilised to examine differences among three or more groups (Grove, Gray and Burns, 2015:351). Therefore, in this study ANOVA was also utilised. The Kruskal-Wallis ANOVA was applied in this study to test the association between years of experience and responses of respondents in relation to hand hygiene and HAIs prevention and reduction with regards to training variables. There were significant statistical associations identified for these variables.

4.4.2. Questionnaire response rate

Medical and nursing staff working in NICU were given the questionnaires. The total population of all the staff, both nursing and medical was 172 (N=172) respondents. The total population was included in the study. The total number of returned questionnaires was 159 (n=159). Therefore, the response rate was 92%. The questionnaire response rate was calculated by dividing the total number of returned questionnaires over the number of total number of respondents that were included.

Table 4.4.2-1 Questionnaire response rate

Profession	Study population (N)	Number of questionnaires returned (n)	Response rate (%)
Nurse	n=160	n=148	92%
Doctor	n=12	n=11	91%
TOTAL	N=172	n=159	92%

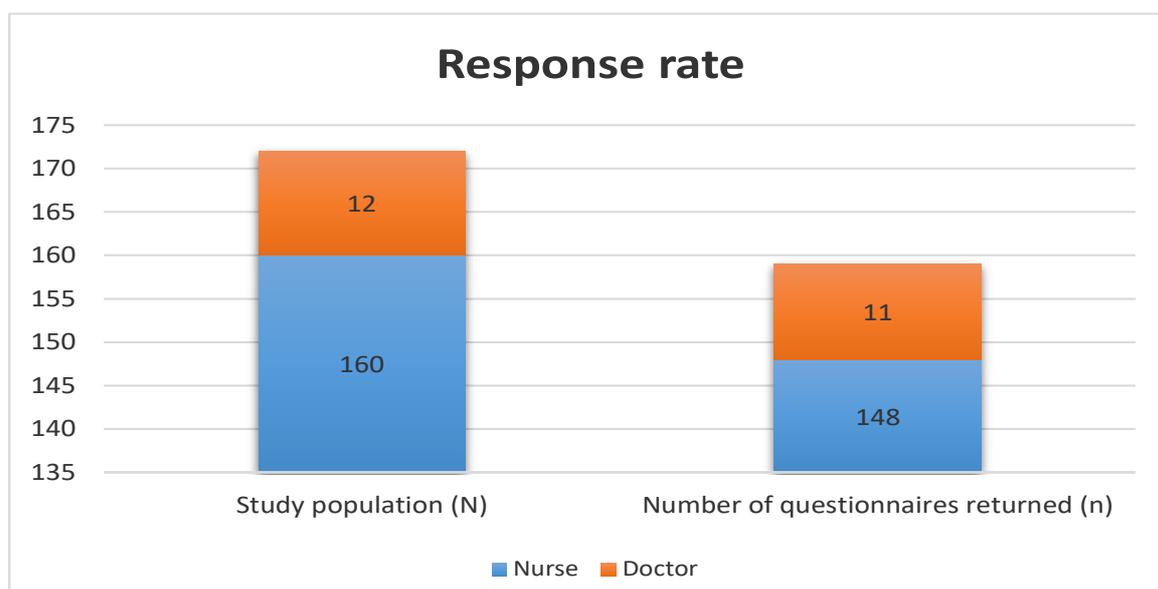


Figure 4.4.2:1 Questionnaire response rate

Out of the 172 respondents working in the NICU, there were 160 nurses and 12 medical doctors. 11(91%) of the medical doctors out of the 12 responded while 148 (92%) out of the 160 nurses returned the completed questionnaires as indicated in figure 4.1 and table 4.1. Polit and Beck (2012:741) described response rate as the rate in which the study participant response and it is designed by dividing the

number of participants by the number of participants that were sampled. Therefore, in this study response rate is 159 (92%) of the professionals responded.

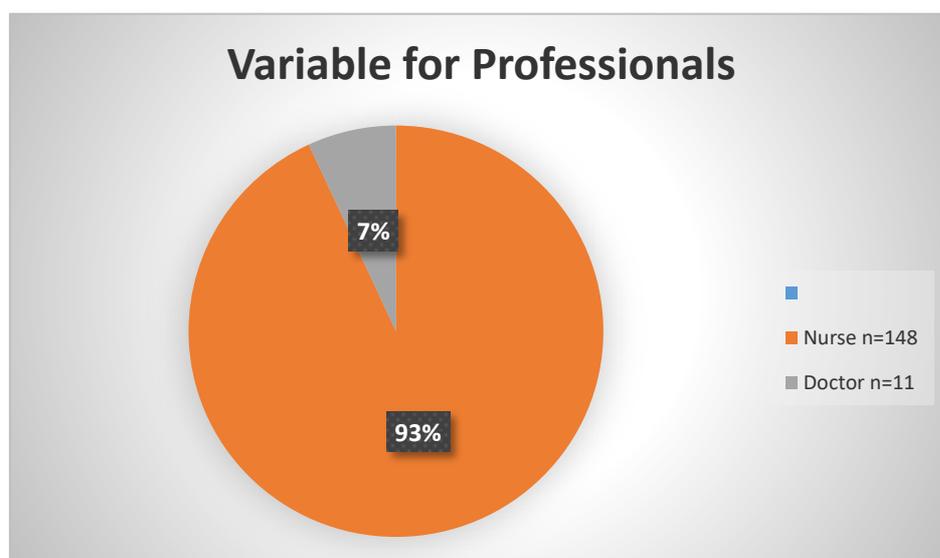
4.4.3. The socio-demographic factors

Table 4.4.3-1 Socio- demographic factors

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS (n=159)		
CRITERIA		Frequency (%)
Profession	Nurse	148 (93.1)
	Doctor	11 (6.9)
Age	19 - 30	52 (32.7)
	31 - 40	98 (61.6)
	41 - 60	9 (5.7)
Gender	Female	152 (95.6)
	Male	7 (4.4)
Nationality	Saudi	9 (5.7)
	Non-Saudi	150 (94.3)
Area of work assignment	NICU	159 (100.0)
Years of employment in this current job	≤5	63 (39.9)
	6 - 10	86 (54.4)
	11 - 15	9 (5.7)
Attendance of infection control course	Yes	154 (96.9)
	No	5 (3.1)

4.4.4. Profession of respondents (n=159)

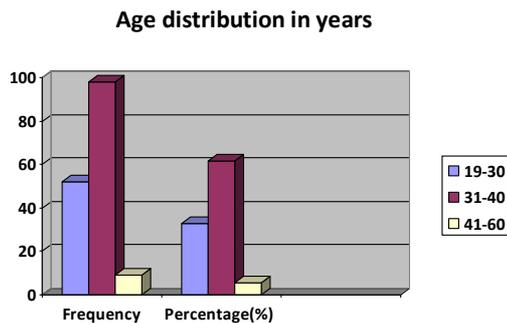
Figure 4.4.4: for Variable for profession



Out of the n=159 (N=172) professionals that responded 148 (93%) were nurses while 11(7%) were doctors. This is a comparatively adequate representation stratified according to the professionals in the NICU. The nurses form a larger number than the doctors.

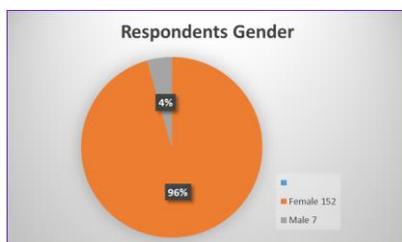
4.4.5. Age in years (n=159)

Figure 4.4.5:1 Age distribution for respondents



Out of the 159 respondents 52(33%) were aged between 19-30 years, 98 (62%) were aged between 31-40 years while 9 (6%) were aged between 41-60 years. Majority of the respondents were aged between 31-40 years' indicative of the active age of professionals in the NICU as shown in the figure above

Figure 4.4.5:2 Respondents' gender



4.5. Respondents Gender (n=159)

Most of the respondents were female 152 (96%) while the males were 7(4%) of the respondents.

4.5.1. Variable for Nationality (n=159)

Minority of the respondents were Saudi Arabian nationals 9 (5.7%) while the majority were non-Saudi Arabian nationals 150 (94.3%). This is because most employees in the unit are predominantly foreign expatriates.

4.5.2. Years of employment in the current job (n=159)

Figure 4.6 shows that the majority of respondents 86 (54.4%) were employed in the current job for a period ranging between six to ten years, 63 (39.9%) of the respondents have been in the current job ranging between one to five years and 9 (5.7%) of the respondents have been as employed for as long as eleven to thirteen years. No respondent was employed for over thirteen years and above because the hospital has only been in operation for a period of thirteen years.

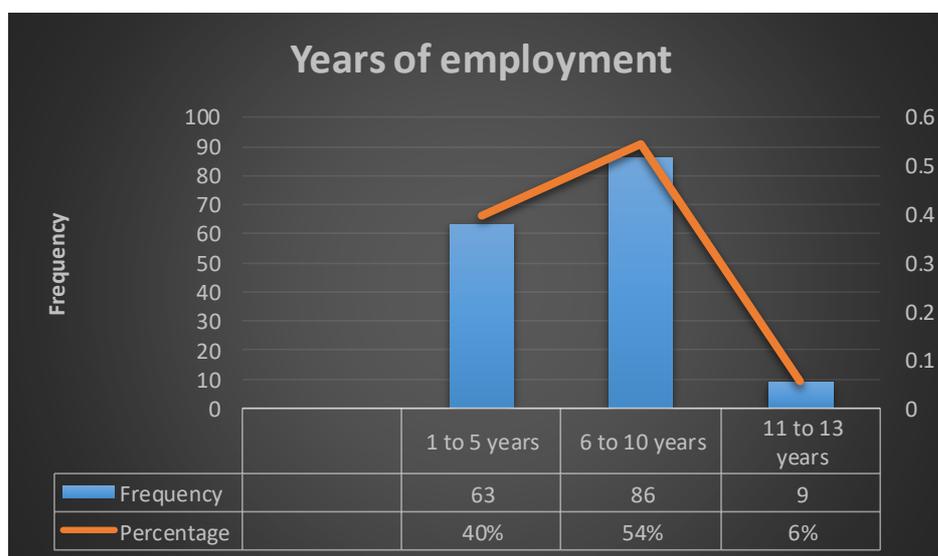


Figure 4.5.2:1 Years of employment

Variable for attending infection control course in that institution (n=159). Majority of the respondents 154 (96.9%) indicated that they attended the infection control course in that institution. However, 5 (3.1%) had not attended the infection control course.

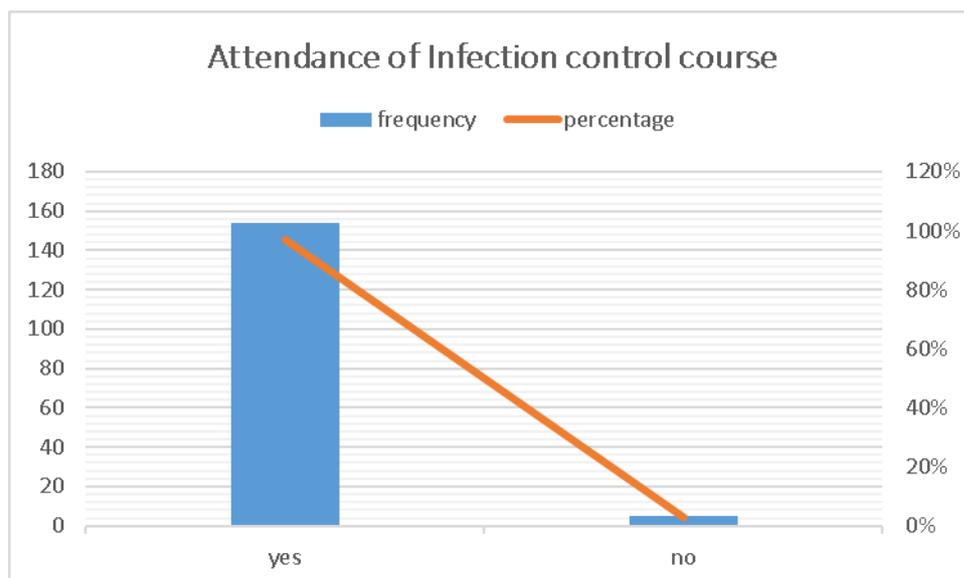


Figure 4.5.2:2: Attendance of infection control course by respondents

4.6. Results on self-assessment, attitudes and perceptions

The theory of planned behaviour was used as a lens for the data analysis. According to the theory, human behaviour is guided by three kinds of considerations as discussed in chapter one, i.e. behavioural beliefs, normative beliefs and control beliefs. To measure these constructs a seven (7) point scale was used.

4.6.1. Behavioral beliefs (self-assessment)

These are beliefs about the likely outcomes of the behaviour and evaluations of those outcomes which produce a favourable or unfavourable attitude towards that behaviour. The behavioural beliefs were measured as unlikely or likely or disagree or agree scales. The evaluations of each outcome were measured as “good or bad”. The persons’ behavioural belief was about the outcome that was measured by having them rate the degree to which the outcome is good or bad.

Figure 4.6.1:1 Hand hygiene self-assessment.

Table 4.5: Absolute and relative frequencies of answers with hand hygiene of self-assessment among all respondents. (n=159)

Questions (score specification	1	2	3	4	5	6	7	mean	SD
	Absolute frequency/ relative frequency (%)								
Do you think that in caring for patients you follow good hand hygiene according to the recommended guidelines? (never (1) - always (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.6)	7 (4.4)	151 (95.0)	6.94	0.26
Do you know recommended indications of good hand hygiene? (not at all (1) - fully (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (1.3)	2 (1.3)	155 (97.5)	6.96	0.25
Do your colleagues comply with hand hygiene according to recommended guidelines? (never (1) - always (7))	0	1 (0.6)	1 (0.6)	4 (2.5)	33 (20.8)	13 (8.2)	107 (67.3)	6.37	1.00
Do you think that your behaviour with hand hygiene is considered as exemplary by your colleagues? (not at all (1) - of course (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	13 (8.2)	28 (17.6)	118 (74.2)	6.66	0.62
Is it difficult to adhere to hand hygiene according to recommended guidelines? (always (1) - never (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	8 (5.0)	151 (95.0)	6.95	0.22

*mean-average scales value

Table 4.5 describes the analysis of the self-assessment of the Health Professionals in the NICU regarding the compliance to hand hygiene. The Health Professionals showed a high degree of self-assessment in hand hygiene by grading themselves on scale 6 and 7. 99.4% (n=157) of the Health Professionals indicated that they follow good hygiene according to the recommended guidelines while caring for the neonates in the NICU. The recommended indications for good hand hygiene were fully known by 97.5% (6.96 ± 0.25) of the respondents. This question had the highest mean on self-assessment indicating that the indications for hand hygiene (HH) were well known to them. However, the respondent's assessment of their co-worker's compliance with hand hygiene guidelines, only 67.3% (6.37 ± 1.00) believed that their colleagues complied. Question B3 had the highest variance with a SD 1.00 with 6 (3.7%) respondents believing that their colleagues do not comply with the recommended guidelines.

The respondents 159 (100%) rated themselves between 5, 6 and 7 indicating that they are a role model for their colleagues as their hand hygiene is considered exemplary. Most respondents 100% (6.95 ± 0.22) indicated that it was not difficult to adhere to the hand hygiene according to the recommended guidelines by rating themselves between 6 and 7.

The Standard Deviation in questions B1 to B5 is consistent and comparable which indicates less variability in the individual responses during the self-assessment of hand hygiene compliance varying between SD= 0.22 (B5), which had the lowest variance on the difficulty to adhere to hand hygiene recommended guidelines. The question which had the highest variance SD=1.00 (B3) on whether the respondents believed that their colleagues complied with the hand hygiene had the highest variance as showed on table 2.

4.7. Attitudes and perceptions

The general attitude and perceptions of the HPS was positive as indicated in table 4.6, which is important in preventing infections with no variance (SD=0.00) in questions C1 and C2. All the respondents, 100 % (7.00 ± 0.00) indicated that hand hygiene was a useful measure to prevent infection in contaminated and clean/sterile wounds. Further, their perception on the need for hand hygiene after contact with body fluids as a useful measure to prevent infection illuminated that their attitude

towards good hygiene was positive with 100% (7.00 ± 0.00) of the respondents indicating that it was useful.

The majority of the respondents (99.4%) perceived hand hygiene as a useful measure to prevent infection in the NICU (6.99 ± 0.16).

Respondents' attitude towards prevention of infection was mainly based on the fact that they felt non-compliance with hand hygiene in certain situations would significantly increase risk of infection. Non-compliance with hand hygiene after treating of dirty/contaminated and clean/sterile wounds 98.7% (6.99 ± 0.11) respondents indicated that this would present significant risk of infection to patients.

Non-compliance with hand hygiene upon contact with body fluids was described as having a significant risk of infection to patients by 99.4% (6.99 ± 0.08) respondents. At least 82.4% (6.80 ± 0.46) viewed non-compliance with hand hygiene after removal/taking off gloves as a factor that presented significant risk of passing infections on to patients.

In comparing the average scores, the respondents perceived hand hygiene compliance highly valuable in prevention of infection within the NICU described by question C1, C2, C3 with a comparison of highest score of (7.00 ± 0.00) and lowest a variance of (6.99 ± 0.16) in the perception of hand hygiene associated with the use of gloves, as mentioned earlier.

The attitude and perceptions of staff regarding the outcomes comparison of non-compliance questions C4, C5, C6 had the highest scale score of (6.99 ± 0.11) in the perception of significant risk due to non-compliance of hand hygiene in treating contaminated clean/sterile wounds. The lowest was scale score of (6.80 ± 0.46) motivation for hand hygiene after taking off gloves.

The respondents did not perceive the need to improve hand hygiene compliance with as high as 98.1% (6.97 ± 0.19) indicating no motivation to improve.

Table 4.7-1 Description of attitudes, and perceptions related to hand hygiene.

Table 4.5: Absolute and relative frequencies of answers with hand hygiene of attitudes and perceptions related to hand hygiene all respondents. (n=157)

Questions (score specification)	1	2	3	4	5	6	7	mean	SD
	Absolute frequency/ relative frequency (%)								
C1 Do you perceive hand hygiene in the following situation "between treating of dirty/ contaminated and clean / sterile would "as useless or useful measure to prevent infection in healthcare? (useless (1) - useful (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	159 (100.0)	7.00	0.00
C2 Do you perceive hand hygiene in the following situation "after contact with body fluids" as useless or useful measure to prevent infection in healthcare? (useless (1) - useful (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	159 (100.0)	7.00	0.00
C3 Do you perceive hand hygiene in the following situation "after removal/taking off gloves" as useless or useful measure to prevent infection in healthcare? (useless (1) - useful (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.6)	0 (0.00)	158 (99.4)	6.99	0.16
C4 Does non-compliance with hand hygiene in the following situation "in treating of dirty /contaminated and clean/sterile wound" presents risk of infection to patients? (no risk (1) - significant risk (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (1.3)	157 (98.7)	6.99	0.11
C5 Does non-compliance with hand hygiene in the following situation "upon contact with body fluids" presents risk of infection to patients? (no risk (1) - significant risk (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.6)	158 (99.4)	6.99	0.08
C6 Does non-compliance with hand hygiene in the following situation "after removal/ taking off gloves" presents risk of infection to patients? (no risk (1) - significant risk (7))	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (2.5)	24 (15.1)	131 (82.4)	6.80	0.46
C7 Do you feel that you can improve compliance with hand hygiene? (yes -perhaps - no)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.6)	2 (1.3)	156 (98.1)	6.97	0.19

*mean-average scales value

4.7.1. Differences in Self-Assessment of HH between Professions

Table 4.7.1-1 Group comparison of doctors and nurses according to Mann-Whitney test

Criteria	Self-assessment hand hygiene					Attitude and perception towards hand hygiene,								
	Groups	B1.	B2.	B3.	B4.	B5.								
Profession	Nurse (n=148)	Mean*	6.99	6.99	6.45	6.70	6.99	7.00	7.00	7.00	6.99	6.99	6.83	6.99
		SD	0.116	0.164	0.921	0.589	0.116	0.000	0.000	0.000	0.082	0.082	0.411	0.164
	Doctor (n=11)	Mean	6.36	6.64	5.27	6.09	6.45	7.00	7.00	6.82	6.91	7.00	6.36	6.82
		SD	0.674	0.674	1.421	0.831	0.522	0.000	0.000	0.603	0.302	0.000	0.809	0.405
		p value	<0.001	<0.001	<0.001	0.002	<0.001			<0.001	0.016	0.786	0.001	0.005

m*—average scale values; 7-point scale; p* - p-value of Mann-Whitney test

From the opinion of the professionals on the questions that focused on self-assessment the nurses showed a higher average scale score on question B1, B2, B3, B4, B5 than the doctors who seemed more critical in their assessment. There were significant differences in the self-assessment between the doctors and the nurses. Regarding the self-assessment of compliance with hand hygiene according to the recommended guidelines (question B1- $p = <0.001$), on the assessment of knowledge regarding recommended indications for hand hygiene B2- ($p < 0.001$), the peer review on the compliance of hand hygiene according to the recommended guidelines B3- ($p = 0.001$), assessment of the colleagues on compliance with hand hygiene B4 ($p = 0.002$) as indicated in the table 4.5

4.7.2. Differences in Attitudes and Perceptions of HH by Profession

The nurses' attitudes and perceptions of hand hygiene as compared to the doctors showed no significant difference. Although their mean scores were higher with an average of response to the Likert scale to the questions on attitudes and perceptions of hand hygiene lowest as (6.83 ± 0.41) and that of the doctors as (6.36 ± 0.8)

The nurses demonstrated a higher positive attitude to hand hygiene in question C3, C4 and C6 while the doctors had a higher attitude in C5. However, the doctors and nurses had a positive attitude with no variance towards question C1 (7.00 ± 0.00) hand hygiene between treating a dirty and clean sterile wound and hand hygiene after contact with body fluids

The Mann-Whitney test confirmed statistical significance in differences of attitudes and perceptions of hand hygiene between doctor and nurses on C3 ($p = <0.001$) on hand hygiene after removal of gloves in order to reduce infection in the NICU. Further the question C6 ($p = 0.001$) showed a significant difference that non-compliance with hand hygiene after removal of gloves poses a risk to patients.

4.7.3. Group comparisons of HH compliance according to age

Table 4.7.3-1 Table of Group comparisons of age according to Mann-Whitney test.

Criteria	<i>Self-assessment hand hygiene</i>							<i>Attitude and perception towards hand hygiene,</i>						
	Groups	<i>B1.</i>	<i>B2.</i>	<i>B3.</i>	<i>B4.</i>	<i>B5.</i>	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4</i>	<i>C5</i>	<i>C6</i>	<i>C7</i>	
Age (yrs.)	19 – 30 (n=52)	Mean	6.94	6.94	6.13	6.46	6.96	7.00	7.00	6.96	6.98	7.00	6.60	6.98
		SD	0.308	.308	.991	.670	.194	0.000	0.000	.277	.139	0.000	.603	.139
	31 – 40 (n=98)	Mean	6.94	6.97	6.56	6.78	6.95	7.00	7.00	7.00	6.99	6.99	6.90	6.97
		SD	0.241	.225	.862	.566	.221	0.000	0.000	0.000	.101	.101	.336	.225
	41 – 60 (n=9)	Mean	7.00	7.00	5.67	6.56	6.89	7.00	7.00	7.00	7.00	7.00	6.89	7.00
		SD	0.000	0.000	1.803	.726	.333	0.000	0.000	0.000	0.000	0.000	.333	0.000
	p value		0.794	0.735	0.004	0.011	0.658	0.36			0.844	0.735	<0.001	0.871

m*—average scale values; 7-point scale; p* - p-value of Mann-Whitney test

4.7.4. Differences in self-assessment of HH and Age

From the point of age of the doctors and nurses as shown in table 4.6. There was a high self-assessment on hand hygiene practices. Both nurses and doctors rated themselves between 6 and 7 showing self-confidence in hand hygiene. The n=9 professionals aged between 40-60 years displayed a high average score on questions B1 and B2 as shown in table 4.6 regarding following hand hygiene according to the recommended guidelines while caring for the patients and understanding the indications of hand hygiene. The age group 31-40 (n=98) had the highest respondents and showed a maximum average score on B3, B4 and B5 regarding colleagues' behaviour in adhering to hand hygiene. There was no significant difference on question B3 ($p=0.004$) with regard to colleagues complying with hand hygiene according to the recommended guidelines. This question had the lowest mean score between all ages showing that they had more confidence in their abilities to adhere to hand hygiene than they believed their colleagues did. There was no significant difference with the other questions (B1, B2, B4, and B5) as indicated in table 4.6

4.8. Differences in Attitudes and Perceptions of HH by Age

According to the analysis of attitudes and perceptions of the nurses and doctors on hand hygiene according to age as indicated on table 4.6, the age group of (19-30, 31-40, 41-60) showed higher average scale responses to Likert scale (median 7) on the questions C1, C2, C3, C4 and C5. The question on whether noncompliance of hand hygiene after removal of gloves increased the risk of infection showed the lowest scale score with the lowest as age group (19-30) as (6.60 ± 0.60) followed by (31- 40) as (6.90 ± 0.34) and (41-60) as (6.89 ± 0.33). The attitude and perception of age groups showed no significance difference in C1, C2, C3, C4, C5 and C7, although their mean score was higher with an average response to the hand hygiene as showed in table 4.6. However, Mann-Whitney test confirmed statistically significant difference of attitude and perception of hand hygiene among the age groups 19-30, 31-40 and 41-60 on C6 ($P = < 0.001$) noncompliance with hand hygiene after removal of gloves and that would present risks of infections to patients.

4.8.1. Group comparisons of HH and Gender

Table 4.8.1-1 Group comparison Gender according to Mann-Whitney test.

Criteria	Self-assessment hand hygiene						Attitude and perception towards hand hygiene,						
	Groups	B1.	B2.	B3.	B4.	B5.	C1	C2	C3	C4	C5	C6	C7
Female (n=152)	Mean	6.96	6.97	6.41	6.66	6.97	7.00	7.00	6.99	6.99	6.99	6.81	6.97
	SD	.195	.242	.952	.630	.179	0.000	0.000	.162	.114	.081	.442	.198
Male (n=7)	Mean	6.57	6.86	5.57	6.57	6.57	7.00	7.00	7.00	7.00	7.00	6.57	7.00
	SD	.787	.378	1.718	.535	.535	0.000	0.000	0.000	0.000	0.000	.787	0.000
p value	<0.001	0.254	0.031	0.701	<0.001	0.831			0.762	0.831	0.183	0.726	

m*—average scale values; 7-point scale; p* - p-value of Mann-Whitney test

4.8.2. Differences in self-assessment of HH by Gender

From the gender perspective, the females had a higher self-assessment than the males as they had a higher average scale score on questions B1, B2, B4 and B5. However, the males had the lowest self-assessment score in question B3 (5.57 ± 1.72) where they believed that their colleagues had poor hand hygiene compliance. There was significant difference ($p < 0.001$) in the self-assessment between females (6.96 ± 0.20) and males (6.57 ± 0.79) with regard to B1 about their ability to follow good hand hygiene according to the recommended guidelines and females (6.97 ± 0.18) and males (6.57 ± 0.54) in question B5 on difficulty in adhering to hand hygiene according to recommended guidelines as indicated in table 4.7. The females had a higher self-assessment score in both of these questions.

4.8.3. Differences in Attitudes and Perceptions of HH by Gender

From the attitudes and perceptions related to gender, the males and females had a positive attitude on all questions regarding their perception of behaviour outcomes relating to non-compliance of hand hygiene with high scale scores of in C1, C2, C3, C4, C5 and C7. There was no statistical significance difference in their attitude and perceptions related to gender. However, the males (6.57 ± 0.79) had a less positive attitude than the females (6.81 ± 0.44) in question C6 which had the lowest score towards compliance with hand hygiene after removal of gloves and perceived that it would hardly pose a risk to the patient.

4.8.4. Group comparisons of HH by Nationality

Table 4.8 Group comparison of nationality according to Mann-Whitney test.

Criteria	Self-assessment hand hygiene						Attitude and perception towards hand hygiene,						
	Groups	B1.	B2.	B3.	B4.	B5.	C1	C2	C3	C4	C5	C6	C7
Saudi (n=9)	Mean	6.22	6.56	4.78	5.89	6.33	7.00	7.00	6.78	6.89	7.00	6.11	6.78
	SD	.667	.726	1.202	.782	.500	0.000	0.000	.667	.333	0.000	.782	.441
Non-Saudi (n=150)	Mean	6.99	6.99	6.47	6.71	6.99	7.00	7.00	7.00	6.99	6.99	6.84	6.99
	SD	.115	.163	.910	.586	.115	0.000	0.000	0.000	.082	.082	.403	.163
p value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			<0.001	0.006	0.807	<0.001	0.001

m*—average scale values; 7-point scale; p* - p-value of Mann-Whitney test

4.8.5. Differences in self-assessment of HH by nationality

In the analysis of self-assessment according to nationality, the non-Saudi professionals (n=150), who were in the majority, had a high self-assessment on their behaviour on hand hygiene compliance with scores between 6 and 7. Further, there was statistically significance difference ($p=0.001$) on all self-assessment questions (B1 to B5) between the Saudi (9) and non-Saudi professionals. Most of the Saudi professionals believed that their colleagues did not comply with hand hygiene as per question B3 with a mean scale score as low as (4.78 ± 1.202) which was the lowest score in the self-assessment for all nationalities. Although the non-Saudis had a high self-assessment they had the lowest score on the same question B3 (6.47 ± 0.910).

4.8.6. Differences in Attitudes and Perceptions of HH by Nationality

Both the Saudi and the non-Saudi professional's attitude and perception towards hand hygiene compliance was positive, scoring 6 and 7 on all questions. There was however a significant difference ($p<0.001$) on their attitude towards hand hygiene following removal of gloves and its perceptions on the risk of infection to the patient. The Saudi nationals scored lowest in C6 (6.11 ± 0.782) as compared to the non-Saudi nationals (6.84 ± 0.403) perceiving that noncompliance with hand hygiene following removal of gloves predisposes the patient to risk of infections.

4.8.7. Group comparisons with work experience

Table 4.8.7-1 Group comparison of work experience according to Mann-Whitney test.

Criteria			<i>Self-assessment hand hygiene</i>					<i>Attitude and perception towards hand hygiene</i>						
	Groups		<i>B1.</i>	<i>B2.</i>	<i>B3.</i>	<i>B4.</i>	<i>B5.</i>							
Work experience (yr.)	<=5 (n=63)	Mean	6.87	6.90	6.05	6.41	6.92	7.00	7.00	6.97	6.97	6.98	6.56	6.94
		SD	.381	.390	1.099	.733	.272	0.000	0.000	.252	.177	.126	.616	.304
	6 - 10 (n=86)	Mean	6.99	7.00	6.64	6.85	6.97	7.00	7.00	7.00	7.00	7.00	6.97	7.00
		SD	.108	0.000	.825	.448	.185	0.000	0.000	0.000	0.000	0.000	.185	0.000
	11 – 15 (n=9)	Mean	7.00	7.00	6.00	6.56	7.00	7.00	7.00	7.00	7.00	7.00	6.89	7.00
		SD	0.000	0.000	1.225	.726	0.000	0.000	0.000	0.000	0.000	0.000	.333	0.000
	p value		0.02	0.062	0.001	<0.001	0.372	0.473			0.22	0.473	<0.001	0.131

m*—average scale values; 7-point scale; p* - p-value of Mann-Whitney test

4.9. Differences in self-assessment of HH by experience.

The analysis according to work experience showed that all professionals self-assessment was high, rating between 6 and 7 regardless of their experience. There was no significant difference in questions B1, B2, B3 and B5. However, the question B3 on whether the colleagues complied with hand hygiene scored lowest on all work experience periods. The most experienced professionals 11–15yrs (n=9) had the least faith in their colleagues complying with hand hygiene practices (6.00 ± 1.225) followed by those with the least experience <5years (n=63) with a mean scale score (6.05 ± 1.099). The professionals thought that their behaviour with hand hygiene was considered exemplary with a high self-assessment score on question B4. There was however a significant difference ($p=0.001$) in their self-assessment of their normative believes.

4.9.1. Differences in Attitudes and Perceptions of HH by work experience

The health professionals had a positive attitude towards hand hygiene with no significant difference in questions C1, C2, C3, C4, C5 and C7 related to years of experience with mean scores between 6.94 and 7 as indicated in table 4.9. However, Mann-Whitney test confirmed statistical difference in question C6 ($p=<0.001$) in attitude of hand hygiene among the age groups of (11-15, 6-10 and <5) years on non-compliance with hand hygiene after removal of gloves and the perception that it would present risks of infections to patients. The lowest scale score was indicated by the health professionals <5 years (n=63) with a mean scale score (6.56 ± 0.616) where they did not perceive a relationship between hand hygiene compliance and risk of infection as being significant.

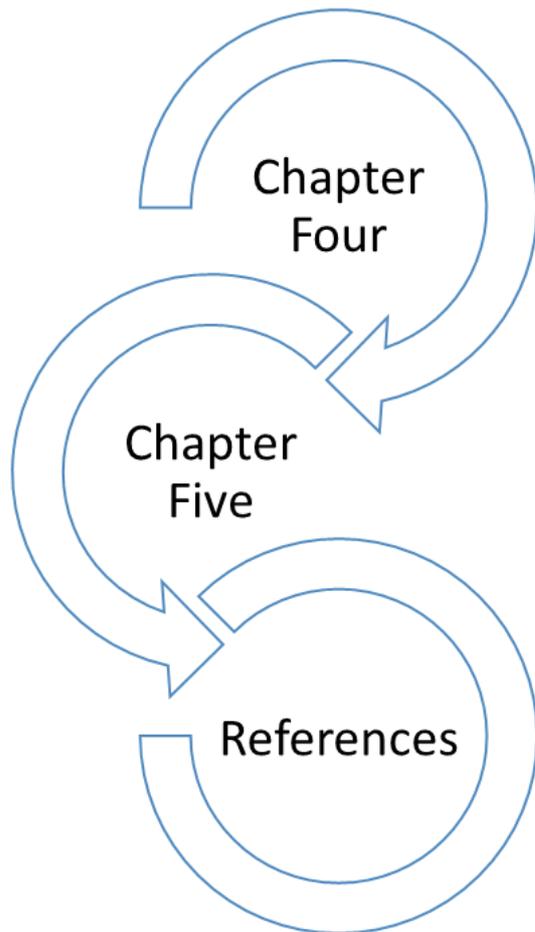
4.10. Summary

The research findings showed that the self-assessment and perception majority of the respondents have knowledge about hand hygiene and prevention of HAIs in NICU and its importance. However, the results show that there are some HPs who still find it difficult to adhere to hand hygiene compliance culture in certain situations, for an example difficulty in performing hand hygiene after the removal of gloves.

4.10.1. Conclusion

In this chapter the data collected was analysed from the questionnaire and it was presented and discussed. The research questions regarding the self-assessment of hand hygiene compliance by HPs working in NICU were adequately answered.

In the succeeding chapter the research findings were summarised and concluded according to the research objectives. Limitations of the study were discussed. Based on the research findings from this study the researcher made some propositions and recommendations.



The previous chapter focussed on describing the findings of the study. Further, the description of the analysed data.

This chapter will provide in-depth discussions of the research findings while reflecting on literature and providing research implications and recommendations.

The references utilized in this study are listed here

5 CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The results discussions, conclusions and recommendations are discussed in this section. The analysed data in chapter four is interpreted according to the researcher's objectives of the study. In the previous chapter results for socio-demographic characteristics were presented, as well as absolute and realistic frequencies of self-assessment answers of hand hygiene among all the respondents, as a group comparison in relation to hand hygiene compliance culture.

In this chapter, the summary of the study findings discussed in line with the study objectives. Limitations of the study, recommendations and conclusion of the study were discussed

5.2 Discussion

The aim of this research is to investigate self-assessment, perceptions and attitudes of health workers towards hand hygiene which influences reduction of HAIs among staff in the NICU at a tertiary hospital in Riyadh in Saudi Arabia. All questions in this questionnaire were analysed and interpreted by using a 7-point Likert scale with the ranges, starting from 1 being regarded as low level of assessment with the exception of question C7. The objectives of this study were reviewed in order to assess during the data collection and analysis to assert the objective of the study was answered.

The study described the self-assessment of hand hygiene compliance of Health professionals in order to reduce HAIs in the NICU. There were 148 nurses out of 160 who answered the questionnaire and 11 out of 12 doctors completed the questionnaire. This is an indication of the ratio of nurses to the doctors. The majority of the respondents (96.9%) had attended an infection control course in the institution which would likely influence their perception of hand hygiene practices. The health professionals showed a high degree of self-assessment as described in chapter four with grades between 6 and 7.

Furthermore, the researcher explored the perceptions of the Health professionals towards hand hygiene in the NICU in order to reduce HAIs. The differences in the attitudes and perceptions towards hand hygiene were described based on age gender, nationality and experience. The majority of the respondents (99.4%) perceived hand hygiene as a useful measure to prevent infection in the NICU (6.99 ± 0.16).

The third objective was to describe the attitudes of health professionals towards hand hygiene in the NICU in order to reduce HAIs. Respondents' attitude towards prevention of infection was mainly based on the fact that they felt non-compliance with hand hygiene in certain situations would increase risk of infection significantly. Non-compliance with hand hygiene after treating of dirty/contaminated and clean/sterile wounds (98.7% 6.99 ± 0.11) respondents indicated that this would present significant risk of infection to patients.

The theory of planned behaviour was used as a lens for the data analysis. According to the theory, human behaviour is guided by three kinds of considerations as discussed in chapter one behavioural beliefs, normative beliefs and control beliefs. HPs intentions to comply with the appropriate methods of performing hand hygiene was determined and enhanced by their positive attitude to perform HH, and how much the HP feels obliged to comply to hand hygiene, and denotes a subjective norm, as well as the HPs perceived behavioural control to perform hand hygiene.

5.3 Self-assessment of hand hygiene compliance

The high self-assessment was illuminated by the score of a mean of 6.37 and 6.96 SD (1.00 to 0.25). This self-assessment shows that the health professionals are aware of the hand hygiene requirements and are confident to carry them out as most respondents indicated that they know recommended indications for hand hygiene (HH) 97.5% (6.96 ± 0.25). The respondents believed that their colleagues did comply with HH according to recommended guidelines.

This was illustrated by the high variance SD 1.00 with 6 (3.7%) which meant that although a few believed there was compliance, some of the health professionals felt that the colleagues did not comply. Morioka, et al (2013:66), Polacco et al. (2015:08)

and Hoovena & Polin (2014:11) emphasise the importance of availability and accessibility of WHO's recommended guidelines on HH and HAIs reduction, they further mention that in order for HPs to have an embedded culture of patients' safety with regards to HAIs reduction and HH compliance, organisation leaders should act as role models to all HPs by performing HH appropriately. In this case feedback would be an essential tool to assist the non-compliant individuals.

On the other hand, the respondents indicated that their HH behaviour was considered exemplary by their colleagues. All respondents 159(100%) rated themselves between 5, 6 and 7. They also indicated that they are role models for their colleagues as their HH is considered as exemplary. According to (Mazi, Senok, Al-Kahldys & Abdullah (2013:07); Smiddy et al. (2015:271); Ajzen and Madden (1996) it is essential for the infection control leaders and management teams in acting as good role models to their colleagues and all HPs in relation to HH compliance. Role modelling may enhance being exemplary to all employees in organisations so that they embrace the culture of patient safety and prevention of HAIs in healthcare organisations. Pressure to portray themselves as role models to their colleagues so as to motivate them to perform hand hygiene correctly, and that was revealed in their self-assessment score is 100 (6.66+-0.62).

Normative beliefs reflect the pressure that is perceived by an individual to perform or not to perform a particular behaviour relative to the significant others or organisation that they regard as important to them. The respondents knew the recommended indications for hand hygiene (HH) 97.5% (6.96+-0.25). The more they understand their responsibility the more they were motivated to comply with HH. The end result was a normative belief and a drive to comply, which enabled the health professionals to follow the guidelines (Edwards, Hawker, Carrier, and Rees: 2015:1256)

Tsai, (2010:225) mentions that there is a direct relationship between perceived behaviour control in relation to attitude and further mentioned that attitude may be the dominant variable of the subjective norm during influencing intention. Hence, the results in this study have proven that attitude of the HPs towards HH compliance is regarded as an intervening variable to the outcome of perceived behavioural control

towards behavioural intention. From this it can be presumed that perceived behavioural control has a positive effect on attitude.

The respondents indicated that they know the recommended indications for hand hygiene (HH) 97.5% (6.96+/-0.25). The availability and accessibility of recommended guidelines enhanced their knowledge of HH and thus encouraged more attitude by HPs to comply with HH. The positive support received by individuals from the organization which provides guidance is important to maintain a positive attitude. Yu et al, (2005); and Kuo, (1998) mentioned in Tsai, (2010:222) assert that when individuals are positive towards an activity, their attitudes also become more positive. The existence of a significant relationship between subjective norm and participation attitude, whereby subjective norms have proven to be directly influencing attitude of the participants towards the behaviour was displayed.

5.4 The attitudes and perceptions of Health professionals

In order to predict if the person has an intention to perform the behaviour, one needs to know if the individual is in favour of the intended action. This is referred to as attitude towards performing that behaviour which can either be positive or negative. Therefore, the greater the individual's positive attitude towards the behaviour the more the likelihood will be that they have an intention to perform the behaviour and vice versa (Ajzen and Madden, 1986:461).

In this study all the respondents (n=159) 100% showed a positive attitude towards hand hygiene. They perceived hand hygiene in situations when treating dirty/contaminated and clean/sterile wounds as a useful measure to prevent infection in healthcare, where the mean score was 7.00 +/-0.00. They further perceived hand hygiene useful after contact with body fluids with a mean of 7.00 +/-0.00.

Further, the attitude towards the behaviour denotes the individual's overall evaluation of the behaviour. It is assumed to have two components which work together. Firstly, the beliefs about consequences of the behavior, e.g. in this study the more the HPs have positive attitude towards HH compliance, the more the chances that they will perform the HH correctly in order to reduce HAIs in NICU and vice versa. Therefore,

the corresponding positive or negative judgments about each of these features of the behavior, the positive or the negative desirable/undesirable the results may be. Conner and Armitage, (1998:1433) mention further that individual's attitude towards the behaviour equals to behavioural belief multiplied by outcome evaluation.

The study showed that 99.4% (n=158) of participants perceived hand hygiene after removal of gloves as a useful measure to prevent infection in healthcare, which is slightly less as compared to when they are in contact with hand hygiene. All the respondents (n=159) 100% perceived that failure to comply with hand hygiene while treating of dirty/contaminated and clean/sterile wounds may cause a significant risk of transmission of infections to patients. This perception would most likely enhance their attitude towards HH.

Perceived behaviour control according to Conner and Armitage, (1998:1433) refers to the belief that the amount of the control which an individual has over the environment. For example, the control of situation, place or resources. That refers to the individual's perception of the extent to which execution of the behaviour being perceived as easy or difficult, and that is enhanced by the individual's availability of means and confidence to perform that behaviour. They further mention that the performance of the individual is affected by the perception in which an individual feels the social pressure to do it.

Majority of HPs (n=159) 100% perceive that non-compliance with hand hygiene in the situation upon contact with body fluids presents significant risk of infection to patient. Further, 97.5% of HPs perceives non-compliance with hand hygiene after removal of gloves present significant risk of infection to patients while 2.5% of participants perceive non-compliance with hand hygiene after removal of gloves present no risk of infection to patients.

The standard deviation (SD) in attitude and perception of hand hygiene issues seem to be more of an individual variability of answers from respondents. However, there seemed to be a greater variability showing precisely with regard to the question of perception of non-compliance to hand hygiene after removal of gloves (SD= 6.80) and the lessor variability demonstrated during the perception of hand hygiene for

treatment of contaminated and sterile wound and after the contact with body fluids as a useful measure (SD =0.00). Motivation and perception for the need to improve the compliance to hand hygiene declared at 99.4 % (mean 6.97 +-0.19). Smiddy, et al. (2015:15) mentioned further in their studies that the more the healthcare professional become committed to patients 'safety the more the positive attitude they may establish in their care of patients.

5.5 Differences in Attitudes and Perceptions of Hand Hygiene

5.5.1 Healthcare professionals

Morioka, et al., (2013: 67e) also discover in their studies that nurses perceived hand hygiene as the most effective method to prevent infection in NICU. There were significant differences ($p < 0.001$) between responses of nurses and doctors in the aspect of showing enthusiasm and perception of the need to improve compliance with hand hygiene in question. Further, there was a clear motivation to improve compliance among the nurses mean (6.45 +-0.921) versus doctors (mean 5.27 +-1.421). Morioka, et al., (2013: 69e) and Song, et al., (2013e105) concur with that their studies that have shown that nurses are more motivated to perform hand hygiene as compared to doctors while taking care of patients in healthcare settings.

Nurses showed more significantly positive attitudes towards hand hygiene than doctors. Smiddy, et al., (2015:13) in their studies also identified that nurses have more positive attitudes in the performance of hand hygiene unlike doctors in NICU. Statistically, in this study, nurses perceive hand hygiene as a more useful measure to prevent infection in NICU than doctors.

The nurses' attitudes and perceptions of hand hygiene as compared to the doctors showed no significant difference. Although their mean scores were higher with an average of response to the Likert scale to the questions on attitudes and perception HPs self-assessed nurses mean (6.99 +- 0.164) and doctors mean (6.82 +- 0.405), ($p = 0.005$) themselves regarding their perception of hand hygiene and feel that they can improve compliance with hand hygiene. Individuals have enough time to plan how they are intending to behave towards certain situations. The best predictor of that behaviour is intention that represents the extent to which an individual is intending to execute the behaviour (Conner and Armitage, 1998:1433).

Mazi, et al., (2013:06) asserts that nurses demonstrate more curiosity and intention in performing HH consistently and correctly as compared to doctors. Hale, Powell, Drey and Gould, (2015:05) mention that HAIs could be reduced through execution of effective approaches and one would be to implant a positive attitude and knowledge to HH so that it may enhance their ability and intentions to perform it appropriately.

5.5.2 Age and gender differences

The attitude and perception of age groups showed no significant difference although their mean score was higher with an average response to the hand hygiene. The HPs perception of hand hygiene was that they can improve compliance with hand hygiene. The highest score was the older HPs 41-60 years old with a mean of (7.00 +0.000), and $p=0.871$ followed by the 19-30 years scored scale (mean 6.98 +- 0.139) and the lower average score by the 31-40 years, scored scale (6.97 +- 0.225).

From the attitudes and perceptions related to gender, the males and females had a positive attitude on all questions regarding their perception of behavioural outcomes relating to non-compliance of hand hygiene with high scale scores of in C7. There was no statistical significant difference in their attitude and perceptions related to gender. However, the males scored higher mean (7.00 +- 0.000) $p=0.001$ than the females (mean 6.97 +- 0.198).

Mazi, Senok, Al-Kahldys & Abdullah, (2013:07) conduct a study about HH compliance in Saudi Arabia in NICUs and identified that females are more compliant to HH as compared to males. Smiddy, et al., (2015:269) advocates that female HPs are performing HH more abidingly and appropriately than males.

5.5.3 Differences in nationality

Both the Saudi and the non-Saudi professionals' attitude and perception towards hand hygiene compliance was positive, scoring 6 and 7 on all questions. There was however, a significant difference ($p<0.001$) in their attitude towards hand hygiene following the removal of gloves and perceptions on the risk of infection to the patient. Question C7 on table 4.8 shows that HPs have self-assessed themselves regarding their perception of hand hygiene and feel that they can improve compliance with hand hygiene, and Saudi scored scale (mean 6.78 +- 0.441), and Non-Saudi scored

scale mean (6.99 +- 0.163). Mazi, Senok, Al-Kahldys & Abdullah, (2013:08) and Resende, et al., (2015:56) conducted a study about HH compliance in Saudi Arabia in NICUs and all recognised no implication of HH in relatively to Nationality. Smiddy, et al., (2015:270) discovered in their study that there was no relationship between HH compliance with regards to Nationality. This is contrary to the findings of this study.

5.5.4 Work experience

The health professionals had a positive attitude towards hand hygiene with no significant difference in all questions related to years of experience with mean scores between 6.94 and 7 as indicated in table 4.9. However, the Mann-Whitney test confirmed a statistical difference in question C6 ($p < 0.001$) in attitude of hand hygiene among the age groups of (11-15, 6-10 and <5) years on non-compliance with hand hygiene after removal of gloves and the perception that it would present risks of infections to patients. The scores did not reflect a relationship between hand hygiene compliance and risk of infection as being significant.

Mazi, Senok, Al-Kahldys & Abdullah, (2013:07) and Resende, et al., (2015:56) conduct a study about HH compliance in Saudi Arabia in NICU and all identify that HPs who worked for a longer period in NICU were more compliant to HH as compared to the ones with fewer years working in NICU. Smiddy, et al., (2015:270), Offner, et al., (2016:669) revealed that the longer the HPs are employed the more confidence they get during performance of HH. Walker, et al., (2014: 1074) cited in their study regarding HH compliance in the U.S. that organizational leadership should focus more on enabling new HPs on HAIs reduction and HH compliance so as to increase patients' safety in healthcare organizations.

Even though Morioka, et al., (2013:66e) discovered in their studies regarding HH compliance in NICU that HH compliance may improve with embedded culture of patients' safety regardless of HP's years of experience. Based on those studies the researcher believes that positive attitude consistency and readiness to performing the correct HH practice, may enhance HH compliance culture among HPs in NICU.

5.6 Limitations of the study

Limitations of the study is defined as “restrictions in a study methodology and/or framework that may decrease the credibility and generalizability of the findings” (Grove, Gray and Burns, 2015 :48). However Polit and Beck, (2015 :65) mention that the study limitations increases implications of limitations of the integrity of the study results. While discussing the limitation of the study the researcher is in the incomparable position to be able indicate sample deficits, design challenges and the research settings. The researcher may also point out some problems identified with research instruments with some limited validity and reliability or some weaknesses in data collection and data analysis.

In this study the researcher identified some limitations, whereby the study was conducted in one setting and one healthcare organisation. However, the results may not be generalised to the general population as the small sample may influence the results of the study, although the total population was included. HPs working in NICU in Saudi Arabia and as the training which had taken place in the setting might have influenced the results. Grove, Grey and Burns, (2015 :48) describe generalisation as the extension of the conclusion got completed from the research outcomes of the sample studied to a larger population. Other limitations are that there is possibility for a tendency of other participants to consider self in a positive light more than others. The instrument also poses limitation due to its comprehensiveness.

5.7 Key findings

This study reveals that there is still some degree of non-compliance in hand hygiene while taking care of patients, moreover, after the removal of gloves among some HPs during their self-assessment. That may be related to the perception of HPs thinking their hands are still clean since they were covered by gloves during the performance of procedures. This is contrary to the results (table 2) which indicated that 94% (n=159) followed good hand hygiene according to recommended guidelines.

Conner and Armitage, (1998:1430) concur with that finding by stating that the theory of planned behaviour is guided by the aspects of attitude towards certain behaviour, subjective norm, perceived behavioural control and behavioural intention. Therefore,

the intention to comply with HH is determined by the attitude, subjective norm and perceived behavioural control to perform that behaviour. Conner and Armitage, (1998:1432) also mention that generally, the more the intention of an individual to perform the behaviour, the more likely that the behaviour is performed.

Conner and Armitage, (1998:1433) mention further that theory states that individuals have enough time to plan how they are intending to behave towards certain situations, that signifies that best predictor of that behaviour is intention. However, on the other hand it was identified that the standard deviation in question B1 and B2 $SD=0.22$ with the lowest variation in B5 showing difficulty of hand hygiene according to recommended guidelines. That may be regarded as lack of some degree of hand hygiene compliance culture.

Song et al. (2013: e103) conduct a retrospective cohort study about strategies to improve hand hygiene compliance, and recommended proper hand hygiene to be widely accepted and regarded as most effective strategy to reduce HAIs in all settings of NICU. This means that if HPs in all the NICUs may have an embedded hand hygiene compliance culture, the HAIs rate may reduce tremendously and that may save the lives of many infants admitted in NICU.

In this study, the majority of respondents 99.4 % ($n=159$) perceived hand hygiene as the useful measure to prevent infection in NICU, however, the response in B3 showed that $SD=1.00$ had a height variance on the respondents' belief about their colleagues' compliance to hand hygiene. Conner and Armitage, (1998:1432) also mention that generally the more the intention of an individual to perform the behaviour, the more likely the behaviour is performed; therefore, these results concur with that statement. Lack of commitment to hand hygiene and HAIs reduction may have a negative impact on patient's health.

Mazi, et al., (2013:06) mention that the multidisciplinary team approach with the guidance of the team leader may be regarded as the modality for behavioural change with regard to hand hygiene and sustainability of hand hygiene compliance culture. In this study, there was some evidence of non-compliance with hand hygiene upon the contact with body fluids 99.4 (6.99 ± 0.8) of respondents and that have a significant risk to of HAIs to patients.

The study conducted by Morioka, et al., (2013:68e) provides clear indication that prevention of HAIs in NICU is directly related to proper hand hygiene, application of standard precaution of hand hygiene and education of all HPs in NICU. Lowest scale was also identified in C1, C2, C3 (mean 6.80 +- 0.46) which showed lack of motivation to perform hand hygiene after removing gloves.

Song, et al., (2013: e102) advocated for WHO's recommendations of the use of five moments of hand hygiene in order to reduce HAIs. By practicing WHO's five moments of hand hygiene the HP's may recognise the significance of hand hygiene after removing gloves as a mechanism that enhances the reduction of HAIs. The results in table 2 showed that the respondents did not perceive the need to improve in hand hygiene compliance and that is supported by 98.1 % (mean 6.97 +-0.19) indicated no motivation to improve on hand hygiene compliance culture.

In summary, the researcher recognises that there are some deficiencies among some HPs in relation with adherence to hand hygiene. Some HP's, during their self-assessment, identified that some of their colleagues are not adhering to hand hygiene. Therefore, in order to prevent HAIs in NICUs, it is of vital importance for all HPs to perform hand hygiene appropriately while taking care of patients. There is an essential need for HPs to recognise hand hygiene as the significant method that reduces HAIs in NICU. Mazi, et al. (2013:02) conducted a study in Saudi Arabia about the implementation of WHO's strategy in enhancing hand hygiene compliance culture and they recommended in their study the WHO's five moments of hand hygiene and multimodal strategies to be regarded in all healthcare settings as the significant standardised approach in educating HPs about the importance of hand hygiene compliance culture in reducing HAIs. Hence HPs should regard hand hygiene as the fundamental method to reduce HAIs.

5.8 Recommendations

Based on the identified study results and evidence-based literature review, a few recommendations were made in order to improve hand hygiene compliance and HAIs reduction.

5.8.1 Empowerment of all HPs about HAIs prevention and HH compliance

Organisation leadership should give top priority and regard empowerment of all HPs on matters of HAIs reduction and HH compliance as a vital aspect that reduces HAIs among patients. That will increase more awareness and encouragement to HPs and will regard HH compliance as the cornerstone method that prevents HAIs.

Provision of continuous education and training should be the top organisation leadership's priority to ensure adequate knowledge and information of HAIs prevention by all HPs. Mazi, Senok, Al- kahldy, Abdullah (2013:01) conduct a study in Saudi Arabia on implementation of WHO's strategy in enhancing HHCC and further mention that should WHO's five moments of hand hygiene being effectively taught and encouraged to be practiced by all HPs, the chances for HAIs to be reduced would be enriched, since hands have been demonstrated in many studies to be the main source of transferring HAIs from one patient to another.

Hosseinalhashemi, et al., (2015:1009) mention that continuous education to all HPs regarding the importance of hand hygiene in HAIs reduction should be emphasised, since lack of knowledge would have negative effect in the reduction of HAIs. Hence, the researcher identifies empowerment as the significant aspect that prevents HAIs and enhances HH compliance among HPs. Walker, et al., (2014:1074) identify in their studies about HAIs reduction in NICU that hand hygiene improves with proper training, increased monitoring and immediate feedback to HCWs regarding their hand hygiene compliance.

5.8.2 Reinforcement of provision of feedback about HAIs and hand hygiene

Based on the study results and literature reviewed, the researcher advocates for the real-time provision of positive feedback to all HPs regarding their HH performance behaviour. That may enhance their awareness about how they are performing HH, thus increasing their intention and confidence in demonstrating HH appropriately.

Walker, et al., (2014:1075) highlight in their study about significance of providing feedback to both complying HPs with HH as well as the non-compliant ones. Some of the strategies to give feedback to non-compliant HPs are distributing feedback

cards written “reminding them to do hand hygiene before and after” and the feedback cards to compliant staff may be written “thank you for complying with proper hand hygiene” which may serve as the encouragement to comply with hand hygiene.

Mernelius, et al. (2013: 586) concur with them regarding the effect of providing feedback to all HPs in improving HH compliance culture and reducing HAIs. Smiddy, et al. (2015:33) applaud the provision of feedback about hand hygiene compliance to HPs and its importance and impact in ensuring patient safety by healthcare workers. They further indicate that giving the feedback to HPs concerning their hand hygiene compliance should be recognised as the most vital component related to the patient safety framework by all healthcare workers.

Walker, et al., (2014; 1075) state that providing immediate feedback for non-compliance to all healthcare workers regarding hand hygiene is very important and that should be regarded as a teaching opportunity rather than as a punishment. Giving feedback regarding how they are performing hand hygiene should be done in a way that will make them realise the importance of compliance.

Even though Hagel, et al. (2014:03) quoted in Wetzker, et al., (2016:331) discovered that HCWs have a tendency to have a Hawthorne effect in hand hygiene compliance. Moreover, when they are aware that they are being observed as compared to when they were not aware. However, the best strategy to observe compliance in hand hygiene is while the HPs are not aware. That may yield honest and non-biased feedback about their performance and their HH compliance. The most important factor will be their ability to change for the better after receiving feedback about their performance of HH.

5.8.3 Implementation of collaborated efforts to reduce HAIs

It is of significance that all HPs including organisational leadership teams in all healthcare organisations to embark on teamwork strategies that prevent HAIs and which promote HH compliance in all setups of patients ‘care.

Chen, et al., (2015: 1324) mention in their study that the most effective and sustainable practice of prevention of HAI it is when all the senior management together with all the HPs aim at ensuring a HH compliance culture. Therefore, teamwork attitude plays a very vital role in the reduction of HAIs in healthcare

organisations. Smiddy, et al., (2015:273), applaud that in order for HHCC to be effective among all HPs, multidisciplinary teams should devote to commitment and support in reducing HAIs. Teamwork approach may be a vigorous contributing factor that may lead to compliance of hand hygiene and a reduction of HAIs in healthcare settings.

Cantey, et.al., (2013; 677) identify in their study that a lack of a multidisciplinary team approach may possibly lead to the spread of HAIs since each individual might perceive reduction of HAIs differently and not complying as it is required. In their study they demonstrated that reductions of HAIs in NICU are directly and positively associated to a collaborated team effort and that includes strengthening of appropriate HH culture to all teams in NICU.

Hosseinalhashemi, et al., (2015:1009) agree and mention that HAIs prevention is a collaborated effort since HAIs are easily spread through the hands of HCWs. Therefore, joined commitment to prevent HAIs may encourage healthcare teams to remind each other about the importance of hand hygiene compliance in reduction of HAIs. The researcher therefore advocates for a teamwork approach in prevention of HAIs and promotion of proper HH practices among all HPs. Thus it is very important for all the healthcare workers to work together as a team to reinforce HH compliance culture throughout the organisation.

5.8.4 Emphasizing of the importance of organizational support and culture.

Organisational leadership should support and design innovative strategies that improve adherence of all HPs to HH compliance, and that may increase motivation of HPs to aim at reducing HAIs in NICUs and improving on HH compliance. Organisational leadership should also reinforce commitment for HH compliance and make them recognise that HAIs reduction and an HH compliance culture is to be regarded as the cornerstone in reducing HAIs in NICU.

Each departmental leader should support enhance a culture of safety among all staff by reinforcement of mandatory education and performance of appropriate HH during their provision of care to patients. Organisational governance should also ensure vigilant and strict compliance by all HPs to appropriate HH performance and HAIs

prevention, and should act as role models in reduction of HAIs by execution appropriate HH processes and promotion of patients 'safety culture.

Organisational management should enhance more support innovative strategies to improve HH compliance and that may include the use of the WHO's five moments of HH and the solicitation of a new hand hygiene monitoring program (HHMP) may enhance hand hygiene compliance culture among NICU HPs.

The application of the WHO's multimodal strategy may enhance hand hygiene compliance culture commitment to reduce HAIs among all the HPs. Walker, et al. (2014:1074) conducted a study about the implementation of a new hand hygiene monitoring program and that revealed a remarkable improvement in hand hygiene compliance culture among HPs. The HHMP consisted of four key components which are as follows: extensive education to be rendered to all HPs regarding the importance of hand hygiene compliance; the setting up of visible monitors; provision of feedback immediate feedback regarding hand hygiene compliance; and, real-time data dissemination to leadership. Mazi, et al. (2013;05) endorse the application of the program and they further mention that the involvement of leadership teams in activities of hand hygiene compliance and continuous education of all HPs about hand hygiene compliance will have a tremendous impact on reduction of HAIs.

5.9 Future research

There is need for further research in order to build on the current information. Research could focus on the use of transformational leadership strategy to enhance hand hygiene compliance in organisations. There is also a need to investigate the provision of rewards as an effective method to motivate healthcare workers to reduce HAIs and to enhance hand hygiene compliance culture. Furthermore, the study needs to be conducted in multiple NICUs in order to enhance the generation of evidence about self-assessment factors regarding hand hygiene and the reinforcement of reduction of HAIs.

5.10 Dissemination

As the leader in an organisation the researcher has a moral obligation to ensure that the key findings and recommendations of this study will be presented to Organisational leadership teams. The core support aim is for them to support and

ensure that the effective implementation of suggested improvement strategies are applied throughout healthcare organisations. Therefore, the researcher has scheduled a meeting so that presentation, discussions and recommendations of the research findings may be discussed in the following forums:

- Infection Control department of KFMC, inclusive of all allied representative senior leadership teams, supply chain, human capital management team and finance
- Quality improvement forum of different centres in the organisation
- General staff orientation in conjunction with nursing and medical education department induction leadership teams.

The findings of this research will be prepared for publication as journal articles and presentation in research and infection control conferences.

5.11 Conclusion

This research study aimed to investigate self-assessment, perceptions and attitudes of health workers towards hand hygiene which influences reduction of HAIs among staff in the NICU at a tertiary hospital in Riyadh in Saudi Arabia. Hence, this evidence-based information is meant for improving strategy to reduce HAIs in NICU and to improve HH compliance among all HPs working in NICU and other departments.

The study results were discussed in this chapter according to the aim and objectives of the study. It can be concluded that the majority of the respondents were nurses who attended the educational training regarding hand hygiene compliance and HAIs reduction. However, despite that, HPs among them were still identified as showing some degree of non-compliance in relation to compliance in hand hygiene and reduction of HAIs.

The application of WHO's strategies to improve hand hygiene compliance has been recognised in many studies that were conducted and it showed tremendous improvement according to the literature. Healthcare organisations should implement innovative methods to enhance a hand hygiene compliance culture in an approach to reduce HAIs. There is a need to implement innovative strategies that may enhance

hand hygiene compliance culture. Innovative strategies may serve as a motivation to HPs to comply in hand hygiene.

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APPENDICES

Appendix 1: Ethics Approval from Stellenbosch University

SELF- ASSESSMENT OF HAND HYGIENE COMPLIANCE BY HEALTH PROFESSIONALS IN NEONATAL INTENSIVE CARE UNIT IN SAUDI FACTORS ARABIA.



UNIVERSITEIT-STELLENBOSCH-UNIVERSITY
Jou kennisvenoot • your knowledge partner

Approved with Stipulations Response to Modifications- (New Application)

24-Apr-2017
Motlhoki, Lillian LD

Ethics Reference #: S17/02/032

Title: **Factors impeding compliance to hand hygiene and reduction of healthcare associated infection in neonatal intensive care unit in Saudi Arabia**

Dear Miss Lillian Motlhoki,

The **Response to Modifications - (New Application)** received on **07-Apr-2017**, was reviewed by members of **Health Research Ethics Committee 1** via Expedited review procedures on **12-Apr-2017**.

Please note the following information about your approved research protocol:

Protocol Approval Period: **24-Apr-2017 -23-Apr-2018**

The Stipulations of your ethics approval are as follows:

Formatting of ICF needs attention.

Timelines of study should be adjusted.

Please remember to use your **protocol number** (**S17/02/032**) on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note a template of the progress report is obtainable on www.sun.ac.za/ids and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number: 00001372

Institutional Review Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No 61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary health care facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms Claudette Abrahams at Western Cape Department of Health (healthres@gwc.gov.za; Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za; Tel: +27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and documents please visit: www.sun.ac.za/ids

If you have any questions or need further assistance, please contact the HREC office at .

Included Documents:

CV D M Rithaa.pdf

20170704 MOD Lillian cover letter for modifications REF S17 02 032.docx

CV L Motlhoki.pdf

Protocol synopsis for Lillian Motlhoki.pdf

Application form.pdf

20170704 MOD 04-04-2017 Proposal final Version for Ethics Edited on 02.04.2017 (002).docx

20170704 MOD 04-04-2017 Proposal final Version (004).docx

Application form_Signature page.pdf

Study Budget for Lillian Dikeledi Motlhoki.pdf

Declaration D M Rithaa V4 2 2 (Eng).pdf

Declaration L Motlhoki.pdf

20170704 MOD Letter for Modifications

Proposal final Version for Ethics.docx

General Checklist(Eng)_V2.1 April 2016.pdf

20170704 MOD declaration of supervisor.pdf

Sincerely,

Franklin Weber

HREC Coordinator

Health Research Ethics Committee 1

From: Fortuin, A, Mev <afortuin@sun.ac.za> **On Behalf Of** ethics application <ethics@sun.ac.za>

Sent: 20 February 2018 10:14 AM

To: M'Rithaa, DKM, Dr <dkm@sun.ac.za> <dkm@sun.ac.za>

Cc: Manuel, AS, Mnr <ashwin@sun.ac.za> <ashwin@sun.ac.za>; Rohland, EL <elr@sun.ac.za> <elr@sun.ac.za>

Subject: RE: Change of title_S17/02/032 (HREC1)

Dear Dr M'Rithaa,

Thank you for your email below.

The HREC acknowledges the change of title and will update our records accordingly.

Kind regards

Mrs Ashleen Fortuin

Administrator: Health Research Ethics

Faculty of Medicine and Health Sciences
Stellenbosch University
PO Box 241, Cape Town, 8000
Francie van Zijl Drive, Tygerberg, 7505
South Africa
Tel: [+27 21 938 9819](tel:+27219389819)
Email: afortuin@sun.ac.za
HREC website: www.sun.ac.za/healthresearchethics

From: M'Rithaa, DKM, Dr <dkm@sun.ac.za>

Sent: Friday, 09 February 2018 1:27 PM

To: ethicsapplication <ethics@sun.ac.za> <ethics@sun.ac.za>

Subject: Change of title

Dear Colleague

This is to inform you that the title for Lilian Muthloki (Ref S17/02/032) was changed from “*Factors impeding compliance to hand hygiene and reduction of healthcare associated infection in neonatal intensive care unit in Saudi Arabia.*” to “SELF- ASSESSMENT OF HAND HYGIENE COMPLIANCE BY HEALTH PROFESSIONALS IN NEONATAL INTENSIVE CARE UNIT IN SAUDI ARABIA”. Kindly please keep this for your records.

The integrity and confidentiality of this email is governed by these terms / Die integriteit en vertroulikheid van hierdie e-pos word deur die volgende bepalings gereël. <http://www.sun.ac.za/emaildisclaimer>



Appendix 2: Participant information leaflet

SELF- ASSESSMENT OF HAND HYGIENE COMPLIANCE BY HEALTH PROFESSIONALS IN NEONATAL INTENSIVE CARE UNIT IN SAUDI ARABIA

Reference Number: S17/02/032

Principal Investigator: Lillian Dikeledi Motlhoki

Supervisor: Dr Doreen Km M'Rithaa

Address: King Fahad Medical City
P.O Box 11525
Riyadh

Contact Number: +966530064705

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff or doctor any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary**, and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University reference S17/02/032** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research. This study is part of a master's degree at Stellenbosch University.

What is this research study all about?

The study will be conducted in Neonatal Intensive Care Unit, King Fahad medical City in Riyadh, Saudi Arabia and total number of participants is 172.

The study will be about to identify what are the factors that may impede Health

professionals in Neonatal Intensive Care Unit to comply with hand hygiene so that healthcare associated infections may be reduced. That is done so that after identifying the factors, the researcher will bring about some recommendations that may promote hand hygiene culture among nurses and doctors.

There is no sampling method that need to be applied in this study because all nurses and doctors working in Neonatal intensive care unit will be included in the study. So, the target population will be only nurses and doctors who are full time employed in Neonatal Intensive Care Unit

Why have you been invited to participate?

You have been invited to participate in the research study about factors impeding compliance to hand hygiene and reduction of healthcare associated infection in neonatal intensive care unit in Saudi Arabia. You are given options to choose your answers and you will not be judged negatively about your opinion. May you kindly note that your information is vital for the success of this study.

What will your responsibilities be?

You are responsible to answer the questions clearly by choosing one answer and after completing your answers, you may put it in a sealed envelope and give it to the investigator.

Will you benefit from taking part in this research?

You will receive no direct benefits from participating in this research study. However, your responses may help us in evaluating the self- assessment of hand hygiene compliance by health professionals in neonatal intensive care unit in SAUDI ARABIA and will help in developing guidelines and to make recommendations on how hand hygiene compliance culture can be enhanced to the nurses and doctors, so that patients can be saved from the risks of healthcare associated infections.

Are there in risks involved in your taking part in this research?

There are no risks involved in participating in this activity

If you do not agree to take part, what alternatives do you have?

Your participation is voluntary, and you have the right to withdraw your consent or discontinue participation at any time without penalty.

Who will have access to your records?

Your participation in this research project is a completely voluntary and anonymous. Your responses will be confidential and data from this research will be reported only as a collective combined total report and the research will be published in the form of thesis and journal will be presented to the university and the organisation with recommendations made. The study will also contribute to development of new policies in the organisation. All the information from the questionnaires will be kept under the lock and key with the researchers and confidentiality of the information ensured by numbering rather than having names on the questionnaires. All questionnaires will be placed in a box within the unit without handing them in to the researchers.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study but your transport and meal costs will be covered for each study visit. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

You can contact Dr Doreen M'Rithaa at +27 79 886 4448 if you have any further queries or encounter any problems.

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.

You will receive a copy of this information and consent form for your own records.

Signed by:

Surname:.....Initials:.....

Date:..... Place:.....

Appendix 3: Permission request to IRB to conduct a study at King Fahad Medical City

Institutional Review Board (IRB) Committee

King Fahad Medical City

P.O Box 59046

Riyadh

11525

Dear sir/madam,

RE: Request for permission to conduct research in the NICU.

I would like to request to be granted a permission to conduct research in your organisation. I am currently a student in Stellenbosch University and my research study topic is about self- assessment of hand hygiene compliance by health professionals in neonatal intensive care unit in Saudi factors Arabia. May you kindly find the following documents attached approval letter from Stellenbosch University, Health Research Ethics Committee (reference S17/02/032) and the research proposal.

Thanking you in advance.

Yours faithfully,

Lillian Motlhoki

Email: lmotlhoki@kfmc.med.sa

Mobile: +966530064705

Appendix 4: Permission obtained from IRB KFMC



IRB Registration Number with KACST, KSA: H-01-R-012

IRB Registration Number with OHRP/NIH, USA: IRB00010471

Approval Number Federal Wide Assurance NIH, USA: FWA00018774

April 30, 2017

IRB log Number: 16-336

Category of Approval: EXEMPT

Dear Lillian Motlhoki,

We have received and recorded the amendment dated April 30, 2017 of the protocol 'Factors Impeding Readiness to Change towards the Reduction of Healthcare Associated Infection in Neonatal Intensive Care Unit' as per details below:

1. Change of title from 'Factors Impeding Readiness to Change towards the Reduction of Healthcare Associated Infection in Neonatal Intensive Care Unit' to self-assessment of hand hygiene compliance by health professionals in neonatal intensive care unit in Saudi factors Arabia.

Sincerely yours,



Prof. Omar H. Kasule Chairman, Institutional Review Board (IRB) King Fahad Medical City, Riyadh, KSA

Tel: + 966 1288 9999 Ext.26913

E-mail: okasule@kfmc.med.sa April 30, 2017



Appendix 5: Research instrument:

Thank you for participating in this study voluntarily.

The aim of the study is exploring self- assessment of hand hygiene compliance by health professionals in neonatal intensive care unit in Saudi factors Arabia. May you kindly note that your information is vital for the success of this study. All information provided by you will be treated with confidentiality and anonymity. It will take approximately 15 minutes to complete this questionnaire. May you kindly tick, x for you answer.

SECTION A

General information:	
A1	Are you a Nurse <input type="checkbox"/> Doctor <input type="checkbox"/>
A2	Your age group 19-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-60 <input type="checkbox"/>
A3	Gender Female <input type="checkbox"/> Male <input type="checkbox"/>
A4	Nationality Saudi <input type="checkbox"/> Non-Saudi <input type="checkbox"/>
A5	Area of work assignment NICU <input type="checkbox"/> PICU <input type="checkbox"/> OR <input type="checkbox"/>
A6	Years of employment in this current job 1 yr. <input type="checkbox"/> 6-10yrs <input type="checkbox"/> 10-15 <input type="checkbox"/> more than 15 yrs.
A7	Have you attended infection control course in this institution Yes <input type="checkbox"/> No <input type="checkbox"/>

SECTION B

Below are the statements about absolute and relative frequencies of answers with hand hygiene of self-assessment. Each number is finishing the sentence, for an example, if one says “In general I believe that” in that case one may believe that the statement is true for one person but not for the other person at a certain time, therefore may you please tick in the box below the word or sentence that is closer to your opinion. It will be highly appreciated if you answer all questions.

B	Questions (Score specification)	1	2	3	4	5	6	7
B1	Do you think that in caring for patients you follow good hand hygiene according to the recommended guidelines? (never (1)- always (7))							
B2	Do you know recommended indications of good hand hygiene? (not at all(1) – fully (7))							
B3	Do your colleagues comply with hand hygiene according to recommended guidelines? (never (1) – always (7))							
B4	Do you think that your behaviour with hand hygiene is considered as exemplary by your colleagues? (not at all (1) – of course (7))							
B5	Is it difficult to adhere to hand hygiene according to recommended guidelines? (always (1) – never (7))							

SECTION C

Below are the statements about attitudes, beliefs and perceptions related to hand hygiene

C	Questions (Score specification)	1	2	3	4	5	6	7
C1	Do you perceive hand hygiene in the following situation “between treating of dirty/ contaminated and clean / sterile would “as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7)							
C2	Do you perceive hand hygiene in the following situation “after contact with body fluids” as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7)							
C3	Do you perceive hand hygiene in the following situation “after removal/taking off gloves” as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7)							
C4	Does non-compliance with hand hygiene in the following situation “in treating of dirty /contaminated and clean/sterile wound” presents risk of infection to patients? (no risk (1) - significant risk (7)							
C	Questions (Score specification)	1	2	3	4	5	6	7
C5	Does non-compliance with hand hygiene in the following situation “upon contact with body fluids” presents risk of infection to patients? (no risk (1) - significant risk (7)							
C6	Does non-compliance with hand hygiene in the following situation “after removal/ taking off gloves” presents risk of infection to patients? (no risk (1) - significant risk (7)							
C7	Do you feel that you can improve compliance with hand hygiene? yes- perhaps- no							

Appendix 6: Arabic translated research instrument

Arabic translated checklist by Mr Mostafa Qarakei, who is trained as Arabic translator in King Fahad Medical City.

Thank you for participating in this study voluntarily. The aim of the study is the self-assessment of hand hygiene compliance by health professionals in neonatal intensive care unit in Saudi factors Arabia. May you kindly note that your information is vital for the success of this study. All information provided by you will be treated with confidentiality and anonymity. It will take approximately 15 minutes to complete this questionnaire. May you kindly tick, x for you answer.

SECTION A شكرًا

General information:	
A1	Are you a Nurse <input type="checkbox"/> هل انت؟ طبيب <input type="checkbox"/> ممرض/ة Doctor <input type="checkbox"/>
A2	Your age group الفئة العمرية 19-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-60 <input type="checkbox"/>
A3	Gender الجنس Female <input type="checkbox"/> انثى Male <input type="checkbox"/> ذكر
A4	Nationality الجنسية Saudi <input type="checkbox"/> سعودي Non-Saudi <input type="checkbox"/> غير سعودي
A5	Area of work assignment NICU <input type="checkbox"/> انعاش حديثي الولادة PICU <input type="checkbox"/> انعاش الاطفال OR <input type="checkbox"/> العمليات
A6	Years of employment in this current job عدد سنوات العمل الحالي 1 yr. <input type="checkbox"/> سنة واحدة 6-10yrs <input type="checkbox"/> سنوات 10-6 10-15 <input type="checkbox"/> سنة 15-10more than 15 yrs. اكثر من 15 سنة.
A7	Have you attended infection control course in this institution هل سبق وحضرت كورس مكافحة العدوى Yes <input type="checkbox"/> نعم No <input type="checkbox"/> لا

SECTION B

Below are the statements about absolute and relative frequencies of answers with hand hygiene of self-assessment. Each number is finishing the sentence, for an example, if one says, "In general I believe that" in that case one may believe that the statement is true for one person but not for the other person at a certain time, therefore may you please tick in the box below the word or sentence that is closer to your opinion. It will be highly appreciated if you answer all questions.

	Questions (Score specification)	1	2	3	4	5	6	7
B	الرجاء الاختيار من 1 الى 7 ابدا (1) دائما (7)							
B1	Do you think that in caring for patients you follow good hand hygiene according to the recommended guidelines? (never (1)- always (7) هل باعتقادك خلال العناية بالمرضى تقوم بتنظيف يديك بطريقة (1)- صحيحة (1) ابدا (7)							
B2	Do you know recommended indications of good hand hygiene? (not at all (1) – fully (7) هل تعلم دواعي غسل اليدين ؟							
B3	Do your colleagues comply with hand hygiene according to recommended guidelines? (never (1) – always (7) هل زملائك يلتزمون بقواعد غسل اليدين ؟							
B4	Do you think that your behaviour with hand hygiene is considered as exemplary by your colleagues? (not at all (1) – of course (7) هل تعتقد التزامك بقواعد غسل اليدين قدوة لزملائك ؟							
B5	Is it difficult to adhere to hand hygiene according to recommended guidelines? (always (1) – never (7) هل من الصعب الالتزام بقواعد غسل اليدين ؟							

SECTION C

Below are the statements about attitudes, beliefs and perceptions related to hand hygiene

التالي التوجهات والاعتقادات السائدة بخصوص غسل اليدين

C	Questions (Score specification)	1	2	3	4	5	6	7
	الرجاء الاختيار غير مفيد (1) مفيد (2)							
C1	Do you perceive hand hygiene in the following situation “between treating of dirty/ contaminated and clean / sterile would “as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7) هل تعتقد ان غسل اليدين بين المرضى او عند الانتقال من جرح ملتهب الى جرح غير ملتهب يساهم في منع انتقال العدوى؟							
C2	Do you perceive hand hygiene in the following situation “after contact with body fluids” as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7) هل تعتقد ان غسل اليدين بعد ملامسة سوائل المريض المحتوية على الميكروبات يساهم في منع انتقال العدوى؟							
C3	Do you perceive hand hygiene in the following situation “after removal/taking off gloves” as useless or useful measure to prevent infection in healthcare? (useless (1) – useful (7) هل تعتقد ان غسل اليدين بعد ازالة القفازات الطبية يساهم في منع انتقال العدوى؟							
C4	Does non-compliance with hand hygiene in the following situation “in treating of dirty /contaminated and clean/sterile wound” presents risk of infection to patients? (no risk (1) - significant risk (7) هل عدم الالتزام بقواعد غسل اليدين بعد معالجة الجروح يمكن ان يشكل خطر نقل العدوى للمريض؟							
C	Questions (Score specification)	1	2	3	4	5	6	7
	الرجاء الاختيار لا خطر (1) خطر (7)							
C5	Does non-compliance with hand hygiene in the following situation “upon contact with body fluids” presents risk of infection to patients? (no risk (1) - significant risk (7)							

	هل تعتقد عدم الالتزام بقواعد غسل اليدين عند ملامسة سوائل المريض ممكن ان يشكل خطر لنقل العدوى للمريض؟							
C6	Does non-compliance with hand hygiene in the following situation “after removal/ taking off gloves” presents risk of infection to patients? (no risk (1) - significant risk (7) هل تعتقد ان غسل اليدين بعد ازالة القفازات الطبية يشكل خطرا وينقل العدوى للمريض؟							
C7	Do you feel that you can improve compliance with hand hygiene? yes- perhaps- no هل تعتقد انك من الممكن ان تحسن من الالتزام بقواعد غسل اليدين؟ نعم ممكن لا							

Appendix 7: Declarations by language and technical editor

**Appendix 8 Jill Stevenson Copy Editor/Proofreader 4 Chesterton 12 Blackheath Road
Kenilworth 7708**

15 November 2017

To whom it may concern

Re: *Copyediting and Proofreading of SELF- ASSESSMENT OF HAND HYGIENE COMPLIANCE BY HEALTH PROFESSIONALS IN NEONATAL INTENSIVE CARE UNIT IN SAUDI ARABIA*

By Ms. Lillian Motlhoki

I, Jill Diane Stevenson, hereby confirm that the changes made to the above thesis were to ensure consistency of grammar and language (concord, spelling, punctuation) and to the conformity of format (headings, indexing and references).

No other changes were made to the body of work submitted by the candidate (conclusions, recommendations, data, factual reporting or commentary).

Yours faithfully

Jill Stevenson Certified Copy-Editor and Proofreader



Cell: 0833092927 Email: Jilldiane18@gmail.com

Appendix 9: Permission to use the questionnaire

On Wed, 21 Jun 2017 at 1:36 PM, Simona Kelcikova

<Simona.Kelcikova@jfmed.uniba.sk> wrote:

Dear Lillian,

you can find all the info on the questionnaire (including the items in English) in the paper about written for me (in copy for the study).

Here comes the permission:

“Herewith I offer you permission to use the following questionnaire:

The Questionnaire (Kelcikova, version I, 2016) was designed specifically for the purposes used for the study. The concept of the questionnaire was aimed to evaluate cognitive factors associated with a compliance of self-assessment of HH according to the recommended guidelines. Reliability of the questionnaire was determined by Cronbach’s alpha with the value of 0.80.

Kind regards.

Simona

PhDr. Mgr. Simona Kelčíková, PhD.

Ústav pôrodnej asistencie

Univerzita Komenského v Bratislave,

Jesseniova lekárska fakulta

Malá Hora 5

036 01 Martin

telefón: 00 421 43/2633428, VoIP 41 428

e - mail: kelcikova@jfmed.uniba.sk

Od: Lillian Motlhoki [lmotlhoki@yahoo.com]

Odoslané: 20. júna 2017 14:09

Do: Simona Kelcikova

Predmet: Re: ODPOVEĎ: Request for a permission to use your questionnaire for my Master study

Good day Dr.Simona

Thank you for your prompt reply

My apology for not mentioning the full details of hand hygiene studies.

That one Dr is Self-Assessment of Hand Hygiene in Health

Professionals as One of the Tools for Measurement of

Provided Health Care Quality.

I have attached the copy for the study

Thanking you once more Dr.

Kind regards

Lillian

On Tuesday, June 20, 2017 12:30 PM, Simona Kelcikova

<Simona.Kelcikova@jfmed.uniba.sk> wrote:

Dear Lillian,

you can find all the info on the questionnair (including the items in English) in the paper - KELČÍKOVÁ, S. ŠKODOVÁ, Z. STRAKA, Š. 2012. Effectiveness of hand hygiene education in a basic nursing school curricula in: Public Health Nursing, vol. 29/ issue 2, pp. 152-159, 2012.

Our questionnaire was in Slovak though I, I attach. Please have a look at our questionnaire and you must translate in the English. I don't have English version. I am almost always willing to offer my permission of the use of my scales. You can I send you a copy of what the permission looks like.

Here comes the permission:

“Herewith I offer you permission to use the following questionnaire:

The Hand Hygiene Knowledge Questionnaire (Kelcikova, version II, 2009) was designed specifically for the purposes used for the study. The questionnaire consisted questions, which intended to measure the level of knowledge among nursing students in HH standards, including hand disinfection, hand washing techniques and the spread of hospital-acquired infection. Existing literature and international documents were analyzed to identify the basic level of knowledge and habits related to the HH issue according to the international standards (Centers for Disease Control and prevention, 2002; World Health Organisation, 2009).

Please see for questionnaire in the attachment.

Kind regards.

Simona

Od: Lillian Motlhoki [lmotlhoki@yahoo.com<mailto:lmotlhoki@yahoo.com>]

Odoslané: 19. júna 2017 16:33

Do: Simona Kelcikova

Predmet: Request for a permission to use your questionnaire for my Master study

Good day Dr Simone,

My name is Lillian. Working in Saudi Arabia in King Fahad Medical City.

I am a study in Stellenbosch University in South Africa, currently studying for Master degree in Nursing. My study is about hand hygiene compliance and I found your questionnaire appropriate for my study.

May you kindly permit me to use your tool.

The University is requesting the permission letter from the author hence I searched for your contacts on the net.

I can be very pleased if my request could be considered.

Thanking you in advance

Kind regards

Lillian

+966530064705

Sent from Yahoo Mail on Android<

<https://overview.mail.yahoo.com/mobile/?src=Android>

>