TESTING THE EFFECT OF A RESIDENT-FOCUSED HAND HYGIENE INTERVENTION IN A LONG-TERM CARE FACILITY: A MIXED METHODS FEASIBILITY STUDY

By

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ABSTRACT

KATHLEEN AUMANN MORALES
TESTING THE EFFECT OF A RESIDENT-FOCUSED HAND HYGIENE
INTERVENTION IN A LONG-TERM CARE FACILITY: A MIXED METHODS
FEASIBILITY STUDY
Under the direction of LAURA P. KIMBLE, PhD, RN, FNP-C, FAHA, FAAN

In the United States of America (U.S.) approximately 3 million people in all healthcare settings develop healthcare-associated infections annually (Centers for Disease Control [CDC], 2016; Office of Disease Prevention and Health Promotion [ODHP], 2013). Hand hygiene is the most effective measure to prevent healthcare-associated infections, making it a clear strategy to prevent healthcare-associated infections. While there is a wealth of evidence regarding the efficacy of healthcare provider’s hand hygiene, there is a paucity of research available related to the role of residents’ hand hygiene in preventing healthcare-associated infections. Many long-term care facilities lack specialized infection control staff, creating a challenge for infection control and surveillance in this setting. The purpose of this study was to test the feasibility and acceptability of a resident-focused hand hygiene intervention within a long-term care facility, using a mixed methods design.
The study followed an exploratory sequential design. The strands were implemented sequentially, starting with qualitative data collection and analysis. The qualitative strand began with direct observation which is the gold standard to monitor hand hygiene adherence. Next, interviews of six residents and six staff members were completed using a semi-structured interview guide. Qualitative findings informed the second strand, which had a quantitative emphasis. The quantitative strand of the study was a quasi-experimental clinical trial (n=12 residents), implemented with a pre-test/post-test design with one experimental group and no control group. Participants in the quantitative strand were recruited and completed pre-intervention questionnaires on day one. Pre-observation occurred on day two with the educational intervention on day three. Post-intervention observation and questionnaires were completed on day four, which was 24 hours post-intervention and 72 hours after the pre-intervention data collection.

The educational intervention revealed clinically important and positive changes in hand hygiene related health beliefs. While findings suggested the educational intervention improved respiratory hygiene, meal-related hand hygiene demonstrated only a minimal increase. Qualitative data revealed hand hygiene may be less amenable to change because of meal-related hand hygiene habits formed in childhood. A resident-focused hand hygiene intervention actively promotes self-efficacy rather than passive reliance on healthcare staff to assure clean hands during meals. Findings from both the quantitative and qualitative strands provide key information for future piloting of a resident-focused hand hygiene intervention on a larger scale.
CHAPTER ONE

INTRODUCTION TO THE STUDY

Among hospitalized patients at any given time, 7% in developed countries and 10% in developing countries will acquire at least one healthcare-associated infection (World Health Organization [WHO], n.d.). In the United States of America (U.S.) approximately 3 million people in all healthcare settings develop healthcare-associated infections annually (Centers for Disease Control [CDC], 2016; Office of Disease Prevention and Health Promotion [ODHP], 2013). Healthcare-associated infections are defined as those infections acquired in a healthcare setting while receiving treatment for other conditions (CDC, 2002). The rate varies among hospitals and long-term care facilities in the US, with an estimated 721,800 infections occurring annually in hospitals (CDC, 2016) and 765,000 to 2.8 million infections occurring annually in long-term care facilities (ODHP, 2013). Many long-term care facilities lack specialized infection control staff, creating a challenge for infection control and surveillance in this setting (Smith et al., 2008). Hospital patients and long-term care facility residents are especially susceptible to infections due to impaired cognition, immobility, and indwelling devices (Smith et al., 2008).

While it is significant to note healthcare-associated infections are the most frequently occurring adverse event in healthcare delivery worldwide, affecting millions each year (WHO, n.d.), the impact of healthcare-associated infections may not be fully evident. Diagnosis of a healthcare-associated infection is complex and based on multiple
criteria rather than a single laboratory test. The lack of widely accepted diagnostic
criteria and methodologies (including surveillance methods and identified outcomes) outside of the acute care setting make comparisons of healthcare-associated infection rates between types of healthcare settings difficult. In 2005, the National Healthcare Safety Network replaced the National Nosocomial Infection Surveillance system, becoming the most widely used healthcare-associated infection tracking system for all healthcare facilities, states, regions, and the nation. However, the lack of national surveillance systems in developing countries contributes to difficulty analyzing the impact of healthcare-associated infections world-wide. Regardless of the surveillance system or healthcare setting, healthcare-associated infections are a significant factor in morbidity, mortality, and healthcare costs world-wide. To further underscore the impact of healthcare-associated infections in the US, healthcare-associated infection prevention, reduction, and elimination is a Healthy People 2020 goal (Healthy People, 2014).

Seriousness of Healthcare-Associated Infections

Healthcare-associated infections are associated with increased long-term disability, multi-drug resistant organisms, and length of stay (WHO, 2009). These infections are associated with admission to any healthcare facility, including acute and long-term care facility settings. The three healthcare-associated infections most frequently reported in both settings are: respiratory tract infections (including pneumonia), gastrointestinal infections (such as norovirus and Clostridium difficile), and urinary tract infections (CDC, 2015). The two-remaining healthcare-associated infections frequently reported in hospitals are primary bloodstream infections and surgical site infections (CDC, 2015; Smith et al., 2008). Hospital-associated infections
may result from a combination of factors, including invasive procedures performed in hospitals and poor hand hygiene. Likewise, as more invasive treatments are being offered in long-term facilities, there is an increased risk of healthcare-associated infections in the long-term care setting as well (ODHP, 2013).

These infections have a serious impact. For example, in one study, *norovirus* outbreaks occurring in long-term facilities surpassed those occurring in restaurants (Schweon, Edmonds, & Kirk, 2013). *Clostridium difficile* is the major infectious cause of healthcare-associated and antibiotic-associated diarrhea, resulting in morbidity and mortality among older residents (Simor, 2010). Approximately 75,000 infection related deaths in US hospitals (CDC, 2016) and 368,000 deaths in long-term care facilities were reported (ODHP, 2013). Pneumonia is the leading cause of death among long-term care facility residents (ODPHP, 2013). In addition to affecting health outcomes, healthcare-associated infections have a significant financial impact on health systems, patients/residents, and their families. The estimated annual economic impact of infections in the US ranges from 28.4-45 billion dollars annually (CDC, 2016). Additionally, healthcare-associated infections are likely to reduce financial reimbursement and the perceived integrity of the institution (U.S. Department of Health & Human Services, 2013).

Statement of the Problem

Because human hands are the most common vehicle of disease transmission (CDC, 2002), hand hygiene is a clear strategy to prevent healthcare-associated infections. Hand hygiene was recognized as the most effective measure to prevent healthcare-associated infections as far back as 1847 by both Semmelweiss and Holmes (WHO,
Nightingale implemented hand washing in Crimean War hospitals (Global Public-Private Partnership for Handwashing, 2015). Hand hygiene is a *preventive health behavior*, an action which promotes health, prevents disease, and enables self-development (Senol, Unalan, Soyuer, & Argun, 2014). Hygiene and infection prevention and control strategies have traditionally been a nursing responsibility, as nurses possess the capacity to educate patients/residents, families, colleagues, and communities about the importance of hand hygiene (Larson, 2016).

Although the evidence clearly indicates hand hygiene is the single most effective intervention to prevent healthcare-associated infections (WHO, 2009), inconsistent and suboptimal hand hygiene practices by healthcare providers continue to inflict harm today. Variability in healthcare providers’ adherence to hand hygiene continues despite the evidence indicating healthcare providers understand the significance of hand hygiene and the boundaries of good and poor practice. As a result, healthcare providers’ adherence to hand hygiene has recently been deemed a quality indicator with mandated public disclosure (Larson, 2016).

Residents may be involved in the spread of pathogens through multiple routes (Landers, Abusalem, Coty, & Bingham, 2012). Environment and direct contamination increase the risk of healthcare-associated infection transmission. Two major factors increase risk of direct transmission (through person-to-person contact) or indirect transmission (exposure to contaminated environmental surfaces) in long-term facilities. First, Medicaid reimburses for semiprivate rooms (Smith et al., 2008). As a result, most residents have one or more roommates. Second, long-term care facilities promote socialization of residents (Smith et al., 2008). Although beneficial, socialization also
increases risk of disease transmission. As a result, residents are susceptible to transmission and subsequent colonization with multi-drug-resistant organisms and other infectious organisms (Boyce, 1992).

Long-term facilities serve susceptible populations at risk for healthcare-associated infections transmitted by poor hand hygiene. The very young and very old may have a diminished immune response and/or malnutrition. Long-term care facility residents may also have multiple co-morbidities and/or polypharmacy (Smith et al., 2008), further compromising the immune system. The cognitive/functional ability of older and younger residents requiring care within long-term facilities (such as incontinence or immobility) may increase the need for hand hygiene, while decreasing the ability to independently perform hand hygiene.

Given the prevalence and impact of healthcare-associated infections, the focus of research and prevention has been healthcare providers’ adherence to hand hygiene, leaving the effect of residents’ hand hygiene largely unexplored. Studies validate the importance of patient hand hygiene, suggesting patients’ hands become a reservoir and provide a means of transmission when they are not adequately cleansed (Lawrence, 1983; Burnett, Lee, & Kydd, 2008). A significant next step in this area of science is to examine the effect of administering a resident-focused hand hygiene intervention in long-term facilities. However, for this work to move forward, the feasibility of the resident-focused hand hygiene intervention must be examined.

**Purpose of the Study**

The purpose of this study was to test the feasibility and acceptability of a resident-focused hand hygiene intervention within a long-term care facility, using a mixed
methods design. This was considered the first step in developing an evidence-based resident-focused hand hygiene intervention, which may ultimately inform guidelines to be incorporated within a long-term care facility as part of routine care. The long-term goal of this researcher is to develop and test a resident-focused hand hygiene intervention for residents within a long-term facility. The benefits of a resident-focused hand hygiene intervention may include reducing morbidity and mortality by decreasing costly healthcare-associated infections.

Research Questions

The research questions for this mixed methods study were as follows:

Qualitative Research Question:

Research Question 1: What are the health beliefs, issues, and concerns identified by staff and residents relevant to implementing a resident-focused hand hygiene intervention in a long-term care facility?

Quantitative Research Questions:

Research Question 2: Is there a clinically meaningful difference between pre-intervention and post-intervention health beliefs related to the hand hygiene intervention?

Research Question 3: Is there a clinically meaningful difference between pre-intervention and post-intervention percentage of adherence to meal-related hand hygiene behaviors related to the hand hygiene intervention?

Research Question 4: What was the participants’ reaction to the hand hygiene intervention?

Research Question 5: Which modifying variables impact long-term care facility residents’ hand hygiene behaviors?
Conceptual Framework

The conceptual framework for the study was the Health Belief Model (Figure 1). Four psychologists, Hochbaum, Kegeles, Leventhal, and Rosenstock, developed this social cognitive model, in the 1950s to examine barriers to preventive health programs (Rosenstock, 1974). The Health Belief Model has been widely used to understand differing behaviors or attitudes under the same condition and has been previously tested as a theoretical model to measure healthcare providers’ attitudes toward hand hygiene (Kretzer & Larson, 1998). The Health Belief Model helped the researcher identify and understand barriers to resident hand hygiene, making it a good fit for a feasibility study.

*Figure 1: Health Belief Model Applied to Resident-Focused Hand Hygiene*

Note: HAIs = Healthcare-Associated Infections; HHI = Hand Hygiene Intervention; HH = Hand Hygiene
The original model had four constructs: perceived susceptibility; perceived seriousness; perceived benefits; and perceived barriers to action (Rosenstock, 1990). Two additional constructs were later added: cues to action and self-efficacy (Rosenstock, 1990). Per the theory, for an individual to take preventive action, such as hand hygiene, the individual must first perceive he/she is personally susceptible to a health risk, such as healthcare-associated infections. Next, the health risk (infections) must have at least a moderately serious impact on some component of the individual’s life. Furthermore, the advised preventive health action must be beneficial, reducing the individual’s susceptibility to the health risk or the seriousness of the health risk. Finally, taking the advised preventive health action must not exceed tangible and/or psychological costs (Rosenstock, 1974). In other words, when an individual believes a health risk can be avoided, has a positive expectation that taking a recommended action will lead to avoiding the health risk, and believes he/she can successfully complete the advised preventive health action, the individual is more likely to complete the advised preventive health action. The Health Belief Model applied to resident-focused hand hygiene is displayed in Figure 1.

As displayed in Figure 1, perceived susceptibility refers to an individual’s subjective risk of personally contracting the health risk (Rosenstock, 1974). It is an individual’s belief or opinion regarding the potential of the health risk occurring. Perceived seriousness refers to an individual’s perception of the seriousness of the health risk and/or its sequelae (Rosenstock, 1974).

Perceived benefits include an individual’s opinion of the efficacy of the advised preventive health action to reduce the health risk or its seriousness (Rosenstock, 1974).
The beliefs related to the effectiveness of the preventive action may include the opinion that changing behavior(s) may reduce the health risk.

Perceived barriers refer to tangible and/or psychological costs of the advised preventive health action (Rosenstock, 1974). The literature review identified barriers to healthcare providers’ adherence to hand hygiene included insufficient time, inaccessible hand hygiene supplies, irritating hand hygiene agents, lack of knowledge of protocols, forgetfulness, and lack of administrative leadership/support. Barriers to residents’ adherence to hand hygiene included lack of knowledge, forgetfulness, decreased cognitive or motor function, presence of medical devices interfering with hand hygiene, inaccessible hand hygiene supplies, and/or irritating hand hygiene agents.

A perceived threat results from the combination of the perceived susceptibility and seriousness. Knowledge about a health risk has the potential to modify an individual’s perceptions (Haefner & Kirsch, 1970). Self-protection is a strong motivator for healthcare providers’ adherence to hand hygiene (Chavali, Menon, & Shukla, 2014; Dawson & Mackrill, 2014; Eiamsitrakoon, Apisarnthanarak, Nuallaong, Khawcharoenporn, & Mundy, 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt, Jefferson, & Mermel, 2013; Liu, Liang, Wu, & Chuang, 2014). It follows self-protection would motivate residents as well. However, while educational interventions and cues regarding hand hygiene may further increase an individual’s willingness to act, knowledge of the perceived threat or perceived benefits of the advised preventive health action does not always ensure the desired behavior. This inconsistency between perception and behavior is described as a knowledge-practice gap (Festinger, 1957).
Barriers may determine the outcome expectation. For example, an individual’s perceptions about the availability and effectiveness of the advised preventive health action influence the individual. The potential barriers for the study included residents’ cognitive and/or dexterity limitations.

Cues to action may stimulate an individual’s readiness to act, resulting in overt behaviors (Rosenstock, 1990). This includes an internal or external stimulus that triggers health-related behaviors. Cues may also include something that makes the individual aware of a health threat, such as mandated public disclosure of healthcare-associated infection rates or hand hygiene adherence rates.

Self-efficacy refers to an individual’s confidence in the ability to successfully perform an action (Rosenstock, 1990). This includes the belief that one possesses the ability to change his/her behavior(s) and the recognition that personal health practices and choices can positively influence health. Self-efficacy correlates with an internal locus of control, where individuals believe they have some control over what happens to them. As a result, people who possess self-efficacy more consistently demonstrate behaviors that facilitate physical wellbeing (Dabbs & Kirsct, 1972; Straits & Sechrest, 1963; Williams, 1972).

Assumptions

There were five main assumptions for the study. The first assumption of this study was all residents are susceptible to and at risk for healthcare-associated infections. Admission to a long-term care facility increases the risk for infection for residents who are susceptible to infection. A second assumption was individuals responsible for personal hand hygiene would have the most insight about potential barriers. A third
assumption was if residents’ hands were not adequately cleansed, they would become a reservoir and provide a means for transmission of serious infections and the associated sequelae. The fourth assumption was residents would engage in the advised preventive health behavior of hand hygiene if barriers were reduced or eliminated by providing appropriate supplies and support. The theoretical framework guiding this investigation was predicated on the fifth and final assumption that personal beliefs influence self-efficacy and behavior.

Significance of the Study

The feasibility study addressed several gaps in the literature. First, the setting was a long-term care facility which is underrepresented in the current literature. The Congressional Budget Office (2013) reported more than two-thirds of 65-year-olds will require assistance due to a loss in functioning at some point during their remaining years of life. With the aging population, the long-term care facility population will likely increase sharply. Next, the role of the residents’ hand hygiene in preventing healthcare-associated infections was examined as there is limited evidence about resident-focused hand hygiene. The conceptual framework guiding this study suggested supporting residents to engage in the preventive health behavior of hand hygiene empowers the resident to prevent disease transmission. Finally, the feasibility study brought a unique focus on hand hygiene, the single most effective way to prevent infection, by examining the role of residents’ hands in transmission. This novel intervention has potential to improve outcomes for this growing, susceptible population, as well as potentially improve the quality or state of the long-term care facility and the financial outcomes.
Summary of Methodology

The study followed a two-strand mixed methods, exploratory sequential design, beginning with the collection and analysis of qualitative data, followed by the collection and analysis of quantitative data. This design allowed the researcher to use both qualitative and quantitative approaches to evaluate the extent to which data collection procedures and outcome measures were feasible, suitable, and appropriate for use in a future study testing the effect of the hand hygiene intervention on healthcare-associated infection rates. The qualitative strand informed the refinement of the intervention during this feasibility study. During the qualitative strand, the researcher observed all meals in dining hall on one weekday and one weekend day in the setting to identify for feasibility issues and barriers. The researcher made observation field notes in the setting regarding feasibility issues and interviewed staff/residents about any issues or concerns related to administering the intervention. Findings from the qualitative data analysis refined the approach to testing the feasibility of the intervention in the quantitative strand.

Definition of Terms

The following terms were defined for the study as follows:

Cues to action. Something that makes the individual aware of a health threat and starts the individual on the path to behavior change (Rosenstock, 1974).

Hand hygiene. An inclusive term for the practice of cleansing hands, which includes hand washing, use of alcohol-based handrubs, or disposable wipes. Hand hygiene does not refer to surgical hand antisepsis performed in surgical settings (WHO, 2009).
Hand hygiene related behaviors. Those behaviors which increase infection risk via self-inoculation through T-zone touching or transmission through respiratory hygiene.

Healthcare-associated infections. Infections acquired while receiving treatment for other conditions within a healthcare setting (CDC, 2002).

Hospital. Acute care institutions offering inpatient care.

Long-term care facilities. Institutions offering long-term or residential healthcare to individuals unable to manage independently in the community (Smith et al, 2008). Another name for long-term care facilities is nursing homes.

Modifying variables. Individual personal factors that affect whether the preventive health action is adopted (Rosenstock, 1974).

Perceived barriers. Tangible and/or psychological costs of the advised preventive health action (Rosenstock, 1974).

Perceived benefits. The individual’s opinion of the efficacy of the advised preventive health action to reduce the health risk or its seriousness (Rosenstock, 1974).

Perceived seriousness. The individual’s judgment as to the severity of the health risk (Rosenstock, 1974).

Perceived susceptibility. An individual’s assessment of personally contracting the health risk (Rosenstock, 1974).

Preventive health behavior/action. Any activity undertaken by an individual to prevent illness, detect illness in an asymptomatic stage, or improve health (Rosenstock, 1974). In this study, the focus was on meal-related hand hygiene behaviors (pre-meal hand hygiene, T-zone touching, and respiratory hygiene).
**Resident-focused hand hygiene intervention.** An educational program for participants that provided information regarding their susceptibility to healthcare-associated infections, the seriousness of healthcare-associated infections, the benefits of the health preventive action (pre-meal hand hygiene with a disposable wipe) and meal-related hand hygiene related behaviors to reduce risk of infection (avoiding T-zone touching and proper respiratory hygiene). The hand hygiene intervention promoted self-efficacy by reducing barriers to hand hygiene and providing cues to action.

**Respiratory hygiene.** Coughing or sneezing into the elbow or covering the cough or sneeze with something other than the bare hand (CDC, 2012).

**Self-efficacy.** An individual’s confidence in the ability to successfully perform an action (Rosenstock, 1990).

**T-zone touching.** Touching the eyes, nose, or mouth, providing a potential means to inoculate oneself.

**Summary**

In this chapter, the problem of healthcare-associated infections within long-term facilities was introduced, along with related literature about the sequelae of healthcare-associated infections. The role of hand hygiene in disease transmission and the significance of the study were explored. The purpose of the hand hygiene intervention study and the conceptual framework were described. Qualitative and quantitative research questions were delineated. Finally, study assumptions, a summary of the study methodology, and definition of terms were provided.
CHAPTER TWO

REVIEW OF RELATED LITERATURE

The occurrence of undesirable complications from healthcare-associated infections has been well documented in the literature over the past thirty years. Although healthcare-associated infections are preventable, they continue to occur at an alarming rate. Additionally, there is a plethora of evidence related to various aspects of the chain of infection in general. There is also a wealth of evidence regarding the efficacy of healthcare providers’ hand hygiene in reducing healthcare-associated infections. However, there is a paucity of research available related to the role of residents’ hand hygiene in preventing healthcare-associated infections. A review of literature organized according to the constructs of the Health Belief Model will be presented. Specifically, areas addressed will include literature relevant to the advised preventive health action, (meal-related hand hygiene behaviors), susceptibility to healthcare-associated infections, benefits and barriers to hand hygiene, outcome expectations (adherence to meal-related hand hygiene behaviors), and hand hygiene self-efficacy.

Synthesis of Literature

A literature search related to patient and hand hygiene was conducted using Mercer University’s Georgia Library Learning Online (GALILEO) database. The initial search returned 28,690 studies. The search was refined to include healthcare-associated infections in peer reviewed journals in the last five years, resulting in a final sample of 27 studies written in English. References were searched for pertinent studies, resulting in 53
additional studies. International and national infection control guidelines and textbooks were also consulted. Eighty studies spanning 33 years (1983-2015) were reviewed. The studies included several different countries, healthcare systems, and settings (hospitals, long-term care facilities, and the community), with hospitals being the most frequent setting. Studies differed in focus, design, and methods. Study foci included healthcare providers’ adherence to hand hygiene, patients’ comfort in asking the healthcare providers to perform hand hygiene, or patients’ hand hygiene. Study designs included qualitative, quantitative, and mixed methods.

Advised Preventive Health Action: Hand Hygiene

To prevent disease transmission, the Centers for Disease Control (CDC) introduced universal precautions in 1987, which were replaced by standard precautions in 1996 (World Health Organization [WHO], 2009). Both universal precautions and standard precautions stressed the role of hand hygiene in preventing healthcare-associated infections regardless of setting. In 2002, alcohol-based handrubs with an alcohol concentration of 60% to 90% were deemed the standard of care for hand hygiene performed by healthcare providers over traditional soap and water, reserving hand washing for particular situations, such as visibly soiled hands, exposure to norovirus and potential spore-forming pathogens such as Clostridium difficile (CDC, 2002). Alcohol-based handrub use is associated with better hand hygiene quality and is less costly than traditional hand washing due to reduced time required (Cimiotti, Stone, & Larson, 2004). While alcohol-based handrubs have no appreciable residual activity, regrowth of bacteria occurs slowly after use due to the sub-lethal effect on the skin’s normal flora (WHO, 2009). Alcohol-based handrubs are rapidly germicidal with greater activity than
antiseptic detergents against multi-drug-resistant organisms, such as vancomycin resistant *enterococci* (VRE) and methicillin resistant *staphylococcus aureus* (MRSA). However, alcohol-based handrubs have little or no activity against bacterial spores, such as *Clostridium difficile*.

Because there are numerous types of opportunities for hand hygiene within a clinical encounter, the WHO (2009) introduced Five Moments of Hand Hygiene (Five Moments) to simplify the guidelines. The Five Moments include: Moment 1 before touching a patient; Moment 2 before clean/aseptic procedures; Moment 3 after body fluid exposure risk; Moment 4 after touching a patient; and Moment 5 after touching patient’s surroundings (WHO, 2009). Adherence by healthcare providers is highest with Moments 3 and 4, suggesting self-protection is a strong motivator, and lowest with Moments 2 and 5, which are the hardest to monitor (Chavali et al, 2014; Dawson & Mackrill, 2014; Eiamsitrakoon et al., 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt et al., 2013; Liu et al., 2014).

Healthcare providers consistently fail to comply with the WHO’s (2009) Five Moments of Hand Hygiene despite the serious risk of harm or injury from healthcare-associated infections to themselves or their patients. Although no single intervention has consistently resulted in improved or sustained hand hygiene adherence, one practical cue to perform hand hygiene for Moment 2 is the inclusion of alcohol-based handrub packets in indwelling urinary catheter trays.

While both the CDC (2002) and WHO (2009) stressed that gloves are not a substitute for hand hygiene, some inconsistencies exist between the guidelines. For example, the CDC (2002) recommended performing hand hygiene before donning clean
gloves, while the WHO (2009) stated there is no evidence for performing hand hygiene before donning clean gloves. The CDC (2002) banned artificial nails in high risk areas such as operating rooms and addressed the length of natural nails to reduce the potential reservoir for pathogens. The WHO (2009) advised against artificial fingernails or extenders for healthcare providers having direct patient contact and that natural nails be kept less than 0.5 centimeters or 0.25-inch long.

Neither the WHO (2009) nor the CDC (2002) differentiated hand hygiene guidelines based on setting. In other words, guidelines are situation specific rather than setting specific. Although the CDC (2002) and WHO (2009) guidelines are the standard in all healthcare settings, many long-term care facilities lack specialized infection control staff or hand hygiene policies (Cohen et al., 2014; Smith et al., 2008).

Additionally, patient hand hygiene is not consistently described. Neither the CDC (2002) nor the WHO (2009) addressed the role of patient hand hygiene. However, both the Society for Healthcare Epidemiology in America (SHEA, 2012) and the Association for Professionals in Infection Control and Epidemiology (APIC, 2014) guidelines suggested patient hand hygiene should be addressed. Landers et al. (2012) suggested nine moments for patient hand hygiene within acute care settings: 1) after toileting, 2) when returning to the room, 3) before oral intake, 4) when visibly soiled, 5) before touching non-intact skin or before an invasive procedure, 6) before dialysis or contact with indwelling devices, 7) after coughing or sneezing, 8) before and after visitor contact, and 9) when there is a concern if hands are clean. However, the unique challenges of long-term facilities, including providing care to a vulnerable population with limited resources, are less delineated (Schweon & Kirk, 2011). Furthermore, there is a lack of
studies related to the residents’ hands serving as a reservoir or means of transmission and the effect of resident hand hygiene in reducing these risks. Since the best approach to conduct a resident-focused hand hygiene intervention study was unknown, the feasibility study informed the optimal ways to obtain the sample, implement the intervention, develop the best study materials, measure variables, and have the most robust statistical analysis.

Susceptibility to and Seriousness of Healthcare-Associated Infections

Respiratory hygiene. Respiratory hygiene was introduced in 2002 as a component of Standard Precautions (Boyce & Pittet, 2002). The recommendations are situation specific rather than setting or person specific. In other words, respiratory hygiene is appropriate whenever and wherever respiratory symptoms develop. In 2009, the CDC recommended coughing or sneezing into the elbow as an integral component of respiratory hygiene (CDC, 2009).

T-zone touching. Healthcare workers’ and residents’ hands may be contaminated from endogenous and exogenous sources. Individuals may colonize themselves through face-touching, especially the eyes, nose, or mouth (T-zone). Given the high frequency of mucosal contact, hand hygiene is essential to prevent pathogen transmission and colonization. In one study, medical students touched their faces 23 times per hour, mouth 4 times per hour, and nose 3 times per hour (Kwok, Gralton, & McLaws, 2015). In another study, healthcare providers touched their T-zones a mean of 19 times in 2 hours (Elder, Sawyer, Pallerla, Khaja, & Blacker, 2014). Additionally, 91% of observed hand washing in that study did not meet the CDC (2002) criteria for effective hand washing due to an insufficient amount of time spent rubbing the hands with soap and water and
not using a towel to turn off the faucet. In contrast, 84% of observed alcohol-based handrub use did meet CDC (2002) criteria. Substandard alcohol-based handrub use included not rubbing the alcohol-based handrub over the entire hand and not allowing the hands to dry before touching something and/or someone (Elder et al., 2014).

Hands contaminated through improper respiratory hygiene have the potential to transmit respiratory infections such as influenza or coronavirus (Kwok et al., 2015). T-zone touching following contact with surfaces contaminated with respiratory droplets may lead to self-inoculation with communicable respiratory diseases. Two studies found decreased respiratory illness after administering a patient-focused hand hygiene intervention (Cheng et al., 2007) or resident-focused hand hygiene intervention (Schweon et al, 2013). Unit-based respiratory outbreaks decreased from 4 per year to 1 per year and respiratory illness decreased from 60 to 6 per year after administering a structured hand hygiene intervention for psychiatric patients (Cheng et al., 2007). Hand hygiene may prevent bacterial transmission in the long-term care facility setting, as lower respiratory tract infection rates were reduced from 0.30 to 0.25 infections per 1,000 resident-days after administering a resident-focused hand hygiene intervention (Schweon et al., 2013).

These findings demonstrate the need for and efficacy of a structured resident-focused hand hygiene intervention to prevent disease transmission and self-inoculation in the long-term facility, where pneumonia is the leading cause of death resulting from infection. The feasibility study further built the evidence-base to prevent infection mortality and morbidity in the long-term care facility setting, by identifying barriers to a structured resident-focused hand hygiene intervention and promoting understanding of residents’ differing behaviors or attitudes toward hand hygiene.
Hands may also be contaminated from the environment and vice versa. For example, gram-positive and gram-negative bacteria transfer from the fingertip to the lip was similar to transmission from hard surfaces to hands, demonstrating the high transmission potential from T-zone touching (Rusin, Maxwell, & Gerba, 2002). Vancomycin-resistant *enterococci* were present on the hands of patients undergoing outpatient procedures as well as in the environment on items such as chairs, couches, and healthcare providers' gowns (Grabsch et al., 2006). Furthermore, *norovirus* found in the long-term care facility environment and on resident associated equipment matched the isolates from residents' stool samples (Wu et al., 2005).

**Susceptibility to the Problem: The Role of Residents’ Hands**

The transmission of hand contamination between patient and healthcare providers is dynamic and reciprocal (Banfield & Kerr, 2005). Patient-indexed outbreaks of *norovirus* in a hospital involved more patients than staff-indexed outbreaks, contradicting the assumption healthcare providers are mainly responsible for person-to-person spread of *norovirus* (Mattner, Mattner, Borck, & Gastmeier, 2005). These findings indicate the patient has a role in the chain of infection. Patients’ hands may be colonized shortly after admission to a healthcare facility. For example, 39% of patients’ hands were colonized with at least one hospital-associated pathogen, such as *Clostridium difficile*, methicillin resistant *Staphylococcus aureus*, vancomycin resistant *enterococci*, or *Acinetobacter* species, within 48 hours of admission to a healthcare agency (Istenes et al., 2011). After seven days, 62% of all patients had enterococcal hand contamination, compared with 10.7% of non-hospitalized adults (Banfield, Kerr, Jones, & Snelling, 2007). Furthermore,
inpatients are more likely to have multi-drug-resistant organisms as part of their skin’s normal flora compared with outpatients (Larson et al., 2009).

Benefits and Barriers to Hand Hygiene

The literature confirmed hand hygiene is the single most effective measure to prevent healthcare-associated infections. For example, an increase in alcohol-based handrub use by healthcare providers correlated with a decrease in healthcare-associated infections (Pittet et al., 2000; Gagne, Bedard, & Maziade, 2010; King, 2004; Vernaz et al., 2008). Although alcohol-based handrubs are not effective for Clostridium difficile, there was no associated increase in Clostridium difficile infections. Although a resident-focused hand hygiene program provides an inexpensive and highly effective preventive health action against healthcare-associated infections (Cheng et al., 2007; Gagne et al., 2010; Schweon et al., 2013), few interventional studies have been conducted to increase resident hand hygiene.

Barriers to Healthcare Providers’ Hand Hygiene

The literature review revealed healthcare providers report various reasons for hand hygiene non-adherence. Reasons included barriers such as insufficient time, inaccessible hand hygiene supplies, irritating hand hygiene agents, lack of knowledge of protocols, forgetfulness (which correlates with cues to action), and lack of administrative leadership/support (which correlates with self-efficacy). Inaccessibility (which correlates with barriers) included an inadequate number of conveniently placed sinks in the work environment (Pittet et al., 2000). In contrast, alcohol-based handrubs require less time than hand washing and may be attached at the bedside or on equipment or carried by the individual (WHO, 2009). However, a wearable alcohol-based handrub dispenser did not
improve use (Haas & Larson, 2008) and anesthesia healthcare providers’ non-adherence continued after body fluid exposure despite alcohol-based handrub dispensers mounted on anesthesia equipment in the operating room (Munoz-Price et al., 2014). The safety of alcohol-based handrub in this oxygen-rich environment must be examined and may have been a factor in the healthcare providers’ reluctance to use in this specific setting. The researchers questioned if the Five Moments may be inappropriate in the operating room setting. Megeus, Nilsson, Karlsson, Eriksson, and Andersson (2015) strongly refuted that position, emphasizing that guidelines are specific to the situation rather than the setting.

Pittet et al. (2004) and Pogorzelska and Larson’s (2008) findings of physician non-adherence with hand hygiene were consistent with Semmelweiss’ and Holmes’ 1847 findings. Despite the overwhelming research in the literature review, physicians perceived a lack of evidence for the importance of hand hygiene in preventing healthcare-associated infections (Erasmus et al., 2009). This suggests concentrated educational efforts toward physicians may produce the greatest improvement in healthcare providers’ adherence to hand hygiene. While Mortell (2012) acknowledged physicians have lower hand hygiene adherence, he challenged nurses to remind physicians of the moral obligation to follow hand hygiene practice rather than holding the physician directly accountable.

A behavioral explanation for hospital nurses’ non-adherence to hand hygiene using the theory of planned behavior identified two distinct behavioral practices (Whitby, McClaws, & Ross, 2006). First, inherent hand hygiene, described as behavior undertaken when hands are physically dirty, feel sticky, or have been somewhere considered to be contaminated, was predicted by behavior, attitudes, and peer behavior. Second, elective
hand hygiene, described as behavior encompassing all other potential hand hygiene opportunities, was predicted by nurses’ beliefs in the benefits of hand hygiene, peer pressure, and role modeling. Elective hand hygiene was predicted only to a minimal extent by the reduction in effort to cleanse hands. These findings suggest introduction of hand hygiene supplies without interventions to affect behavior is unlikely to produce a sustained increase in hand hygiene adherence. The findings also emphasize the challenge of changing hand hygiene behavior. Despite direct knowledge of the importance of infections, nurses still did not perform hand hygiene per established guidelines. It would be expected that increasing resident hand hygiene would be challenging as well.

Barriers to Residents’ Hand Hygiene

Along with studies of barriers to healthcare providers’ hand hygiene, barriers to resident hand hygiene have been investigated. One study revealed out of 290 total hand hygiene observations in an acute care setting over a 36-hour period, not one episode of hand hygiene was by a patient (Savage, Fuller, Besser, & Stone, 2010). Individual factors which increase residents’ susceptibility and make resident hand hygiene especially important, include bowel or bladder incontinence, chronic health diseases such as diabetes, immunosuppression, presence of wounds, environmental multi-drug-resistant organisms, social activities, prolonged length of stay, semiprivate rooms, and number and ages of visitors (Boyce, 1992; Smith et al., 2008; WHO, 2009). Barriers which may affect long-term care facility residents’ ability to complete hand hygiene, thereby increasing healthcare-associated infection risk include decreased cognitive or motor function, and presence of orthopedic devices or bandages interfering with hand hygiene. Healthcare providers must assess the resident’s hand function and assist with hand
hygiene as needed (Hill et al., 2014) as patients unable to perform hand hygiene independently are often not assisted (Burnett et al., 2008).

Patients’ home hand hygiene predicted their hospital hand hygiene, with a notable decrease in hospital hand hygiene before eating and after toileting (Barker et al., 2014). Decreased hospital hand hygiene compared to home hand hygiene was greater among older patients and those with mobility problems, suggesting a need for a resident-focused hand hygiene intervention for long-term care facility residents, who, as a population, are often older and have decreased mobility.

Hand Hygiene Self-Efficacy

A resident-focused hand hygiene intervention may actively promote self-efficacy, engaging and empowering residents to become partners in ensuring safety, rather than relegating the resident to supporting and encouraging others’ hand hygiene practices (Landers et al., 2012). Because most residents are willing and able to participate in their own hand hygiene (Landers et al., 2012), the resident-focused hand hygiene intervention was designed to be incorporated into the residents’ care routine. Anchoring the hand hygiene intervention in the culture may inculcate hand hygiene, ritualizing the behavior (Savage et al., 2011). A systematic hand hygiene program for patients in acute care settings promoted self-efficacy, by empowering patients to take more responsibility in their care (Banfield & Kerr, 2005) and to take charge of their own safety (Gagne et al., 2010). A resident-focused hand hygiene program may be used in any healthcare setting, even those with limited infection prevention and control resources (Cheng et al., 2007; Gagne et al., 2010).
Resident-centered care which is focused on the resident’s safety may include a resident-focused hand hygiene program using hand wipes (O’Donnell et al., 2015; Schweon et al., 2013; Whiller & Cooper, 2000). Barriers in the O’Donnell et al. (2015) study included residents’ decreased visual acuity and dexterity, which made it difficult or impossible to see or open the individually packaged hand wipes provided in group dining halls or on meal trays. Furthermore, a transient decrease in hand hygiene performance was attributed to failing to restock the dining hall hand hygiene station.

Outcome Expectations: Measurement Issues in Hand Hygiene Research

The long-term outcome of better hand hygiene is to decrease infections. An intermediate outcome is adherence to meal-related hand hygiene behaviors. Measurement of hand hygiene adherence in various settings have involved self-report, direct observation (including quality and frequency of hand hygiene), or product use measurement (including electronic monitoring of alcohol-based handrub or soap use). Self-report is not recommended as the primary method of measurement of hand hygiene adherence as it is subjective and the least accurate method, with participants over-reporting favorable behavior and under-reporting unfavorable behavior (Ellingson et al., 2014; Gould, Moralejo, Drey, & Chudleigh, 2010). For example, mean hand hygiene adherence for hospital healthcare providers to all Five Moments was 82.4% by self-report versus 23.2% by direct observation (Eiamsitrakoon et al., 2013). Although 64% of hospital nurses reported offering patients hand hygiene, only 15% of patients recalled being offered hand hygiene (Burnett et al., 2008). Direct observation revealed out of 75 identified opportunities to offer patient hand hygiene, it was offered on only one occasion. More than half of patients reported they were not offered hand hygiene, despite
nurses’ acknowledgment of patient hand hygiene in controlling and preventing healthcare-associated infections (Ardizzone, Smolowitz, Kline, Thom, & Larson, 2013). Healthcare providers in an out-patient clinic who stated they frequently avoided touching their face, touched it at the same rate as those who reported only occasionally or rarely touching their face (Elder et al., 2014).

Although direct observation is expensive and time consuming, it is the gold standard to monitor hand hygiene adherence (WHO, 2009). Direct observation typically evaluates simply whether hand hygiene was performed, rather than hand hygiene quality or effectiveness. A conventional method is to calculate observations by defining the numerator as an episode and the denominator as an opportunity. Training for observers improves inter-rater reliability for direct observations.

Estimates of hand hygiene frequency fluctuate with the monitoring method and observation setting (Randle, Arthur, Vaughan, Wharrad, & Windle, 2014). Direct observation may be confounded when individuals modify or improve an aspect of behavior due to being observed, which is known as the Hawthorne effect. Hand hygiene observation may provide an opportunity to appeal to the desire for positive feedback and conformity (Haessler, 2014). For example, nurses’ hand hygiene adherence in free standing long-term facilities was only 11.3%, despite their awareness of the observer (Liu et al., 2014), suggesting an even lower adherence in day-to-day practice. Electronic counters may reduce or quantify the Hawthorne effect (Whitby, McLaws, Slater, Tong, & Johnson, 2008). For example, hand hygiene adherence among healthcare providers in the hospital setting was threefold higher in hallways within view of an auditor compared to when no auditor was visible (Srigley, Furness, Baker, & Gardam, 2014). The increase
occurred after the auditors' arrival. These findings were consistent with the Hawthorne effect, questioning the accuracy of direct observations.

Product use measurement allows for passive monitoring by recording the volume of products used. For example, Savage et al. (2011) measured the average daily alcohol-based handrub volume used as a percentage of the average daily volume procured by the hospital ward over the previous 12 months. Product use measurement simply indicates the amount of hand hygiene product used, not who used the products, or the quality of hand hygiene. Additionally, product usage may be falsely inflated without increasing hand hygiene. Product use measurement has also included comparing antibiotic usage with hand hygiene adherence for a specified period. A disadvantage of comparing antibiotic usage is this may indicate treatment of a healthcare-associated infection rather than prevention.

Inferences for Current Study

General concepts related to transmission of infectious agents have been studied since their discovery in the late 19th century with emphasis in the late 20th century (WHO, 2009). The literature showed hand hygiene is important, especially in the susceptible long-term care population. Hand hygiene programs may decrease healthcare-associated infections. A review of the literature revealed the foci of recent studies have been on the healthcare providers’ role in transmission of healthcare-associated infections. Although residents’ hands may serve as a reservoir of infectious agents, their role in transmission potential is not well described.

Resident-focused infection control practices may reduce morbidity and mortality in this vulnerable population and reduce costs to the facility and the overburdened
healthcare system. However, the need for evidenced-based infection control measures is often thwarted by limited available resources. A resident-focused hand hygiene intervention has the potential to increase self-efficacy, improve resident care and outcomes, and requires few resources. Promoting hand hygiene among long-term care facility residents has the potential to reduce the rate and impact of healthcare-associated infections.

Barriers to providers’ hand hygiene include insufficient time, inaccessible supplies, irritating agents, lack of knowledge of protocols, forgetfulness (which correlates to cues to action), and lack of administrative support (which correlates to self-efficacy). Additional barriers to residents’ hand hygiene include decreased cognitive or motor function or presence of medical devices interfering with hand hygiene. Because individuals perform advised preventive health behaviors according to their health state (Senol et al., 2014), perceived barriers for participants with decreased visual acuity and dexterity were removed by providing disposable hand wipes which were easy to see and already opened.

Because a hand hygiene intervention for this population is challenging, the goal of the hand hygiene intervention was to optimize residents’ hand hygiene self-efficacy by providing additional cues to remind and motivate participants. The resident-focused hand hygiene intervention refined through this study has the potential to increase self-efficacy and well-being, with participants serving as role models for healthcare providers and other residents, contributing to culture change. The hand hygiene intervention is an example of residents and nurses working as partners to enhance hand hygiene self-efficacy as the skill remains with the resident regardless of setting or staffing. It also
allowed the resident to serve as a role model to others regarding hand hygiene (Gagne et al., 2010).

Summary

The literature related to the Health Belief Model’s constructs was synthesized in this chapter. A review of the literature on the seriousness of infections with an emphasis on long-term care facility residents’ susceptibility to infection was delineated. The benefits of hand hygiene and related guidelines and barriers to healthcare workers’, residents’, and patients’ hand hygiene were explored. The outcome expectations and measurement issues in hand hygiene research were delineated and inferences for the current study discussed.
CHAPTER THREE
METHODOLOGY

In this chapter, the methodology for the study for both the qualitative and quantitative strands is summarized, along with how the qualitative findings informed the quantitative strand. The rationale and philosophical assumptions underlying the mixed methods approach are described. For each strand, the design, setting, and sample are identified. The instrumentation for the study is delineated, along with the data analysis plan. Procedures for protecting human subjects are discussed.

Overview of Mixed Methods Research Design

Because resident hand hygiene has not been widely researched, the study followed a two-strand mixed methods exploratory sequential design. In this design, the methods are implemented sequentially, starting with qualitative data collection and analysis in strand one. Qualitative findings were used to inform the second strand, which had a quantitative emphasis. This design includes multiple worldviews which shift from one strand to the other (Creswell & Plano Clark, 2011). The typical paradigmatic foundation for the exploratory sequential design is constructivist in the first (qualitative) strand and post positivist in the second (quantitative) strand (Creswell & Plano Clark, 2011). The level of interaction is interactive, with the design and methods being mixed before the final interpretation takes place (Creswell & Plano Clark, 2011). Priority of the
strands typically includes a qualitative emphasis, with the qualitative strand occurring first (Creswell & Plano Clark, 2011). However, in this study the strands had equal priority. The primary point of interface for mixing the strands is at data collection, identifying variables from qualitative data analysis to inform quantitative data collection (Creswell & Plano Clark, 2011). In this study, qualitative results were used to tailor components of the intervention. During the qualitative strand, the researcher observed in the long-term care facility setting for feasibility issues around the implementation of the resident-focused hand hygiene intervention and interviewed staff members and residents. The anticipated intervention delivery was modified as needed based on qualitative findings with the goal of reducing perceived barriers and promoting adherence to meal-related hand hygiene behaviors.

Setting for Qualitative and Quantitative Strands

The setting for the study was a non-profit, long-term care facility in the Southeast. The multidisciplinary staff provides continuous care to medically complex residents requiring long-term care. The staff include certified nurse assistants, licensed practical nurses, registered nurses, and physical therapists. The facility has 150-beds, including private and semi-private rooms. The population consists of 106 female residents (71%) and 44 male residents (29%). The facility receives financial payment as follows: Medicaid for 122 residents (81%), private payment from 16 residents (11%), Medicare for 10 residents (7%), and Veterans’ Administration for 2 residents (1%).

Methodology for the Qualitative Strand

The researcher conducted observations within the facility relevant to implementation of the resident-focused hand hygiene intervention. Qualitative interviews with residents and staff followed the observation period.
Sample for the Qualitative Strand

The resident sample for the qualitative strand (n=6) was a purposive sample which included three male and three female residents meeting the following inclusion criteria: 1) speak English; 2) be at least 18 years of age; 3) able to provide written, informed consent; and 4) Brief Interview for Mental Status (BIMS) score of 13-15 (Saliba et al., 2012). The BIMS exam is routinely administered and recorded by facility staff. Because a score of 13-15 indicated intact cognition (Saliba et al., 2012), this score was required for participation in the study. The assistant administrator informed the researcher about residents with a BIMS score of 13-15 whom she believed could provide rich data. These recommended individuals were the focus of recruitment. The sole exclusion criterion included incomprehensible speech, such as dysphasia. One female resident was excluded due to dysphasia.

The staff member sample for the qualitative strand (n=6) was a purposive sample which included three male and three female staff members who met the following inclusion criteria: 1) speak English; 2) be at least 18 years of age, 3) able to provide written, informed consent, and 4) provide direct resident care, including assisting with meals. There were no exclusion criteria for the staff sample.

Justification for the Sample Size for the Qualitative Strand

The sample size of twelve for the qualitative strand was consistent with the suggested sample size of 4-10 participants recommended by Creswell (2007) for the qualitative strand of mixed methods studies. The qualitative strand focused on identifying issues or concerns relevant to resident hand hygiene and to inform the intervention in the quantitative strand. The qualitative sample of 12 was deemed
adequate for the study because qualitative findings were consistent about how the intervention should be modified. The data were clear about what would be appropriate for administering the intervention. Male and female residents and staff members were included to identify any variation in responses based on gender, such as differences in toileting habits or male healthcare provider’s possible reluctance to assist female residents with hand hygiene following toileting. However, no gender specific findings were identified in the data.

Instrumentation for the Qualitative Strand

The researcher observed and recorded the baseline meal-related hand hygiene behaviors on the Field Observation Flowsheet (Appendix A). Qualitative data included the researcher’s Observation Field Notes (Appendix B) which were completed for each observation period. The researcher wrote notes about interactions between residents and staff, including verbatim quotes, as well as the context of the interactions. Sensory information, such as movement, sights, and sounds in the setting, was also noted. Observation was limited at times by staff and residents obstructing the researcher’s view.

A semi-structured interview guide was used to collect data for the qualitative strand (Appendix C). The interview guide focused on the Health Belief Model theory-based issues relevant to resident hand hygiene. The following questions were included.

To explore the perceived seriousness of healthcare-associated infections: *Tell me what you know about infections people get in healthcare facilities. What do you think is the impact of infections people get in healthcare facilities?* To explore perceived susceptibility: *What factors do you think increase your risk for getting an infection in a healthcare facility?* To explore the advised preventive health action: *What can you do to
prevent getting an infection in a healthcare facility? To explore the perceived benefits: 

What are the benefits of cleaning your hands? To explore the perceived barriers: What keeps you from cleaning your hands? To explore cues to action: If we were to supply you with wipes to help you clean your hands, where would you like them to be located? If we were to supply you with reminders, where would you like them to be located? How would you prefer to be reminded? To inform the intervention: What can we do to help you clean your hands? What other recommendations would you make? To explore self-efficacy: If we helped find ways to clean your hands, tell me about your confidence in doing it yourself.

Procedures for the Qualitative Strand

The qualitative strand included observation in the setting for feasibility issues and to identify perceived barriers to hand hygiene. To establish credibility and capture a complete picture of practices, the researcher observed current clinical practice in relation to meal-related hand hygiene behaviors (including T-zone touching and respiratory hygiene) in the dining hall during scheduled mealtimes (7:00 a.m.-9:00 a.m.; 11:30 a.m.-1:00 p.m.; and 4:30 p.m.-6:00 p.m.) for two days, including one weekday and one weekend day.

The researcher met with the assistant administrator to obtain permission to interview residents and staff who met the inclusion/exclusion criteria. Volunteers were recruited through direct invitation. Participants in the qualitative strand were consented to be interviewed by the researcher. The qualitative data collection involved face-to-face audio-recorded interviews using the semi-structured interview guide. Signed copies of
the written informed consents were provided to the assistant administrator upon the completion of the qualitative interviews at her request.

Data Analysis Plan for the Qualitative Strand

The qualitative research question (Research Question 1) was “What are the issues and concerns identified by staff and residents relevant to implementing a resident-focused hand hygiene intervention in a long-term care facility?” Resident and staff participants’ data were transcribed verbatim and analyzed using the six-step procedure for mixed methods data analysis described by Creswell and Plano Clark (2011). The six analytic steps were: preparing the data for analysis; exploring the data; analyzing the data; representing the data analysis; interpreting the results; and validating the data and results.

As the researcher prepared the data, the documents and visual data were organized. Qualitative data included field notes and transcripts of the interviews. To explore the data, the researcher read the data, wrote memos, and developed a qualitative codebook. The researcher coded the data using procedures recommended by Saldaña (2013), assigned labels to codes, grouped codes into categories, and interrelated the categories into a smaller set of categories. To represent the data, the findings were presented in discussions of categories using theoretical perspectives of the Health Belief Model, such perceptions of susceptibility, benefits, and barriers, along with issues/concerns and recommendations for administering the intervention.

Transition Between Qualitative Strand and Quantitative Strand

Findings from the qualitative data analysis were used to refine the approach to testing the feasibility of the intervention in the quantitative strand. The intervention protocol was refined based on staff and resident feedback and the researcher’s
observations. All refinements based on the qualitative data were carefully documented as part of the mixed methods design.

Methodology for the Quantitative Strand

The design for the quantitative strand of the study was a quasi-experimental clinical trial. The final design in the quantitative strand was implemented with a pre-test/post-test design with one experimental group and no control. In brief, the study evaluated long-term care residents’ perception of susceptibility to and seriousness of healthcare-associated infections and adherence to a resident-focused hand hygiene intervention based on the Health Belief Model. The design included a pre-test/post-test measurement of health beliefs related to hand hygiene and adherence to meal-related hand hygiene and related behaviors. Data collection for the entire quantitative strand occurred over a 22-day period.

Sample for the Quantitative Strand

A non-probability, convenience sample of long-term care facility residents was obtained (n=12). Inclusion criteria were broad, including 1) speak English, 2) be at least 18 years of age, 3) be able to provide written, informed consent, 4) have a Brief Interview for Mental Status score of 13-15, 5) correctable vision and hearing acuity; and 6) able to perform hand hygiene independently with a disposable wipe. These inclusion criteria ensured participants were cognitively intact and could perform hand hygiene. After the qualitative strand, inclusion criteria were modified to include consuming meals in the dining hall rather than the resident’s room. Eating meals in the dining hall facilitated measurement of the outcome variables. Exclusion criteria included: 1) sensitivity to the disposable wipes; and 2) nothing by mouth status. Two male residents who were
suggested by the assistant administrator were excluded from quantitative strand of the study due to not being able to perform hand hygiene independently. Furthermore, participants in the qualitative strand were excluded from the participation in the quantitative strand. Signed copies of the written informed consents were provided to the assistant administrator at her request.

Justification for the Sample Size for the Quantitative Strand

As a feasibility study, the test of this hand hygiene intervention was not designed or powered for the researcher to perform statistical hypothesis testing (Lancaster, 2015). However, the study permitted estimation of Cohen’s d effect sizes which will inform researchers in determining sample size for further studies. The population size was 150 residents (number of beds in the facility). The targeted sample size for the quantitative strand of the study was 12 residents.

Description of the Intervention

The hand hygiene intervention was designed to address common barriers to meal-related hand hygiene behaviors in the dining hall. To overcome the barrier of cost, the hand hygiene intervention included disposable wipes, already available within the facility, as a convenient option (O’Donnell et al., 2015; Schweon et al., 2013; Whiller & Cooper, 2000). This required no additional investment of infrastructure and time. The use of disposable wipes further allowed participants to perform hand hygiene discretely and conveniently.

All participants were provided disposable wipes and verbal cues to clean their hands prior to meals consistent with the facility’s current practice. Collection of baseline data included direct observation of meal-related hand hygiene behaviors. Based on these
data, the percentage of baseline adherence to meal-related hand hygiene behaviors was calculated. Because educational interventions and cues may further increase an individual’s willingness to act, all participants received education related to healthcare-associated infections and hand hygiene. This included a video demonstrating the susceptibility to infection and the seriousness of transmission potential using fluorescent residue (Glo Germ) transferred from environment to persons and from persons to the environment. To explore the role of verbal cues on hand hygiene behavior, verbal cues, provided by the staff to participants, were observed and noted by the researcher. To explore the role of visual cues on hand hygiene behavior, six participants received a laminated visual cue (Appendix D). The researcher re-measured post-intervention percentage of adherence to meal-related hand hygiene by direct observation.

Based on the qualitative data the implemented design for quantitative strand involved repeated measures with one group. Participants received disposable wipes per the facility’s practice. Participants also received structured education including written materials and a video regarding the seriousness of health care associated infections, the participants’ susceptibility to infections, and how hand hygiene could reduce this risk.

Instrumentation for the Quantitative Strand

Data collection for this strand included four researcher developed tools: the Participant Demographics and Environmental Context Questionnaire (Appendix E), the Risk for Healthcare-Associated Infections (Appendix F), the Health Beliefs Related to Hand Hygiene Tool (Appendix G), and the Flowsheet for Hand Hygiene Observation (Appendix H). In addition, a modified Participant’s Reaction to the Hand Hygiene Intervention (WHO, 2009; Appendix I) was also administered. To accommodate
participants’ visual or dexterity deficits, the researcher administered the tools face-to-face. Quantitative data included percentage of adherence to meal-related hand hygiene behaviors calculated by the researcher through direct observation, the gold standard for measuring hand hygiene adherence.

To obtain content validity evidence in this study, the Health Beliefs Related to Hand Hygiene Tool and Risk for Healthcare-Associated Infections Tool were reviewed by eight experts in infection control or long-term care. Experts were given two weeks to complete the review using a 4-point Likert scale, ranging from 1 “not relevant” to 4 “highly relevant.” Item-level content validity indices (CVI) were determined as described by Polit, Beck, and Owen (2007). Revisions to the instruments based on low item content validity were subsequently reviewed by three of the eight original experts who provided varied responses and rich comments. The threshold for acceptable item-level CVI was at least .83 based on the number of experts (Polit et al., 2007).

Participant Demographics and Environmental Questionnaire

The Participant Demographics and Environmental Questionnaire was developed to obtain essential demographic data and collect data regarding potential modifying variables identified through the literature review that could impact hand hygiene or the development of healthcare-associated infections. The researcher completed this questionnaire for each participant. Modifying variables measured at the interval/ratio level included age in years, BIMS score, time in seconds required to perform hand hygiene, and numbers of routine medications, daily routine medication doses, indwelling devices, and days in the facility at time of study entry. Co-morbid diagnoses were noted based on body system (cardiac, respiratory, etc.).
Risk for Healthcare-Associated Infections Tool

The Risk for Healthcare-Associated Infections measured residents’ risk factors for healthcare-associated infections. Items for this instrument were developed from the literature. The instrument contains 12 dichotomously scored items. The possible range of scores was 0-12, with higher scores indicating greater risk for healthcare-associated infections. The score was calculated by the researcher and the implications of the score regarding personal risk were discussed with each participant after the Health Beliefs Related to Hand Hygiene Tool was completed at the beginning of the quantitative strand.

After expert review, one item on the Risk for Healthcare-Associated Infection Tool, *age above 60*, had an item-content validity index below 0.83. This item was revised to read *age above 65*. The instrument was re-reviewed by the three of the original eight experts who provided varied responses and rich comments. The revised item had a CVI of 1.0. The sample size of 12 was not large enough to accurately estimate Cronbach’s alpha.

Health Beliefs Related to Hand Hygiene Tool

The Health Beliefs Related to Hand Hygiene Tool was administered at the beginning and upon completion of the study. The tool was based on the work of Champion (1984). The initial version of the tool contained 42 Likert items. After expert review (n=8), thirteen items had an item-content validity index below 0.83. One item was omitted (*I worry a lot about getting infections*). Twelve items were revised and re-reviewed by the experts (n=3) who provided varied responses and rich comments.

Eleven revised items had unanimous ratings of 3 “quite relevant” or 4 “highly relevant” from the experts yielding an item-content validity index of 1.0. However, based on the second review by experts, two additional items were removed from the final tool (*I would...*).
be embarrassed if I had an infection which required others to wear gowns or masks to be around me and Treating an infection can be expensive). To facilitate clarity for one item about respiratory hygiene behavior, photos were also added demonstrating covering a cough with a hand and coughing into the elbow.

The final version of the tool included 39 items on a 5-point Likert scale, from 1 “strongly disagree” to 5 “strongly agree.” Higher scores indicated stronger health beliefs related to hand hygiene in six different Health Belief Model-related constructs. Six items measured perceived susceptibility with a range of subscale scores from 6-30. Five items measured perceived seriousness with a range of subscale scores from 5-25. Perceived benefits were measured with eight items with a range of subscale scores from 8-40. Seven items measured perceived barriers with a range of subscale scores from 7-35. Cues to action were measured with six items with a range of subscale scores from 6-30. Finally, seven items measured self-efficacy with a range of subscale scores from 7-35. The sample size was not large enough to estimate Cronbach’s alpha for the subscales of this instrument.

Flowsheet for Hand Hygiene Observation

Observation of hand hygiene situations, behaviors, and adherence both prior to the intervention and after were recorded on the Flowsheet for Hand Hygiene Observation. A hand hygiene episode was considered hand hygiene if the action referred to cleaning the surfaces of both hands. Respiratory hygiene episodes included covering a cough or sneeze with anything other than the bare hand. T-zone touching was defined as skin-to-skin contact of the hand with the eyes, nose, or mouth. Finger licking was included as an
episode of T-zone touching. Wiping the mouth with a napkin was not included as an episode of T-zone touching.

The percentage of adherence to hand and respiratory hygiene was calculated using the conventional method defining the numerator as an observed episode of hand or respiratory hygiene and the denominator as an observed opportunity when hand or respiratory hygiene would be appropriate. For example, if a participant ate all three meals in the dining hall, there were three opportunities for pre-meal hand hygiene. If the participant performed hand hygiene prior to one of those meals, the adherence score would be .33. If a participant did not eat a meal in the dining hall, no data were entered for that meal.

Participant’s Reaction to the Hand Hygiene Intervention

Upon completion of the hand hygiene intervention, the participants’ reaction to the intervention was evaluated using the Participant’s Reaction to the Hand Hygiene Intervention questionnaire, derived from the World Health Organization’s (WHO, 2009) Perception of Hand Hygiene Survey. The questionnaire included nine items on a 5-point Likert scale, ranging from (1) not at all to (5) a large extent, creating a possible range of total scores from 9-45, with higher scores indicating more positive reaction to hand hygiene. Although this was an established, widely accepted questionnaire, there were no reported reliability or validity data found in the literature.

Implementation of the Intervention

Each of the three cycles of the intervention was implemented over a 4-day period with four participants per cycle. To facilitate observation, twelve participants were recruited and a cycle of pre-test data collection, intervention, and post-test data collection
was completed. Each cycle began on different days of the week (Thursday, Wednesday, and Saturday) to determine the adherence to meal-related hand hygiene behaviors. The schedule for mealtime observation was based on the facility’s current practice. The researcher recruited participants and completed the pre-intervention questionnaires on day one of each cycle. Pre-observation occurred on day two with the educational intervention on day three. The researcher completed the post-intervention observation and questionnaires on day four (24 hours post-intervention and 72 hours after the pre-intervention data collection). The study design and flow is summarized in Appendix J.

A convenience sample was recruited through direct invitation. The researcher informed residents about the study, obtained written consent, and assigned participants unique identifiers. To explore the effect of different cues to perform meal related hand hygiene behaviors, six participants received a visual cue at meal time in the form of a table tent on their assigned tables. A table tent with visually pleasing images was placed on all other tables in the dining hall. Individual risk for healthcare-associated infections was calculated by the researcher and discussed with the participant. The participants’ health beliefs regarding hand hygiene were also assessed using the Health Beliefs Related to Hand Hygiene Tool.

Participants received structured education regarding the seriousness of healthcare-associated infections (Massachusetts Hospital Association, 2016; Appendix K). To promote the perceived benefit of the advised preventive health action and enhance self-efficacy, participants received content contained in Infection Prevention Basics (APIC, 2014; Appendix L). For consistency, education was also presented in a short web-based video. The video included a nurse-moderator. In addition to the
educational content, the video included a demonstration of fluorescent residue transferred from environment to persons and from persons to the environment during a simulated delivery of meal trays. Following education about hand hygiene, participants provided return demonstration of proper hand hygiene with a disposable wipe accompanied by a hand cleaning song written by the researcher to the tune of *Happy Birthday* (Appendix M) to time the hand hygiene. Any questions participants asked about healthcare-associated infections were noted and answered. Post-intervention percentage of adherence to meal-related hand hygiene behaviors was re-measured by direct observation in a similar manner as pre-intervention. For all participants, the researcher recorded reactions to the hand hygiene intervention using the Participant’s Reaction to the Hand Hygiene Intervention questionnaire.

**Data Collection Procedures for the Quantitative Strand**

Following written informed consent, baseline data collection was conducted in a location chosen by the participant (participant’s room or common area) on study day one. Data collection took approximately 20 minutes. The researcher observed participants for approximately 60-90 minutes during each meal (breakfast, lunch, and the evening meal) both prior to and after the intervention.

**Data Analysis Plan for the Quantitative Strand**

The researcher entered the quantitative data into Excel and then imported the data into SPSS 23.0 for analysis. Frequencies and percentages were used to describe nominal and ordinal level data. Measures of central tendency were used to describe the interval/ratio level data. Data were examined for implausible values and for missing data. Cohen’s d effect size served as an index of the magnitude of the difference pre- and
post-intervention and as an index of the magnitude of the relationship among variables within the study, although it may have overestimated the effect (Pallant, 2013). The researcher used the following formula to calculate the effect size for paired t-tests:

\[ \text{Cohen's } d = \frac{(M_2 - M_1) \div \text{SD}_{\text{pooled}}} \]

(Pallant, 2013). An effect size of .2 was considered small. An effect size greater than .2 but less than .5 was considered small to medium. An effect size of .5 was considered medium. An effect size greater than .5 but less than .8 was considered medium to large. An effect size greater than .8 was considered large (Pallant, 2013).

Data Analysis Plan per Research Questions

Research Question 1

The qualitative research question was What are the health beliefs, issues, and concerns identified by staff and residents relevant to implementing a resident-focused hand hygiene intervention in a long-term care facility? The data analysis plan for this question was detailed in the prior section describing the methodology for the qualitative strand. Issues and concerns identified in the qualitative data analysis were used to increase acceptability of the hand hygiene intervention. Any changes to the hand hygiene intervention in the quantitative strand based on the qualitative data were noted.

Research Question 2

Is there a clinically meaningful difference between pre-intervention and post-intervention health beliefs related to the hand hygiene intervention? To address this research question, mean post-intervention scores on the individual items and total scores for the Perceived Susceptibility, Seriousness, Benefits, Barriers, Cues to Action, and Self-Efficacy subscales of the Health Beliefs Related to Hand Hygiene Tool were compared
between pre- and post-intervention. Cohen’s d effect size was used to quantify the clinically meaningful difference between pre- and post-intervention scores.

Research Question 3

Is there a clinically meaningful difference between pre-intervention and post-intervention percentage of adherence to meal-related hand hygiene behaviors related to the hand hygiene intervention? To address this research question, percentage of adherence to hand and respiratory hygiene and number of T-zone touching episodes were compared between pre- and post-intervention. Cohen’s d effect size was used to quantify the clinically meaningful difference between pre- and post-intervention adherence.

Research Question 4

What was the participants’ reaction to the hand hygiene intervention? To address this research question, individual item scores on the Participant’s Reaction to Hand Hygiene questionnaire were examined. Descriptive statistics including mean and standard deviation were used to describe residents’ reaction to the hand hygiene intervention.

Research Question 5

Which modifying variables impact long-term care facility residents’ hand hygiene behaviors? To address this research question, descriptive statistics were used to examine variables relevant to hand hygiene such as gender, age in years, BIMS score, number of routine medications, number of daily routine medication doses, and number of indwelling devices and days in the facility at time of study entry.

Overall, the general area of focus for this feasibility study included identifying the most appropriate outcome measures to develop a pilot study. The results helped the
researcher estimate treatment effect and determine whether the ideas and findings are relevant to practice. The researcher evaluated the staff and resources required to implement the hand hygiene intervention, such as recruitment (including issues of eligibility), consent, retention, percentage of adherence to pre-meal-hand hygiene (including any refusals), and logistics. The integrity of the hand hygiene intervention and the data collection methods were evaluated to determine whether any important data were overlooked or if the hand hygiene intervention is appropriate for further testing. The feasibility study allowed the researcher to evaluate if components of the hand hygiene intervention work together, determine process time, and assess the facility’s willingness and capacity to participate. The feasibility study was a preliminary test of the researcher developed tools, including the Risk for Healthcare-Associated Infections Tool and the Health Beliefs Related to Hand Hygiene Tool.

Protection of Human Subjects

Permission was obtained from the Mercer University Institutional Review Board (IRB) and a letter of support was obtained from the administrator of the facility. Hand hygiene poses minimal risk with the potential for maximal benefits. Justice was addressed by including a vulnerable population who would most benefit from the study. Hand hygiene has potential to prevent harm as the most effective measure to prevent infection. Potential risks of the intervention were minimal as the facility currently used the disposable wipes which were integral to the intervention. Participation was voluntary and could be withdrawn at any time. The participant retained the right to assent or refuse each encounter. There was no incentive for participation. To assure confidentiality, participants were assigned a unique identifier for use on instruments and transcripts. The
audio recording was stored on a password-protected, secure device and website. All other data were kept under lock and key in a secure location. Computer data were stored on a password-protected computer accessible only to the researcher.

Summary

In this chapter, the methodology for the quantitative and qualitative strands of this mixed methods research study was described. The rationale for research approach was discussed. The setting, sample, and instrumentation were presented. Procedures for recruitment, data collection, and analysis were described. Approaches to assure the protection of human subjects were delineated.
CHAPTER FOUR

RESULTS

The data from this mixed methods exploratory sequential study testing the feasibility and acceptability of a resident-focused hand hygiene intervention within a long-term care facility are presented in this chapter. Data management and cleaning for both strands are discussed. Characteristics of the qualitative and quantitative samples are delineated. The results relevant to each research question are presented. Consistent with the mixed methods exploratory sequential design, the qualitative findings are discussed first, followed by the quantitative findings.

Qualitative Data Management and Analysis

Researcher Observation in the Setting: Hand Hygiene

The qualitative research question (Research Question 1) was “What are the issues and concerns identified by staff and residents relevant to implementing a resident-focused hand hygiene intervention in a long-term care facility?” The intervention protocol was refined based on staff and resident feedback, the researcher’s observation, and the qualitative data. Data obtained via direct observation will be discussed first, followed by the qualitative interview findings. Because direct observation is the gold standard to monitor hand hygiene adherence (WHO, 2009), the qualitative strand began with observation in the setting to note feasibility issues related to implementing a hand hygiene intervention for residents and to identify perceived barriers to hand hygiene. The researcher observed whether hand hygiene was performed and did not attempt to quantify
how well the residents cleansed their hands or colonization of hands with bacteria. Observation of meal-related hand hygiene behaviors occurred during the facility’s mealtimes (7:00 a.m., 11:30 a.m., and 4:30 p.m.). Observation was completed in both the qualitative and quantitative strands. For the qualitative strand, the researcher learned about current practice and identified the feasibility of quantifying meal-related hand hygiene behaviors by observing and recording baseline meal-related hand hygiene behaviors including T-zone touching and respiratory hygiene. The researcher observed all three meals over two days, for a total of 17 hours and 45 minutes of observation. Specifically, the researcher noted whether the residents used a wipe prior to eating the meal, whether they touched their T-zones, and if and how they covered coughs/sneezes. This extended observation time allowed the researcher to note repeated patterns and increased the staff and residents’ comfort with the researcher’s presence. Observing on different days of the week (Friday and Saturday) allowed a more complete assessment of current practice and strengthened credibility of the qualitative findings. The facility subdivided mealtimes to include two groups of residents who ate in the dining hall. The first group was independent, while the second group could not independently feed themselves and required assistance to perform hand hygiene.

The researcher recorded the baseline meal-related hand hygiene behaviors on the Field Observation Flowsheet. Adherence was calculated using the conventional method of defining the numerator as an episode and the denominator as an opportunity. An episode of hand hygiene referred to the action of cleaning the surfaces of both hands with a disposable wipe. An opportunity for hand hygiene referred to the situation where hand hygiene would typically be performed in the dining hall prior to each meal. During the
two-day (six meals) observation, there was a total of 155 episodes and 386 pre-meal hygiene opportunities for an overall adherence of 40% for the residents who ate in the dining hall. Forty-six of these hand hygiene episodes (29.7%) were assisted by staff. While the researcher’s presence in the dining hall may have initially served as a reminder for participants to perform hand hygiene, pre-meal hand hygiene trended downward during the observation time. Adherence declined from 55% prior to breakfast on day one of the observation to 25% prior to the evening meal on day two of the observation, perhaps due to acclimation of staff and residents to the researcher’s presence during meals, resulting in a decreased Hawthorne effect.

The observations supported the need to improve residents’ hand hygiene behaviors to prevent disease transmission and self-inoculation in the long-term care facility. Possible sources of contamination and transmission related to hand hygiene during meal times were identified. For example, many residents were wheelchair bound, using their hands to propel themselves to the dining hall. There were several tables of four or more, with residents sharing condiments at each table. Residents occasionally assisted each other and attempted to share food, which was prohibited by facility administrators. Residents shared pens to fill out menus and two residents were observed using cell phones during meals. Residents played cards prior to one meal. One resident wore cloth gloves each day. No one had polished or artificial nails. Residents and visitors were mingling about, shaking hands. Additionally, several young children visited the facility. During these multiple activities before, during, and after meals, few hand hygiene episodes were observed.
Respiratory hygiene involves behaviors associated with coughing/sneezing that prevent the spread of infection. Because limited mobility may have made it difficult for residents to cover coughs/sneezes with the elbow, coughing or sneezing into the elbow or covering the cough or sneeze with something other than the bare hand was considered acceptable respiratory hygiene for the study. Covering a cough or sneeze with a bare hand was considered unacceptable as it contaminated the hands and potentiated the spread of infection. Tissues were not provided to the residents in the dining hall, however, disposable napkins were provided. During the 17 hours and 45 minutes of observation, 490 episodes of coughing/sneezing were observed. None were addressed by residents using acceptable respiratory hygiene methods. The field observation results are displayed in Table 1.
### Table 1

**Field Observation of Hand Hygiene Behaviors, T-zone Touching, and Respiratory Hygiene**

<table>
<thead>
<tr>
<th>Date and Length of Observation Time</th>
<th>Pre-meal Hand Hygiene Episode</th>
<th>Pre-meal Hand Hygiene Opportunity</th>
<th>Pre-meal Hand hygiene Adherence</th>
<th>Mealtime Respiratory Hygiene Episode</th>
<th>Mealtime Respiratory Hygiene Opportunity</th>
<th>Mealtime T-zone Touching Episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day One Breakfast: 3 hours 15 minutes</td>
<td>36 (12 assisted)</td>
<td>66</td>
<td>55%</td>
<td>0</td>
<td>76</td>
<td>25</td>
</tr>
<tr>
<td>Day One Lunch: 3 hours</td>
<td>25 (14 assisted)</td>
<td>69</td>
<td>36%</td>
<td>0</td>
<td>42</td>
<td>27</td>
</tr>
<tr>
<td>Day One Evening Meal: 3 hours</td>
<td>23 (3 assisted)</td>
<td>60</td>
<td>38%</td>
<td>0</td>
<td>93</td>
<td>49</td>
</tr>
<tr>
<td>Day Two Breakfast: 3 hours</td>
<td>27 (11 assisted)</td>
<td>63</td>
<td>43%</td>
<td>0</td>
<td>110</td>
<td>28</td>
</tr>
<tr>
<td>Day Two Lunch: 2 hours 30 minutes</td>
<td>29 (5 assisted)</td>
<td>69</td>
<td>42%</td>
<td>0</td>
<td>90</td>
<td>53</td>
</tr>
<tr>
<td>Day Two Evening Meal: 3 hours</td>
<td>15 (1 assisted)</td>
<td>59</td>
<td>25%</td>
<td>0</td>
<td>79</td>
<td>34</td>
</tr>
</tbody>
</table>

T-zone touching referred to skin-to-skin contact of the bare hand with the eyes, nose, or mouth (T-zone). Wiping the mouth with a napkin was not considered T-zone touching. Only episodes of T-zone touching were recorded, not the specific area touched. There were 216 episodes of T-zone touching during the observation period, serving as possible sources of self-inoculation. Specific behaviors included a resident who licked...
her fingers to turn pages of a magazine and a resident who constantly touched her T-zone. Residents wearing nasal cannula oxygen touched their T-zones more often than those who were not wearing nasal cannula oxygen. Many food items served during the meal were “finger foods”, which involved residents frequently touching their mouths to consume the foods.

Staff and residents were curious regarding the researcher’s presence. The researcher answered any direct questions candidly, stating she was there to observe resident’s dining hall behavior. At no time during the observation period did the researcher interfere with the facility’s or residents’ current practices.

Observation field notes were also completed for each observation period, including notes about interactions between residents and staff, including verbatim quotes, as well as the context of the interactions. Sensory information such as movement, sights, and sounds in the setting were also noted. Observation was limited at times by staff and residents obstructing the researcher’s view. Staff provided residents with Coviden Curity Pre-Moistened Washcloths to perform pre-meal hand hygiene. The nonbacterial disposable wipe minimized skin irritation and/or dryness, prevented antibacterial resistance, and promoted antibiotic stewardship. The wipes were available in packages of 96 wipes, with individual wipes placed on the table for the residents. However, no standard method to place or discard the used wipes in the dining hall was observed. Typically, the wipes were either handed to the resident as the beverage order was taken or placed on the table prior to the residents’ arrival. When wipes were left on the table, they were usually placed by the healthcare workers on the right side of the place setting.
Several cues to action relevant to hand hygiene and hand hygiene related behaviors were noted. A hands-free alcohol-based hand rub dispenser and a “Cover your cough” sign were observed at the entrance of the facility, although no similar signs were noted at the entrance of the dining hall. Visitors were observed using the hand rub when entering and exiting the facility. In the dining hall, the staff greeted the residents, offering a wipe, but this behavior was not consistent. The variation in delivery of wipes appeared to be related to the work routine of the staff.

The staff allowed residents to interject personal preferences or refuse the suggested dining hall hand hygiene behaviors. The staff assisted residents who were not independent in feeding themselves to perform hand hygiene. There was notably better adherence to hand hygiene in the dining hall when the staff provided a visual and verbal cue, such as: “Here, (name), wipe your hands” or “This is to wash your hands” as the staff handed the residents the wipes. Verbal cues provided by staff for respiratory hygiene included, “Cover your mouth.” Verbal cues provided by staff for respiratory hygiene did not included instructions to cough/sneeze into the elbow or a napkin. Additionally, such cues could only be offered after unacceptable coughing/sneezing behaviors occurred.

Perceived Barriers to Hand Hygiene

Multiple barriers to hand hygiene were identified. Residents had varying cognitive and motor deficits. While many residents appeared to have had arthritic changes to their hands, no orthopedic devices interfered with hand hygiene. The availability of the disposable wipes before meals varied based on the delivery method.
Some staff offered the wipe as they served the beverage. Others placed the wipe on the table prior to the residents’ arrival. Residents who arrived late were not offered a wipe.

All residents wore a clothing protector, suggesting preventing food stains on clothing was a strong motivator for behavior. Residents who did not have a clothing protector would request one. The clothing protectors were folded and placed on the table prior to the residents’ arrival. The clothing protectors became damp when the disposable wipes were placed on top. The residents were visibly uncomfortable with the damp clothing protector, preferring one that was dry. Residents would touch the other clothing protectors on the table and select the driest one.

Sample for Qualitative Interviews

Three female and male residents (n=6) and three female and male staff members who provided care during meals (n=6) were interviewed to obtain multiple perspectives about hand hygiene. There was a 100% participation rate for recruitment for this strand of the study. No demographic data were obtained for residents and staff members interviewed other than gender and whether the participant was a staff member or resident. Because no licensed personnel provided direct care in the dining hall, staff member participants were all unlicensed assistive personnel. Both wings of the facility were represented in the resident samples in each strand of the study.

Individual staff and resident interviews lasted approximately 10-15 minutes each, for a total of 2-2.5 hours of recorded data. Interviews were conducted face-to-face using a semi-structured interview guide. Residents often preferred to be interviewed outside of their room to avoid “nosey” roommates. Staff were interviewed in a location chosen by the participant (the staff lounge or in the empty dining hall between meals).
Qualitative Data Analysis

Qualitative data included field notes and transcripts of the interviews. The researcher coded the data using procedures recommended by Saldaña (2013). Following the six-step mixed method of data analysis described by Creswell and Plano Clark (2011), the data were prepared for analysis as resident and staff participants’ data were transcribed verbatim. The transcripts were formatted with line numbering and a large margin to use for coding. The formatted transcripts were posted in Dropbox, accessible only to the transcriptionist, the researcher, and the dissertation chair. The researcher read the data, wrote memos, and developed a qualitative codebook. Next, the researcher explored and analyzed the data through first cycle coding using descriptive and in-vivo coding. The researcher and chair coded the data in parallel and met when finished to discuss findings, question, and substantiate emerging categories, and confirm interpretations. The seven identified categories were informed by the Health Belief Model and reflected issues and concerns relevant to the hand hygiene intervention. The categories that emerged from the data were as follows: susceptibility to infection, social exposure/social distancing, seriousness of infection, benefits of hand hygiene, barriers to hand hygiene, cues to action, and lack of personal accountability/self-efficacy.

Susceptibility to Infection

The first major category noted in the data was susceptibility to infection. Residents and staff participants did not recognize the long-term care facility population as inherently at increased risk for infection. One staff participant asked, "How do they (residents) get it (infections) if they never leave the facility?" When asked if she was at risk for infections, a female resident participant replied, "Not if I take precautions."
Furthermore, residents and staff participants possessed a false sense of protection, leading to a misconception that no further health preventive actions were needed. For example, a male resident participant stated he was at less risk for infection in the facility due to all the infection control measures. Another male resident participant said, "You've got everything here to protect it, to keep from getting that (infections)." A female resident participant said, "I'm not around that many people."

Social Exposure/Social Distancing

The second category noted in the qualitative data was social exposure/social distancing. Both residents and staff participants identified an increased risk of exposure from sick visitors and cross contamination from objects touched by hands of multiple individuals. Participants recognized social activities and the close living conditions may increase their risk of infection. Residents spent less time in their rooms and more time in social areas. The close living conditions included four residents (mixed genders) sharing one bathroom, which some residents indicated they did not like. One female resident participant stated she refused to shake hands at church to avoid exposure to germs on other’s hands to attempt to avoid contracting or spreading infection, a behavior suggested by Sklansky, Nadkarni, and Ramirez-Avila (2014).

Several resident and staff participants mentioned the need for social distancing, which included not permitting residents or family members with contagious conditions to eat in the dining hall. In the facility, social distancing only occurs with severe outbreaks. One staff participant said, “They shouldn’t come in here (the dining hall) when they are sick.” Facility implemented social distancing only occurs with severe outbreaks. This may involve a group of residents being confined to one hall or an individual resident
confined to his/her room. For example, residents on the blue hall were confined to their hall due to a gastrointestinal outbreak. One female resident was confined to her room due to a respiratory infection. Another female resident stated she did not get the flu during a recent flu outbreak in the facility because she stayed in her room. The qualitative interviews were consistent with an observation of two residents who decided to eat in their room rather than the dining hall when another male resident refused to cover his cough. While staff participants promoted social distancing for residents, they admitted to personally working while sick. For example, a staff participant with a past medical history of *Clostridium difficile* said, "I kept working until I couldn't."

**Seriousness of Infection**

*Seriousness of infection* was another category identified in the data by staff and resident participants. The data analysis revealed a lack of knowledge regarding the seriousness of healthcare-associated infections among resident and staff participants. Staff participants stated the impact of healthcare-associated infections “depended on the resident” and that "residents don't have a clue." Participants who had not experienced infection during times of increased risk did not see infection as concerning. For example, one resident participant noted, “No one died or went to the hospital during the recent flu outbreak in the facility.” Another resident participant stated, “I went to Belize with health corps and didn’t get an infection.”

However, if the participant’s (either the residents’ or staff) past medical history included an experience with a healthcare-associated infection, the participant expressed a greater recognition of personal risk and perceived seriousness of infection. For example, one female resident participant with a past medical history of *Staphylococcus* infection
said, "Staph infections. They're very serious, I mean, and easy to pick up, more than what people think." In contrast, those without prior experience tended to think infections posed a less serious risk. For example, one resident participant stated infections are “a real bad inconvenience.” A resident participant stated, "I think it's (infections) a …pain in the neck frankly."

Staff participants reported increased workload due to required personal protective equipment when caring for residents with healthcare-associated infections. Staff participants specifically named methicillin resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* as serious healthcare-associated infections. The past medical history of one male staff participant who had been diagnosed with *Clostridium difficile* helped him recognize the psychological impact of required isolation precautions for those with healthcare-associated infections.

With respect to susceptibility to infection, residents focused on the cleanliness of the environment rather than personal cleanliness. For example, residents who did not use the wipe either moved it aside or used it to clean the table rather than their hands during the observation. One resident noted “dirty shoes that's been on the floor, and sit it up on the bed…. that’s cross contamination" and suggested "keeping the rooms…clean, and keeping your furniture clean, and the sinks clean, and the faucets warm" to prevent infection.

**Benefits of Hand Hygiene**

The category, *benefits of hand hygiene*, reflected participants who had varying views of why hand hygiene is important. There was a lack of knowledge regarding optimal hand hygiene and when to perform hand hygiene. Resident participants admitted
they often forgot to perform hand hygiene. One staff participant observed, "I hardly see the residents washing their hands” and a male resident participant reported he washed his “twice a day.” While most resident participants recognized the benefit of hand hygiene to protect self and others from infection, one resident participant did not believe hand hygiene prevented one from spreading infection. Observed behaviors which offset the benefits of hand hygiene were noted as resident participants who washed their hands in their rooms contaminated their hands with mobility devices as they propelled themselves to the dining hall.

A staff participant said she does not often see residents cover their cough or sneeze, but "if they do it, with their hand.” One female resident participant noted she touches her eyes often due to dry eyes and had a recent eye infection. Two resident participants preferred to cover coughs or sneezes with a disposable tissue to keep hands clean rather than coughing and sneezing into the elbow.

Barriers to Hand Hygiene

The category barriers to hand hygiene was identified as staff and resident participants described reasons for suboptimal hand hygiene within the facility. While a staff participant observed, residents "don't remember to wash their hands," a resident participant believed home hygiene practices determined the resident’s long-term care facility hygiene. For example, residents who performed hand hygiene before meals at home were more likely to perform hand hygiene before meals in the long-term care facility. This was similar to previous findings that home hand hygiene predicted hospital hand hygiene, with a notable decrease in hospital hand hygiene before eating and after toileting (Barker et al., 2014), especially among older patients and those with mobility
problems. Resident participants identified physical limitations, such as arthritis or upper limb amputation as making hand hygiene more difficult. Staff participants cited inadequate staff prior to and during meals, especially during weekends. Staff participants reported a need for additional staff members to assist residents with hand hygiene.

Perception of the availability of the wipes varied. One resident participant said, “I don't have no wipes” while another resident participant observed, “You got wipes all over the place” and ”Those things (wipes) are there if they would use them.” Staff participants expressed concern about the residents hoarding the wipes. One staff participant stated, “Wipes get lost in the residents’ rooms.” One resident participant noted the lack of storage space for wipes, stating, “The television stand is the only place to put them.” One staff participant wondered if residents viewed the wipes placed on the table as being contaminated, although resident participants stated this was not an issue. One resident participant believed attitude may be a barrier, stating “A lot of them (residents) don’t know. Either don’t know or don’t wanna” and "If you want to (clean your hands), you do it, if you don't, you don't."

Cues to Action

The category cues to action emerged as data revealed resident participants reported different cues to perform meal related hand hygiene behaviors. When the resident participants were asked what the staff could do to remind residents to perform hand hygiene, one resident participant said, “How can they forget when the girl is standing there, 'Here [redacted], wipe your hands'. How can they forget?” Another resident participant replied, “Stand right over you.” One staff participant said, “Some residents have a verbal barrier so maybe using pictures or posters could promote" hand
hygiene. Staff were mixed about who should be responsible for initiating hand hygiene with wipes. While some staff participants thought the residents forgot to clean their hands, other staff thought residents should initiate hand hygiene, saying the residents “need to ask for wipes.” Another staff participant said, ”We should just give it (the wipe) to them.” However, resident participants indicated both verbal and visual cues would be helpful overall.

Lack of Personal Accountability/Self-Efficacy

Few residents indicated the critical need for personal cleanliness during the interviews. The data revealed a lack of personal accountability for preventing infection in self and others, with few residents speaking in first person (“People should wash their hands”; “You spread germs…”; ”To get it to other people, you mean?”, etc.). The category, lack of personal accountability/self-efficacy reflected these perceptions. Residents viewed others at risk for infection, as sources of infection, and in need of hygiene rather than self. Residents viewed the environment as needing cleaning rather than their own hands as a threat to self. For example, during the observation residents who did not use the wipe either moved it aside or used it to clean the table rather than their hands.

Residents viewed the staff as the experts and depended on the staff to follow procedures to prevent infection. Rather than take responsibility for controlling infections, the resident participants expressed a sense of protection in the long-term care facility which may contribute to a belief that no action is required on the resident's part.
Modifications of the Quantitative Strand Based on Qualitative Strand

Based on the qualitative findings, the following changes were made in the study design and flow of the quantitative strand. After the qualitative strand, the researcher narrowed the setting and the timeframe for the direct observation in the quantitative strand to hand hygiene behaviors in the dining hall throughout the meal. This assured direct observation of meal-related hand hygiene behaviors, which is the gold standard. In addition, meals are key situations where the chain of infection can be broken. The focus of the observed behaviors was widened to include respiratory hygiene and T-zone touching during the meal. To allow for direct observation, the inclusion criteria were modified to include residents who ate in the dining hall. As a result, no additional observers were needed in the quantitative strand.

Another aspect of the study that was changed based on the qualitative strand was how participants were recruited. Although the design originally proposed invitational flyers to be distributed by nurses, volunteers were recruited through direct invitation by the researcher, eliminating the burden on the nurses. A convenience sample based on the assistant administrator’s recommendation of residents meeting the inclusion criteria, including their BIMS score, eliminated the need for the researcher to review the medical record to screen for eligibility. However, participants provided Health Insurance Portability and Accountability Act (HIPAA) release within the written informed consent for the researcher to view protected health information.

The intervention was originally proposed to be the provision of disposable wipes to increase hand hygiene behavior. However, because the facility already provided disposable wipes, the focus of the intervention had to change. In the final design of the
quantitative strand, the structured education about health-care associated infections and the importance of hand hygiene was the intervention. This decision was supported by Whitby et al.’s (2006) study, which found introducing hand hygiene without interventions to affect behavior is unlikely to produce a sustained increase in hand hygiene adherence. The decision was also supported by Bonel (1999) who found education for older adults in long-term care facilities and their families was an under-developed resource.

Based on qualitative data, the final design in the quantitative strand was implemented with pre-test/post-test design with one experimental group. This design allowed for beneficence, posing minimal risk with the potential for maximal benefits. The design allowed for non-maleficence with the potential to prevent harm from infection through hand hygiene, the most effective measure to prevent infection (CDC, 2002). Based on observation during the qualitative strand, the Participant Demographics and Environmental Questionnaire was revised to collect additional data about the use of assistive devices (such as wheelchairs, walkers, etc.) which can be sources of contamination, and a history of dry eyes or oxygen use which may increase the frequency of T-zone touching and self-inoculation.

The qualitative strand also informed the educational materials used in the educational intervention. The educational video used as part of the intervention was filmed in the clinical setting. The script was based on the Healthcare-Associated Infections and Infection Prevention Basics documents. The fluorescent powder demonstration was also filmed in this setting. A room scheduled for cleaning following the recent discharge of a patient was selected to ensure all powder would be removed
from the room upon completion. The video was edited to demonstrate transfer of powder directly from person to person and indirectly from contaminated objects. The three behaviors (hand hygiene, respiratory hygiene, and refraining from T-zone touching) were also reinforced as a means of protecting oneself and others. The video was posted privately on YouTube for convenient but secure access. An individual other than the researcher narrated the video to reduce the desire to please the researcher. A male narrated the fluorescent powder demonstration. The male voice was easier for the participants to hear and understand. The *Healthcare-Associated Infections and Infection Prevention Basics* was revised to be consistent with the language and organization of the video. The content was arranged by the Health Belief Model, language simplified to a sixth-grade level; abbreviations removed to improve readability.

The final modification of the originally proposed design based on the qualitative strand was the need to have evaluation data for the intervention. The following item was added to the modified Participant’s Reaction to Hand Hygiene Intervention questionnaire:

> My goal was to help you learn more about infections and what you can do to prevent them. How effective was this program? If I were to do it again, what suggestions do you have for me? Additionally, the sentence, *Please comment on any score below to a moderate extent*, was also added to each item on this tool.

**Quantitative Data Collection**

Observation of meal-related hand hygiene behaviors occurred during the facility’s mealtimes, beginning at 7:00 a.m., 11:30 a.m., and 4:30 p.m. One cycle began on different days of the week (Thursday, Wednesday, and Saturday) to determine the adherence to meal-related hand hygiene behaviors on both weekdays and the weekend.
All participants received disposable wipes per the facility’s current practice. The researcher observed meal-related hand hygiene behaviors throughout the meal. The researcher began observing as participants entered the dining hall and ended when the participant removed the clothing protector and left the dining table. If the wipe was placed on the table for resident, it was recorded as a visual cue. If the wipe was handed to the resident, it was recorded as a nonverbal cue. Verbal cues from healthcare workers were recorded on the Flowsheet for Hand Hygiene Observation.

The educational sessions were face-to-face and one-on-one. The educational setting for eight participants (66%) was a classroom. The education setting for four participants (33%) was the participant’s rooms. The variation in education setting was due to unavailability of classroom space. Participants viewed the video on the researcher’s personal laptop computer, which has a 15.25-inch diagonal screen. To accommodate participants with hearing deficits, the researcher provided an external speaker. The educational materials were printed in Times New Roman font, size 12 and provided to participants to follow along with the video. The researcher reviewed the participant’s calculated risk for healthcare-associated infections with each participant, writing the calculated risk in the right-hand margin of the Healthcare-Associated Infections sheet beside the Who’s at Risk? section. Participants returned demonstration of proper hand hygiene with a disposable wipe timed by lyrics written by the researcher to the tune of Happy Birthday.

Overview of Data Analysis for the Quantitative Strand

The researcher entered the quantitative data into an Excel spreadsheet and created a codebook. Dichotomous items were coded 0 for no and 1 for yes. Likert items were
scored according to instrument documentation. Quantitative data analysis was conducted using SPSS version 23.0. The researcher entered the data into SPSS, screened the data for errors, and cleaned the data using established protocols (Pallant, 2013). Frequency distributions were calculated for each variable to check the minimum and maximum scores and to assess valid and missing data. Missing data were minimal and assigned the code 999.

Description of Quantitative Sample

The demographic and clinical data for the sample are reported in Table 2. The quantitative sample was predominantly female with a mean age of 85 years. On average, they resided in the facility for 2½ years. Polypharmacy was noted, with a mean of 14 routine medications (with a range of 9-23 medications) and a mean of 21 total daily doses of routine medications (with a range of 7-40 doses) for the sample. The participants were otherwise similar with no variability in the history of healthcare-associated infections, participation in social events, and weekly visitors. One participant did not complete the post-intervention data collection, stating she was too tired to complete the questionnaires. Therefore, data for this individual were missing for the post-intervention variables.
Table 2
Sample Demographic and Clinical Characteristics (n=12)

<table>
<thead>
<tr>
<th>Variable</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>84.75 (11.55)</td>
</tr>
<tr>
<td>BIMS score</td>
<td>14.75 (.45)</td>
</tr>
<tr>
<td>Number of days in the facility at time of study entry</td>
<td>951 (1197)</td>
</tr>
<tr>
<td>Number of routine medications</td>
<td>14.08 (5.27)</td>
</tr>
<tr>
<td>Number of total daily doses of routine medications</td>
<td>21.33(10.85)</td>
</tr>
</tbody>
</table>

Frequency (%)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4 (33)</td>
</tr>
<tr>
<td>Female</td>
<td>8 (66)</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation; BIMS = Brief Inventory of Mental Status

While there was a 100% overall recruitment rate for the qualitative strand for staff and residents, there was a 70% response rate for recruitment to the quantitative strand of the study. Thirty percent of the residents who were approached to participate declined to participate due to the researcher’s anticipated time commitment, which was originally estimated to be 60 minutes per encounter. However, the time commitment was ultimately determined to be approximately 15 minutes per encounter. Residents later approached the researcher and stated an additional reason they were reluctant to participate was they initially thought the researcher was a state inspector despite the introduction and credentialing displayed by the researcher. Two potential participants did not meet eligibility criteria to perform hand hygiene independently with a wipe due to orthopedic changes from arthritis and loss of limb. Eleven of the twelve participants completed the study, resulting in an 8% attrition rate.
Data Analysis by Quantitative Research Questions

Research Question 2

Research question 2 asked, *Is there a clinically meaningful difference between pre-intervention and post-intervention health beliefs related to the hand hygiene intervention?* Changes in health beliefs from pre-intervention to post-intervention were examined for the health belief subscales of the Health Beliefs Related to Hand Hygiene Tool: Perceived Susceptibility, Perceived Seriousness, Perceived Benefits, Perceived Barriers, Cues to Action, and Self-Efficacy. To further understand changes in health beliefs in the total sample, both item-level analyses and total score analyses were conducted. A paired samples t-test was used to compare pre-and post-test scores. In addition, Cohen’s d was calculated to examine whether clinically meaningful differences were demonstrated following the intervention. An effect size of .2 was considered small. An effect size greater than .2 but less than .5 was considered small to medium. An effect size of .5 was considered medium. An effect size greater than .5 but less than .8 was considered medium to large. An effect size greater than .8 was considered large (Pallant, 2013).

The item-level and subscale total analyses for the Perceived Susceptibility subscale are reported in Table 3. Most of the items and the subscale total score demonstrated minimal change after the intervention. However, the items, *I am more likely to get an infection because I touch my eyes, nose, or mouth with my hands* and *Covering my coughs and sneezes with my hands makes me more likely to spread an infection* demonstrated small to medium effect sizes. These finding suggests the participants had an increased awareness of the role of respiratory hygiene in transmission
of infection following the educational intervention. While neither the residents nor staff
participants recognized the population as inherently at increased risk for infection, the
mean score on the Risk for Healthcare-Associated Infections tool for the sample was 7,
with a range of scores from 4-10.

Table 3
Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of
Perceived Susceptibility (n=11)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a long-term care facility resident, it is very likely I may get an infection.</td>
<td>M (SD) 3.2 (1.2)</td>
<td>M (SD) 3.3 (1.0)</td>
<td>.06</td>
</tr>
<tr>
<td>My health condition makes me more likely to get an infection than others.</td>
<td>2.7 (.91)</td>
<td>2.6 (.9)</td>
<td>.08</td>
</tr>
<tr>
<td>I am concerned about getting an infection from others in the long-term care facility.</td>
<td>3.2 (1.0)</td>
<td>3.1 (1.0)</td>
<td>.06</td>
</tr>
<tr>
<td>I am more likely to get an infection because I touch my eyes, nose, or mouth with my hands.</td>
<td>3.3 (.9)</td>
<td>3.6 (.8)</td>
<td>.25</td>
</tr>
<tr>
<td>Covering my coughs and sneezes with my hands makes me more likely to spread an infection.</td>
<td>3.8 (.6)</td>
<td>4.1 (.3)</td>
<td>.42</td>
</tr>
<tr>
<td>Failing to clean my hands before meals can make me sick.</td>
<td>4.1(.3)</td>
<td>4 (.4)</td>
<td>.17</td>
</tr>
<tr>
<td>Total Perceived Susceptibility Subscale</td>
<td>20.3 (2.8)</td>
<td>20.6 (3.2)</td>
<td>.10</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation

The item-level and subscale total analyses for the Perceived Seriousness subscale
are detailed in Table 4. Within this subscale, 3 of the 5 items demonstrated small to
medium or medium to large effects related to change following the intervention. The
item *Infections are a serious problem for long-term care facility residents like me*
demonstrated a medium to large effect size. The item *If I had an infection my quality of life could be affected* demonstrated a small to medium effect size. These findings suggest that following the intervention, participants had an increased perception of the seriousness of infection within the population of which they are members and its impact on their lives. The item, *Infections can be more serious for the very young and the very old,* also demonstrated a small to medium effect in quantifying change over time. However, the mean went down suggesting they had less strong beliefs related to this idea following the intervention. Participants stated they were not sure how to answer this double-barreled item, which may have confounded this result.
Table 4
Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of Perceived Seriousness (n=11)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention M (SD)</th>
<th>Post-intervention M (SD)</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infections are a serious problem for long-term care facility residents like me.</td>
<td>3.5 (.8)</td>
<td>3.7 (.9)</td>
<td>.59</td>
</tr>
<tr>
<td>If I had an infection, my quality of life could be affected.</td>
<td>3.9 (.8)</td>
<td>4.2 (.4)</td>
<td>.35</td>
</tr>
<tr>
<td>Infections would affect my ability to be with my family and friends.</td>
<td>4 (.0)</td>
<td>3.9 (.7)</td>
<td>.13</td>
</tr>
<tr>
<td>Problems I may experience from an infection could last a long time.</td>
<td>4.1 (.5)</td>
<td>4 (0)</td>
<td>.17</td>
</tr>
<tr>
<td>Infections can be more serious for those who are very young or very old.</td>
<td>4.1 (.3)</td>
<td>3.8 (.6)</td>
<td>.42</td>
</tr>
<tr>
<td>Total Perceived Seriousness Subscale</td>
<td>19.6 (1.2)</td>
<td>19.6 (1.2)</td>
<td>.08</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation

The item-level and subscale total analysis total for the Perceived Benefits subscale are detailed in Table 5. The total score for Perceived Benefits demonstrated a medium to large effect. Four items demonstrated small to medium effects: Cleaning my hands can keep me healthy, Cleaning my hands may prevent me from getting an infection, Cleaning my hands is an easy way to prevent infections, and Cleaning my hands prevents spreading infection to others. The means for the items increased over time indicating more positive health beliefs about the benefits of hand hygiene in reducing the risk of infection or its seriousness increased following the intervention.
Table 5

Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of Perceived Benefits (n=11)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>Cleaning my hands is really not important.</td>
<td>4.6 (.5)</td>
<td>4.6 (.5)</td>
<td>0</td>
</tr>
<tr>
<td>Cleaning my hands can keep me healthy.</td>
<td>4.3 (.5)</td>
<td>4.5 (.5)</td>
<td>.45</td>
</tr>
<tr>
<td>Cleaning my hands may prevent me from getting an infection.</td>
<td>4.0 (.8)</td>
<td>4.4 (.5)</td>
<td>.45</td>
</tr>
<tr>
<td>Coughing and sneezing into my elbow keeps my hands clean.</td>
<td>3.7 (.6)</td>
<td>3.6 (.8)</td>
<td>.13</td>
</tr>
<tr>
<td>By avoiding touching my eyes, nose, and mouth I can prevent infection.</td>
<td>3.7 (.6)</td>
<td>3.8 (.8)</td>
<td>.17</td>
</tr>
<tr>
<td>Cleaning my hands is an easy way to prevent infections.</td>
<td>4.1 (.3)</td>
<td>4.2 (.4)</td>
<td>.30</td>
</tr>
<tr>
<td>Cleaning my hands prevents spreading infection to others.</td>
<td>3.8 (.6)</td>
<td>4.0 (.8)</td>
<td>.45</td>
</tr>
<tr>
<td>I can be an example to others by cleaning my hands.</td>
<td>4.1 (.3)</td>
<td>4.1 (.3)</td>
<td>†</td>
</tr>
<tr>
<td>Total Perceived Benefits</td>
<td>32.3 (2.1)</td>
<td>33.1 (2.2)</td>
<td>.51</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation; † Effect size could not be computed because standard error of the difference between means was 0

The item-level and subscale total analyses for the Perceived Barriers subscale are detailed in Table 6. Most of the items demonstrated minimal change after the intervention. However, one item (The staff are too busy to help me clean my hands) demonstrated a medium to large effect. Additionally, the total score for the Perceived
Barriers and one item (I often forget to clean my hands before I eat) demonstrated small to medium effect sizes. These findings suggest the participants’ perceived barriers to hand hygiene were lower following the intervention.

Table 6
Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of Perceived Barriers (n=11)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>I do not know how to properly clean my hands.</td>
<td>1.7 (.6)</td>
<td>1.6 (.5)</td>
<td>.17</td>
</tr>
<tr>
<td>I often forget to clean my hands before I eat.</td>
<td>2.2 (1.0)</td>
<td>1.8 (.4)</td>
<td>.39</td>
</tr>
<tr>
<td>The staff forget to help me clean my hands.</td>
<td>2.8 (1.1)</td>
<td>2.8 (.8)</td>
<td>0</td>
</tr>
<tr>
<td>The staff are too busy to help me clean my hands.</td>
<td>2.8 (.9)</td>
<td>2.5 (.8)</td>
<td>.54</td>
</tr>
<tr>
<td>I need help to clean my hands.</td>
<td>1.9 (.5)</td>
<td>1.8 (.4)</td>
<td>.17</td>
</tr>
<tr>
<td>Cleaning my hands can be irritating to my skin.</td>
<td>2.1 (.7)</td>
<td>2.2 (.6)</td>
<td>.10</td>
</tr>
<tr>
<td>I cannot access the supplies to clean my hands.</td>
<td>1.9 (.3)</td>
<td>1.9 (.3)</td>
<td>0</td>
</tr>
<tr>
<td>Total Perceived Barriers</td>
<td>15.8 (3.3)</td>
<td>15.0 (1.5)</td>
<td>.33</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation

The item-level and subscale total analyses for the Cues to Action subscale are detailed in Table 7. Five of the six items demonstrated small to medium effect sizes; however, the direction of the means differed. Beliefs about Cues to Action decreased related to the following items: Following directions from staff benefits my health and I
clean my hands when they are soiled. This may be a result of increased Perceived Self-Efficacy. Beliefs about Cues to Action increased for the items, *I find visual reminders help me remember to take healthy actions; When I clean my hands, it may remind others to clean their hands; and Seeing the staff clean their hands reminds me to clean my hands.* These findings suggest visual cues and peer behavior may positively impact hand hygiene actions.

Table 7
*Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of Cues to Action (n=11)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following directions from staff benefits my health.</td>
<td>4.0 (.0)</td>
<td>3.7 (.6)</td>
<td>.42</td>
</tr>
<tr>
<td>I clean my hands when they are soiled.</td>
<td>4.3 (.5)</td>
<td>4.1 (.3)</td>
<td>.45</td>
</tr>
<tr>
<td>I find visual reminders help me remember to take healthy actions.</td>
<td>3.7 (.6)</td>
<td>3.9 (.8)</td>
<td>.45</td>
</tr>
<tr>
<td>I find verbal reminders help me remember to take healthy actions.</td>
<td>3.8 (.4)</td>
<td>3.8 (.6)</td>
<td>0</td>
</tr>
<tr>
<td>When I clean my hands, it may remind others to clean their hands.</td>
<td>3.8 (.6)</td>
<td>3.9 (.3)</td>
<td>.30</td>
</tr>
<tr>
<td>Seeing the staff clean their hands reminds me to clean my hands.</td>
<td>3.6 (.8)</td>
<td>4.0 (0)</td>
<td>.45</td>
</tr>
<tr>
<td>Total Cues to Action Subscale</td>
<td>23.3 (1.7)</td>
<td>23.5 (1.6)</td>
<td>.17</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation
The item-level and subscale total analyses for the Self-Efficacy subscale are detailed in Table 8. The majority of the items and the subscale total score demonstrated minimal change after the intervention. However, three items demonstrated small to medium effect sizes: *I can keep my hands from getting soiled, I prevent infections by keeping my hands clean, and I know how to get help if I need to clean my hands.* The changes over time were positive indicating an increase in the participants’ confidence in their ability to successfully perform hand hygiene.

Table 8
*Comparison of Pre- and Post-Total and Item-level Scores for Health Beliefs Subscale of Self-Efficacy (n=11)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to clean my hands.</td>
<td>4.2 (.4)</td>
<td>4.2 (.4)</td>
<td>0</td>
</tr>
<tr>
<td>I am able to properly clean my hands.</td>
<td>4.2 (.4)</td>
<td>4.2 (.4)</td>
<td>0</td>
</tr>
<tr>
<td>I can keep my hands from getting soiled.</td>
<td>3.0 (1.0)</td>
<td>3.4 (.9)</td>
<td>.40</td>
</tr>
<tr>
<td>I have cleaned my hands today.</td>
<td>4.3 (.5)</td>
<td>4.2 (.4)</td>
<td>.17</td>
</tr>
<tr>
<td>I do what I can to improve my health.</td>
<td>4.2 (.4)</td>
<td>4.2 (.4)</td>
<td>0</td>
</tr>
<tr>
<td>I prevent infections by keeping my hands clean.</td>
<td>4.2 (.4)</td>
<td>4.3 (.5)</td>
<td>.30</td>
</tr>
<tr>
<td>I know how to get help if I need it to clean my hands.</td>
<td>4.1 (.3)</td>
<td>3.9 (.3)</td>
<td>.45</td>
</tr>
<tr>
<td>Total Self-Efficacy Subscale</td>
<td>28.1 (1.8)</td>
<td>28.3 (1.2)</td>
<td>.14</td>
</tr>
</tbody>
</table>

Note: M = mean; SD = Standard Deviation
Research Question 3

Research question 3 asked, *Is there a clinically meaningful difference between pre-intervention and post-intervention percentage of adherence to meal-related hand hygiene behaviors related to the hand hygiene intervention?* To address this research question, adherence to meal-related hand hygiene behaviors post-intervention was compared to pre-intervention. The meal-related hand hygiene data and the associated effect size are reported in Table 9. There was minimal change in mealtime hand hygiene following the intervention. While hand hygiene opportunities were constant for all participants eating in the dining hall, respiratory hygiene opportunities and episodes of T-zone touching varied. The mean percentage of adherence to acceptable respiratory hygiene behaviors increased. There was also a decrease of T-zone touching following the intervention. These findings suggest the participants were more aware of the role of the meal-related hand hygiene behaviors of respiratory hygiene and T-zone touching in disease transmission after the intervention.

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention M (SD)</th>
<th>Observed Range</th>
<th>Post-intervention M (SD)</th>
<th>Observed Range</th>
<th>Cohen’s d effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Hygiene</td>
<td>42.4% (32.8)</td>
<td>0-100%</td>
<td>43.8% (39.6)</td>
<td>0-100%</td>
<td>.04</td>
</tr>
<tr>
<td>Respiratory Hygiene</td>
<td>36.2 (35.5)</td>
<td>0-75%</td>
<td>82.8 (35.2)</td>
<td>0-100%</td>
<td></td>
</tr>
<tr>
<td>T-zone</td>
<td>4.3 (3.3)</td>
<td>1-11 episodes</td>
<td>3.6 (2.4)</td>
<td>1-7 episodes</td>
<td></td>
</tr>
</tbody>
</table>

Note: M = mean; SD = standard deviation
Research Question 4

Research question 4 asked, *What was the participants’ reaction to the hand hygiene intervention?* To address this research question, measures of central tendency were used to describe the total scale and item-level means on the Participant’s Reaction to Hand Hygiene Intervention questionnaire. For all items, participants indicated the extent of their agreement related to aspects of the hand hygiene intervention. These data are reported in Table 10. The three lowest item means were related to agreement that visual and verbal cues and being observed had an impact on hand cleaning practices. The visual cues item mean was surprising as the change in health beliefs around visual cues demonstrated a medium effect on the Health Beliefs subscale. However, participants who received visual cues reported a more positive reaction to them. The low verbal cues item mean was not surprising as no verbal cues from staff were observed during the observation period of the quantitative strand. In addition, with the subjective nature of self-report, participants may have under-reported the effect of being observed. The two highest means related to agreement that the use of disposable wipes was well tolerated and educational activities were important to improve the residents’ hand cleaning practices. These findings suggest the residents tolerated the wipes and valued the educational intervention.
Table 10

*Participants’ Reaction to Hand Hygiene Intervention (n=11)*

<table>
<thead>
<tr>
<th>Question</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did knowing your risk for healthcare-associated infections improve your hand cleaning practices?</td>
<td>3.8 (1.2)</td>
</tr>
<tr>
<td>Do you consider the nurses and staff support your efforts to clean your hands?</td>
<td>4.1 (1.2)</td>
</tr>
<tr>
<td>Did the visual reminders improve your hand cleaning practices?</td>
<td>2.9 (1.5)</td>
</tr>
<tr>
<td>Did the verbal reminders improve your hand cleaning practices?</td>
<td>2.0 (1.7)</td>
</tr>
<tr>
<td>Were the educational activities you participated in important to improve your hand cleaning practices?</td>
<td>4.2 (1.1)</td>
</tr>
<tr>
<td>Was the use of the disposable wipes well tolerated by your hands?</td>
<td>4.3 (1.6)</td>
</tr>
<tr>
<td>Has being observed made you pay more attention to your hand cleaning practices?</td>
<td>2.9 (1.6)</td>
</tr>
<tr>
<td>Has the hand cleaning program helped you personally to improve your hand cleaning practices?</td>
<td>4.1 (0.8)</td>
</tr>
<tr>
<td>Has your awareness of your role in preventing health-care-associated infection through improving your hand cleaning practices increased during the current hand cleaning program?</td>
<td>4.1 (1.2)</td>
</tr>
<tr>
<td>Total Scale</td>
<td>32.1 (5.5)</td>
</tr>
</tbody>
</table>

*Note: M = mean; SD = standard deviation*
Research Question 5

Research question 5 asked, which modifying variables impact long-term care facility residents’ hand hygiene behaviors? To address this research question, descriptive statistics were used to describe modifying variables identified in the literature as impacting healthcare-associated infections. The mean score on the Risk for Healthcare-Associated Infections Tool was 7, with a range of scores from 4-10. As depicted in Table 11, several modifying variables were noted to be present in the sample. The first four were identified \textit{a priori} and the last three were identified after the qualitative strand.

Table 11

\textit{Modifying Variables Impacting Healthcare Associated Infections (n=12)}

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current use of antibiotics</td>
<td>1 (8.3)</td>
</tr>
<tr>
<td>Number of indwelling medical devices</td>
<td>2 (16.7)</td>
</tr>
<tr>
<td>Current use of immunosuppressants</td>
<td>5 (46.7)</td>
</tr>
<tr>
<td>Trouble controlling bowel/bladder</td>
<td>6 (50)</td>
</tr>
<tr>
<td>Oxygen via nasal cannula</td>
<td>1 (8.3)</td>
</tr>
<tr>
<td>History of dry eyes</td>
<td>4 (33.3)</td>
</tr>
<tr>
<td>Use of assistive devices such as wheelchair or walker</td>
<td>11(91.7)</td>
</tr>
</tbody>
</table>

Over one third of the sample had a history of dry eyes and one participant received oxygen via nasal cannula, which resulted in increased T-zone touching. Over 90% of participants required the use of assistive ambulatory devices such as a walker or wheelchair to ambulate to the dining hall. This resulted in contact of the participants’ bare hands with assistive devices prior to the meal.
Ninety-one percent of the sample had a semi-private room. Approximately 40% of participants were taking immunosuppressive medications. Ninety-one percent of the sample was being treated for at least one chronic health condition. Almost 60% of participants had bowel/bladder incontinence. Sixteen percent of the sample had an indwelling medical device. One male had an indwelling urinary catheter and one female had a pessary. All participants received visitors once a week or more and participated in social activities within the long-term care facility. Visiting family in a long-term care facility is a social norm in the setting, a small Southern town. These findings indicate the participants were at increased risk for healthcare-associated infections based on the risk factors identified in the literature review.

Along with modifying variables identified in the literature, situation-specific modifying variables were also noted related to delivering the educational intervention. When the education occurred in the participant’s room, there were several interruptions and space was limited with nowhere for the researcher to sit. Furthermore, the mean post-intervention hand hygiene adherence was 25% for participants who received the education in the resident’s room compared to 55% for participants who received the education in the classroom. The Cohen’s d effect size was .43, which is considered a small to medium effect.

An additional modifying variable was around meal service. The researcher observed excessive time spent waiting for the meal to be served resulted in increased fidgeting and T-zone touching. Additionally, the day of the week was recorded to determine if behavior changed on the weekend versus weekday. The residents were very busy with social activities on Sundays, making it difficult to meet for education. In
addition to staffing variations on weekends, several residents chose to eat outside or left with family on weekends.

The researcher did not ask participants about their preferred method of hand cleansing prior to the intervention. However, the researcher asked participants at the completion of the study. One participant preferred alcohol-based handrubs and had a container clipped to her walker. Eight participants preferred soap and water, two preferred alcohol-based handrubs, and one preferred a wipe. Of the eight who preferred soap and water, six found wipes an acceptable alternative. Two found wipes unacceptable, stating the wipes left their hands wet and sticky. One participant stated wipes did not offer any antibacterial benefit, saying “Wipes don’t have disinfectant. They are just wet.”

Peer behavior played a positive role in hand hygiene. During the post-intervention observation, other residents at the table were noted cleaning hands as participants cleaned their hands. Peer reminders were evident as participants instructed others to perform hand hygiene or cover their coughs and sneezes. Occasionally such peer reminders were not well received. One participant recalled, "She (another resident the participant reminded) got mad. I said, 'It's okay.'" One participant offered alcohol-based handrub to other residents at her table but they did not accept it. Another participant stated seeing healthcare workers handle foods without gloves served as a negative visual cue for her to perform hand hygiene.
Summary

The data management and analysis of the qualitative data were discussed in this chapter. The qualitative findings were discussed, including how they informed the quantitative strand. The quantitative strand sample was described. Quantitative data management was described. The quantitative analyses were reported according to each research question.
CHAPTER FIVE
DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

A discussion and interpretation of the study findings are presented in this chapter. Based on the findings from both strands of data, along with the merging of those findings, recommendations and implications for nursing education and practice are addressed. Next, recommendations for future research are presented along with the limitations of this study. Finally, suggestions for how this study may help answer the call to eliminate healthcare-associated infections (Cardo et al., 2010) are highlighted.

Discussion of Findings

The discussion of findings is structured around each research question. Overall, it is important to note that for the quantitative strand, the sample size of 12 was appropriate for a feasibility study. However, estimates of statistics and changes over time are not robust with a small sample. All findings should be interpreted with caution based on the low sample size.

Research question 1 asked: What are the health beliefs, issues, and concerns identified by staff and residents relevant to implementing a resident-focused hand hygiene intervention in a long-term care facility? The findings of the qualitative strand of the study supported that health beliefs of residents and staff influenced hand hygiene behavior. Despite being in an environment associated with increased susceptibility to infection, participants did not recognize this fact. Long-term care facility residents’ perceived susceptibility to healthcare-associated infections is largely unexplored in the
literature. One potential explanation for the lack of insight regarding increased susceptibility is perceptions that infection control measures alone, such as universal precautions, are adequate to prevent the spread of infection. Furthermore, the perceived seriousness of healthcare-associated infections ranged greatly among participants, with increased perceived seriousness among participants who had a history of infection. The benefit of hand hygiene was universally recognized among staff and residents. However, the focus expressed by both resident and staff participants was the benefit of other people performing hand hygiene. Also, self-report was subjective, with participants over-reporting hand and respiratory hygiene and under-reporting T-zone touching (Ellingson et al., 2014; Gould et al., 2010). The response to perceived barriers was quite variable, with some participants stating they had no access to wipes and others stating wipes were accessible throughout the facility. All participants stated they were able to perform hand hygiene, although this was an inclusion criterion. Most participants thought verbal and visual cues would be helpful, although there was poor reception when the verbal cue was offered from a peer. Few participants focused on their behavior or spoke in first person about their need to change their behavior, but rather focused on the need for others to change their behavior.

Reported health beliefs about Perceived seriousness and susceptibility may have been affected by selection bias. Because the mean age of participants was 85 years and the mean time in the facility was 2 years, participants entered the facility at age 83 on average. This age is 10 years past the average life expectancy. It may be challenging to increase participants’ awareness of their susceptibility to a serious risk for death since they have already defied the odds with their longevity.
Various concerns relevant to hand hygiene behavior were identified in the qualitative strand of this study. Within the setting, the researcher observed that without a verbal and visual cue for hand hygiene, residents either moved the wipe aside or used it to clean the table rather than their hands. While this finding is largely unexplored in the literature, it is consistent with the previously mentioned finding that participants identified others or the environment (the table) rather than themselves as soiled.

Various concerns relevant to hand hygiene were identified in the qualitative strand of the study. While long-term care facilities provide for and promote socialization of residents, one of the most surprising findings expressed by residents and staff was a need for social distancing from others with contagious conditions to avoid contracting an illness. Social distancing was consistently addressed in the resident and staff interviews, although it was not identified in the literature or by the researcher a priori. However, when social distancing was self-imposed it was a self-protective measure rather than a measure to prevent spreading infections to others.

Research question 2 asked: Is there a clinically meaningful difference between pre-intervention and post-intervention health beliefs related to the hand hygiene intervention? Each subscale had an item which demonstrated a medium effect size except for Perceived Barriers and Cues to Action. The Perceived Barriers score may have been affected by the accessibility of the wipes and the inclusion criterion to be able to perform hand hygiene independently. All subscales had items which demonstrated small to medium effect sizes. The subscale with the least number of items demonstrating a small to medium effect size was Cues to Action (one item). The Cues to Action score
may be affected by inconsistent cues, with a lack of verbal cues for all participants and visual cues provided to half of the participants.

The subscale with the most number of items demonstrating a small to medium effect size was Perceived Benefits (four items). The self-protective nature of the items in this subscale may be a factor as self-protection is a strong motivator (Chavali et al., 2014; Dawson & Mackrill, 2014; Eiamsitrakoon et al., 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt et al., 2013; Liu et al., 2014). Following the intervention, participants demonstrated an increased perception of the benefits of hand hygiene to prevent infections. However, this finding may also indicate a knowledge-practice gap, where increased knowledge does not always ensure the desired hand hygiene behavior (Festinger, 1957).

Research question 3 asked: Is there a clinically meaningful difference between pre-intervention and post-intervention percentage of adherence to meal-related hand hygiene behaviors related to the hand hygiene intervention? Among the three targeted behaviors (hand hygiene, respiratory hygiene, and avoiding T-zone touching), the intervention resulted in clinically meaningful differences in respiratory hygiene only. This was a surprising finding as the focus of the intervention was on hand hygiene. One factor which may have increased respiratory hygiene awareness was a flu outbreak in the facility during weeks 3-6 of data collection. Verbal cues for respiratory hygiene were more frequent as the outbreak led to increased coughing and sneezing in the dining hall. While there was a gastrointestinal outbreak in the facility during the final week of data collection, verbal cues for hand hygiene did not increase as gastrointestinal symptoms were less obvious in the dining hall. Another potential explanation is that the emphasis
on hand cleansing was not salient to participants. Several participants commented that the information provided in the educational intervention was basic information that they had learned as children. However, the need for respiratory hygiene is a much more recent concept, as it was introduced in 2002. Recommendations for coughing/sneezing into the elbow were introduced in 2009. It is possible that because the respiratory hygiene information was more novel it had a stronger impact on behavior. Furthermore, behaviors established at a young age may be more firmly established and difficult to change in older adults (Harada, Natelson Love, & Triebel, 2013). For example, hand hygiene behaviors are established at a young age and may be more difficult to impact, especially with a onetime educational intervention. Literature suggests that hand hygiene behavior is influenced by the hand hygiene practices established in one’s home, with a notable decrease in hospital hand hygiene before eating and after toileting (Barker et al., 2014). Additionally, it may be difficult to convince older adults without a past medical history of infection that they are susceptible to serious healthcare-associated infections.

Research Question 4 asked: *What was the participants’ reaction to the hand hygiene intervention?* The highest scoring item on the Participant’s Reaction to The Hand Hygiene Intervention related to how the wipe was tolerated by participants’ hands. This supported previous findings that wipes are well tolerated and convenient options for hand hygiene (O’Donnell et al., 2015; Schweon et al., 2013; Whiller & Cooper, 2000). However, while the wipes were well tolerated, one participant stated wipes offered no antibacterial benefit and several participants stated wipes left their hands feeling uncomfortably wet and sticky. The next highest mean related to the role of the educational intervention on improving hand hygiene. This was consistent with findings
that educational interventions can increase an individual’s willingness to act (Senol et al., 2014) and that educational interventions may produce a sustained increase in hand hygiene adherence (Whitby et al., 2006). The findings also emphasize the challenge of changing hand hygiene behavior. Despite direct knowledge of the importance of infections, participants did not demonstrate adherence to pre-meal hand hygiene.

While lack of administrative leadership/support was an identified barrier to hand hygiene in the literature, (Burnett et al., 2008; Hill et al., 2014), the residents also reported a moderate increase in perception of the nurses and staff support of hand cleaning efforts. The lowest range of scores was reported on the Cues to Action subscale. Because the literature identified barriers to hand hygiene due to forgetfulness, cues to action were expected to impact hand hygiene. Verbal cues were anticipated to be scored low as no verbal cues were observed within the facility during the quantitative strand. Visual cues were also scored low. The visual cues score on this tool was surprising as visual cues demonstrated a small to medium effect on the Health Beliefs subscale. However, participants who received a visual cue scored this item higher. The three questions related to Self-Efficacy included the effect of being observed and self-report. The effect of being observed may be affected by the subjective nature of self-report.

Research question 5 asked: Which modifying variables impact long-term care facility residents’ hand hygiene behaviors? The modifying variables which indicated the participants were susceptible to healthcare-associated infections were consistent with those identified in the literature (Boyce, 1992; Smith et al., 2008; WHO, 2009). Additionally, the researcher noted additional modifying variables which affected possible sources of contamination (the use of assistive ambulatory devices, such as a walker or
wheelchair) or T-zone touching and self-inoculation (history of dry eyes or use of oxygen via nasal cannula). Prior experience with infection was a modifying variable which impacted the Perceived Threat from infection. A modifying variable which impacted the outcome expectation of hand hygiene was access to disposable wipes in the dining hall (O’Donnell et al., 2015; Schweon et al., 2013; Whiller & Cooper, 2000). This was consistent with the barrier to hand hygiene from inaccessible hand hygiene supplies identified in the literature. The delivery method of the wipes by the staff greatly affected availability. Recommendations for practice related to delivery of wipes are discussed later in this chapter.

A surprising finding was the role of the educational setting, with a decrease in mean post-intervention hand hygiene adherence for participants who received the education in the resident’s room compared to participants who received the education in the classroom. Furthermore, residents were very busy with social activities on Sundays, making it difficult to meet for education. Modifying variables related to meal service include excessive time spent waiting for the meal to be served which resulted in increased fidgeting and T-zone touching. In addition to staffing variations on weekends, several residents chose to eat outside or left with family on weekends. These findings were not discussed in the literature.

The Hawthorne effect was a modifying variable affecting staff. During the qualitative observation, staff believed the researcher was a state inspector. Verbal cues and delivery of wipes were consistent during this time. However, during the quantitative observation, the staff were comfortable with the researcher’s presence and understood the
researcher’s purpose in the setting. During this time, no verbal cues from staff were observed and the delivery method of wipes was inconsistent.

Although the wipe was well tolerated by the participants’ hands, another modifying variable was the preferred method of hand cleansing prior to the intervention. Most participants preferred soap and water, although the majority found wipes an acceptable alternative. Another surprising modifying variable was peer behavior, which often played a positive role in hand hygiene. Self-protection played a role (Chavali et al., 2014; Dawson & Mackrill, 2014; Eiamsitrakoon et al., 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt et al., 2013; Liu et al., 2014) as participants instructed others to perform hand hygiene or cover their coughs and sneezes.

Significance of the Study

This feasibility study addressed several gaps in the literature related to resident-focused hand hygiene in the long-term care facility setting. The study revealed neither the residents nor staff recognized the vulnerability of the long-term care facility population to infection. The researcher identified unique challenges of behavioral modification in this age group, such as lifetime meal-related hand behaviors and the impact of prior experience with infection.

Another gap in the literature addressed by this study was the role of the residents’ hand hygiene in transmission and prevention of infections. The study found residents focused on the cleanliness of the environment, rather than their hands. Additionally, the findings suggested residents focused on the behaviors of others rather than themselves.

The study provided insight into optimal approaches for pilot testing the resident-focused hand hygiene intervention. For example, personal preference of hand hygiene,
visual and verbal cues, and delivery of wipes impacted residents’ hand hygiene. In addition, the researcher identified modifications for the researcher developed tools.

Although the findings are not intended for generalization, they suggest explicit strategies to enhance resident-focused interventions to increase meal-related hand hygiene. The resident-focused hand hygiene program may be used in any healthcare setting, even those with limited infection prevention and control resources. The hand hygiene intervention may have positive impact on the facility. The administration and staff at the facility were willing and able to participate. The staff and resources required to implement the hand hygiene intervention required no additional investment of infrastructure and time. Furthermore, the hand hygiene intervention has potential to lead to better resident outcomes, increase financial reimbursement, and increase the integrity of the institution.

Implications of Findings for Theory

Several participants in the quantitative strand commented on the basic information in the education, saying, “These (health beliefs) are obvious,” and “I was taught this in third grade.” However, a female participant said she was never taught how to clean her hands. She stated she timed hand washing to “one Mary Had a Little Lamb.” Because the study indicated participants did not merely have a knowledge deficit, there is a need for a more inclusive nursing diagnosis to reflect behavioral modification. This researcher noted for behavior modification to occur, the knowledge must Click, Stick, and Convict. Each of these areas is discussed below.

Click

The term click is used to describe one’s realization or understanding of one’s susceptibility to and seriousness of healthcare-associated infections. While the long-term
care population is particularly vulnerable to respiratory tract infections (including pneumonia), gastrointestinal infections (such as *norovirus* and *Clostridium difficile*), and urinary tract infections (CDC, 2015; Smith et al., 2008), residents and healthcare workers did not recognize the long-term care population as inherently at increased risk for infection. The qualitative data revealed staff and resident participants’ lifetime experience with infections may impact the hand hygiene intervention. This is because an individual must first perceive he/she is personally susceptible to a health risk which has at least a moderately serious impact on some component of the individual’s life. As a result, it is important that educational interventions for residents of long-term care facilities emphasize the participant’s individual susceptibility to and seriousness of infections.

To address multiple ways of knowing the education should address all domains of learning. The cognitive domain was addressed as the researcher provided education regarding the seriousness of infections and the efficacy of meal-related hand hygiene behaviors in preventing infections. The psychomotor domain was addressed as participants demonstrated proper hand hygiene with a disposable wipe accompanied by lyrics written by the researcher to the tune of Happy Birthday. The affective domain was addressed as the researcher discussed the calculated risk of infections with each participant and the participants viewed the demonstration of fluorescent powder transfer. All residents wore a clothing protector, suggesting self-protection from an obvious food stain was a strong motivator for behavior. Self-protection can be a strong motivator for adherence to hand hygiene (Chavali et al., 2014; Dawson & Mackrill, 2014; Eiamsitrakoon et al., 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt et al.,
2013; Liu et al., 2014). This suggests residents were more motivated by the visible threat and negative judgments related to stained clothing than the invisible threat of infection. To increase residents’ perceived susceptibility, one participant suggested including the testimony of someone who had contracted a healthcare-associated infection within the educational intervention.

Stick

The term *stick* is used to describe connecting barriers and benefits of hand hygiene behaviors to prevention of healthcare-associated infections. When an individual believes a health risk can be avoided, has a positive expectation that taking a recommended action will lead to avoiding the health risk, and believes he/she can successfully complete the advised preventive health action, the individual is more likely to complete the advised preventive health action (Whitby et al., 2006).

Cues to action supported the hand hygiene behavioral changes. While the participants reported staff were too busy or forgot to help them with hand hygiene, the staff cited inadequate personnel prior to and during meals, especially during weekends. There was notably better adherence to hand hygiene in the dining hall when the staff provided a visual and verbal cue, such as: “Here, (name), wipe your hands” or “This is to wash your hands” as they handed the residents the wipes. Verbal cues for respiratory hygiene included, “Cover your mouth.”

Convict

The term *convict* is used to describe the behavioral change supported by cues to action which results in self-efficacy to maintain the hand hygiene behaviors. Lack of personal accountability may have contributed to the small effect sizes for hand hygiene
and avoiding T-zone touching. At the conclusion of the study, few participants spoke in first person about their need to change their behavior. One resident participant responded with, "To get it (the hand hygiene intervention) to other people, you mean?" when asked What do you think would help (with the intervention)? Residents may need to be encouraged to focus on what they can control (own behavior) rather than behaviors of others. One participant focused more on other residents’ and staff hand hygiene when completing the Participant’s Reaction to Hand Hygiene Intervention, replying, “What about them?”

The hand hygiene program may generate evidence for best practices and policies. Residents reported a moderate increase in awareness of their role in preventing healthcare-associated infections. The residents also reported a moderate increase in perception of the nurses and staff support of hand cleaning efforts. This increase in perception of staff caring may increase resident satisfaction. Satisfaction scores are a marketing tool, which greatly impact hospital reimbursements. Healthcare-associated infections are “never events,” preventable and egregious events, which should never happen (Centers for Medicare & Medicaid Services, 2008). Institutions are not reimbursed for costs associated with never events.

Recommendations for Future Research

The criteria for success of this mixed methods feasibility study established a priori included determining the recruitment and retention of the sample and refining the intervention for a pilot study. Based on the study findings, the researcher developed recommendations regarding the optimal methods to obtain the sample, implement the
intervention, develop the best tools, measure variables, and have the most robust statistical analysis. Each of these areas is explored below.

Recruitment and Retention

Recruitment strategies, willingness of residents to consent or be randomized, and the number of eligible participants given inclusion/exclusion criteria were acceptable. The qualitative and quantitative samples were purposive and convenience respectively, based on the assistant administrator’s recommendation of participants meeting the inclusion criteria. This eliminated the need for the researcher to review the medical record prior to obtaining written informed consent. While potential barriers identified \textit{a priori} included residents’ cognitive and/or dexterity limitations, an assumption was that residents would be able to independently perform hand hygiene with a wipe. During the field observation, staff assisted residents with hand hygiene as needed. Factors which impeded residents’ ability to perform hand hygiene were noted. The age of this population presented unique challenges which are discussed in the appropriate sections below.

Although the retention rate (92\%) was acceptable, the researcher will refine the research protocol in preparation for a future larger scale study based on participant feedback. While the researcher obtained a copy of the facility’s mealtimes to inform the observation in the dining hall, the residents’ daily schedule should also inform the timing of the administration of post-intervention outcome assessments. For example, after dinner may not be the ideal time to administer the post-intervention tools as participants
were preparing for bed. The one participant who refused to complete the post-intervention questionnaires stated it was too late in the day because it was “almost 6:00 p.m.”

Optimizing the Intervention

Inclusion of family. Teaching residents and family the benefits of hand hygiene can promote healthy outcomes, involve the family in the resident’s care, promote advocacy for making informed health promotion choices, and support the resident’s maximal autonomy (Bonel, 1999). Because some families ate in the dining hall with the residents, it is recommended in the pilot study that the family should be included in the educational activity. Inclusion of the family may reinforce teaching and avoid misunderstandings. For example, one female participant in the quantitative strand was identified as at risk for infection. She told her family she was at risk for death rather than infection. However, participants who are roommates should be separated when completing questionnaires, as spouses tended to answer for one another when they were in the same room during the feasibility study.

Revision of educational materials to address auditory and visual deficits. The age of this population presented unique challenges, such as visual and auditory deficits. Future educational materials should include large print materials (Font size 48). Additionally, the educational video could be recorded on a digital versatile disc (DVD) and played on the facility’s/individual’s television. One participant recommended closed captioning subtitles. Furthermore, a light diffuser would spread the ultraviolet light used to illuminate the fluorescent powder more evenly over a larger area.
Revision of educational materials for clarity. In the future, the following should be clarified in the *What’s at Stake?* section of the Infection Prevention Basics: update infection related statistical information. To clarify the benefit of respiratory hygiene and avoiding T-zone touching, the following should be clarified in the *What You Can Do to Prevent Healthcare-Associated Infections?* section of the Infection Prevention Basics. *To help prevent infecting yourself, avoid touching your eyes, nose, or mouth and always cough or sneeze into your elbow.* The suggested clarification is *To help prevent infecting yourself, avoid touching your eyes, nose, or mouth.* *To help prevent infecting others, always cough or sneeze into your elbow.*

To promote self-efficacy, participants should be instructed to ask for help if they need it by revising the second item in the *Here are the top 10 things you can do* section of the Infection Prevention Basics. The current item is *Clean your hands regularly. To make it easy for you, the nursing home provides disposable wipes to clean your hands.* The suggested revision is *Clean your hands regularly. To make it easy for you, the nursing home provides disposable wipes to clean your hands. Please ask for help or a wipe if a wipe is not provided to you prior to eating.*

The researcher observed that the participants who received the educational intervention in their rooms retained less of the information than those who received the educational intervention in a class room. Quiet educational settings with little background noise help older adults better understand educational presentations (Bonel, 1999).

Because excessive time spent waiting for the meal to be served resulted in increased fidgeting and T-zone touching, one participant in the quantitative strand recommended using this time for education. This would reduce idle time and engage residents in education. Methods to engage residents while they wait may include talking
points on monthly theme posters for awareness, weekly fact/fiction informational flyers, or games with prizes, including a question of the week. Another participant suggested involving more residents and staff in education.

An assumption of the study was residents would engage in hand hygiene if barriers were reduced or eliminated by providing appropriate supplies and support. Such inherent hand hygiene has been predicted in the literature by personal preference of hand hygiene method (Whitby et al., 2006). However, a barrier in the study was not providing the residents with their preferred method of hand hygiene. In the future pilot study, it is recommended a greeter or free-standing unit with wipes and/or or alcohol-based handrub be placed in the dining hall entry to accommodate multiple preferences of hand hygiene.

Develop the Best Study Instruments

No instruments were found which measured participants’ perceptions of health beliefs constructions related to hand hygiene. An identified weakness for this study was not obtaining face validity for the researcher-developed tools, which would identify the time required for completion and obtain suggestions for items from residents themselves. The following should be added to the top of each tool: participant identification number and date. Additionally, a box to check if the tool was administered pre-or post-intervention should be added to the Health Beliefs Related to Hand Hygiene Tool and the Flowsheet for Hand Hygiene Observation. Specific recommendations for revision and/or psychometric development for the tools based on use in this feasibility study are detailed below.
Participant Demographics and Environmental Context Questionnaire

This tool captured non-modifiable individual factors which increased residents’ susceptibility to infection and made resident hand hygiene especially important, including age and history of healthcare-associated infections. It also captured modifiable individual factors which increased residents’ susceptibility to infections and made resident hand hygiene especially important, including current use of antibiotics, current use of medications which suppress the immune system, chronic health conditions, trouble controlling bowel/bladder, and open wounds.

The time for hand hygiene, episodes of T-zone touching, and respiratory hygiene episodes should be removed from the Participant Demographics and Environmental Questionnaire as these variables are recorded on Flowsheet for Hand Hygiene Observation. However, an item to assess the preferred method of hand hygiene should be added to the Participant Demographics and Environmental Questionnaire.

Risk for Healthcare-Associated Infections Tool

This tool captured the individual participant’s risk for healthcare-associated infections based on risk factors identified in the literature. The sample had many risk factors which made hand hygiene important. This included bowel or bladder incontinence, chronic health diseases such as diabetes, immunosuppressive therapy, social activities, prolonged length of stay, semiprivate rooms, and frequent visitors. However, to further delineate risk from immunosuppressive therapy, in future studies the fourth item of the instrument should be revised. The current item is *Does the resident currently take any medications which suppress his/her immune system?* The suggested
revision is *Does the resident currently take any medications which suppress his/her immune system? List medications.*

Health Beliefs Related to Hand Hygiene Tool

Because older adults tend to think more concretely than younger adults (Harada et al., 2013), participants voiced the desire to score each item dichotomously as true or false, rather than on the 5-point Likert scale. Consideration should be given to changing the response option to a dichotomy. Two items in the Perceived Barrier subscale focused on the behaviors of others (the staff) rather than the participant. However, participants had to be able to perform hand hygiene independently to meet inclusion criteria for the quantitative strand of the study. Recommendations for each subscale based on use in the feasibility study are detailed in Table 12 below.
Table 12
*Recommended Changes to the Health Beliefs Subscales*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Current Item</th>
<th>Item with Proposed Changes</th>
<th>Rationale for Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Susceptibility</td>
<td>As a long-term care facility resident, it is very likely I may get an infection. I am concerned about getting an infection from others in the long-term facility.</td>
<td>As a nursing home resident, it is very likely I may get an infection. I am concerned about getting an infection from others in the nursing home.</td>
<td>Use terms familiar to participants to avoid confusion (DeVellis, 2012); One participant stated, “I am not a long-term resident. I am here for short term rehabilitation.”</td>
</tr>
<tr>
<td>Perceived Seriousness</td>
<td>Infections are a serious problem for long-term care facility residents like me</td>
<td>Infections are a serious problem for nursing home residents like me.</td>
<td></td>
</tr>
<tr>
<td>Perceived Susceptibility</td>
<td>I am more likely to get an infection because I touch my eyes, nose, or mouth with my hands.</td>
<td>I am more likely to get an infection if I touch my eyes, nose, or mouth with my hands.</td>
<td>Language should reflect possible action rather than certain action. Older adults tend to think more concretely than younger adults (Harada et al., 2013)</td>
</tr>
<tr>
<td>Perceived Benefits</td>
<td>By avoiding touching my eyes, nose, and mouth I can prevent infection.</td>
<td>I may prevent infection by avoiding touching my eyes, nose, and mouth.</td>
<td></td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>I can keep my hands from getting soiled.</td>
<td>I can help keep my hands from getting soiled by covering my coughs and sneezes in my elbow.</td>
<td></td>
</tr>
</tbody>
</table>
Table 12
Recommended Changes to the Health Beliefs Subscales (Continued)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Current Item</th>
<th>Item with Proposed Changes</th>
<th>Rationale for Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Seriousness</td>
<td>If I had an infection my quality of life could be affected.</td>
<td>If I had an infection my quality of life could be impacted</td>
<td>Affect and infect sound very similar and can be confusing to participants with hearing deficits.</td>
</tr>
<tr>
<td></td>
<td>Infections would affect my ability to be with my family and friends.</td>
<td>Infections would impact my ability to be with my family and friends.</td>
<td></td>
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<tr>
<td>Perceived Seriousness</td>
<td>Infections can be more serious for those who are very young or very old.</td>
<td>Infections can be more serious for those who are very young.</td>
<td>Double-barreled items should be avoided (DeVellis, 2012).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infections can be more serious for those who are very old.</td>
<td></td>
</tr>
<tr>
<td>Perceived Benefits</td>
<td>Cleaning my hands is really not important.</td>
<td>Cleaning my hands is not really important.</td>
<td>Avoid misplaced modifiers and spit infinitive (DeVellis, 2012) which confused participants.</td>
</tr>
</tbody>
</table>

Flowsheet for Hand Hygiene Observation

A section for respiratory hygiene opportunity should be added next to the episodes of respiratory hygiene section. Only acceptable respiratory hygiene actions should be recorded as an episode with unacceptable respiratory hygiene actions recorded as an opportunity. For future use, the time required for hand hygiene on the Flowsheet for Hand Hygiene Observation should be in seconds rather than minutes.
Participant’s Reaction to Hand Hygiene Intervention

The instructions for the Participant’s Reaction to Hand Hygiene should be revised from Instructions: *Please indicate how strongly you agree or disagree with each of the following statements by checking the box following the option which best indicates your response* to Instructions: *Please indicate your response to each of the following questions by checking the box following the option which best indicates your response.* Because increased length is associated with increased complexity and decreased clarity (DeVellis, 2012), the third item in the Self-Efficacy subscale should be revised. The current item is *Has your awareness of your role in preventing health-care-associated infection through improving your hand cleaning practices increased during the current hand cleaning program?* The suggested revision is *Were you more aware of preventing infection by cleaning your hands during the program?*

Measure Variables: Hand Hygiene Adherence

Participants’ percentage of hand hygiene adherence was suboptimal before eating and after touching their surroundings, such as assistive devices. This is similar to the low percentage of hand hygiene adherence for healthcare professionals associated with Moments 2 (before clean/aseptic procedures) and 5 (after touching patient’s surroundings) of the World Health Organization’s (2009) Five Moments of Hand Hygiene (Chavali et al., 2014; Dawson & Mackrill, 2014; Eiamsitrakoon et al., 2013; Ellingson et al., 2014; Erasmus et al., 2009; Kowitt et al., 2013; Liu et al., 2014). The failure to perform hand hygiene adherence after contact with the surroundings was surprising as the participants viewed the environment as dirty. Whether failing to perform hand hygiene before clean procedures (such as eating) or after contact with dirty
surroundings is a universal finding or a result of poor behavioral modeling from the healthcare workers should be further explored.

**Most Robust Statistical Analysis**

To allow for the most robust statistical analysis, complete demographic information should be collected on all participants. No demographic data were obtained for residents and staff members interviewed in the qualitative strand other than gender and whether the participant was a staff member or resident.

As a feasibility study, the test of this hand hygiene intervention was not designed or powered for the researcher to perform statistical hypothesis testing (Lancaster, 2015). The small sample size in the quantitative strand was not adequate for inferential statistical analysis or psychometrics. However, the results of the quantitative strand helped the researcher estimate treatment effect and determine whether the ideas and findings are relevant to practice.

Recommendations for future research include using the methods and steps in this feasibility study in a pilot study. During the study, the researcher had an opportunity to work with undergraduates on a hand hygiene project for elementary students. Future studies could compare educational efforts for behavior modification when the intervention is started early in a younger population who may be more impressionable than in the older, long-term care facility population. Additionally, future studies could compare educational efforts with subsequent and historic infection rates.

**Recommendations for Nursing Practice and Education**

The results of this study support the need to incorporate a resident-focused hand hygiene program in the mealtime routine. The delivery method of the wipes and the cues
to action are essential components to providing a quality hand hygiene program. Self-efficacy may promote the partnership for ensuring safety. These components are discussed below.

Delivery of Wipe

While a resident-focused hand hygiene intervention may be incorporated as part of routine care, the lack of a standard delivery method resulted in a lack of access to wipes for residents. A standard method of delivery is needed. During field observation, the researcher noted the residents preferred the warm clothing protectors, causing the researcher to consider if warm wipes would promote hand hygiene adherence. Prior to implementation of the quantitative strand, the researcher purchased a wipe warmer to determine if it was suitable for use at the facility. The wipe warmer was not adequate for the volume of wipes used at each meal at the facility. Placing wipes on top of the plate cover could warm the wipe, ensuring all residents would receive a warm wipe with the meal tray. Alternatively, the delivery of the wipe could be cued to donning the clothing protector as 100% of residents donned the clothing protector. However, the wet wipe should not be placed on top of the clean clothing protector because participants did not want to wear a damp clothing protector.

Cues to Action

The study supported Whitby et al.’s (2006) findings that elective hand hygiene was predicted by visual cues and peer behaviors. While the researcher’s presence in the dining hall may have served as a visual cue for all residents, the participants reported they were not aware of the researcher’s presence. Cues for respiratory hygiene may be especially effective during periods with high respiratory illness. A negative cue to action
may include routine disclosure of healthcare-associated infections or hand hygiene adherence rates within the facility. Additionally, recognition of champions of excellent hand or respiratory hygiene each month may improve practice.

Self-Efficacy

A resident-focused hand hygiene intervention may actively promote self-efficacy rather than relegating the resident to supporting and encouraging others’ hand hygiene practices (Landers et al., 2012). Hand hygiene should be included on the American Hospital Association Patient Care Partnership and on the Rights and Responsibilities of Residents of Long-Term Care Facilities as part of the expectation for high quality care, a clean and safe environment, and involvement in care. A resident-focused hand hygiene intervention may engage and empower residents to become partners in ensuring safety (Landers et al., 2012). Healthcare workers should explore methods to optimize residents’ independence, maintain healthy living, and provide opportunities for socialization (Lange, 2012). The researcher observed residents in the first (independent) dining group consistently waiting for healthcare workers to do what the residents could do themselves. In contrast, the researcher observed the delivery of wipes to consistently be a problem for residents in the second (dependent) dining group. This appeared to be related to a lack of time to prepare the dining hall after the first group but prior to the arrival of the second group. When staff forgot to provide wipes, residents did not ask for them.

Limitations

Limitations of the study included the use of convenience sampling, a small quantitative sample size, and the use of a single site for the quantitative strand. The use of non-probability, convenience sampling is common in nursing studies (Polit & Beck,
The major limitation with convenience sampling is the possibility the sample is not representative of the targeted population (Polit & Beck, 2012). However, this was a feasibility study, and methodological decisions such as convenience sampling, sample size, and the use of a single site were based on practical constraints such as access to participants, time, and resources.

Conclusions

In conclusion, the need to reduce healthcare-associated infection rates has been identified by multiple leading organizations (Cardo et al., 2010). Hand hygiene is an essential component of infection prevention. Healthcare providers have an obligation to provide quality, safe patient care. A resident-focused hand hygiene intervention is an example of residents and healthcare workers collaborating to build a new paradigm in healthcare. Engaging residents in the three meal-related hand hygiene behaviors could prevent the spread of healthcare-associated infections. The intervention may enhance self-efficacy as the skill remains with the resident regardless of setting or staffing.

This study tested the feasibility and acceptability of a resident-focused hand hygiene intervention within a long-term care facility, using a mixed methods design. The recruitment strategies, willingness of residents to consent or be randomized, and the number of eligible residents given inclusion/exclusion criteria suggest the hand hygiene intervention is appropriate for pilot testing. In addition, the study provided initial psychometric evidence for the researcher developed tools. The tools should be modified as previously described. This feasibility study assessed current hand hygiene behaviors in the long-term care facility residents. The study incorporated behavior modification
and hand hygiene research to inform future studies to establish evidence-based practice to prevent healthcare-associated infections.

This chapter covered the discussion and interpretation of the findings of this study. Also, research implications along with recommendations for nursing education and future research were delineated. The addition of a resident-focused hand hygiene intervention may assist in the delivery of safe patient care in an ever-changing, complex healthcare system.
REFERENCES


Munoz-Price, L. S., Patel, Z., Banks, S., Arheart, K., Eber, S., Lubarsky, D. A., ...Birnbach, D. J. (2014). Randomized crossover study evaluating the effect of a hand sanitizer dispenser on the frequency of hand hygiene among anesthesiology staff in the operating room. *Infection Control & Hospital Epidemiology, 35*, 717-720. doi: 10.1086/676425


APPENDICES
APPENDIX A

FIELD OBSERVATION FLOWSHEET
### Field Observation Flowsheet

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Pre-Meal Hand Hygiene Episode</th>
<th>Pre-Meal Hand Hygiene Opportunity</th>
<th>Hand Hygiene Adherence</th>
<th>Mealtime Respiratory Hygiene Episode</th>
<th>Mealtime Respiratory Hygiene Opportunity</th>
<th>Episodes of Mealtime T-zone Touching</th>
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</table>
APPENDIX B

OBSERVATION FIELD NOTES
Observation Field Notes

Sights

Appearance

Noises

Verbal

Physical Factors (decreased cognitive or motor function, presence of medical devices interfering with hand hygiene, inaccessible hand hygiene supplies, or irritating hand hygiene agents)

Personal Factors

Interactions between staff and residents (including verbatim quotes)

Traffic Issues Related movement in setting (resident or staff)

Outliers
Qualitative Interview Guide

**Seriousness:** Tell me what you know about infections people get in healthcare facilities.

What do you think is the impact of infections people get in healthcare facilities?

**Susceptibility:** What factors do you think increase your risk for getting an infection in a healthcare facility?

**Advised preventive health action:** What can you do to prevent getting an infection in a healthcare facility?

**Benefit:** What are the benefits of cleaning your hands?

**Barriers:** What keeps you from cleaning your hands?

Prompt: What keeps you from cleaning your hands before meals?

**Cues to action:** If we were to supply you with wipes to help you clean your hands, where would you like them to be located?

If we were to supply you with reminders, where would you like them to be located?

How would you prefer to be reminded?

**Inform the intervention:** What can we do to help you clean your hands?

What other recommendations would you make?

**Self-efficacy:** If we helped find ways to clean your hands, tell me about your confidence in doing it yourself.
APPENDIX D

VISUAL CUE
Always cough or sneeze into your elbow.

Avoid touching your eyes, nose, or mouth.

Clean your hands.

Enjoy your meal!

Have a nice day!

Live, Laugh, Love.
APPENDIX E

PARTICIPANT DEMOGRAPHICS AND ENVIRONMENTAL CONTEXT

QUESTIONNAIRE
Participant Demographics and Environmental Context Questionnaire

Demographics:

Participant Identification: ______________________ Unit: ________

Marital Status: _______Single _______Married _______Widowed

Gender: _______Male _______Female

Race: _______Black _______White _______Hispanic

_______Other

Primary Diagnosis/Diagnoses__________________________________________________________

_______History of dry eyes

Assistive devices: _______Walker _______Wheelchair

_______Oxygen

Modifying Variables: Interval Ratio

_______Age in years

_______BIMS score

_______Number of routine medications

_______Number of total daily doses of routine medications

Portal of entry: Number of indwelling devices at time of study entry:

_______Urinary Catheter

_______Central Line

_______Peripheral IV

_______Other (list) ______________________

Number of days in facility on entry to study: _______Days
APPENDIX F

RISK FOR HEALTHCARE-ASSOCIATED INFECTIONS TOOL
Risk for Healthcare-Associated Infections Tool

Participant: _______________________________ Date: ___________________
Location: ________________________________ Rater: _____________________

Is the resident over the age of 65 years of age?        _______Yes     _______No

Does the resident have a history of healthcare-associated infections?

_______Yes     _______No

Is the resident currently taking antibiotics?     _______Yes     _______No

Does the resident take any medications which suppress his/her immune system?

_______Yes     _______No

Is the resident being treated for chronic health diseases such as diabetes?

_______Yes     _______No

Does the resident have trouble controlling his/her bowels or bladder?

_______Yes     _______No

Does the resident have any open wounds, including surgical sites?

_______Yes     _______No

Does the resident have any medical devices such as a urinary catheter or intravenous line?

_______Yes     _______No

Has the resident been in this facility for more than 30 days?

_______Yes     _______No

Does the resident have a semi-private room?

_______Yes     _______No

Does the resident participate in social activities within the long-term care facility?

_______Yes     _______No
Does the resident have visitors once a week or more?

________Yes  ______No

Total score = Number of yes responses_______

Possible range of scores is 0-12, with higher scores indicating greater risk for healthcare-associated infections.
APPENDIX G

HEALTH BELIEFS RELATED TO HAND HYGIENE TOOL
Health Beliefs Related to Hand Hygiene Tool

Instructions: Please indicate how strongly you agree or disagree with each of the following statements by placing an “X” in the appropriate column.

<table>
<thead>
<tr>
<th>Perceived Susceptibility</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a long-term care facility resident, it is very likely I may get an infection.</td>
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<tr>
<td>My health condition makes me more likely to get an infection than others.</td>
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<tr>
<td>I am concerned about getting an infection from others in the long-term care facility.</td>
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<tr>
<td>I am more likely to get an infection because I touch my eyes, nose, or mouth with my hands.</td>
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<tr>
<td>Covering my coughs and sneezes with my hands makes me more likely to spread an infection.</td>
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<tr>
<td>Failing to clean my hands before meals can make me sick.</td>
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<tr>
<td>Perceived Seriousness</td>
<td>Strongly Disagree (1)</td>
<td>Disagree (2)</td>
<td>Neither Agree nor Disagree (3)</td>
<td>Agree (4)</td>
<td>Strongly Agree (5)</td>
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<tr>
<td>Infections are a serious problem for long-term care facility residents like me.</td>
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<tr>
<td>If I had an infection my quality of life could be affected.</td>
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<tr>
<td>Infections would affect my ability to be with my family and friends.</td>
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<tr>
<td>Problems I may experience from an infection could last a long time.</td>
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<tr>
<td>Infections can be more serious for those who are very young or very old.</td>
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</table>

<table>
<thead>
<tr>
<th>Perceived Benefits</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning my hands is really not important.</td>
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<tr>
<td>Cleaning my hands can keep me healthy.</td>
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<tr>
<td>Cleaning my hands may prevent me from getting an infection.</td>
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<tr>
<td>Coughing and sneezing into my elbow keeps my hands clean.</td>
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</tr>
</tbody>
</table>
By avoiding touching my eyes, nose, and mouth I can prevent infection.

Cleaning my hands is an easy way to prevent infections.

Cleaning my hands prevents spreading infection to others.

I can be an example to others by cleaning my hands.

<table>
<thead>
<tr>
<th>Perceived Barriers</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I do not know how to properly clean my hands.</td>
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<td>I often forget to clean my hands before I eat.</td>
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<tr>
<td>The staff forget to help me clean my hands.</td>
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<tr>
<td>The staff are too busy to help me clean my hands.</td>
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<tr>
<td>I need help to clean my hands.</td>
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<tr>
<td>Cleaning my hands can be irritating to my skin.</td>
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<tr>
<td>I cannot access the supplies to clean my hands.</td>
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</table>

<table>
<thead>
<tr>
<th>Cues to Action</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following directions from staff benefits my health.</td>
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<tr>
<td>I clean my hands when they are soiled.</td>
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<tr>
<td>I find visual reminders help me remember to take healthy actions.</td>
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</tbody>
</table>
I find verbal reminders help me remember to take healthy actions.

When I clean my hands, it may remind others to clean their hands.

Seeing the staff clean their hands reminds me to clean my hands.

<table>
<thead>
<tr>
<th>Self-efficacy</th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Neither Agree nor Disagree (3)</th>
<th>Agree (4)</th>
<th>Strongly Agree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know how to clean my hands.</td>
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<tr>
<td>I am able to properly clean my hands.</td>
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<tr>
<td>I can keep my hands from getting soiled.</td>
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<td>I have cleaned my hands today.</td>
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<tr>
<td>I do what I can to improve my health.</td>
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<tr>
<td>I prevent infections by keeping my hands clean.</td>
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<tr>
<td>I know how to get help if I need it to clean my hands.</td>
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</tbody>
</table>
Flowsheet for Hand Hygiene Observation

Instructions: Observe and record each opportunity and episode of meal-related hand hygiene behaviors.

<table>
<thead>
<tr>
<th>Date</th>
<th>Participant</th>
<th>Time required for pre-meal hand hygiene episode or reason if not completed (participant refused, healthcare provider refused, medical device interfered with hand hygiene, unable to access supplies, etc.)</th>
<th>Episodes of respiratory hygiene</th>
<th>Episodes of T-zone touching</th>
<th>Miscellaneous hand hygiene observations (If participant leaves to use restroom, prefers soap and water, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before breakfast</td>
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<td>Before lunch</td>
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<td></td>
<td>Before evening meal</td>
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</table>
APPENDIX I

PARTICIPANT’S REACTION TO THE HAND HYGIENE INTERVENTION
Participant’s Reaction to the Hand Hygiene Intervention

Instructions: Please indicate how strongly you agree or disagree with each of the following statements by checking the box following the option which best indicates your response.

**Susceptible**

Did knowing your risk for healthcare-associated infections improve your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

________________________________________

**Barriers**

Do you consider the nurses and staff support your efforts to clean your hands?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

________________________________________

**Cues**

Did the visual reminders improve your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

________________________________________
Did the verbal reminders improve your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

Outcome

Were the educational activities you participated in important to improve your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

Was the use of the disposable wipes well tolerated by your hands?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”

Self-efficacy

Has being observed made you pay more attention to your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent  ☐ To a Large Extent

Please comment on any score below “to a moderate extent”
Has the hand cleaning program helped you personally to improve your hand cleaning practices?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent

☐ To a Large Extent

Please comment on any score below “to a moderate extent”

________________________________________

Has your awareness of your role in preventing health-care-associated infection through improving your hand cleaning practices increased during the current hand cleaning program?

☐ Not at All  ☐ To a Small Extent  ☐ To Some Extent  ☐ To a Moderate Extent

☐ To a Large Extent

Please comment on any score below “to a moderate extent”

________________________________________

My goal was to help you learn more about infections and what you can do to prevent them.

How effective was this program?

If I were to do it again, what suggestions do you have for me?

Thank you very much for your time!

(Who, 2009)
APPENDIX J
STUDY DESIGN AND FLOW
Recruitment of Qualitative Participants

Qualitative Interviews

Qualitative data analysis

Quantitative Strand: Intervention Implementation

Day One: Recruitment of quantitative participants and collection of baseline data including health beliefs related to hand hygiene. Random assignment to receive visual cue

Day Two: Baseline measurement of current hand hygiene practices for each participant by observation

(Continued next page)
Day Three: Individual patient education regarding the perceived risk of HAIs (Massachusetts Hospital Association, 2016) and benefits of hand hygiene (Infection Prevention Basics; APIC, 2016), including videotaped demonstration of fluorescent powder transfer

Day Four: Repeat observation

(n=6) received education and wipe and verbal cues as per the facility’s current practice

(n=6) received education, wipe, and verbal cue as per the facility’s current practice, and visual cue

Repeat Health Beliefs Related to Hand Hygiene and complete the Reaction to Hand Hygiene

Quantitative Data Analysis
Detailed Study Procedures

**Qualitative Strand**

1. Researcher observed all meals in dining hall on one weekday and one weekend day in the setting for feasibility issues and to identify barriers.

2. The researcher met with the assistant administrator to obtain permission to interview residents and staff who met inclusion criteria. Volunteers were recruited through direct invitation. Participants in the qualitative strand were consented to be interviewed by the researcher. A copy of the consent was provided to the assistant administrator.

3. The qualitative data collection involved face-to-face interviews using a semi-structured interview guide. Three female and male residents (n=6) and three female and male staff members (n=6) were interviewed. Interviews were audio-recorded and transcribed verbatim. Qualitative data included observation notes, field notes, and transcripts of the interviews.

4. The researcher read the data, wrote memos, and developed a qualitative codebook.

5. The researcher coded the data using procedures recommended by Saldaña (2013).

6. The intervention protocol was refined based on staff and resident feedback and the researcher’s observation.

**Quantitative strand**

7. Day One: The researcher met with the assistant administrator to obtain permission to interview residents who met inclusion criteria. Volunteers were recruited through direct invitation.
8. The researcher screened and informed participants, obtained written consent, and assigned participants unique identifiers.

9. The researcher randomly assigned participants to receive visual cues.

10. The schedule for the hand hygiene interventions included the meal-related hand hygiene related behaviors (including respiratory hygiene and T-zone touching) based on the facility’s current practice.

11. Pre-Health Beliefs Related to Hand Hygiene was administered face-to-face by the researcher.

12. Individual risk factors for healthcare-associated infections were calculated by the researcher.

13. Day Two: One cycle began on different days of the week (Thursday, Wednesday, and Saturday) to determine the adherence to meal-related hand hygiene behaviors under various conditions.

14. All participants received disposable wipes per the facility’s current practice.

15. The researcher observed episodes of meal-related hand hygiene behaviors throughout the meal. This included verbal cues from healthcare workers. Results were recorded on the Flowsheet for Hand Hygiene Observation.

16. To determine the effect of the hand hygiene intervention in real world conditions, the researcher did not interfere with the meal routine. The researcher observed the usual mealtime practice and observed if the participant performed hand hygiene and hand hygiene related behaviors.

17. The researcher recorded the encounter on the Flowsheet for Hand Hygiene Observation.
18. The researcher did not provide any direct resident care.

19. The percentage of adherence to meal-related hand hygiene behaviors was measured by direct observation and calculated using the conventional method defining the numerator as an observed episode and the denominator as an observed opportunity.

20. Day Three: Participants received education regarding the seriousness of healthcare-associated infections (Massachusetts Hospital Association, 2016). To promote perceived benefit of the advised preventive health action and enhance self-efficacy, participants received Infection Prevention Basics (APIC, 2016; O). The individual risk factors for healthcare-associated infections were discussed with the participants.

21. For consistency, education was also presented in a short web-based video. The video included a nurse-moderator. In addition to the education, the video included a demonstration of fluorescent residue transferred from environment to persons and from persons to the environment during a simulated delivery of meal trays. Finally, participants demonstrated proper hand hygiene with a disposable wipe accompanied by lyrics written by the researcher to the tune of *Happy Birthday* to time the hand hygiene.

22. Day Four: The researcher re-measured post-intervention percentage of adherence to meal-related hand hygiene behaviors by direct observation. Data collection occurred in a similar manner as the pre-intervention.

23. Random assignments for visual cues
   a. Six participants (n=6) received education and a disposable wipe and verbal cues per the facility’s current practice
b. Six participants (n=6) received education, disposable wipe, verbal cues per the facility’s current practice, and a laminated visual cue, a triangular table tent placed in the participant’s table. Other tables had a similar table tent with a generic greeting.

24. Post-Health Beliefs Related to Hand Hygiene was completed.

25. The researcher recorded the participant’s reaction to the hand hygiene intervention using a modified Participant’s Reaction to the Hand Hygiene Intervention questionnaire, derived from the World Health Organization’s (2009) Perception of Hand Hygiene Survey.

26. For all participants: The researcher thanked the participant.
**Calendar for Hand Hygiene Intervention**

<table>
<thead>
<tr>
<th>Week</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>1/29/17</td>
<td>1/30/17</td>
<td>1/31/17</td>
<td>2/1/17</td>
<td>2/2/17</td>
<td>2/3/17 Observation</td>
<td>2/4/17 Observation</td>
</tr>
<tr>
<td>2.</td>
<td>2/5/17 Recruitment Qual</td>
<td>2/6/17</td>
<td>2/7/17</td>
<td>2/8/17</td>
<td>2/9/17</td>
<td>2/10/17 Qualitative</td>
<td>2/11/17 Qualitative</td>
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<tr>
<td>3.</td>
<td>2/12/17 Qualitative</td>
<td>2/13/17 Qualitative</td>
<td>2/14/17 Transcribe</td>
<td>2/15/17 qualitative</td>
<td>2/16/17 Data/Recruit Quant</td>
<td>2/17/17</td>
<td>2/18/17</td>
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<td>4.</td>
<td>2/19/17</td>
<td>2/20/17</td>
<td>2/21/17</td>
<td>2/22/17</td>
<td>2/23/17</td>
<td>2/24/17</td>
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<tr>
<td>Date</td>
<td>Activity Description</td>
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<td>3/12/17</td>
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APPENDIX K

HEALTHCARE-ASSOCIATED INFECTIONS
Healthcare-Associated Infections

What They Are?

Healthcare-associated infections are infections people get while receiving treatment for medical or surgical conditions. These infections occur in all settings, including long-term care facilities, such as nursing homes and rehabilitation facilities.

Who's at Risk?

While all people may get infections, some people are at greater risk than others. Young children, the elderly, and people with weakened immune systems are more likely to get an infection. Other risk factors are long hospital stays, use of medical devices, such as tubes to drain your bladder or administer intravenous fluids, failure to clean hands, and overuse of antibiotics.

When you enter a long-term care facility, you have a greater risk of catching infections. Your personal risk of infection has been calculated and discussed with you by Ms. Morales.

What's at Stake?

These infections have serious consequences. In American hospitals alone, there are an estimated 1.7 million infections and 99,000 associated deaths each year. Of these infections:

- 32% are urinary infections
- 22% are surgical infections
- 15% are respiratory infections
- 14% are infections of the blood

The annual infection rate is similar for hospitals and long-term care facilities in the US, with an estimated 1.6 to 3.8 million infections occurring annually in long-term care facilities.

Because hands are the most common way we spread infection, cleaning your hands is the most effective way to prevent infection.

While cleaning your hands can help prevent infections, you may not know the best way to clean your hands or may forget to clean them. Arthritis or medical devices may also keep you from cleaning your hands. You may have trouble getting hand cleaning supplies or they may irritate your hands.
What You Can Do to Prevent Healthcare-Associated Infections?

The good news is there are simple steps you can take to prevent infections.

Clean your hands regularly. We are exploring the most effective reminder to help you remember to clean your hands at these important times:

- Whenever you enter or leave your room
- Whenever hands look or feel unclean
- Whenever there is a concern if hands are clean
- Before you eat or drink
- Before touching any broken skin or before any medical procedure
- Before contact with indwelling medical devices, such as tubes to drain your bladder or administer intravenous fluids
- Before and after touching others
- After using the toilet
- After coughing or sneezing

To help prevent infecting yourself, avoid touching your eyes, nose, or mouth and always cough or sneeze into your elbow.

Ask each day if you still need any indwelling medical devices, such as tubes to drain your bladder or administer intravenous fluids. Also, ask about vaccines you need to stay healthy.

While infections can be serious, taking these simple steps to prevent infection can help you take charge of your health.

(Massachusetts Hospital Association, 2016)
APPENDIX L

INFECTION PREVENTION BASICS
Infection Prevention Basics
When you enter a long-term care facility, you have a greater risk of catching infections. The good news is there are simple steps you can take to prevent infections.

Here are the top 10 things you can do:

1. **Speak up** for your care and ask plenty of questions when you go into any healthcare facility. Don’t be shy.

2. **Clean your hands** regularly. To make it easy for you, we have given you a package of disposable wipes to clean your hands.

3. **Ask about safe injection practices.** Remember: One needle, one syringe, only one time.

4. **Ask to have your room cleaned** if it looks dirty.

5. **Ask questions about the medications that are prescribed to you.** Know what they are for, how to take them, and how often you should take them. If you are prescribed antibiotics, take all of them—even if you start to feel better.

6. **Ask if you should shower with a germ-killing soap before having surgery.**
7. **Ask each day if you still need any indwelling medical devices**, such as tubes to drain your bladder or administer intravenous fluids.

8. **Ask about vaccines** you need to stay healthy.

9. **Know about infection preventionists.** These “germ sleuths” work every day to protect you. They use their detective skills to find the bad germs and keep them from making you sick.

10. **Become familiar with healthcare-associated infections.** Healthcare-associated infections are infections people get while receiving treatment for medical or surgical conditions.

   It’s also important to know how to be a good visitor!

   (APIC, 2016)
APPENDIX M

HAND CLEANING SONG
Hand Cleaning Song

Clean the palm of your hands.
Clean the back of your hands.
Clean the sides of your hands;
Every time that you eat.

We have to sing this song twice.
To keep the germs from spreading
To you and your friends
Every time that you eat.
(Morales, 2017)
APPENDIX N

MERCER UNIVERSITY INSTITUTIONAL REVIEW BOARD APPLICATION

APPROVAL LETTER
Mercer University IRB Application Approval Letter

Tuesday, January 17, 2017

Ms. Kathleen A Morales
3001 Mercer University Drive
Georgia Baptist College of Nursing
Atlanta, GA 30341

RE: Testing The Effect of a Resident-Implemented Hand Hygiene Intervention in a Long-Term Care Facility: A Mixed Methods Feasibility Study (IRB1700085)

Dear Ms. Morales:

On behalf of Mercer University’s Institutional Review Board for Human Subjects Research, your application submitted on 09-Jan-2017 for the above referenced protocol was reviewed in accordance with federal regulations 21 CFR 56.102d and 45 CFR 46.310(b) (for expedited review) and was approved under category (vi) 5, 6, 7 per 63 FR 60366.

Your application was approved for one year of study on 17-Jan-2017. The protocol expires on 16-Jan-2018. If the study continues beyond one year, it must be re-evaluated by the IRB Committee.

Item(s) Approved:
The purpose of this two-phase mixed methods exploratory sequential study is to evaluate the feasibility and acceptability of a resident-implemented hand hygiene intervention within a long-term care facility.

NOTE: Please report to the committee when the protocol is initiated. Report to the Committee immediately any changes in the protocol or consent form and all accidents, injuries, and serious or unexpected adverse events that occur to your subjects as a result of this study.

We at the IRB and the Office of Research Compliance are dedicated to providing the best service to our research community. As one of our investigators, we value your feedback and ask that you please take a moment to complete our Satisfaction Survey and help us to improve the quality of our service.

It has been a pleasure working with you and we wish you much success with your project! If you need any further assistance, please feel free to contact our office.

Respectfully,

[signature]

Ava Chambisz-Richardson, M.Ed., CIP, CIM
Associate Director of Human Research Protection Program (HRPP)
Member
Institutional Review Board

“Mercer University has adopted and agrees to conduct its clinical research studies in accordance with the International Conference on Harmonization’s (ICH) Guidelines for Good Clinical Practice.”

Mercer University IRB & Office of Research Compliance
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