Hand Hygiene Barriers faced by Health Care Workers in The Gambia:

A Health Belief Model Approach

By: Anna Rosenberg

Supervisor: Inger Porsch-Hällström
Södertörn University | School of Natural Sciences, Technology and Environmental Studies
Master’s Degree Project 15 ECTS
Environmental Science | Spring Semester 2016
Infectious Disease Control
Abstract

Health care associated infections cause major challenges to the provision of health care. This is due to the burden placed on individuals, their families, and health services. Hand hygiene actions are cost effective measures towards reducing the spread of health care associated infections and have proven very effective in preventing microbial transmission during patient care. It has been proven that health care workers hands are the main routes of transmission of health care associated infections. Despite this, hand hygiene is still frequently overlooked by health care workers especially in settings with limited resources. This paper therefore explores hand hygiene knowledge and behaviours of public and private health care workers in The Gambia with focus on the health belief model. The required information has been gathered from 4 public and 2 private health care facilities through the use of a questionnaire based on the WHO evaluation toolkit. Hand hygiene knowledge of health care workers corresponded with their hand hygiene behaviour. Inadequate hand hygiene performance was noted in many health care workers as well as limited availability of hand hygiene resources from health care facilities. Private health care facilities provided better hand hygiene opportunities for their health care workers yet neither private nor public health care facilities offered adequate hand hygiene training and feedback on hand hygiene performances to their health care workers.

Keywords: Health Care Associated Infections, Health Care Facilities, Health Belief Model, Health Care Workers, Handwashing, Handrubbing, Infection Control.
## Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>ABHR</td>
<td>Alcohol-Based Handrub</td>
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<td>HBM</td>
<td>Health Belief Model</td>
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<td>HCAI</td>
<td>Health Care Associated Infection</td>
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<td>HCW</td>
<td>Health Care Worker</td>
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<td>HH</td>
<td>Hand Hygiene</td>
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<td>LIC</td>
<td>Low Income Country</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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<td>SDGs</td>
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1. Introduction

1.1 Health Care Associated Infections

A Health Care Associated Infection (HCAI) is defined as an infection acquired by patients whilst seeking treatment in a health care facility (Ocran and Tagoe, 2014). It can be caused by different microbes such as viruses, parasites, fungi but is most readily linked with bacteria. Transmission routes can occur either through endogenous or exogenous infectious agents (Barrett and Jacqueline Randle, 2007). Endogenous infections are referred to as infections caused by microorganisms already present in the body of a patient which spreads from one area to another usually through the hands of a health care worker (HCW) by touching the infected area (WHO, 2011). Endogenous sources which also act as reservoirs of infections include the skin, nose, mouth, gastrointestinal tract or the vagina. HCWs with poor hand hygiene (HH) compliance who do not wash their hands in between direct contact with patients may rapidly transfer potential antimicrobial resistant bacteria to other patients (Maskerine and Loeb, 2006). HCWs hands gradually get exposed and colonized by germs and possibly microbes when tending to patients. Therefore, there is an increased risk of acquiring a HCAI from a HCW with an increased amount of hand contamination especially in health care facilities lacking hand hygiene.

Exogenous infections are spread as a result of external sources usually via direct contact with infected patients or through the environment (Barrett and Jacqueline Randle, 2007). Sources of exogenous infections also include health care workers, visitors, patient care equipment and medical devices. In summary, the hands of HCW together with patients are the main cause for the spread of both endogenous and exogenous infections to fellow patients as well as visitors and HCW themselves (WHO, 2009). It is therefore of interest to examine HH behaviour of HCWs in a low-income country (LIC) faced with providing quality health care and patient safety despite limited health system resources.
1.2 Burden of Disease

Figures of the global burden of HCAI are not exact due to the difficulty in gathering reliable data. Studies indicate that around 5% to 30% of hospitalized patients per year get infected with at least one HCAI, which subsequently leads to increased financial burden for these patients and their families as well as healthcare facilities (Maskerine and Loeb, 2006; WHO, Health through safe health care). These high expenses on health care providers could be directed towards attaining additional resources beneficial for the health care system. It is important to note that HCAI is an issue faced by both high and low income countries where patient impacts range from prolonged hospital stay to long-term disability alongside exposure to antibiotic resistant organisms.

Albeit, health care facilities in low-income settings are burdened with the additional responsibility of providing safe health care to patients admits mostly overcrowded outpatient care facilities. These facilities worldwide are faced with the challenge of providing quality access to patient treatment and care for an increasing population. A growing proportion of which are immunocompromised and subsequently more vulnerable to HCAI. Targeted action is necessary to combat this significant proportion of diseases spread through unsafe health care settings. The new Sustainable Development Goal 3 (SDGs) specifically aims to promote good health and wellbeing (United Nations Sustainable development health). Two of these targets are partially expressed as: achieving universal health coverage with access to effective health care services and also extensively increasing health financing with intent to promote development, training and retention of health care staff most especially in low income countries.

1.3 Effective Hand Hygiene Methods

Hand hygiene is an important health-promoting act towards preventing the spread of microbes via direct contact and fecal-oral transmission (Kaya et al, 2015). Interestingly, there is clear evidence by studies from the mid-1800s supporting the positive health effects of clean hands. Semmelweis, a physician at the hospital of Vienna, observed higher maternal mortality rates in one clinic compared to another. He had initiated an intervention study demonstrating a decrease
in the mortality rates of women at the labour ward when they were tended to by HCW who had washed their hands with an antiseptic agent. Not only did Semmelweis prove the protective effects of hand hygiene against HCAIs using antiseptic agents rather than regular soap bars, he also helped promote the necessary actions towards a successful epidemiologically motivated infection control intervention namely, “Recognise-Explain-Act” (WHO, 2006).

HH compliance has since then been of utmost importance within health care environments. Foremost are requirements for HCWs to perform hand hygiene practices at point of care for patient safety. There are different ways in keeping hands free from potentially harmful microbes and safe for patient care. These can either be carried out through hand washing with soap and water or by applying an alcohol based handrub. However, the effectiveness of proper hand hygiene actions depend on a combination of various factors such as application of suitable type and amount of hand hygiene agent, sufficient duration of hand hygiene action, satisfactory coverage of all hand surfaces and proper hand drying methods (Boyce and Pittet, 2002).

Handwashing is preferred when faced with the following: visibly dirty hands soiled with blood or body fluids, exposure to spore-forming organisms and after using the restroom. However, various HH guidelines recommends the use of an alcohol-based handrub as the most effective method of hand hygiene. Thus, an alcohol-based handrub is to be used as the ideal choice of hand hygiene practice whenever available as it ensures the elimination of the majority of germs and viruses; it cuts down on the duration of time spent on hand hygiene; it can be readily available at point of care thereby excluding the need for extra resources such as availability of clean water for hand washing along with functioning hand wash basins with soap and proper hand drying material and last but not least alcohol-based handrubs have good skin tolerability in that many contain humectants and skin conditioning agents for combating the drying effect of alcohol (WHO, 2006).

As mentioned before, proper hand hygiene execution, irrespective of whether through handwashing or an alcohol-based handrub, is subject to various determining factors to be considered for increased patient and HCW safety when introducing interventions. Maskerine and Loeb (2006) carried out a review on the theoretical basis of interventions and provided an

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1 An outlined detail of these techniques towards securing effective disinfection of hand surfaces can be observed in the annexes chapter of this paper.
overview of the evidence for interventions. They stress that barriers to HH must be identified prior to the introduction of theory based interventions. In conclusion, they suggest a combination of HCWs education with performance feedback to be carried out through randomized controlled trials. On assessing HH compliance, the findings of Whitby et al (2008) as well as Giannitsioti et al (2009) both show that the introduction of an alcohol-based handrub as a single intervention does not improve HH compliance in a sustainable manner. They also advocate for the combination of interventions targeting HCWs behaviour such as continuous feedback, education and motivation practices.

1.4 Five moments of hand hygiene

Health activities within health care settings are based on direct and indirect contact with patients from all health professionals apart from administrative staff. These different health activities usually differ in degrees of microbe transmission. The issue here refers to standardising HH routines for specific health activities. It is challenging in particular to predetermine situations and persons at higher risk of association with transmission regardless of the health activity to be carried out. As a result, all HCW who are engaged with health care provision are subject to carrying out HH actions regardless of whether conducting direct or indirect patient contact is indication of risk of transmission of microbes or not.

Figure 1 illustrates when to carry out these actions as a way to facilitate HH promotion for HCW (WHO, 2009). There are 5 specific moments to consider when performing hand hygiene actions for HCW namely:

- Before touching a patient
- Before clean or aseptic procedure
- After body fluid exposure
- After touching a patient
- After touching patient surroundings

As noticed, two HH actions: before contact with a patient and before clean or aseptic procedure, are aimed at minimising the risk of microbial transmission to the patient. The remaining three HH moments occurring after patient contact or exposure to body fluids are protective against the
transfer of microbes from the patient to the HCW and subsequently to surroundings within the health care facility. Various health care activities are usually carried out together during health care provision. For this reason, it might be sufficient to only carry out one HH action at a time. Therefore, in case of numerous health activities, choice of HH action should be based on individual patient assessment. Thus in order to prevent the transmission of HCAI, HCWs need to understand and recognise all five hand hygiene moments so as to execute appropriate HH action when a certain situation calls for it. The WHO has made it possible for countries worldwide irrespective of cultural and educational backgrounds, levels of progress and financial resources, health-care system, and patient population to successfully adapt the HH strategies towards achieving a significant increase in HH compliance for HCWs (Allegranzi et al, 2013). In their own study on HH improvement, Allegranzi et al (2013) noted sustainable HH actions 2 years after the intervention with an increase in overall HH compliance and HH knowledge of HCWs.
Figure 1. Poster on the 5 moments for HH (WHO, 2009)
1.5 Problem Formulation

HCAI is a problem that is currently faced by all health care facilities around the globe regardless of economic state. Not only does it compromise patient safety but also that of HCWs. It is in the interest of all health care providers to address this situation and ensure improved patient safety as well as create suitable work environment for employees. Most especially since the negative impacts of HCAIs include excessive costs for patients, increased resistance to antimicrobials and a higher financial burden for the community as a whole. Many of the health care providers in LIC are faced by a combination of several determinants causing a higher transmission risk of HCAIs. As previously noted, these might include understaffing, poor infrastructure with lacking hygiene and sanitation conditions, lack or shortage of basic equipment, patient overcrowding all of which can be linked to limited financial resources (Allegranzi et al, 2011).

Surveillance on HCWs HH practices plays an important role towards achieving safer and higher quality patient care. Worldwide, campaigns have been set up in order to support infection prevention and control including HH initiatives. However only 23 out of 147 low-income countries manage to provide functional national evaluation and monitoring systems (WHO, 2010). Likely reasons for this are the demanding and intensive requirements of a national surveillance system linked with limited resources allocated towards HCAI in low and middle income settings where other emerging health issues and diseases are given priority (Allegranzi et al, 2010).

This research will focus on HH compliance for HCWs in The Republic of The Gambia (The Gambia) which is the smallest country on mainland Africa with a population of 1.909 million and a per capita income in 2013 at US$ 487.7 per annum (UNdata). It is also one of the poorest nations in the world, with a human development index ranking of 175 of 188 countries (UNDP, 2015). Apart from health care facilities in settings typically dominated by lack of resources against basic infection control, The Gambia also faces health care barriers similar to other African nations such as lack of access to basic preventive and medical services. Frontline health workers are commonly underpaid or working in poor conditions with chronic understaffing, and have low incentives (Dixey and Njai, 2013).
The public health care system of The Gambia is divided into three tiers: primary (492 health posts), secondary (36 health care centres and clinics) and tertiary level (4 hospitals)\(^2\) care alongside traditional community health care workers (Lerberg et al 2014; Global health workforce alliance). The issue of insufficient health care personnel at the primary level disrupts quality health care provision. Expansion of health care services has not necessarily met adequate requirements and this can be seen in the ratio of physicians (0.5) per inhabitants (10 000) compared with 2.4 per 10 000 in the WHO African Region (Iddriss et al, 2011). As also revealed by Iddriss et al, the majority of practicing physicians (80%) are of non-Gambian nationality. However, their study accounted for sufficient nursing and health care staff as did Cole-Ceesay et al (2010) indicating an estimated 75% representation of nurses within overall healthcare workforce.

2. Purpose

HH knowledge and practice in The Gambia was analysed by the use of questionnaires distributed to 4 public and 2 private healthcare facilities. Four general areas of enquiries outlined below are central towards the development of this study regarding HH behaviours of health care workers in The Gambia. Emphasis will be placed on HCWs knowledge and performance on HH actions towards basic infection control measures as well as access to HH opportunities. This will be based on personal and institutional determinants influencing hand hygiene actions of HCWs in relation to the chosen public and private health care facilities. Finally, this research will touch upon HCWs perceived susceptibility of HCAIs.

3. Research Questions

Four enquiries surrounding knowledge and practice of HH have been identified for this study:

- Do health care workers in The Gambia have good knowledge on hand hygiene routines?

\(^2\) Tertiary level health care provider within the research area is noted at 1.
• What are the differences between public and private health care facilities in implementation of hand hygiene practices for their health care workers?

• Does knowledge on hand hygiene practices correspond with health care workers hand hygiene behaviour?

• Does health care workers knowledge on hand hygiene correlate with self-protection or patient safety?

4. Theory

4.1 Applying the Health Belief Model on hand hygiene knowledge and practice

This chapter introduces the use of the Health Belief Model (HBM) as a framework for measuring and combining various variables affecting health behaviours of HCWs HH actions and will also include the importance of direct observation of HCWs. Conner and Norman (2005) described health behaviours as activities carried out with the intention of disease prevention or for improving health and well-being. A wide range of variables were identified from different health models as factors affecting compliance to these health behaviours. Yet, there are considerable differences in HH behaviours between HCWs within the same health care facility and even within wards suggesting individual social cognitive variables that could be accountable for this (WHO, 2009).

The HBM was initially produced in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels to guide public health and health promotion plans and has since been applied by researchers towards developing and evaluating behaviour change interventions (Abraham and Sheeran, 2005). Despite reasonable research linking differences in health behaviour with sociodemographic variables (for instance gender, socio-economic and ethnic status), Armitage and Conner (2000) describe a shift in focus to social cognitive variables instead since these are modifiable. As such, the concentration on beliefs more readily predicts preventive
behaviour between individuals from identical backgrounds. Abraham and Sheeran (2005) explain how early research identified certain main health beliefs that were linked with health behaviours. It was therefore possible to distinguish between those individuals that carried out certain health behaviours as opposed to those that did not.

Six main beliefs were identified as determinants of behaviour or health beliefs associated with the HBM. All of which are generally observed as mutually exclusive factors towards predicting health behaviour. However, the HBM is based on two main components of these namely threat perception and behavioural evaluation. Threat perception regards HH performance in response to the perceived threat of an infection by the HCW. It combines 2 of the 6 beliefs: perceived susceptibility of HCAI together with perceived severity.

4.2 Threat Perception

Perceived susceptibility as a HH determinant translates to whether the HCW believes that they are at risk of acquiring a HCAI or not. Education interventions on HH are primarily concerned with raising awareness surrounding correct HH actions rather than on informative guidance on the beliefs of HCWs. Those HCWs that do not identify themselves as being at risk of infection might be less responsive to HH educational intervention. Take for instance the belief that one’s hands are less compromising towards infection spread than another HCWs. This is referred to as the actor-observer bias in which personal noncompliance to HH would be blamed on external factors whereas noncompliance of other HCWs would be blamed on those individuals personal shortcomings. Subsequently, a HCW might experience their own hands to be cleaner than their colleagues and therefore less dangerous towards patient care. A study comparing self perception of HH against perception towards others showed that nurses as well as doctors believed their own hand hygiene to be cleaner than their co-workers (McLaughlin and Walsh, 2011).

Perceived severity determines how serious a problem HCWs identify the effects of poor compliance to HH actions. Is HH performance only considered a matter of option and common sense? The focus here lies on whether there is a personal level of concern faced by HCWs in omitting HH actions. The gravity of the situation and the implication cost may determine the health behaviour of the HCW. It is therefore crucial for HCWs to understand the correlation of health care provision and the risk of microbe transmission. Universal HH standards within
healthcare facilities are important towards reducing the normative differences in the understanding of HH actions between HCWs (WHO, 2009). There should therefore be no opportunity for personal interpretation of HH performance. Clear and plain information is necessary in order for HCWs to understand the severity of poor HH compliance.

4.3 Behavioural Evaluation

The second component of the HBM, behavioural evaluation, examines the course of action taken in response to an infection threat. It is made up of the two variables: perceived benefits and perceived barriers. These determine the likelihood for the HCW to follow up with HH behaviours considering the positive outcomes or costs of this action.

Perceived Benefits relays to HCWs awareness and beliefs on the positive impacts of carrying out HH actions towards reducing risk of infection spread. For instance, Larson and Kretzner’s (1995) report on handwashing compliance states that one major determining factor for HH was the prevention of infection. Indicating an adequate level of understanding the benefits of HH practices.

Perceived barriers to HH practices faced by HCWs vary depending on physical, mental or financial influences. Even though similar throughout, barriers are normally situational for each healthcare facility ranging from adverse skin effects, lack of accessible products, insufficient staff and high workload (McLaughlin and Walsh, 2011). Reports commonly mention HCWs awareness of HH as preventive towards HCAI yet factors such as professional level of nursing, level of health care resources and the type of patient contact, just to name a few, determines HH compliance (Mclaws et al, 2012). This is also confirmed by Larson and Kretzer’s (1995) study in which nurse’s and physician’s understanding of the benefits of HH did not necessarily reflect in their HH performance. Apart from similar barriers as recently mentioned, the main obstacle towards hand washing compliance was noted as skin irritation and dryness. Not only does skin damaged hands cause discomfort for HCWs, it also disrupts the microbial flora nature of hands, consequently increasing colonization by staphylococci, enterococci, gram negative bacterias and candida (Alves Rocha et al, 2009). HH compliance demands constant use of products and performance of hand hygiene procedures resulting in damaging effects. However, this occurs mainly due to lack of knowledge surrounding correct HH performance and skin care protection.
as well as failure in using quality HH products (Boyce and Pittet, 2002).

Therefore, the HBM indicates that HH measures are likely to be carried out when HCWs:

- Assume threat of disease due to high susceptibility and severity
- Acknowledge benefits to be obtained from HH performance
- Encounter low number of barriers towards HH performance
- Experience one or combinations of the above mentioned factors.

The remaining two beliefs on the HBM are: health motivation and cues to action. The first mentioned refers to the HCWs incentive to engage in HH actions. This is associated with the degree of self-efficacy commanded by the HCW and relates to the extent to which the HCW believes that the barriers to HH measures can be overcome and managed. It relies on individual abilities of HCWs to literally undertake the task at hand. Therefore, HH actions are more likely to be carried out if the HCW is confident in their health motivation.

Cues to action are made up of a various range of internal and external triggers to the HCW for carrying out HH actions. Both of which are sufficient in conducting and monitoring HH behaviour among HCWs. Internal triggers normally consist of observed physical symptoms from surrounding individuals or co-workers whilst external triggers can include health communication such as guidelines for HH promotion from assumed reliable sources ranging from mass media and specializing physicians to politicians (Conner and Norman, 2005). In this case, external triggers can also include observation of HCWs HH actions as a cue to action.

4.4 Observation of Hand hygiene Action

Observation of hand hygiene practices within health care facilities is necessary in monitoring HCWs HH actions and whether the standard of performance is being maintained. Information gathered from these observations are to help guide the selection of suitable interventions for hand hygiene promotion within health care settings (WHO, 2009). Observations carried out prior to and afterwards the introduction of such hand hygiene interventions facilitate the assessment of the program and whether there is the need for any adjustments to be made.

A popular HH observation method used is the direct observation of HCW during routine health care activities. This type of observation allows for quite accurate data on HCWs compliance of the HH moments. However, it should be noted that these results are not
necessarily a representation of reality due to underlying influences. One main barrier towards direction observation of HCWs HH behaviours is known as the Hawthorne effect and is based on HCWs knowledge of being observed and thereby temporarily altering their HH actions during that moment of observation (Smiddy et al, 2015). The ideal situation for carrying out direct observation of HH routines for HCWs would be to do so anonymously and to keep it confidential. This is a consistent form of observation method that provides a more representative view of reality since all HCWs are assessed through the same angle. However, results from these types of surveys are prone to being condemned for overly generalizing and in which individual representation is focused on numerical form instead of raising awareness surrounding the experience of individuals in this case HCWs and HH actions (Baum F, 1995). As useful as these numbers are towards identifying HH issues regarding compliance, they do not reveal the true identity of HCW’s experience in comparison to others.

Although, direct observations are not to be employed as instruments for individual assessment of HCWs, identification of HCWs can sometimes be recommended as beneficial towards raising awareness on HH promotion as well as receiving instant feedback on HH performances of the observed HCW (WHO, 2009). What matters most is to ensure cultural safety within epidemiology by facilitating communication between researchers and HCWs seeing as this produces valid results and recommendations. Such type of improved communication includes providing feedback to HCWs within appropriate workspaces either during individual or collective meetings. It also involves easily understood and interpretable results in order to encourage dialogue surrounding HH practices. As such direct observation through surveillance, feedback and recommendation of appropriate measures in promoting HH is usually accompanied by instant effect as HCWs are made aware of the importance of carrying out hand hygiene actions.

In summary, the HBM is applicable in predicting the HH behaviour of HCWs. Not only does it serve as motivation towards HH compliance against HCAI but it also helps evaluate the available alternatives making it easier to determine which health belief should be the main focus for producing suitable HH intervention plans.
5. Method

5.1 Study Design

This study employed an integrated methodology approach with the aim to describe as well as understand HH behaviour by HCWs. The main source of data was applied by the use of a knowledge, attitude and practice (KAP) survey. A literature review on already carried out research was useful towards strengthening aspects of this study.

This research was conducted in The Gambia and concentrated on urban areas with access to both private and public health care facilities. The make-up of the questionnaire used in this survey was constructed based on the WHO’s tools for evaluation and feedback from the “Save lives: Clean Your Hands” campaign. The evaluation toolkit was adapted to support this research. No pretesting occurred since the framework for the questionnaire development was based on that of the WHO with regards to established validity and credibility.

5.2 Data collection

The HCW questionnaire used for this KAP survey consisted of 17 structured questions in categorical and multiple-choice form and were based on HH knowledge and risk of infection spread. It included questions on demographic data such as age, gender and profession; HH performance; HH knowledge and health care facility resources on HH measures. The use of closed ended questions enabled standardized responses for statistical analysis. The questionnaires were distributed to six major health care providers in an urban area setting and consisted of 4 public (Public A, B, C, D) and 2 private (Private A, B) facilities. Two of the smaller public health facilities received 40 and 35 questionnaires respectively whilst the remaining larger public and private health care facilities received 50 questionnaires each. Those eligible for partaking in the survey were HCWs in contact with patients on a daily basis and were randomly selected. Those of whom were eligible to partake but declined, expressed work related barriers such as lack of time and in some cases preparations for upcoming trials. The HCWs were briefed face-to-face on informed consent as well as via the questionnaire. Also, The
Gambia government’s joint ethics committee with the Medical Research Council (MRC) granted approval of this study in order to ensure suitable adherence to research protocol and protection of study participants. KAP surveys usually imply the collection of personal information from individuals towards raising awareness surrounding the chosen subject typically for intervention programs (WHO, 2008). However, responses were kept confidential and this survey did not require information that would reveal the identity of the respondents. At the same time, the distribution of questionnaires was facilitated by consent from the Department of State for Health and Social Welfare.

The information gathered from the survey was manually cleaned in which unusable data such as unreadable, conflicting or unanswered responses were eliminated. This was then registered in a Microsoft excel package and sorted through by using pivot tables and running frequency counts for further statistical analysis. Chi square tests were calculated using the excel program for comparison between groups which ranged from combinations of public against private health care facilities to correlations between gender, age and profession and HH activities.

The literature examined for this research was obtained through academic journal databases. The aim was to search for already carried out research and reports on HH behaviour and academically based literature in order to strengthen my choice of applied theory. This was performed through the assistance of the Södertörn University’s search motor called Söder Scholar as well as through Google Scholar. Combinations of the following search criteria were applied: hand hygiene, hand hygiene compliance, hand wash, health care workers, health care associated infections, health belief model. Abstracts of peer-reviewed articles were then assessed and those articles relevant to my study in terms of context were selected amounting to 39. Skimming through the articles provided an additional selection process according to suitable hand hygiene related context. This resulted in a final assortment of 28 applicable articles, books and reports; 8 discarded articles and another 3 that were possible contenders as additional reference material.

Qualitative methods alone have a problem of failing to provide a representative view of reality therefore demanding the introduction of a reliable form of research approach in which all HCWs are view through the same angle. The use of a quantitative method confronts the problem of selection bias by targeting uniform HCWs. Representation of reality is based on the average
HCW thereby making it possible to construct knowledge on HH behaviour. Quantitative methods are precise and reliable proving beneficial towards summarising the patterns of HCWs HH practices. The importance lies within its ability to provide us with reliable knowledge and beliefs of respondents according to themselves.

Possible problems involved with conducting this type of self-reporting research includes the social desirability bias. HCWs were aware of the purpose of the questionnaire and might have been eager to provide what they assumed to be desirable responses (Abraham and Sheeran 2005, Launiala 2009). In similar ways, HCWs might have also responded according to their ideal image of HH performances. This way of measuring beliefs through self-reporting has been criticised since respondents tend to answer in the manner which is generally accepted as the norm. One way of minimising this risk of social desirability bias would have been to place questions both referring to HCWs actual as well as ideal beliefs on HH.

6. Results

A total of 275 questionnaires were initially distributed to the 6 healthcare facilities. The number of respondents amounted to 201 with 81 participants from private and 120 from public healthcare facilities. The response rate from private health facilities was 81% and public 69%. Gender distribution was 54% female and 46% male and HCW’s were categorised into 8 different professions listed as: auxiliary nurses, medical doctors, medical students, midwives, nurses, nurse technicians, nurse students and “others” who are categorized as HCWs with occupations other than those listed yet who meet the criteria of daily exposure to patients. One of the public healthcare facilities (Public C) was a teaching hospital. The response rate gathered was sufficient in order to provide descriptive data and for comparison between public and private health care facilities. It should be noted that some questions were left unanswered by respondents.
Public health care facilities had a majority of female staff (62.5%) whilst private facilities had a larger proportion of male HCWs at 59% as shown in figure 2.

![Figure 2](image)

Figure 2. Gender distribution between private and public health care facilities.

The main professions consist of nurses (58), midwives (37) and auxiliary nurses (31) as seen in the following figure 3, followed by nurse students (17). Medical doctors (4), medical students (6) and nurse technicians (3) were the least noted occupations. Those in the field of “others” added up to 45.  

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3 Professions other than auxiliary nurses; medical doctors; medical students; midwives; nurses; nurse technicians and nurse students added up to 45, however this is a combination of various occupations and cannot be identified as part of one majority.
Gender distribution within the different professions are presented in figure 4 and identifies a majority of females within auxiliary nurses (24); medical students (4); midwives (27) and nurse students (15). All 4 medical doctors were male. Nurses (36); nurse technicians (2) and occupations other than mentioned (29) had a majority of male HCWs.

The highest proportion of HCWs are between the ages 26-33 (69) followed by 18-25 (52) and 34-41 (36). One out of 5 HCWs were between the ages 42-49 (24) and over 50 (20). In Public C,
70% of HCWs were between the ages 18-25. It should be noted that Public C is a teaching hospital (figure 5).

Figure 5. Age distribution according to health care facilities.

### 6.1 What knowledge on hand hygiene routines do HCWs possess?

The first research question regards the understanding that HCWs have on HH routines and results are based on analysing frequency of answers from 6 different questions. All 6 examinations provided valid multiple choice answers, however, one out of each set of answers was most accurate.

Despite the fact that the majority of all HCWs (73%) believed in HH as highly or every highly effective towards preventing HCAI (figure 6), only 55% answered accurately on the main route of cross transmission of potentially harmful germs between patients in the health care facility as due to HCWs hands when not clean (figure 7). The remaining proportion of responses were:

- Air circulating in the hospital (6%)
- Patients exposure to colonised surfaces (22%)
- Sharing non-invasive objects between patients (17%)
Figure 6. Response frequency on the capacity of HH in preventing HCAI as (A) Very low (13%); (B) Low (14%); (C) High (35%) and (D) Very high (38%).

Figure 7. Response rate on question regarding main route of cross transmission of germs between patients. (A) HCWs hands when not clean; (B) Air circulating in the hospital; (C) Patients exposure to colonised surfaces; (D) Sharing non-invasive objects between patients.

The most effective measure against preventing transmission of germs to the patient is through HH actions before administering care to that patient. Although 63% of HCWs (125) accurately identified this (figure 8), 37% still lack knowledge on proper HH measures and responded as follows:

- Immediately after risk of body fluid exposure (12%)
• After exposure to the immediate surroundings of a patient (9%)
• Immediately before a clean/sterile procedure (16%).

Also noted is that HCWs at Public-A assumed that patient safety HH measures were just as effective before touching a patient (44%) as immediately before a sterile procedure (39%).

![Figure 8](image-url)

Figure 8. Response frequency on most effective HH actions towards preventing transmission of germs to patient based on (A) before touching a patient; (B) immediately after risk of body fluid exposure; (C) after exposure to the immediate surroundings of a patient; and (D) immediately before a clean/sterile procedure.

On the transmission of germs to the HCW, only 58% of HCWs (114) responded accurately that HH actions should be carried out after touching the patient (figure 9.) The remaining 42% of HCWs (82) lacked knowledge on self-protective measures and answered as follows:

- Immediately after a risk of body fluid exposure (13%)
- Immediately before a clean/sterile procedure (12%)
- After exposure to the immediate surroundings of a patient (17%)

Health care facility Public A, presented little difference between the multiple choice questions:
(A) 28%; (B) 33%; (C) 22% and (D) 17%.
The majority of HCWs (137) lacked knowledge on the highest risk of colonisation of hands with harmful germs. Only 30.5% of HCWs (60) accurately identified damaged skin as an indication of highest likelihood of colonisation of hands by harmful germs (figure 10). The rest answered as follows:

- Wearing jewellery (30.5%)
- Artificial fingernails (34%)
- Regular use of hand cream (5%).

Only for Public A (41%) and Public C (41%) was the correct answer in majority. However, only 5% of HCWs associated increased risk with regular use of hand cream.
Figure 10. Response rate on most increased likelihood of colonisation of hands with harmful germs through (A) Wearing jewellery; (B) Damaged skin; (C) Artificial fingernails and (D) Regular use of hand cream.

Lastly for this enquiry, only 34% of all HCWs accurately identified handrub as:

- More rapid for hand cleansing than handwashing (22%)
- More effective against germs than handwash (12%)

The majority of HCWs (66%) lacked knowledge on handrub and handwashing procedures with the following responses:

- Handrub causes skin dryness more than handwashing (5%)
- Handwashing and handrubbing are recommended to be performed in sequence (61%)

In fact, the majority of the 6 health care facilities answered incorrectly D and in frequencies of 45% and over (figure 11).
Figure 11. Response frequency on statements on alcohol-based handrub and handwashing with soap and water: (A) Handrub (is) more rapid for hand cleansing than handwashing; (B) Handrub causes skin dryness more than handwashing; (C) Handrub is more effective against germs than handwash and (D) Handwashing and handrubbing are recommended to be performed in sequence.

6.2 Differences between public and private health care facilities

Frequency results of 6 questions indicated HH features of public and private health care facilities respectively (table 1). Apart from absence of regular feedback on their HH performance (65%), the majority of HCWs in both public and private health care facilities consider their workplace to deliver sufficient HH promotion. One single health care facility, Public-A, reported overall inadequate HH opportunities for HCWs (figures 13-17). Respondents from private health care facilities report better opportunities for good HH.

Response rate with a majority (89%) of HCWs confirming clear and simple HH instructions visible to all HCWs (figure 12).
The majority of HCWs (143) confirmed HH education provided for all HCWs (figure 13) with following responses: Private A (83%) and Private B (76%). Public B (79%); Public C (71%) and Public D (63%). However, Public A’s main proportion of HCWs (58%) conveyed a lack of HH education from their workplace.

The majority of HCWs (121) further confirmed receiving formal training in HH during the past 3 years according to the following: Public B (50%); Public C (76%); Public D (58%); Private A
(60%) and Private B (64%). The majority of HCWs at Public A (58%) conveyed lack of recent formal training in HH (figure 14).

Figure 14. Response rate of HCWs receiving formal HH training during the past 3 years.

The majority of HCWs (147) stated that their health care facilities provided alcohol-based handrub at all sites where staff are in contact with patients as follows: Public B (83%); Public C (79%); Public D (60%); Private A (87.5%) and Private B (81%). However, the majority of HCWs at Public A (68%) conveyed lack of availability of handrub at HCW-patient contact sites (figure 15).
The majority of HCWs (163) stated that they use an alcohol-based handrub as a routine with answers as follows: Private A (92%); Private B (88%); Public A (58%); Public B (87.5%) and Public C (79%) and Public D (76%)(figure 16). Public A had 11 out of 19 HCWs who stated the use of an alcohol-based handrub as a routine.
The majority of all HCWs (149) state that HH posters are displayed at all sites where staff are in contact with patients as reminders as follows: Public B (91%); Public C (85%); Public D (56%); Private A (81%) and Private B (94%). However, the majority of HCWs at Public A (68%) conveyed lack of availability of HH posters at HCW-patient contact sites (figure 17).

Figure 17. Response frequency on presence of HH poster-display at point of HCW-patient contact.

The majority (128) of HCWs reported lack of regular feedback on HCWs HH performance as follows: Public A (89%); Public C (71%); Public D (63%); Private A (58%) and Private B (73%). Only 58% of Public B conveyed regular feedback on HCWs HH performance (figure 18).

Figure 18. Response rate on lack of regular feedback of HCWs HH performances:
More specific differences between private and public health care facilities were then calculated using Chi-squared testing. The following result were noted:

Table 1. Indicating Chi squared test on differences between public and private health care facilities

<table>
<thead>
<tr>
<th></th>
<th>Public</th>
<th>Private</th>
<th>X²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Clear and simple instructions for</td>
<td>84%</td>
<td>16%</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>hand hygiene are made visible for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all health-care workers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All health-care workers at the</td>
<td>65%</td>
<td>35%</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>health-care facility where you</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>work receive education on hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hygiene.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you received formal training in</td>
<td>59%</td>
<td>41%</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>hand hygiene during the last three</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The health-care facility where you</td>
<td>66%</td>
<td>34%</td>
<td>85%</td>
<td>15%</td>
</tr>
<tr>
<td>work provides alcohol-based handrub</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at all sites where staff are in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contact with patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hygiene posters are displayed</td>
<td>67%</td>
<td>33%</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>at all sites where staff are in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contact with patients as</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>reminders.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health-care workers regularly</td>
<td>42</td>
<td>78</td>
<td>28</td>
<td>50</td>
</tr>
<tr>
<td>receive feedback on their hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hygiene performance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The figures of table 1 shows significant differences as follows:
• A higher proportion of public HCWs (16%) experienced lack of clear and simple HH instructions at their work place than did the private HCWs (5%).
• Public HCWs (35%) reported significantly lower provision of HH education from their employees than private HCWs (20%).
• Public HCWs (34%) experienced significantly lower availability of alcohol-based handrub at all sites where staff are in contact with patients compared to private HCWs (15%).
• More public HCWs (33%) noted lower presence of HH posters displayed at all sites where staff are in contact with patients compared to private HCWs (14%).

Lastly, there were no noted differences between public (41%) and private (38%) HCWs on the issues of receiving formal training in hand hygiene during the last three years. Both conveyed similar levels of formal HH training from their healthcare facilities. Nor were there any significant differences between public and private HCWs on receiving regular feedback on their hand hygiene performances. Similar frequencies of public HCWs (65%) and private HCWs (64%) stated that they had received feedback on their HH performances.

The response frequencies from Public A prompted further comparison between the public healthcare facilities outlined below using Chi squared testing (table 2).
Table 2. Indicating Chi squared test on differences between health care facility Public A and health care facilities Public B+C+D.

<table>
<thead>
<tr>
<th></th>
<th>Public A</th>
<th>Public B+C+D</th>
<th>X²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Clear and simple instructions for hand hygiene are made visible for all health-care workers.</td>
<td>68%</td>
<td>32%</td>
<td>87%</td>
<td>13%</td>
</tr>
<tr>
<td>All health-care workers at the health-care facility where you work receive education on hand hygiene.</td>
<td>42%</td>
<td>58%</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>Have you received formal training in hand hygiene during the last three years?</td>
<td>42%</td>
<td>58%</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>The health-care facility where you work provides alcohol-based handrub at all sites where staff are in contact with patients.</td>
<td>32%</td>
<td>68%</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Hand hygiene posters are displayed at all sites where staff are in contact with patients as reminders.</td>
<td>32%</td>
<td>68%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Health-care workers regularly receive feedback on their hand hygiene performance.</td>
<td>11%</td>
<td>89%</td>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Differences on the visibility of clear and simple instructions for HCWs on HH between HCWs from Public A and HCWs from Public B+C+D could not be established by chi-squared testing since at least one expected value < 5 implying that interpretation of these results would be discredited. The rest of the figures in table 2 shows that:
• Public A HCWs (58%) reported significantly lower provision of HH education from their employees than HCWs from Public B+C+D (30%).
• More A HCWs from Public A (68%) experienced lower availability of alcohol-based handrub at all patient-contact sites than HCWs from Public B+C+D (28%).
• Public A HCWs (68%) noted significantly lower presence of HH posters at patient-contact sites than HCWs from Public B+C+D (25%).
• Public A HCWs (89%) reported significantly lower level of feedback on their HH performance from their employees than HCWs from Public B+C+D (60%).

Lastly, there were no noted differences between HCWs from Public A and HCWs from Public B+C+D on the issue of receiving formal training in hand hygiene during the last three years. All Public health care facilities conveyed similar absence of formal HH training from their healthcare facilities. However 76% of HCWs from Public C stated that they had received formal training in the past 3 years. It is to be noted that Public C is a teaching hospital.

Due to the differences identified between Public A and the remaining public health care facilities (B+C+D), a final Chi squared test was performed between Public B+C+D and Private A+B (table 3).
Table 3. Indicating Chi squared test on differences between Public health care facilities B+C+D and Private A+B

<table>
<thead>
<tr>
<th></th>
<th>Public B+C+D</th>
<th>Private A+B</th>
<th>X²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and simple instructions for hand hygiene are made visible for all health-care workers.</td>
<td>87% 12%</td>
<td>95% 5%</td>
<td>3.34</td>
<td>0.07</td>
</tr>
<tr>
<td>All health-care workers at the health-care facility where you work receive education on hand hygiene.</td>
<td>69% 31%</td>
<td>80% 20%</td>
<td>2.8</td>
<td>0.09</td>
</tr>
<tr>
<td>Have you received formal training in hand hygiene during the last three years?</td>
<td>62% 38%</td>
<td>61% 39%</td>
<td>0.008</td>
<td>0.9</td>
</tr>
<tr>
<td>The health-care facility where you work provides alcohol-based handrub at all sites where staff are in contact with patients.</td>
<td>72% 28%</td>
<td>85% 15%</td>
<td>4.19</td>
<td>0.04</td>
</tr>
<tr>
<td>Hand hygiene posters are displayed at all sites where staff are in contact with patients as reminders.</td>
<td>74% 26%</td>
<td>86% 14%</td>
<td>4.08</td>
<td>0.04</td>
</tr>
<tr>
<td>Health-care workers regularly receive feedback on their hand hygiene performance.</td>
<td>40% 60%</td>
<td>36% 64%</td>
<td>0.26</td>
<td>0.61</td>
</tr>
</tbody>
</table>

In table 3, only 2 differences were noted between public health care facilities B+C+D and private health care facilities A+B. The first is that a significantly higher number of the public HCWs (28%) stated lower provision of alcohol-based handrub at all sites where staff are in contact with patients than private HCWs (15%).
Secondly, a significantly higher number of the public HCWs (26%) indicated lower presence of HH posters displayed at all sites where staff are in contact with patients as reminders than the private HCWs (14%).

6.3 Does knowledge on hand hygiene practices correspond with HCWs hand hygiene behaviour?

Chi-square tests of independence were used to determine the relationship between variables associated with HCWs and HH behaviour. Combinations of two suitable variables from the survey were all tested in order to discover existing correlations. The predetermined level of significance was set to p<0.05 and those combinations that yielded significant differences are outlined below:

Table 4. Indicating Chi squared test

<table>
<thead>
<tr>
<th>1. Routine use of an ABHR</th>
<th>Statements on alcohol-based handrub (ABHR) and handwashing with soap and water.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Handrub more rapid for hand cleansing than handwashing (A)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Handrub causes skin dryness more than handwashing (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Handrub is more effective against germs than handwash (C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Handwashing and handrubbing are recommended to be performed in sequence (D)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>98</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>21</td>
</tr>
</tbody>
</table>
### 2. Gender

Effectiveness of HH in preventing HCAI.

<table>
<thead>
<tr>
<th></th>
<th>Very low (A)</th>
<th>Low (B)</th>
<th>High (C)</th>
<th>Very High (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female</strong></td>
<td>18</td>
<td>18</td>
<td>38</td>
<td>30</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>7</td>
<td>10</td>
<td>32</td>
<td>44</td>
</tr>
</tbody>
</table>

\[X^2 = 9.70, \quad \text{P-value} = 0.021\]

### 3. Occupation

Knowledge on colonization of hands by germs.

<table>
<thead>
<tr>
<th></th>
<th>Wearing jewellery (A)</th>
<th>Damaged skin (B)</th>
<th>Artificial fingernails (C)</th>
<th>Regular use of a hand cream (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HCWs as “Others”</strong></td>
<td>9</td>
<td>9</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td><strong>The rest of the HCWs</strong></td>
<td>51</td>
<td>51</td>
<td>44</td>
<td>7</td>
</tr>
</tbody>
</table>

\[X^2 = 9.62, \quad \text{P-value} = 0.022\]

### 4. Routine use of an ABHR

The health-care facility where you work provides alcohol-based handrub at all sites where staff are in contact with patients.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
<td>137</td>
<td>26</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td>10</td>
<td>26</td>
</tr>
</tbody>
</table>
The first combination shows that neither of the HCWs (who used or did not use an alcohol-based hand rub as a routine) answered more often than expected that it causes skin dryness more than handwashing (table 4).

Secondly, there was a significant association between gender and views on HH towards preventing HCAIs (table 4). More male HCWs than expected correctly viewed HH as very highly effective towards preventing HCAIs. Whereas there was a lower than expected number of female HCWs who identified HH as very highly effective towards preventing HCAIs.

Thirdly, more of the HCWs categorised as “Others” stated artificial nails as the highest likelihood of hands being colonised with harmful germs (table 4). Also, similar frequencies of “Others” (7%) as the rest of the HCWs (6%) stated the regular use of hand cream as highest likelihood of hands being colonised by germs.

Lastly, the responses from figures 15 and 16 prompted further investigation into additional factors affecting HCWs HH behaviour by comparing the use and availability of alcohol-based handrub. There was a significant association between HCWs use of an ABHR as a routine and the availability of ABHR at their place of work (table 4). HCWs experiencing lower provision of ABHR from their health care facilities resulted in lower use of ABHR among those HCWs.

6.4 Does HCWs knowledge on hand hygiene correlate with self-protection or patient safety?

Finally, chi-square method of testing for relationships between suitable variables was also used for this last enquiry. The first statement tested for was preventive HH actions towards patient safety and the other was on preventive HH actions regarding HCW safety. These were tested against several factors such as gender, occupation, routine performance of handwashing and handrubbing. The only significant results were identified in the following combination (table 5):
<table>
<thead>
<tr>
<th>Occupation</th>
<th>Effective HH actions in preventing spread of germs to HCWs.</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After touching a patient (A)</td>
<td></td>
</tr>
<tr>
<td>Nurse Students</td>
<td>7</td>
<td>= 7.50</td>
</tr>
<tr>
<td>The rest of the HCWs</td>
<td>107</td>
<td>P-value</td>
</tr>
<tr>
<td></td>
<td>Immediately after a risk of body fluid exposure (B)</td>
<td>= &lt;0.001</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Immediately before a clean/sterile procedure (C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>After exposure to the immediate surroundings of a patient (D)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

There was a significant association between nurse students and their opinions on effective HH actions against germ spread to HCWs. More nurse students incorrectly identified HH actions after exposure to the immediate surroundings of a patient as the most effective HH measure for HCWs protection suggesting low self-protection.
7. Analysis

The intent of this analysis is to examine the earlier proposed research questions. Therefore the terms: “threat perception”, “behavioural evaluation”, “health motivation”, “cues to action” and “self-efficacy” are used in reference of how the applied theory, namely the Health behaviour model, interacts with those enquiries on HCWs knowledge and practice of HH.

7.1 Health Care Workers knowledge on Hand Hygiene

The first research question is reviewed by analysing frequencies of responses from HCWs in order to understand their knowledge on HH routines. These results can be categorized into two different blocks. The first indicating comprehension of HH actions and the remainder highlighting lack of proper HH actions. Most of the encouraging responses on HH knowledge corresponded to the perceived threat of transmission of germs in accordance to the HBM. These included HH as very and highly effective towards preventing HCAI; HCWs hand as the main route of transmission of germs; HH actions to be carried out before and after touching patients as protective measure towards the patients and surrounding health care environment respectively. Accurate opinions show that the perceived threat of infection is being taken seriously enough for HCWs to be aware of standard patient and workplace safety routines. HCWs are conscious of the high risk and seriousness of impacts surrounding HH negligence. The outcome is therefore regarded through the HBM as HCWs carrying out health behaviours towards health promotion which in this sense refers to HH behaviour. Behavioural evaluation has therefore occurred as HCWs realise the perceived benefits of HH actions as subsequently reducing the risk of infection.

On the other hand, some HCWs lack proper awareness on HH actions with otherwise low variance between the response options. Public-A health care provider produced indecisively balanced response rates on which HH behaviours to avoid and this could be linked with the HBM’s cues to action. External triggers could then explain HCWs mixed opinions on whether jewellery (31%), artificial nails (34%) or damaged skin (31%) results in increased likelihood of colonisation of hands. Guidelines or advice from supposedly confident sources could therefore
also result in spread of incorrect information to HCWs and as a result inappropriate HH execution. Thus, cues to carrying out HH actions can also involve incorrect actions.

Perception of threat is individually interpreted according to how much at risk and danger HCWs assume to be in. As such, those with increased beliefs of threat of infection would carry out as many health actions as possible in order to keep infections at bay. In the context of HH actions, the majority of HCWs in 5 out of the 6 health care facilities (61%) believed that handwashing as well as handrubbing were recommended to be performed concomitantly. Not only is this an unnecessary act, it aggravates skin conditions and could lead to increased colonisation of hands by germs. Thus, the combination of protective measures in fear of increased perception of threat does not automatically relate to appropriate health behaviours.

7.2 Differences between public and private health care facilities

Here too an analysis of frequencies was used revealing similarities in responses from public and private HCWs. The majority of HCWs in both public and private health care facilities considered their work places to promote HH behaviour. However, statistical analysis shows that public healthcare facilities differs from private ones (table 1). Nevertheless, response frequencies indicated Public A as an outlier prompting further statistical analysis differentiating it from the rest of the public health care facilities B+C+D (table 2). A final investigation showed less differences in HH promotion between public health care facilities B+C+D and private health care facilities A+B (table 3).

The overall HH facilitation by public and private health care providers at the organisational level can be an indication of perceived threat of infection spread to patients as well as staff. An operating health care facility should be able to provide quality health care to its growing number of patients. Thus, health care administration duly realise the adverse effects of HCAI. A rise in number of infections will increase HCWs workload and disrupt schedules resulting in less effective health care facilities. Also, infected HCWs compromises the strength of the health care facility’s workforce thereby disrupting health care provision. The perceived severity and gravity of the situation according to the HBM triggers administration to provide incentives towards health behaviour and subsequently HH promotion.

Despite some satisfaction with HH opportunities, public HCWs experienced a few
differences on HH facilitation when compared with views from private HCWs. These include:

- Significantly higher lack of alcohol-based handrub at all sites where public HCWs are in contact with patients.
- Significantly higher absence of HH posters displayed at all sites where staff are in contact with patients as reminders.

These differences revealed by statistical analysis can be based on financial barriers. As previously mentioned, health care facilities in low-income settings are usually faced with limited resources and inadequate health systems. According to the HBM, healthcare facilities incentives to promote HH opportunities for their HCWs should be based on the fact that the perceived benefits of good health outweigh the perceived barriers of increased costs. In this sense, the financially perceived barriers causing lack of accessible HH products and measures reduces HH opportunities for public HCWs. This is subsequently reflected in their behavioural evaluation. Public HCWs are thereby faced with accomplishing good HH behaviour according to their individual degrees of self-efficacy despite these financial barriers. This can be related to Boyce and Pittet’s (2002) study showing that some of the issues regarding poor HH are directly linked to institution or system liabilities.

Even though there were no significant differences between private and public healthcare facilities on lack of regular feedback on HCWs HH performances, both parties still experienced inadequate feedback from their healthcare facilities. There were also no significant differences between public and private HCWs on formal training in HH during the last 3 years yet neither yielded satisfactory responses on recent formal training for all HCWs.

As mentioned earlier, the responses from Public A triggered further investigation by statistical analysis (table 2). This revealed less HH opportunities faced by HCWs from Public A than those from Public B+C+D on the following points:

- Higher lack of HH education for public HCWs.
- Higher lack of alcohol-based handrub at all sites where public HCWs are in contact with patients.
- Higher absence of HH posters displayed at all sites where staff are in contact with patients as reminders.
- Higher absence of regular feedback on HH performance.

HCWs from Public A+B+D had received similar levels of formal training in HH during the last
three years apart from HCWs in Public C which stated that they had received more formal
training in the past 3 years. As mentioned earlier this discloses Public C as a teaching hospital
together with a 70% coverage of HCWs between the ages of 18 to 24.

7.3 Does knowledge on hand hygiene practices correspond with HCWs hand hygiene
behaviour?

Evaluation of this enquiry focuses on HCWs HH actions in relation to their beliefs. This is
necessary since behavioural evaluation of the HBM is linked to perceived benefits of HH
compliance against encountered barriers. Therefore, a selection of suitable HH opportunities;
gender and occupation were cross-analysed with HCW’s beliefs in order to discover significant
associations between the two variables. Those combinations of HH knowledge and actions that
yielded significant associations are listed below:

Firstly, there was a significant difference between HCWs who did not use alcohol-based
handrub as a routine and their opinion that handrub causes skin dryness more than handwashing.
Behavioural evaluation of this perception and cues to action against HH performance can be
assessed through two point of views. Perceived barriers are situational for each HCW and could
also occur as a result of internal triggers. The HCWs could in fact have previously experienced
symptoms of skin dryness due to lack of quality products or poor knowledge of proper alcohol-
based HH procedures. Therefore, past experience of perceived disadvantages of skin dryness
would then possibly discourage the present use of alcohol-based handrubs as a routine. On the
other hand, the HBM’s cues to carrying out HH actions can also depend on external triggers.
Which in this situation would be information based on misconceptions causing mental barriers in
the sense that those HCWs who do not use alcohol-based handrub are the ones who believe that
it causes skin dryness more than handwashing would. This would imply that misleading
information activates HCWs perceived barriers towards following supposedly protective actions
and thus HH negligence.

This form of misleading information can also be applied to the significant amount of
HCWs within non-specified occupational fields who stated artificial nails as the most likely risk
factor towards hands being colonised by harmful germs. Here too, failure to identify highest risk
of colonisation of hands through damaged skin could be overlooked by general assumption of
artificial nails (which are more visible) as the highest risk factor. Thus, according to the HBM, these HCWs could be additionally convinced of this by cues to action through external triggers such as the general HH guidelines on possibility of nails puncturing gloves or through personal levels of concern from co-workers. HH behaviour that is based on opinions and common sense is situational for each HCWs and so might provoke perceived threat of infection. Assumptions of poor HH compliance based on opinions and “common sense” can therefore trigger perceived severity thereby identifying artificial fingernails instead of damaged skin as the highest risk of hands being colonised by germs.

There was a significant association between gender and views on HH as preventive methods of HCAI. More male HCWs accurately identified HH actions as very effective towards preventing infections. Perceived threat through high susceptibility and severity can influence the level of beliefs regarding infection prevention and control. Male HCWs evident views of HH performance as highly protective conveys the HBM’s take on behavioural evaluation. The perceived benefits of HH performance raises awareness surrounding HH knowledge and actions.

More importantly on other factors affecting HH behaviour was the correlation between routine use and availability of an alcohol-based handrub. There was a highly significant relationship between those HCWs who did not use an alcohol-based handrub as a routine and the lack of this product at their place of work. This is clearly a perceived barrier for the HCWs towards achieving HH compliance in that they experience a lack of available resources towards carrying out health behaviours.

7.4 Does HCWs knowledge on hand hygiene correlate with self-protection or patient safety?

Finally, the last enquiry to be evaluated relates to whether HCWs knowledge on HH reflects in protection of self or that of patient’s wellbeing. Different possible associations were tested between HCWs HH actions; gender and occupation against HH knowledge on infection control towards patients and HCWs. Two combinations resulted in significant differences stated below:

Surprisingly, there was a significant relationship between nurse students and their beliefs of HH performance directly after exposure to the immediate surroundings of a patient as the most effective HH measure for protection against transmission of germs to HCWs. It is assumed
that nurse students in training would have correctly identified the most protective HH measure as that which is carried out after touching a patient. However, to the less experienced nurse students, exposure to immediate surroundings a patient can be perceived as high risk of exposure to germs. Also, nurse students might not always have the opportunity to carry out health activities during patient care, thus the closest opportunity to carrying out HH actions might be after exposure to patient surroundings. Therefore the perception of threat can relate to carrying out HH actions according to nurse student’s contact of patient surroundings.

Even though there was a significant association between nurse technicians and their HH performances immediately after a risk of body fluid exposure as most effective against germ transmission to the patient, this testing did not meet the Cochran criteria (Rosner 2000) and was therefore discarded.

8. Discussion

The objective of this debate is to comment upon the survey results and HH situation in The Gambia experienced by HCWs in the 2 private and 4 public health care facilities. This chapter focuses on assessing the relationship between the different variables according to formerly mentioned research questions.

The first discussion will centre around HCW’s knowledge on HH and how this reflects on their health behaviour. HCWs knowledge of HH has been assessed based on context by providing multiple choice statements that are best fitting situations requiring HH actions. In this sense, some enquiries might include more than one true statement. It is however the task of the HCW to demonstrate competence by identifying the preferred alternative on HH measures. Generally speaking, most HCWs realise the importance of HH towards preventing the spread of germs and most HCWs also confirm the presence of clear and simple instructions visible at all locations in which patients are received. Only 5% of HCWs associated increased colonisation of hands with regular use of hand cream. However, there is indeed need of improvement towards achieving and promoting HH behaviour for HCWs within public as well as private health care facilities. Many HCWs (45%) fail to identify HCWs hands as the main route of cross transmission of potentially harmful germs to the patient. Others lack knowledge on protective HH measures against the transmission of germs to the patient (37%) and to the HCWs (42%).
Figures from this research also show that 69.5% of HCWs cannot identify damaged skin as the highest likelihood of colonisation of hands by harmful germs. Even though the majority of HCWs stated that they use an alcohol-based handrub as a routine, many of them still conveyed that handwashing and handrubbing were to be performed in sequence. It should be kept in mind that handwashing with regular soap and water immediately before or after using an alcohol based hand product is unnecessary and may cause dermatitis (Kampf and Loeffler, 2003). Thus, in general, the HH performance of HCWs is reflected in their levels of knowledge. These results undoubtedly call for further investigation into the HH behaviour of HCWs. Intervention programs that monitor and evaluate HH behaviour are necessary towards HH promotion. These include direct observation of HH compliance, measurement of utilised HH products and feedback of HCWs HH performance (Pan et al 2013).

Feedback is a major aspect towards achieving HH compliance which is demonstrated in a systematic review by Maskerine an Loeb (2006) where audit and feedback on health behaviour and health care outcomes show positive results of increase in compliance. Unfortunately, 65% of all HCWs lack regular feedback on their HH performances with each healthcare facility experiencing an absence of feedback ranging between 42% and 89%. In addition to this, HCWs at the different health care facilities state that between 12.5% and 68% of them lack access to alcohol-based handrub at their work places. Also, between 9% and 68% of health care workers at the different health care facilities relay a lack of HH posters displayed at all sites where staff are in contact with patients. Finally, HCWs experiencing lack of access to HH education at the 6 different health care facilities ranges from 17% to 58% as well as those with lack of formal training in HH during the past 3 years ranging from 24% to 50% across the different health care facilities. Private HCWs experience HH situations at their work places where they report better opportunities for improved HH behaviour on availability of alcohol-based handrub and presence of HH posters at all patient-contact sites.

All of the above statements confirm the lack of financial and educational resources made available to HCWs towards HH improvement. Non-compliance to HH behaviour is typically based on system failure rather than lack of knowledge or motivation of HCWs (Maskerine and Loeb 2006). Interventions should therefore be aimed towards strengthening organisational structures as well as targeting situational factors of respective health care facilities.
According to the survey results, public A is the health care facility that is most affected by difficulties regarding proper HH measures. This has been established in comparison to the rest of the public health care facilities. Also, all public health care facilities with the exception of Public A showed more similarities than differences with the private healthcare facilities A and B. Although not the largest, Public A is the public health care facility that receives the most patients amongst the 4 public ones. Perhaps this can account for many barriers faced by HCWs similar to many health care facilities in low-income settings in terms of increased workload, insufficient staff, lack of financial resources and priorities placed on preventing diseases other than HCAIs.

However, interesting to note is that one public health care facility (Public C) indicated that 76% of the HCWs had received formal training in HH during the past 3 years. A fact less surprising since Public C happens to be a teaching hospital with the majority of respondents ranging between the ages of 18 and 25. The availability of formal training on HH measures should not be reserved for teaching hospitals alone. It is essential that HCWs from all other public health care facilities receive the same HH opportunities as Public C whether or not those HCWs are in training or fully qualified.

Interpretation of survey results indicate that although HCWs correctly view HH as very highly effective towards preventing HCAIs they have insufficient knowledge on protective HH measure against the transmission of germs to themselves. For instance, more nurse students incorrectly identify HH actions after exposure to the immediate surroundings of a patient as the most effective HH measure for HCWs protection. These are worrying results as student nurses in training with recent and direct access to medical educational programs are required to identify the most accurate HH action towards preventing the spread of germs to the HCW. Also, both groups of HCWs who used and did not use an ABHR as a routine had similar rates of opinion that handwashing and handrubbing are recommended to be performed in sequence. Health care facilities are liable to providing safe environments not only for visiting patients but also for their own employees. HCWs need to be aware of protective HH features towards preventing the transmission of HCAIs. HCWs education on HH and infection control demands limited efforts and is central towards securing continued competence and wellbeing for quality health behaviour.

Limitations to this discussion include the fact that it would have been beneficial to compare direct observations of HCWs HH compliance against the results from the questionnaire.
Direct HH observation is recognised to enhance HCW’s compliance in which regular evaluation and feedback serves as a reminder to HCWs of the importance of HH actions (Maury et al, 2006).

9. Conclusion

The following insights were obtained from the main enquiries that shaped this study:

*Do healthcare workers in The Gambia have good knowledge on hand hygiene routines?*
This paper has demonstrated that knowledge on HH as a single strategy is insufficient towards achieving hand hygiene compliance. Nevertheless, according to the evaluation of HCW’s knowledge and HH performance, they did not command acceptable knowledge on HH measures. It is important for HCWs to realise the indications for HH performance according to general recommendations of:

1. Before and after touching a patient
2. Before handling an invasive device for patient care
3. After contact with body fluids
4. If moving from a contaminated body site to another body site of the same patient
5. After contact with immediate surroundings of a patient

Many HCWs had difficulties in distinguishing the correct HH measure for the presented situation.

*What are the differences between public and private health care facilities in implementation of hand hygiene practices for their HCWs?*
This examination has explored the role of health care facilities in providing hand hygiene opportunities for their health care staff. Currently, private health care facilities provide the best opportunities towards proper HH actions for their HCWs. Private HCWs experience lower barriers for proper HH measures. However, in defence of some public health care facilities, it is important to note that public health care facilities B+C+D did not differ much from the private health care facilities. It has been distinguished that Public A experienced the least opportunities
for improved HH behaviour. However, this can be understood due to the fact that Public A is the second smallest health care facility of all public ones in this survey, yet it receives the most of patients on a daily basis throughout the region. This will of course not explain all perceived barriers but it will surely account for many of the difficulties faced by their HCWs on executing proper HH measure. Lastly, both public and private HCWs faced similar issues of no feedback on their HH performances nor did they receive sufficient HH training during the last 3 yrs.

**Does knowledge on hand hygiene practices correspond with HCWs hand hygiene behaviour?**

It can be concluded that HCWs knowledge on HH does correspond with their HH behaviour. Some of this is due to the lack of HH knowledge commanded by HCWs resulting in inadequate HH measures during patient care. However, poor HH behaviour is also grounds to the lack of HH resources and products made available by health care facilities. HCWs have conveyed lack of readily accessible resources for improved HH behaviour such as absence of ABHR, limited formal training on HH practices and lack of available HH posters and guidelines at their health care facilities.

**Does HCWs knowledge on hand hygiene correlate with self-protection or patient safety?**

Despite knowledge on the risk of HCAIs, many HCWs are unaware of preventive HH actions towards their own safety. This is not to say that HCWs do not value their own safety, but simply that many lack information on proper HH procedures.

Hand hygiene promotion within health care provision is faced with particular challenges in that the stakeholders are not those seeking care or treatment but in fact the HCWs. This differs from other health campaigns in the sense that health behaviour in focus is preventive towards many different infections and diseases. Improving HH compliance is therefore a cost effective measure towards reducing the spread of infections especially in low income settings. Thus, more resources should be invested on promoting HH compliance in health care settings as well as increased monitoring, evaluation and feedback on HCWs HH behaviour.

**General recommendations from the WHO**

It is advisable for the following actions to be taken into consideration with the intention of improving current HH situations for HCWs in The Gambia.
For health care workers:
HCWs are advised to identify the 5 indications for HH practices. Hands should be washed with soap and water when visibly dirty or soiled. ABHR is otherwise the preferred choice for routine HH for all other situations.

Proper HH techniques should be carried out. This refers to the amount of HH product used, the time spent performing this HH action and the manner in which is it carried out. A brief summary of general guidelines include:
- HH product should cover all surfaces of the hands
- Use clean and running water when handwashing. Avoid hot water as this causes dermatitis. Turn off tap/faucet with towel. Dry hands thoroughly. Avoid recontamination when drying hands. Do not use same towels several times of by several individuals.
- All forms of soap are acceptable. However soap bars should be left to dry in racks that enable drainage.
- Avoid artificial fingernails. Natural fingernails should be kept short. (WHO, 2009)

For health-care administrators:
Health care administrators at all levels are liable for providing quality health care provision including improved HH opportunities. These include:
- Opportunities for handwashing with continuous access to improved and water sources.
- Readily accessible ABHR at all sites where HCWs are in contact with patients.
- Provide access to formal training in HH and infection control.
- Raise awareness and place priority on HH implementation through strong leadership.
- Apply HH intervention programmes situational for each health care facility
10. References


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Knowledge and Perception of Hand Hygiene for Health-Care Workers

I am a Masters’ candidate of Gambian nationality currently enrolled within the “Infectious Disease Control” programme at a university in Stockholm, Sweden. As a health-care worker, you are in direct contact with patients on a daily basis and this is why I am interested in your opinion and knowledge of health care-associated hand hygiene. **Your answers will be kept confidential.**

- It will take you approximately **10 minutes** to complete this questionnaire.
- Only provide **one answer at each multiple-choice question**.
- Please **read the questions carefully** before answering.

Short Glossary:

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

Facility: health-care setting where the survey is being carried out (e.g., hospital, ambulatory, long-term facility, etc).

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Hand washing: washing hands with plain or antimicrobial soap and water.

(Please turn over)
1. **Gender**
   - [ ] Male
   - [ ] Female

2. **Age**
   - [ ] 18 - 25
   - [ ] 26 - 33
   - [ ] 34 - 41
   - [ ] 42 – 49
   - [ ] 50 and over

3. **Profession**
   - [ ] Nurse
   - [ ] Auxiliary nurse
   - [ ] Nurse Technician
   - [ ] Medical Doctor
   - [ ] Student Nurse
   - [ ] Medical Student
   - [ ] Midwife
   - [ ] Other

4. Do you as a routine perform hand washing at the health-care facility where you work?
   - [ ] Yes
   - [ ] No

5. Do you as a routine use an alcohol-based handrub for hand hygiene at the health-care facility where you work?
   - [ ] Yes
   - [ ] No

6. Clear and simple instructions for hand hygiene are made visible for all health-care workers.
   - [ ] Yes
   - [ ] No

7. All health-care workers at the health-care facility where you work receive education on hand hygiene.
   - [ ] Yes
   - [ ] No

(Please turn over)
8. Have you received formal training in hand hygiene during the last three years?
   ☐ Yes
   ☐ No

9. The health-care facility where you work provides alcohol-based handrub at all sites where staff are in contact with patients.
   ☐ Yes
   ☐ No

10. Hand hygiene posters are displayed at all sites where staff are in contact with patients as reminders.
    ☐ Yes
    ☐ No

11. Health-care workers regularly receive feedback on their hand hygiene performance.
    ☐ Yes
    ☐ No

12. What do you think is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? *(Choose one answer only)*
    ☐ Health-care workers’ hands when not clean
    ☐ Air circulating in the hospital
    ☐ Patients’ exposure to colonised surfaces (i.e., beds, chairs, tables, floors)
    ☐ Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

13. What do you think is the effectiveness of hand hygiene in preventing health care-associated infection? *(Choose one answer only)*
    ☐ Very low
    ☐ Low
    ☐ High
    ☐ Very high

(Please turn over)
14. Which of the following hand hygiene actions do you think is most effective in preventing the transmission of germs to the patient? *(Choose one answer only)*

- Before touching a patient
- Immediately after a risk of body fluid exposure
- After exposure to the immediate surroundings of a patient
- Immediately before a clean/sterile procedure

15. Which of the following hand hygiene actions do you think is most effective in preventing the transmission of germs to the health-care worker? *(Choose one answer only)*

- After touching a patient
- Immediately after a risk of body fluid exposure
- Immediately before a clean/sterile procedure
- After exposure to the immediate surroundings of a patient

16. Which of the following should be avoided, as associated with the most increased likelihood of colonisation of hands with harmful germs? *(Choose one answer only)*

- Wearing jewellery
- Damaged skin
- Artificial fingernails
- Regular use of a hand cream

17. Which of the following statements on alcohol-based handrub and handwashing with soap and water is true? *(Choose one answer only)*

- Handrubbing is more rapid for hand cleansing than handwashing
- Handrubbing causes skin dryness more than handwashing
- Handrubbing is more effective against germs than handwashing
- Handwashing and handrubbing are recommended to be performed in sequence

Thank you very much for your time!
12. Acknowledgements

I would like to take this moment to express my sincere gratitude to my thesis supervisors of the Department of Natural Sciences, Technology and Environmental: to Inger Porsch-Hällström on rendered support and guidance that has helped improve necessary skills in undertaking the task of writing this thesis and Patrik Dinnetz for the comprehensible concepts on statistical analysis of infectious disease.

I am appreciative of the Department of State for Health and Social Welfare of The Gambia, the Medical Research Centre and respective health care facilities for providing me with the opportunity to perform my research as requested. My credit goes out to all those health care workers and administrative staff who took the time out of their busy schedules in order to answer my questionnaire and/or share with me their experiences and knowledge of hand hygiene.

I would also like to thank those who assisted in conducting this survey including distribution and collection of survey materials (Ilene Dick and John Carayol) as well as printing services offered by Dambell Business Corporation

This project would not have been possible without the support, encouragement and understanding of my family, friends and colleagues of Södertörn University. Their enthusiasm and motivation has been tremendous during this process.