IMPROVING HAND HYGIENE IN THE CLINICAL SETTING

A BEST PRACTICE APPROACH

BY

CRYSTAL LYNN MACIEL

A Thesis Submitted to The Honors College
In Partial Fulfillment of the Bachelors degree
With Honors in
Nursing
THE UNIVERSITY OF ARIZONA
MAY 2016

Approved by: Lisa Kiser, CNM, WHNP
Clinical Instructor, University of Arizona College of Nursing
Improving Hand Hygiene in the Clinical Setting

A Best Practice Approach

Crystal Lynn Maciel

The University of Arizona

College of Nursing
ABSTRACT

The purpose of this paper is to use evidence based recommendations to develop a best practice protocol in an effort to improve hand hygiene compliance among healthcare workers (HCWs) in the clinical setting. Infections that are acquired while receiving healthcare are the most common adverse healthcare related event, with 1.7 million people affected yearly in the United States. Hand hygiene is believed to be the most effective preventative measure against healthcare acquired infections, yet adherence rates among HCWs are estimated to be well below 50%. A literature review was conducted to examine which interventions have been evaluated and indicated the greatest association with improvement in hand hygiene compliance rates. The proposed best-practice protocol is based on these evidence-based interventions and includes suggestions from implementation, monitoring, and evaluation. It is believed that the implementation of this protocol will increase hand hygiene compliance rates and subsequently reduce healthcare associated infections.
CHAPTER ONE

Statement of Purpose

The purpose of this thesis is to develop a best practice protocol designed to improve hand hygiene (HH) compliance rates among healthcare workers (HCWs) in the clinical setting. The following sections will provide background information about healthcare associated infections (HAIs) as well as information about HH compliance rates and the significance of both to nursing. After providing background information about HH and HAIs, recent literature about the effectiveness of multiple interventions designed to improve HH compliance rates will be examined. This thesis will detail proposed best practice HH improvement interventions, which were developed using evidence-based research studies examining the effectiveness of multiple interventions designed to improve HH compliance rates among HCWs.

Healthcare Associated Infection Information

HAIs, defined as any infection acquired within 48 hours of admission or 30 days after discharge from the healthcare setting, affect one in 25 patients in the United States (Cherry, Brown, Bethell, Neal, & Shaw, 2012; Centers for Disease Control and Prevention [CDC], 2015). HAIs are considered to be the most common complication after receiving any form of healthcare, with an estimated 1.7 million occurrences in the United States every year (Department of Health and Human Services [HHS], 2015). Even more critical is that HAIs have also become the leading cause of preventable deaths in the United States with rates estimated to be nearly 100,000 per year (HHS, 2015). There is also a significant economic impact on society, with the financial burden of HAIs costing an estimated $30 billion yearly to U.S. hospitals (Agency for Healthcare Research and Quality [AHRQ], 2014; CDC, 2015). The numbers themselves are overwhelming, but it is important also to consider the stress and loss in productivity experienced
by the patient including longer hospital stays, lost wages, family obligations, pain and suffering, and possible disability (Cherry et al., 2012; Harne-Britner, Allen, & Fowler, 2011).

While exposure to various microorganisms is common in the community setting, however, hospitalized patients are often ill or vulnerable in some way, such as their age, a wound, extended antibiotic use, or stress in general (Ryan & Ray, 2014). A large part of modern day medicine’s success is brought about by the use of medical devices, innovative surgeries, and invasive testing and procedures; while these advances bring about many positives, there are negatives as well, one of which is creating an entryway for pathogens (Ryan & Ray, 2014). These vulnerabilities increase the susceptibility of acquiring an infection, and the hospital is a location with the potential for multiple exposures opportunistic pathogens (Aranaz-Andrés, Limón, Mira, Aibar, Gea, & Agra, 2011).

The prevalence of HAIs is becoming increasingly dangerous with the rise of multidrug-resistant organisms (MDROs); every year more HAIs are reported to be the result of a MDROs (Aboumatar et al., 2012). Bacteria such as Methicillin-resistant *Staphylococcus aureus* (MRSA) and Vancomycin Resistant *Staphylococcus aureus* (VRSA) are potentially lethal bacteria that can cause pneumonia, surgical site infections, and bloodstream infections (CDC, 2015). These complications are increasingly difficult to treat due to their resistance to multiple antibiotics (CDC, 2015; Levinson, 2014). The overuse of antibiotics is one of the main factors that has led to the emergence and increase in MDROs (Levinson, 2014). In addition, the use of antibiotics by a patient may kill off their normal flora, leaving the patient susceptible to colonization and infection by other organisms including yeast, fungus, bacteria, and viruses (Aboumatar et al., 2012; Levinson, 2014). It is vital that these patients' exposure to pathogens be limited as much as possible.
The majority of HAIs stem from four different categories: urinary tract infections, surgical site infections, pneumonia, and bloodstream infections (HHS, 2015). Research suggests that the majority of these HAIs, approximately 70%, are preventable by practices that are already widely suggested, a significant finding when considering the lives and money lost every year to HAIs (HHS, 2015). After examining the considerable loss of lives, health, function, and money, it is imperative that the prevention of HAIs be addressed at a system-wide level.

**Hand Hygiene and HAIs**

The most widely recognized cause of HAIs is a failure to adhere to evidence-based recommendations regarding HH (Wachter, 2012). Even before the discovery of microorganisms, an obstetrician by the name of Ignaz Semmelweis exposed the importance of HH to remove what he referred to as "invisible particles" (Ryan & Ray, 2014). In 1848, Semmelweis discovered that by requiring hand washing with a chlorine solution before providing obstetric care, it was possible to reduce the deaths attributed to puerperal endometritis by 90%; his insistence on strict adherence to a HH protocol prevented many infections and fatalities (Ryan & Ray, 2014).

Killing microbes before they can be transferred to patients is the cornerstone of HAI prevention, yet HHC rates are estimated to be about 40%, with physicians regularly exhibiting the poorest level of compliance, and nurses exhibiting the highest adherence rates (Harne-Britner et al., 2011; Cherry et al., 2012; Langston, 2011). Years after Semmelweis's discovery, and with significantly more knowledge about microorganisms and the importance of HH, the healthcare field is still lacking in adherence to the most basic of patient safety standards, washing their hands.

The failure of HCWs to perform adequate HH allows for the transfer of pathogenic organisms from HCW's hands to patients (Wachter, 2012). Through the simple act of performing
adequate HH, there is a reduction in both the transfer of organisms as well as a reduction in the rates of HAIs (Langston, 2011). To combat HAIs caused by poor HH compliance rates, the World Health Organization (WHO) developed guidelines for when HH should be performed, known as *My Five Moments for Hand Hygiene* (Chou, Achan, & Ramachandran, 2012). According to the guidelines, HH should be performed at five different points throughout providing care for patients, which include: before patient contact, before clean procedures, after exposure to body fluids, after patient contact, and after contact with patient surroundings (Chou et al., 2012). The CDC further recommends the use of an alcohol-based hand rub (ABHR) when hands are not visibly soiled (Cherry et al., 2012). By following these well-established guidelines, the rates of HAIs can be significantly decreased; the key is getting HCWs to follow them.

**Nursing Implications**

While providing care to patients, nurses’ hands become contaminated through contact with the patient themselves, as well as the surroundings. Studies have shown that contact with patients and their surroundings can cause the nurse’s hands to become contaminated with 100-1000 colony forming units of bacteria, with 17 percent of contacts resulting in the transfer of MRSA (Erkan, Findik, Tokuc, 2011). Some of those bacteria can live on the hands of the nurse for up to 3 hours after contamination; contact with another patient before adequate HH has been performed can easily spread the microorganisms to the next patient (Erkan et al., 2011).

Research has shown that nurses regularly self-report their HH compliance rates by 300% more than the actual observed rate, even when they were aware of being observed (Harne-Britner et al., 2011). This finding highlights the concern that nurses may not be fully aware of all of their missed opportunities for HH (Harne-Britner et al., 2011). When asked about missed
opportunities to perform HH multiple reasons were given, including high workloads, lack of knowledge, understaffing, complaints of dry or sore hands, lack of priority, lack of convenient ABHR dispensers, and lack of time (Harne-Britner et al., 2011). Institutions and organizations must work to develop interventions that address these commonly stated barriers in an effort to improve HH compliance rates and lower HAIs.

Two of the cornerstone ethical principles of nursing are nonmaleficence and beneficence; nonmaleficence encompasses the concept of do no harm, and beneficence is at the heart of nursing, the desire to help people while showing empathy, compassion, and mercy (McCormack, 2013; Munyadzi, 2012). The American Nurses Association (ANA) defines the role of nursing as “the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations” (Potter, Perry, Stockert, & Hall, 2013, p.1). Given the considerable costs and extended hospital stays, as well as the possibility of disability and death, nurses are legally, morally, and ethically required to take all possible precautions to protect patients from HAIs. Pathogenic microorganisms will always be abundant in the environment, particularly in a healthcare setting, but by not following well-established guidelines HCWs are putting their patients, themselves, and their families at risk.

Summary

The purpose of this thesis is to develop a best practice program that introduces interventions designed to improve the poor HH compliance rates that are rampant in the clinical setting. HAIs occur in almost 2 million people in the United States yearly and may cause death, disability, and the eventual financial ruin of the healthcare system due to the increased financial losses of treating HAIs (Shannon, 2011). Increasing HH compliance rates is the most important
factor in reducing the transmission of microorganisms and reducing the prevalence of HAIs infections. By instituting an evidence-based HH improvement program, organizations can help to reduce their incidences of HAIs, keeping both patients and HCWs safe.
CHAPTER TWO

Review of Literature

The purpose of this review of literature is to evaluate the link between hand hygiene and HAI, as well as examine the effectiveness of common interventions designed to improve HHC in the healthcare setting. The review was performed using PubMed, CINAHL and the Cochrane Library for articles ranging from 2010-2015. The keywords “hand hygiene”, “healthcare associated infection”, “nosocomial infection”, and “hospital acquired infections” were used to find relevant published studies. The information obtained from these studies will be used to develop a proposed best practice approach to hand hygiene improvement in the clinical setting.

Improving HAI Rates with Hand Hygiene

Improved hand hygiene has been shown to be an extremely effective solution to the reduction of HAIs transmission (Harne-Britner et al., 2011). By increasing the rates of HHC over a sustained period, several studies have shown that healthcare settings can reduce their HAIs rates. The following six studies included in this section, one review and meta-analysis and five quasi-experimental, will examine the association between HAIs and HHC in the healthcare setting. The studies are organized by an evidence grading system that rates meta-analysis and systemic reviews first, followed by randomized controlled trials, and then quasi-experimental studies (Brown, 2014).

In a recent systematic review and meta-analysis performed by De Angelis and his research team (2014), researchers examined which infection control and prevention (ICP) measures implemented in hospitals were effective at controlling and preventing the spread of vancomycin- resistant enterococci (VRE). A search of MEDLINE, EMBASE, CINAHL AND Cochrane databases, for studies from 1950-2012, produced nine studies that met eligibility
criteria, including the requirement that studies must have implemented an intervention designed to reduce VRE acquisition and monitored VRE rates (De Angelis et al., 2014). The eligibility criteria also required that interventions evaluated by the studies must have included either hand hygiene measures, contact precautions, screening cultures, isolation, cohorting patients, environmental cleaning interventions, antibiotic formulary interventions or ward closures (De Angelis et al., 2014). The results of the review and meta-analysis demonstrated that HH was a significant contributing factor in preventing VRE, with a 47% reduction in the VRE acquisition rate; researchers were unable to demonstrate that any of the other interventions caused a reduction in VRE acquisition (De Angelis et al., 2014).

Helder, Brug, Van Goudoever, Looman, Reiss, and Kornelisse (2014) conducted an interrupted time-series study over a 10-year period to determine how hand hygiene promotion contributed to the reduction in nosocomial bloodstream infections in very-low birth weight babies. The sample included 1,964 VLBW infants admitted to a teaching hospital in the Netherlands between January 1, 2002, and December 31, 2011 (Helder et al., 2014). During the study period interventions such as education, reminders, feedback and goal setting, marketing videos and products, workshops, and role modeling by senior staff were implemented in a continuing sequence so as to keep HHC a top priority (Helder et al., 2014). The results showed a significant decrease in VLBW infant infections from 47.6% to 21.2%, as well as a reduction from 16.8 to 8.9 infections per 1,000 patient days (Helder et al., 2014). While the rate of HHC was not monitored, this study does suggest the effectiveness of interventions used by other reviewed studies such as senior staff participation, education, feedback, and continuous reminders over an extended period of time in reducing HAIs (Fuller et al., 2012; Huis et al., 2013; Cherry et al., 2012; Schweizer et al., 2014).
Researchers at Vanderbilt University performed a time series study using a Quality Improvement (QI) program in an attempt to improve HH as well as prevent HAIs (Talbot et al., 2013). The QI was a system-wide program that included all of the medical center healthcare personnel over a period of three years (Talbot et al., 2013). The results of this study were that researchers were able to maintain an improved level of hand hygiene that was sustained over the three-year period of the study; regression analysis indicated that HHC was inversely correlated with device associated HAI rates ($R^2=0.70$) (Talbot et al., 2013). The analysis of the association between HHC rates and HAI rates indicated that there was only a minor reduction in HAIs until HHC rates reached 75%, at which point there was a significant reduction in the HAI rates (Talbot et al., 2013). While a correlation does not indicate that increased HHC caused decreased HAIs, it reasonable to suggest that the increased focus on HHC and awareness of HAI risks had some impact on the incidence of HAIs.

A before and after quasi-experimental designed study performed in Australia examined the rates of HAIs in 38 hospitals in six different Australian states after the implementation of The National Hand Hygiene Initiative (Barnett et al., 2014). The initiative included education and auditor training for HH monitoring and was implemented throughout the country at different times, the average data from before the intervention for each state covered 39 months, the average data for each state post-intervention was 30 months (Barnett et al., 2014). Infection rates were collected from the largest public hospitals and then each infection type was analyzed separately, and hospitals were grouped by state to evaluate regional changes before and after the implementation of the initiative (Barnett et al., 2014). The researchers found that 11 out of 23 state and infection combinations had statistically decreased rates of HAIs after implementation of the HHC initiative (Barnett et al., 2014). In four of the states, it was discovered that HHC
improvement programs had already been implemented, and the national initiative did not cause further decreases in HAI rates, this may indicate that the previously implemented programs were equally effective (Barnett et al., 2014). In one state HAIs increased in three out of four hospitals after the initiative was introduced, it is possible that resources that were previously effective were refocused to implement the initiative, causing a disruption in prior HHC programs (Barnett et al., 2014).

In a quasi-experimental study published in the Journal of Nursing Care Quality in 2013, researchers attempted to use a QI program to reduce the incidence of HAIs by increasing the baseline HH rate of 78% to above 90% (Cumbler et al., 2013). The QI program involving feedback, leadership involvement, and a punishment/reward system, was implemented with registered nurses, certified nursing assistants, and student nurses over a two-year period at the 13-bed Acute Care for the Elderly Unit at The University of Colorado Hospital (Cumbler et al., 2013). The unit baseline rate for urinary catheter-associated infection was 4.8 per 1000 catheter-days and for central line infections it was 4.3 per 1000 line-days (Cumbler et al., 2013). After instituting a HH improvement program and maintaining a mean adherence rate above 90% for two years, the unit was able to eliminate completely all device associated HAIs for the length of the study (Cumbler et al., 2013). Although this was a QI program on a small unit, the results are impressive and indicate the need for further research to determine if the results are generalizable to a larger population, as well as what interventions are successful at increasing HHC rates above 90%.

Harne-Britner, Allen, and Fowler (2011) conducted a study examining the effect of two different behavioral interventions on improving HH adherence, maintaining any improvements, and the relationship between improved HH adherence rates and HAI rates (Harne-Britner et. al.,
The sample was registered nurses and patient care assistants from three different medical-surgical units in an urban health care system, which were randomly divided into three different groups and observed for a period of six months, with a total of 1203 observations (Harne-Britner et al., 2011). The results of this study indicate that there was no significant change in the rate of HAI infections on the units and that although one of the intervention groups initially achieved a statistically significant improvement of HH adherence, the improvement was not consistently sustained over the six-month period (Harne-Britner et al., 2011). This failure of this study to improve HAIs even with an initial improvement in HHC rates may suggest that any HH improvement program needs sustained improvements to make a difference in HAI rates.

After examining these studies, it is reasonable to suggest that bringing awareness to hand hygiene practices by encouraging compliance through a structured program does decrease the rates of HAIs. De Angelis et al.’s review (2014), even though only examining VRE acquisition rates, does seem to fall in line with the CDC’s (2015) assertions that hand hygiene is the single most effective way to decrease the rate of HAIs. Out of the five quasi-experimental studies reviewed, four managed to reduce HAIs by significant amounts over the course of the studies; the one reviewed study that did not have an impact on HAI rates, also did not show a sustained improvement in HHC rates (Helder et al., 2014; Talbot et al., 2013; Barnett et al., 2014; Cumbler et al., 2014; Harne-Britner et al., 2011). This conformed to the general trend among the reviewed studies that indicated that the longer the intervention was in place, the greater the improvement in both HHC rates and HAI rates. These studies indicate that there is indeed a link between HHC rates and HAI rates. Additionally, these studies suggest the importance of a well designed HH improvement program that extends over a period of years, not months, when addressing the reduction of HAIs.
Interventions for Improved Hand Hygiene Rates

The concern surrounding HAIs has brought about a greater focus on the importance of developing programs that improve and maintain high levels of HHC. As more studies are conducted, there is a greater opportunity to evaluate which interventions most successfully bring about improvements in HHC. The following section will evaluate one meta-analysis, three systematic reviews, four randomized controlled trials (RCTs), and nine quasi-experimental studies in order to examine which interventions are most associated with an improvement in HHC rates. The studies are organized by the interventions that were implemented.

Education

Education can be conducted in multiple forms and delivered through various means. The majority of studies reviewed sought to include some type of educational component in their interventions. The following reviewed studies either focused on using education as a main component in their study or on evaluating which types of educational methods produced the greatest impact on HH compliance rates.

Cherry, Brown, Bethel, Neal and Shaw (2012) conducted a systematic review evaluating studies that used an educational component as part of a multimodal HH improvement program to try and determine which education intervention was associated with the greatest improvement in HHC. Researchers found 30 studies of all designs; they assessed the educational interventions of each study, and then they classified them into six different groups of education delivery types, with combinations of demonstration, self-study, online component, video or none of these (Cherry et al., 2012). The findings showed that all of the intervention groups reported a statistical increase in patient outcome improvement, HHC or both (Cherry et al., 2012). Researchers also found that as the number of education delivery components included in the
interventions increased, as well as programs that included interventions with continuous or repeating reinforcement, the greater the impact on HHC rates as well as sustained improvements (Cherry et al., 2012).

Huis, Achterberg, Bruin, Grol, Schoonhoven and Hulscher (2012) conducted a systematic review in order to examine the outcomes of studies designed to test hand hygiene improvement programs. The 41 included studies were experimental or quasi-experimental studies published between 2000 and 2009 (Huis et al., 2012). Researchers classified the interventions of each study by determinants using the Taxonomy of Behavioural Change Techniques; the effectiveness of each study was then analyzed to determine which interventions/determinants were most effective (Huis et al., 2012). The results of the review showed that studies that only implemented behavioral determinants that were classified as knowledge, awareness, action control, and facilitation, were not effective at increasing rates of HH (Huis et al., 2013). On the other hand, social influence, attitude, self-efficacy, and intention were found to be effective determinants when implementing HH adherence programs (Huis et al., 2012). The study further found that the increase in HH rates was closely correlated to the number of different behavioral determinants integrated into the improvement program’s design. (Huis et al., 2012). The results of this review suggest that some interventions work better than others based on the behavioral aspects they are developed around; it also found that the more behavioral aspects that were addressed by interventions, the more effective the improvement program was.

This purpose of the systematic review performed by Gould, Moralejo, Drey, and Chudleigh (2010), was to evaluate studies that examined the effectiveness of different interventions implemented to increase the rates of HH adherence in healthcare settings, to
evaluate whether any improvements were sustained over time, and to examine any correlations between the rates of improvement in HH adherence and rates of HAIs. There were four original studies used in the review, two of the reviewed studies used education alone as an intervention and the other two studies used multi-faceted interventions. The results do point to multi-modal interventions including social marketing and staff involvement being significantly more effective than education alone over both a short and long-term period of 18-months (Gould et al., 2010).

In this study, the aim of Eveillard et al. (2011) was to assess the impact of a multi-faceted intervention program on HH adherence rates over an extended period. The study was quasi-experimental with Eveillard et al. (2011) using a direct observational before-after design to assess HH compliance of 75 HCWs in 4 different healthcare settings, before the intervention and again one year after the intervention was implemented. An intervention involving multi-disciplinary educational sessions, verbal reminders, boxes containing black lights to show healthcare workers missed areas during hand hygiene, and posters that emphasized HH techniques was implemented (Eveillard et al., 2011). The results showed that there was a similar overall compliance of HH before and after the intervention, however, there was a statistically significant rise of 20% in the HH adherence during intra-series opportunities (Eveillard et al., 2011). There was also a statistically significant decrease of 18.4% between the incidences of compliance before contact between 2008 and 2009 (Eveillard et al., 2011). The findings of this study indicate that a multi-modal intervention developed with education, reminders and visual demonstrations of HH may influence HH adherence over an extended period. The decrease in HH before patient contact and the similar increase in intra-series compliance may indicate that 19% baseline intra-series HH compliance rate (Eveillard et al., 2011) was considered a problem and stressed during education, HCWs may have shifted their focus to the emphasized areas, this
may indicate the need for further consideration of what material should be presented for the educational component of an intervention.

**Reminders and Awareness**

Reminders and awareness are often used in studies in an attempt increase HH compliance rates, sometimes alone, but usually in combination with other interventions. The effectiveness of reminders is dependent on the HCW noticing the reminders and understanding their significance. The following reviewed studies evaluate different forms of reminders, and which ones had the biggest impact on HHC rates.

The purpose of Reisinger et al.'s (2014) five-month cluster-randomized trial was to evaluate the effectiveness of HH reminder signs that were designed with theoretically grounded messages, on HHC rates. The sample for this study was HCWs from 11 wards in three geographically distinct hospitals (Reisinger et al., 2014). The signs that included messages focused on gain-framing and patient consequences had the highest HHC, however, none of the signs improved HHC rates by a statistically significant amount (Reisinger et al., 2014). While this study suggested that reminder signs alone are not effective as an intervention, they may be effective when used in a multi-modal bundle of interventions designed to improve HHC rates.

Nevo et al. (2010) performed a randomized quasi-experimental study in an attempt to determine the effectiveness of visual cues on HHC. The sample included 75 doctors and 75 nurses, from a medical-surgical unit at the University of Miami Jackson Memorial Hospital (Nevo et al., 2010). The participants were randomly assigned to five different groups designed to test HHC; groups consisted of a control group with the ABHR dispenser in the usual place, a group with ABHR dispenser moved to direct line-of-sight on entry, one with the ABHR dispenser in its usual place with flashing lights, another with the ABHR moved to line-of-sight
with flashing lights, and a group with a warning sign posted on the door that the room was being electronically monitored for HHC and failure would be reported to management (Nevo et al., 2010). All experimental groups reported improvements from the 36.7% baseline in pre-examination HHC, however only significant improvements were found in the group with the warning sign threatening to report a lack of HHC to management at 93.3%, and the group with an ABHR in line of sight with flashing lights at 66.7% (Nevo et al., 2010). Significant improvements in post-examination HHC were only found in the group with the warning sign, raising HHC to 93.3%, however using only ABHR dispenser awareness tactics did not achieve such results (Nevo et al., 2010).

In a study performed by KuKanich, Ramandeep, Freeman, and Powell (2013) researchers used a quasi-experimental design in an effort to observe whether an intervention designed to increase HH achieved positive results. The sample consisted of HCWs at two outpatient clinics who were observed before the intervention to determine baseline HH adherence, immediately after the intervention, and again one month after the intervention (KuKanich et al., 2013). The intervention KuKanich et al. (2013) developed was to install 10 gel hand sanitizer bottles and informational posters throughout the two clinics, which were only using soap and water or foam sanitizer prior to the intervention. The results pointed to a significant improvement both immediately after the intervention and one month after the intervention (KuKanich et al., 2013). A post-intervention survey was distributed, 50% of respondents agreed or strongly agreed that seeing the posters and bottles of gel sanitizer increased their awareness about hand hygiene (KuKanich et al., 2013). Physicians demonstrated the least amount of adherence to HH with one influential physician exhibiting resistance to the posters in one of the clinics (KuKanich et al., 2013). The results of this study demonstrate that interventions that bring awareness and
reminders of HH may increase HH adherence; they also indicated that multiple and easily accessible gel sanitizers may improve hand hygiene. Although there was significant improvement in HH adherence, from 11% to 36% at one clinic and 21% to 54% at the second clinic, rates were still low post-intervention, with physicians exhibiting the lowest adherence rates (KuKanich et al., 2013). This study used poster reminders and increased access to ABHR, which did increase HHC, however, the HHC rates were still low indicating that more components may need to be added to raise HHC levels to an appropriate level.

**Multimodal Education with Administrative Support**

Multiple studies evaluated administrative support and its role in successful HHC campaigns. This support was conducted in multiple different varieties, sometimes with just general support as far as keeping HHC rates a focus of the organization, other times by implementing consequences or rewards. The following studies evaluate administrative support and involvement, with an additional section evaluating the effectiveness of consequences or incentives that are implemented by administrations.

A meta-analysis conducted by Schweizer and his team (2014) examined 45 studies, including six randomized controlled trials and 39 quasi-experimental trials, published from 2000-2012 in an attempt to determine which HH improvement bundled interventions were most successful at improving HHC rates. Researchers found that two bundles of interventions were statistically effective at improving HHC. One of these bundles included feedback, education, and reminders, with a 1.47 pooled odds ratio (95% confidence interval); the other bundle included the same interventions with the addition of administrative support and improved access to alcohol-based hand rub (ABHR), with a pooled odds ratio of 1.88 (95% confidence interval) (Schweizer et al., 2014). This meta-analysis suggests that a bundle with education, reminders,
feedback is effective, but may be even more effective with administrative support and increased access to ABHR.

In a quasi-experimental study performed by Rees, Houlahan, Safdar, Sanford-Ring, Shore, and Schmitz (2013) at a 566-bed academic medical center in Wisconsin, researchers attempted to determine if a multi-modal program involving education, leadership, reminders, a multi-media campaign, and a leadership committee could help improve the baseline HH adherence rate. The intervention began with a computer-based training program; unit-based feedback; poster, e-screen and notepad reminders; a video including staff; and a task force that provided ongoing direction (Rees et al., 2013). As the program progressed it was determined that an Executive Leadership Team was needed to ensure that HHC remains a priority in the hospital and units (Rees et al., 2013). The results of the study indicated that the interventions were associated with an upward trend in HHC rates, with a 57.4% increase over the course of a year (Rees et al., 2013). These results are similar to those of other studies that indicate that a program with strong leadership, feedback and reminders can be beneficial when attempting to improve HHC rates. This program also includes a component similar to other successful interventions with the taskforce and leadership team that are designed to evaluate the program and possibly help it evolve as shortcomings or suggestions for improvement develop, as well as keep HHC a priority.

Consequences and Incentives

The results of Nevo's (2010) previously mentioned study, that used a warning sign implying that there was video monitoring and managerial consequences, suggests an important issue. While one study with simple warning signs was not shown to improve HHC (Reisinger et al., 2014), this sign was associated with an increase HHC levels to above 90%. This study, along with the following reviewed studies, suggest not only the
importance of administrative involvement but also the possibility of increased improvements with the additional component of consequences or incentives.

In the study mentioned in the previous section performed by Talbot et al. (2013) at Vanderbilt University Medical Center, researchers used a time-series design to evaluate the results of a system-wide intervention program aimed at increasing the level of HH compliance, which was at a baseline of 52% overall. Talbot et al. (2013) developed a structured program that included a 17-month first phase involving goal setting, strong management support, departmental financial incentives, a marketing campaign, education, and an HH observation pool made up of people from each department. The 23-month second phase included everything from the first phase with an executive committee made up from all healthcare disciplines to ensure HH remained a priority, department specific consequences that could include disciplinary action against unit leaders in the event of low adherence, and individual disciplinary interventions in the event that goals were repeatedly not met by an individual. The results determined that there was a significant and steady increase in HH compliance with an overall mean increase in adherence rates to 75% throughout the first phase and a sustained overall adherence mean of more than 89% for the second phase of the study (Talbot et al., 2013). The findings of this study suggest that HH adherence rates can be increased and maintained at a consistently high level through the influence of a multi-modal strategy that includes strong leadership, focused goals, incentives, and consequences. It is also important to note that although the first phase did correspond with an increase in HHC rates, adherence rates rose dramatically with the introduction of consequences to individuals as well as unit leaders.

Aboumatar et al.’s (2012) quasi-experimental time series study was performed at Johns Hopkins Hospital over a three-year period using a sample consisting of all HCWs at the hospital.
The purpose was to evaluate the long and short-term effects of an intervention program using education, multimedia communications, management involvement, feedback, and leadership responsibility (Aboumatar et al., 2012). Unit leaders were involved in goal-setting, adherence rates were regularly updated and available, and leaders with units that had poor adherence rates were required to do additional work with infection control to develop improvement plans and goals that they must meet as a unit (Aboumatar et al., 2012). This study showed a sustained improvement from 35% to 77% in HHC during the intervention period and over the course of a 20-month follow-up period among all HCWs and units (Aboumatar et al., 2012). Like other studies performed, consequences, both individual and for the unit leaders, seems to help improve adherence rates.

Harne-Britner et. al.’s (2011) study discussed in the previous section sought to determine the effectiveness of different behavioral interventions in comparison to education alone, on improving HH adherence, maintaining any improvements, and the relationship between improved HH adherence rates and HAI rates. The control group received an educational self-study module with a pre and post-test (Harne-Britner, et. al., 2011). The other two groups received the same self-study model but also received interventions, with one group receiving positive reinforcement using individual and unit rewards for adherence, and the other group receiving information on the risk of non-adherence, which included additional education based on the microbes that were cultured from the group’s hands and HH reminder posters with the presence of cartoon bugs (Harne-Britner, et. al., 2011). The results of this study indicated that only the positive reinforcement group achieved a statistically significant improvement of HH adherence, however, the improvement was not consistently sustained over the six-month period, with two of the months reporting below baseline adherence (Harne-Britner, et. al., 2011). The
initial improvement of the positive reinforcement group indicates that the promotion of rewards, both individual and unit-wide, may help influence a positive change in HH adherence, however, the lack of sustained adherence over the course of the study indicates the need for more research into what may produce lasting results.

**Team Approach**

In some studies, a team centered approach was set up to test the ability to improve HHC rates. Often this was reinforced by team-based goal setting. As previous studies have suggested (Huis, 2013), social influence likely plays a part in altering behaviors, a feeling of not wanting to let the team down may help improve HHC rates.

Researchers Huis, Schoonhoven, Grol, Donders, Hulscher and Achterberg (2013) conducted a cluster RCT, in which two different HH improvement programs were designed and implemented among nurses from 67 wards of three different hospitals in the Netherlands for six months, with follow-up measurements taken again six months after the end of the intervention. The goal was to determine whether a control group program based on current literature or an experimental teams and leader approach, was more effective at increasing HHC among nurses (Huis et al., 2013). The literature based program included education, feedback, reminders; the team and leader based program included all of the interventions from the literature based program but further supplemented these interventions with a team and leader approach with modeling by leaders, ward goal setting and group meetings led by ward managers to discuss achievement of goals (Huis et al., 2013). The control group showed a sustained improvement of 23% over baseline, however, the experimental group had a 33% sustained improvement (Huis et al., 2013). This study suggested that while education, feedback, and reminders can influence improvement in HHC, the addition of a team approach with designated leaders may add an
additional component that has an even greater effect on HHC.

The purpose of Marra et al.’s (2013) quasi-experimental study was to evaluate the effectiveness of using positive deviance to improve HHC rates in HCW from nine different units in hospitals throughout Brazil and Thailand (Marra et al., 2013). Positive deviances involves the creation of a group of individuals from the units who wanted to educate and develop interventions to improve their unit’s HHC rates (Marra et al., 2013). The groups often used HH demonstrations, discussed when to perform HH, regular meetings, and encouraged their peers to perform HH; some groups also created badges or certificates to give out for both positive and negative HHC performance (Marra et al., 2013). The findings were that HHC rates were continuously improved among all HCWs from 46.5% to 62% (Marra et al., 2013). The fact that each unit had its own intervention team means that each group designed their own program, this did make it so researchers were unable to collectively group and compare the interventions. This also means that each intervention bundle was tailored to the specific unit, possibly making them more effective than a one-size-fits-all plan. This study proposes not only that a carefully tailored approach may be successful, but also that a team building approach may be helpful, this suggests the importance of future research on the importance of taking an individual unit’s culture and needs into consideration when designing a program to improve HHC rates. It is also important to take into consideration that HHC rates only rose to 62%, but this intervention was a peer supported group, it is possible that with increased management support that rates would have improved even more.

**Performance Feedback**

Fuller and his team (2012) performed a three-year RCT designed to determine the effectiveness of a behavioral based feedback intervention on the HHC of all HCWs in 60
different wards in 16 Welsh/English hospitals from 2006 to 2009. The intervention was implemented as a four-week repeating cycle, with individual nurses observed the first week, individual non-nurse medical professionals observed the second week, group observation performed the third week, and a group centered performance review and action plan occurring on the fourth week. During individual observations if there was a failure in HHC, feedback was immediately conducted with an action plan put into place for the individual (Fuller et al., 2012). The results showed a significant constant absolute improvement of 13-18% on intensive treatment units (ITU) and a significant 10-13% constant absolute increase in HHC on acute care of the elderly (ACE) units (Fuller et al., 2012). This study indicates that immediate feedback and action plan setting may be associated with increased HHC rates in the healthcare setting.

The purpose Linam, Margolis, Atherton, and Connelly's (2011) quasi-experimental staggered intervention study was to evaluate whether HHC rates could be raised to greater than 90% before and after patient contact among HCWs from two different general pediatric units, one of which had a baseline HHC rate of 65%, the other of which had a baseline HHC rate of 74%. The interventions involved leadership support, regular updates of unit compliance, and education. When these interventions were not enough to raise compliance above 90% a new intervention was implemented that involved immediate feedback in the event of failed HH with the offering of ABHR before patient contact could be performed (Linam et al., 2011). The results of this study were that both units achieved HHC rates over 90%, which was sustained over 18 months, it is interesting to note that there was no improvement in physician HHC until the immediate feedback and required ABHR was implemented (Linam et al., 2011). This study supports the findings of previous studies that had increased success with strong leadership support and immediate feedback. In addition, the immediate correction and the requirement to
perform HH may cause embarrassment and could potentially be considered a consequence for failed adherence. In this event, Linam et al.'s (2011) findings are similar to those of Talbot et al.'s (2013), which also had to implement an individual consequence to increase HHC rates to almost 90%.

In a quasi-experimental study performed by Langston (2011), the objective was to determine if an intervention using peer monitoring and feedback would be successful in increasing HH adherence rates. The sample included all of the staff of three different units at University of North Carolina Hospitals (Langston, 2011). Langston (2011) used an intervention that was developed so that healthcare workers could audit their peers HH adherence, both prior to and after patient care with differentiation between patient contact and nonpatient contact and then they were encouraged to provide feedback if HH was not performed; each healthcare worker was required to complete 10 audits per week over the course of two-months. The results showed a statistically significant increase in HH adherence rates overall for nonpatient contact, with statistically significant improvement for just nurses in nonpatient contact, as well. The results of this study indicate that peer monitoring and feedback may help influence the HH adherence rate after nonpatient contact in a positive way, it did not, however, have any effect on HCWs HH habits when they were in contact with patients.

**Summary**

The majority of the studies reviewed included multiple interventions combined into a multi-modal program, making it difficult to determine which interventions were the most effective, which were effective as a singular method, or which were effective only when in combination with additional interventions. While reminders were often used in multi-modal improvement programs, studies such as that performed by Reisinger et al. (2014), suggest that
reminders are not an effective way to increase HHC rates. KuKanich et al. (2013) did find that reminders along with greater access to ABHR dispensers were effective at increasing HHC rates, but the improvement still only brought compliance rates up to about 50% at best. Nevo et al.'s (2010) study indicated that by adding flashing lights and moving the ABHR into line-of-sight they were able to improve HHC rates, however, this was not tested over an extended period of time. This study involved introducing the intervention to HCWs once and testing their response, repeated exposure or use over an extended period may not show a sustained improvement in HHC rates. The same study had a very high success rate with a reminder sign (Nevo et al., 2010); however, the sign stated that there was video surveillance, and failure to perform HH would result in a referral to management. This warning suggests consequences, whether the claim was true or not the intimation of consequences likely played a factor in compliance.

Like reminders, education, when used alone, was also found to be less effective at improving HHC rates. Studies performed by Harne-Britner et al. (2011) and Eveillard et al. (2011) found that education alone did not produce lasting improvements in overall HHC. The systematic review performed by Huis et al. (2013) found that programs that only included behavioral determinants that were classified as knowledge, awareness, action control, and facilitation were not effective. Although these determinants were not necessarily effective alone, reviews performed by Cherry et al. (2012) and Gould et al. (2010) found that education was more likely to produce a sustainable result when combined with other interventions. The study performed by Linam et al. (2011) originally included education, reminders, and management role modeling and support; improvement was made, but when HHC rates did not reach the target goal of 90% other interventions were added, and the compliance rate reached 91%. Almost all of the studies reviewed provided an educational component and reminders of some sort using various
delivery methods; while these do not appear to be highly effective when used alone, they may be important elements of a multi-layered program that should be considered when working towards sustained improvement.

Similar to what Nevo et al. (2010) found when making use of the threat of consequences, Talbot et al. (2013) was unable to improve HHC rates beyond 75% until consequences for individual HCWs and unit leaders were instituted, at which point HHC rates rose and were sustained above 89%. Cumber et al.’s (2013) use of consequences in their multi-modal interventions study helped influence an increase in HHC to 90%. The study performed by Aboumatar et al. (2012) also used both individual and unit leader consequences to increase HHC levels by a continuously increasing 42%. Often times the consequences began with an informal meeting, but then progressed to structured plans for improvements with goal setting and eventually disciplinary action.

Consequences are tied to leadership and management involvement, a component that Schweizer et al.’s (2014) review suggested that HHC improvement programs were most effective when a strong leadership component were included. This was also a factor that Rees’s team (2013) found important and stressed when adding a leadership team partway through their study, which continued an upward trend in HHC improvement. These studies suggest that leadership and consequences used at all levels, from the individual HCW and unit leaders to unit-wide consequences, may play an integral role in creating a more personal incentive to improve HHC levels.

A team based approach was used in several studies that had positive results. Marra et al.’s (2013) study successfully used a peer-based team approach to educate and encourage HH compliance. Aboumatar et al. (2012) and Talbot et al. (2013) both used a team-based approach
that provided unit incentives and rewards, as well as consequences for unit or team leaders when adherence was not improved or maintained. These two studies were among the very few that were able to raise HH levels to at least 89%.

Feedback was an important tool used by several of the studies in an attempt to achieve successful increases in HHC rates. Studies such as those conducted by Langston (2011) and Harne-Britner et al. (2011) used feedback as interventions in their studies; however, it was not immediate feedback and often not personally delivered. These studies did not produce a significantly sustained improvement in HHC rates before or after patient contact. Several other studies that used immediate feedback did produce both significant and sustained results including studies such as Talbot et al. (2013), Cumberl et al. (2013), Rees et al. (2013), and Linam et al.’s (2011). In the Linam et al. (2011) and Talbot et al. (2013) studies compliance rates only reached approximately 75% until an immediate feedback component was added that helped raised compliance rates to 89-92%. An overall evaluation of these studies suggests that immediate personal feedback may be a valuable tool when designing a HH improvement program.

The sustainability of any improvements that were seen seemed to involve repeated or sequential interventions, a fact also found by Cherry et al.’s systematic review (2012). Helder et al.’s (2014) study lasted 10-years with repeated workshops and education, ensuring that the importance of HH remained a priority. In addition to repeated interventions, the ability to evolve also increased the rates of compliance. When studies conducted by Linam et al. (2011), Rees et al. (2013) and Talbot et al. (2013) did not reach goals, interventions were added or changed to help improve compliance rates. These results highlight the importance of maintaining consistency through repetition, but also the ability to reassess and evolve to meet goals.
Conclusion

The studies in this chapter were chosen to evaluate the connection between HAIs and HH, as well as examine the effectiveness of interventions and programs designed to improve the HHC rates in a healthcare setting. A wide range of study designs and sizes were reviewed, and the majority of them had similar findings and results. The literature review supports the CDC’s (2014) claim that hand hygiene plays a significant role in the reduction of HAIs. Overall, in studies that monitored and reported the HAIs in the healthcare settings where their interventions were implemented, there was a negative association between a sustained increase in HHC rates and the reduction in HAI rates. Considering the consequences of HAIs, these finding support the goal of studies attempting to find effective interventions that will sustainably increase the rates of HHC.

When developing an evidence-based approach to improving HHC rates, it is important to consider what current studies have discovered. A review of the current literature suggests that, while reminders and education may play an important role in the development of a HH improvement program, they should be used in combination with other interventions. Addressing the problem from multiple directions using a compilation of interventions that fit together in a multi-modal program seems to be the best approach. The interventions that have produced the greatest success so far include a team based strategy employing both incentives for improved adherence and consequences for failed improvement at a unit or team level, strong management support with consequences for repeated individual failures, immediate personal feedback, education, reminders, and adequate access to ABHR dispensers. The addition of a team that reviews goals and adjusts accordingly may also greatly enhance a program's success rate.
CHAPTER THREE

**Best Practice Protocol: Hand Hygiene Improvement**

The purpose of this thesis was to design a best practice protocol intended to improve the HH among healthcare workers in the clinical setting. Chapter two examined current research concerning the link between HH and HAIs, as well as the effectiveness of interventions designed to improve HHC rates. Chapter three will detail the best practice protocols that evidence has suggested are the most effective ways to improve HHC rates among healthcare workers.

**Purpose**

The purpose of this protocol will be to increase HHC rates among HCWs, which research has shown is the single most effective way to combat HAIs. By implementing a protocol that increases the rate of HHC it will be possible to reduce the transmission of HAIs in the clinical setting. The goal is not only to improve HHC rates, but to also sustain any improvements.

**Target**

The targeted personnel that this protocol is designed to influence are all HCWs work in the clinical healthcare setting. Studies have indicated that HCWs from every discipline perform HH at an inadequate rate. The problem is further compounded with the fact that their personal perception of HHC is vastly overestimated. Any protocols implemented must target HCWs level of knowledge, perceptions, attitudes, and commitment to performing HH in an attempt to reduce the incidence of HAIs.

**Interventions**

The interventions specified in Table 1 are designed using evidence-based data in an effort to address the areas that seemed to provide the most effective and sustained improvements in HHC among HCWs.
Table 1

<table>
<thead>
<tr>
<th>Multi-modal Component</th>
<th>Research Support</th>
<th>Level of Evidence</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>• Education alone does not produce a sustained improvement in HHC</td>
<td>Level I</td>
<td>Cherry et al., 2012</td>
</tr>
<tr>
<td></td>
<td>• Education when used as part of a multi-modal bundle may influence positive HAIs and HHC results</td>
<td>Level I</td>
<td>Gould et al., 2010</td>
</tr>
<tr>
<td></td>
<td>• Nurses cite lack of knowledge as a reason for failing to perform HH</td>
<td>Level I</td>
<td>Schweizer et al., 2014</td>
</tr>
<tr>
<td></td>
<td>• A singular educational delivery method was less effective at increasing HHC rates than when multiple delivery educational delivery methods were used</td>
<td>Level II</td>
<td>Huis et al., 2012</td>
</tr>
<tr>
<td></td>
<td>• Sequential or repeated delivery of education was more effective at increasing HHC rates, than a one-time delivery</td>
<td>Level III</td>
<td>Eveillard et al., 2012</td>
</tr>
<tr>
<td></td>
<td>• Nurses cite lack of knowledge as a reason for failing to perform HH</td>
<td>Level III</td>
<td>Helder et al., 2014</td>
</tr>
<tr>
<td></td>
<td>• A singular educational delivery method was less effective at increasing HHC rates than when multiple delivery educational delivery methods were used</td>
<td>Level III</td>
<td>Harne-Britner et al, 2012</td>
</tr>
<tr>
<td></td>
<td>• Sequential or repeated delivery of education was more effective at increasing HHC rates, than a one-time delivery</td>
<td>Level III</td>
<td>Aboumatar et al., 2012</td>
</tr>
<tr>
<td></td>
<td>• Nurses cite lack of knowledge as a reason for failing to perform HH</td>
<td>Level III</td>
<td>Linam et al., 2011</td>
</tr>
<tr>
<td></td>
<td>• A singular educational delivery method was less effective at increasing HHC rates than when multiple delivery educational delivery methods were used</td>
<td>Level III</td>
<td>Marra et al., 2013</td>
</tr>
<tr>
<td></td>
<td>• Sequential or repeated delivery of education was more effective at increasing HHC rates, than a one-time delivery</td>
<td>Level III</td>
<td>Rees et al., 2013</td>
</tr>
</tbody>
</table>
### ABHR
- Placement of an ABHR dispenser in the entryway of each room
- ABHR will be in the line of sight upon entry and exit

- Increasing the amount of ABHR dispensers was associated with an increase in HHC
- Increasing the visibility of ABHR dispensers was associated with an increase in HHC

<table>
<thead>
<tr>
<th>Level</th>
<th>Study Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Schweizer et al., 2014</td>
</tr>
<tr>
<td>II</td>
<td>Huis et al., 2013</td>
</tr>
<tr>
<td>III</td>
<td>Nevo et al., 2010</td>
</tr>
<tr>
<td>III</td>
<td>Aboumatar et al., 2012</td>
</tr>
</tbody>
</table>

### Reminders
- Placement of a flashing green light on ABHR dispensers that are placed in line-of-sight

- When used alone, reminders were often associated with an initial but insignificant improvement in HHC rates
- When used alone, reminders were ineffective at sustaining any initial improvements
- When combined with other interventions, such as feedback, increased access to ABHR, and education, reminders were associated with better outcomes

<table>
<thead>
<tr>
<th>Level</th>
<th>Study Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Schweizer et al., 2014</td>
</tr>
<tr>
<td>II</td>
<td>Huis et al., 2013</td>
</tr>
<tr>
<td>II</td>
<td>Reisinger et al., 2014</td>
</tr>
<tr>
<td>III</td>
<td>Eveillard et al., 2011</td>
</tr>
<tr>
<td>III</td>
<td>Nevo et al., 2010</td>
</tr>
<tr>
<td>III</td>
<td>Linam et al., 2011</td>
</tr>
<tr>
<td>III</td>
<td>Rees et al., 2013</td>
</tr>
</tbody>
</table>

### Feedback
- Immediate personal feedback will be provided by the observer when an opportunity to perform HH is missed by the HCW
- Initial feedback will be in verbal form so that it is immediate but does not slow or impede patient care

- Studies that used personal individual feedback achieved the highest levels of HHC
- Studies that used immediate feedback were more effective than those that used delayed feedback
- The study that achieved the highest rate of HHC required immediate use of ABHR with feedback

<table>
<thead>
<tr>
<th>Level</th>
<th>Study Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Schweizer et al., 2014</td>
</tr>
<tr>
<td>II</td>
<td>Huis et al., 2013</td>
</tr>
<tr>
<td>II</td>
<td>Fuller et al., 2012</td>
</tr>
<tr>
<td>III</td>
<td>Cumbler et al., 2013</td>
</tr>
<tr>
<td>III</td>
<td>Aboumatar et al., 2012</td>
</tr>
</tbody>
</table>
**IMPROVING HAND HYGIENE**

- HCWs will be required to perform HH immediately following feedback
  
  *Level III* Linam et al., 2011

**Team Based**
- Units will be treated as teams with unit managers considered the leaders
- Unit leaders will be expected to work with upper management and infection control (IC) to establish reasonable unit HHC goals
- Unit leaders will receive monthly updates on progress towards goals
- Unit leaders will be expected to model good HH habits and will be held responsible for the unit’s performance

- A team based approach was associated with positive HHC results
- Studies that used teams that had strong leadership that modeled HH, had sustained improvements in HHC
- Team based environments may help encourage a change in culture and social influence, which was found to improve study results

*Level I* Schweizer et al., 2014
*Level II* Huis et al., 2012
*Level II* Huis et al., 2013
*Level II* Fuller et al., 2012
*Level III* Aboumatar et al., 2012
*Level III* Linam et al., 2011
*Level III* Marra et al., 2013
*Level III* Rees et al., 2013

**Incentives and Consequences**
- Meeting unit goals will result in unit wide incentives
- Failing to meet unit goals will result in consequences such as further training and reeducation
- Individuals who routinely fail to perform HH will face disciplinary measures starting with informal verbal discussions and increasing in severity with repeated failures

- Studies that used incentives for adherence to HHC and consequences for failure to adhere, were associated with a sustained improvement in HHC rates
- Studies that included consequences for unit leaders if their units did not meet their goals had the highest rates of HHC

*Level I* Schweizer et al., 2014
*Level II* Reisinger et al., 2014
*Level III* Cumbler et al., 2013
*Level III* Aboumatar et al., 2012
• Unit leaders will be evaluated on their ability to help their units reach their goals and may be required to undergo further training or removal if unable to do so.

• Unit leaders that help their unit reach goals will receive a yearly financial bonus.

• Both unit wide and individual consequences and incentives were associated with improvements.

Note: Level of evidence based on Melnyk & Fineout-Overholdt’s *Evidence-based practice in nursing and healthcare: a guide to best practice. 3rd Ed.*
Summary

The proposed best practice protocol is designed to be implemented in the healthcare clinical setting. Through the implementation of these evidence-based protocols HHC rates should increase, research has shown that HHC is the number one way to reduce HAIs (Wachter, 2012). The reduction of HAIs will help chip away at the nearly 100,000 lives and $30 billion lost every year to this wide-spread public health concern (HHS, 2015; AHRQ, 2014, CDC, 2015).
CHAPTER FOUR

Implementation and Evaluation

The following chapter will focus on the implementation of the designed best practice protocol, as well as the evaluation of the results achieved. The implementation will follow the guidelines of Dr. Sarah Jo Brown (2014), a nursing consultant who helps practices develop evidence-based care protocols and standardized plans of care. Dr. Brown (2014) focuses on implementing changes through the use of convincing, evidence-backed communication; education; leadership; fine-tuning the protocol based on feedback; and evaluation. Components of the protocol will be individually addressed and the method of evaluation will be detailed. The desired outcome of this evidence-based protocol is that the hand hygiene rates among HCWs will increase, and secondarily that the incidence of HAIs will decrease.

Quality Improvement Council

In order to organize and implement the evidence-based protocol, Dr. Brown suggests that it is important to identify a group that values quality improvement and evidence-based practice (2014). Members of the committee should be drawn from management, administration, and IC, as well as a member from each healthcare discipline. This will help establish investment and ownership in the protocol, as well as provide a direct link to each discipline for feedback and concerns about the protocol (Brown, 2014). A council will help ensure that focus is kept on meeting the established goals and outcomes of the protocol, as well as establish the appropriate incentives and consequences for the specific setting.

Baseline

It is vital to evaluate the impact of any protocol implemented, in doing so it is possible to determine if protocols are effective and if outcomes are being met (Brown, 2014). In the event
that there is no improvement, interventions can be tweaked or altered to more adequately meet the needs of the particular unit (Brown, 2014). In order to establish a HHC baseline number, a small group of anonymous observers will be trained to covertly observe HCWs’s HHC on each unit, the observers should be expected to remain on that unit for at least one month to establish consistency. Studies have used nursing students, medical residents, nurses floated from other units, and researchers as secret observers; this will help minimize the Hawthorne Effect. Observers will receive training and education about the appropriate times to perform HH from the infection control department, and their inter-rater reliability will be evaluated. After a one-month observation period, the results of the observations will be compiled to establish the unit’s baseline number for HHC.

In addition to HHC, HAIs rates for each unit will be reported to IC and compiled over a 3-month period, prior to beginning any changes. This will help establish a unit baseline for HAIs in order to determine how any HHC changes affect the unit’s HAI rate. As the previous chapter mentioned, HAI rates should decrease as HHC rates increase (De Angelis et al., 2014; Helder et al., 2014; Talbot et al., 2013; Barnett et al., 2014; Cumbler et al., 2014; Harne-Britner et al., 2011).

**Interventions**

The proposed protocol will involve a multimodal intervention to address HHC issues, which research suggests is more effective at increasing HHC rates (Schweizer et al., 2014, Cherry et al., 2012; Gould et al., 2010; Rees et al., 2013). The protocol will include, education, increased access to ABHR, individualized performance feedback, and team-based incentives and consequences. By using these evidence-based interventions, clinical settings should be able to increase HHC rates, thereby reducing HAIs.
**Education.** When nurses were questioned about missed opportunities for HH they gave several answers, one of which was a lack of knowledge (Harne-Britner et al., 2011). Several of the reviewed studies indicate that education, while not effective when used alone, is an important component of a well-designed hand hygiene improvement program (Cherry et al., 2012; Gould et al., 2010). Additionally, it was suggested that employing multiple educational delivery methods, as well as repeated delivery of education, had a positive effect on hand hygiene compliance rates (Cherry et al., 2012). The proposed education for this protocol is the introduction of a mandatory annual educational workshop. The purpose of this educational workshop will be to provide knowledge about the prevalence, dangers, and causes of HAIs, as well as the significance of performing HH to prevent HAIs; HCWs are more likely to implement changes that they believe will improve outcomes for their patients (Brown, 2014). This workshop will also highlight the appropriate times to perform HH, as well as the best technique for HH.

The addition of education, hands-on opportunities, and experts versed in HHC and HAIs, will increase the chances of successful adoption of the protocol (Brown, 2014). This educational workshop will be designed using multiple delivery methods including an interactive lecture, written materials, and a video that highlight the dangers and statistics of HAIs, as well as the benefits and importance of HH. Interactive activities will also be included, such as demonstrations highlighting proper hand hygiene technique and the use of a black light box, such as those used in the study performed by Eveillard et al. (2011), to illustrate the amount of material on HCW’s hands pre and post HH. By introducing multiple educational delivery methods, studies suggest that there will be a greater positive impact on HHC (Cherry et al., 2012; Eveillard et al., 2011). The use of repeated yearly education will help increase the chances of sustaining improvements in HHC (Cherry et al., 2012).
Access to ABHR. One of the commonly used excuses for not performing HH is the lack of convenient access to ABHR dispensers (Harne-Britner et al., 2011); it is vital to make performing HH as easy and convenient as possible to increase the chances that these protocols will be successful (Brown, 2014). Multiple studies had some initial success with increased access to ABHR, which served as both a convenience, as well as a visual reminder (Schweizer et al., 2014; Nevo et al., 2010; KuKanich et al., 2013). In order to increase the likelihood of HCWs performing HH, an ABHR dispenser with a small flashing green light will be installed in each patient’s room. The dispenser will be placed in the direct line of sight of the HCW upon both entry and exit to the room. By increasing the convenience and access of HH materials to HCWs, as well as by including a noticeable flashing green light, the HCWs will be more likely to perform HH, which will help reduce that transmission of pathogens from patient to patient (Nevo et al., 2010; KuKanich et al., 2013; Schweizer et al., 2014).

Individualized Performance Feedback. Due to the success of studies that included feedback as an intervention, personal feedback will be provided when a failed opportunity for HH is observed. Because of the increased success when immediate personal feedback was performed, it is important that the feedback is provided immediately upon failure to perform HHC (Talbot et al., 2013; Cumbler et al., 2013; Rees et al., 2013; Linam et al., 2011). Additionally, by providing individual feedback, HCWs are provided with ownership in their part of improvement (Brown, 2014). Observers will provide verbal feedback to the HCW that fails to perform HH immediately. This feedback will be conducted prior to patient contact when it occurs before patient care, or immediately upon exit of the room when it occurs after patient care. Feedback will not be given in front of the patient, rather the HCW will be called into the hallway so that they may be reminded that HH is required, and so that they may perform it
before resuming patient care. Should an individual have repeated incidences of failure to perform HH, there will be further education and personal goal setting required. Continued failure may escalate to disciplinary measures as individuals who refuse to improve their HH performance are deterring from patient care goals and should be held accountable by the unit (Brown, 2014).

**Team-Based Incentives and Consequences.** Individual units will be treated as teams, with the unit manager considered the team leader. The most successful reviewed studies used a team-based approach that involved consequences and incentives to achieve high rates of HHC (Aboumatar et al., 2012; Talbot et al., 2013; Rees et al., 2013). Unit leaders will be expected to act as role-models and supporters in the performance of HH, this is an important component of implementing change on units and convincing compliance with interventions (Brown, 2014). Unit leaders will receive education about HAIs and HH, individualized information about their units, and ideas for encouraging complying with evidence-backed protocols, all of which will help to encourage their support and a smooth transition for the units as a whole (Brown, 2014).

After a baseline HHC rate is established for the unit, team leaders will work with administration and infection control (IC) to set HHC goals for their unit. Observers will track both successful and failed HH opportunities, which will then be reported, by unit, on a monthly basis. Unit managers will have the opportunity to evaluate whether their unit goals were met, what their new goals will be, and how to meet their goals if they are failing to do so. The repeated failure of a unit to meet their goals may result in further mandatory trainings for both the unit and the leaders, as well as other disciplinary measures that the administration and management deem necessary, up to and including leadership replacement.

When teams continuously meet their goals they will earn an incentive to be determined
by the clinical facility; it has been suggested that financial incentives and bonuses may help improve HHC rates of units (Talbot et al., 2013). Successful incentives suggested by the Joint Commission (2009) have included movie tickets, parties, raffle tickets and yearly bonuses. This team-based approach provides a cohesive environment for individuals and may help change the unit culture and encourage them to work towards a common goal (Talbot et al., 2013).

**Monitoring and Evaluation**

After initiating the protocol interventions, observations will no longer be covert, as this would likely be pointless after the units were aware of the new protocol. At this point a consistent group of individuals should be trained and used as long-term observers, to maintain consistency. Observation will continue on a weekly basis with trained observers, using a simple audit tool, as it is necessary to use an easily understood and accessible tool to encourage sustained use (Brown, 2014). Results will be compiled and examined on a monthly basis by IC and management. This information will be relayed in meeting with unit managers and leaders to address the individual units upon implementation.

Unit HAI rates will be compared to baseline on a monthly basis, as well. This is to ensure that the interventions that have been implemented to increase HHC rates are effective at reducing HAIs. Should HHC rates increase, but HAIs not decrease, it will be necessary to evaluate further areas for improvement and what other factors need to be addressed with the ultimate goal of decreasing HAIs.

It is important to monitor improvements on a long-term and ongoing basis to ensure that changes are sustained over time (Brown, 2014). By evaluating the impact of the protocol it is possible to ensure that individualized clinical outcomes are being maintained over time (Brown, 2014). Should outcomes and goals not be met, it is important to re-evaluate the protocols and
institute further changes that may be more successful with the unit (Brown, 2014).

Summary

The purpose of this thesis was to develop a best practice protocol to improve hand hygiene among HCWs in the clinical setting in an effort to reduce the incidence of HAIs. A review of the research indicates that HAIs are associated with poor HHC rates, and as indicated by the CDC, the most effective way to reduce HAIs is by increasing rates of HHC (2015). The suggested best practice protocol was developed based on a review of the current literature that has evaluated several interventions designed to improve HHC rates. The evaluation of the protocol will be based on observations of HHC rate, as well as comparisons of monthly HAI rates to baseline numbers. Ultimately, the goal of this best practice protocol is to reduce the incidences of HAIs, saving both money and lives, and resulting in the best outcomes possible for patients.
References


Cherry, M. G., Brown, J. M., Bethell, G. S., Neal, T., & Shaw, N. J. (2012). Features of educational interventions that lead to compliance with hand hygiene in healthcare professionals within a hospital care setting. A BEME systematic review: BEME Guide


