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Implementation of a Multimodal Hand Hygiene Intervention at a Rural Critical Access Hospital

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Implementation of a Multimodal Hand Hygiene Intervention at a Rural Critical Access Hospital

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Abstract

Healthcare acquired infections are the most common complication of hospital care in the United States, with subsequent negative implications on the healthcare system. While hand hygiene has long been considered the single most important and cost-effective way of reducing healthcare-acquired infections, compliance among healthcare professionals is low, and most efforts to improve it fail. When compared to single-component hand hygiene interventions, research demonstrates that tailored multimodal interventions are an effective way to improve compliance with hand hygiene practices among healthcare professionals. This Doctor of Nursing Practice project focused on implementing a multimodal hand hygiene intervention, tailored to fit the specific needs of a rural critical access hospital, to determine its effect on compliance and sustainability of hand hygiene practices among healthcare professionals. Results demonstrate an increase in organization-wide hand hygiene compliance and improved reporting from multiple departments following project implementation.

Keywords: hand hygiene, hand washing, handwashing, multimodal, compliance, adherence

Implementation of a Multimodal Hand Hygiene Intervention at a Rural Critical Access Hospital

Healthcare associated infections (HAIs) are a major source of morbidity and mortality across healthcare organizations around the world (Dunn-Navarra et al., 2011). HAIs are the most common complication of hospital care in the United States, resulting in 1.7 million infections and 99,000 deaths each year (Agency for Healthcare Research and Quality [AHRQ], 2014). The Centers for Disease Control and Prevention (CDC) estimate that at any given time, one of every 25 hospitalized patients in the United States has an HAI, meaning that nearly 650,000 patients contract an HAI annually (AHRQ, 2017). HAIs place a tremendous financial burden on the healthcare system, leading to increased costs for patients, insurance companies, and hospitals alike (Kingston, O'Connell, & Dunne, 2015). The overall annual cost of HAIs in the United States is estimated to be \$28 to \$45 billion (Kingston et al., 2015).

Hand hygiene has long been considered the single most important way of reducing HAIs. Many HAIs, such as methicillin-resistant *Staphylococcus aureus* (MRSA), *Streptococcus pyogenes*, and vancomycin-resistant *Enterococcus*, can be spread through the hands of healthcare workers due to lapses in hand hygiene (Neo, Sagha-Zadeh, Vielemeyer, & Franklin, 2016). Even though evidence supporting the reduction of HAIs through adequate hand hygiene practices has been available for over two centuries, compliance among healthcare professionals continues to be low, and most efforts to improve it fail (Kirkland et al., 2012).

Although healthcare professionals should be washing their hands before and after every patient contact to protect themselves and their patients from infections, experts estimate that healthcare professionals comply with recommended hand hygiene practices less than 50 percent of the time (CDC 2018; Institute for Healthcare Improvement [IHI], 2018a). There are numerous reasons for non-compliance with hand hygiene practices among healthcare professionals. Some of the top reported barriers include ineffective placement of alcohol-based hand rub (ABHR)

dispensers or sinks, lack of accountability, ineffective or incomplete education, distractions, emergency situations, heavy workloads, inadequate safety cultures that do not stress the importance of hand hygiene for all caregivers (regardless of role), or skin irritation from hand cleaning products (Chassin, Mayer, & Nether, 2015).

Routine compliance with hand hygiene practices are critical in providing a safe environment for all employees, patients, visitors and community members. The World Health Organization's (WHO) "My 5 Moments for Hand Hygiene" is the most commonly recognized framework for defining key moments for performing hand hygiene among healthcare workers (WHO, 2018). These opportunities include before patient contact, before performing clean/aseptic procedures, after bodily fluid exposure or risk, after touching a patient, and after touching patient surroundings (WHO, 2018).

Research suggests that multimodal interventions are more effective than single interventions at increasing hand hygiene compliance (Kingston et al., 2016). However, with variability in certainty of evidence, interventions, and methods, more research is needed to explore the effectiveness of multimodal versus simpler interventions, such as single-component approaches, to increase hand hygiene compliance, and to identify which components of multimodal interventions or combinations of strategies are most effective in a particular context (Gould, Moralejo, Drey, Chudleigh, & Taljaard, 2017).

This Doctor of Nursing Practice (DNP) scholarly project focused on hand hygiene compliance and the perceptions among healthcare professionals on hand hygiene and its impact on HAIs at a rural critical access hospital (CAH) in Southwest Michigan. In addition to an organizational assessment, a thorough appraisal of current hand hygiene literature was undertaken to identify effective hand hygiene compliance strategies. Over the past year, the rural CAH has made efforts to improve low rates of hand hygiene compliance throughout the organization with

limited success. Therefore, the focus of this project was to improve and sustain compliance with hand hygiene practices among healthcare professionals at the rural CAH through multimodal intervention. This project evaluated improvement in hand hygiene compliance by comparing pre- and post-implementation data. Quality improvement methodologies were used for analysis and display of data.

Assessment of the Organization

The leadership team at the CAH identified a need to improve compliance with hand hygiene practices at their organization. In order to assess the CAH's culture, readiness for change, and feasibility of a multimodal hand hygiene intervention, an organizational assessment was performed using the Burke-Litwin Organizational Performance and Change (OP&C) model. In addition, a strengths-weaknesses-opportunities-threats (SWOT) analysis was performed.

Framework: The Burke-Litwin Organizational Performance and Change Model

The Burke-Litwin OP&C Model has been developing from theory and practical application for over 30 years (Stone, 2015). This model provides a robust level of analysis through the assessment of 12 simultaneously existing internal and external factors that impact the climate and culture of an organization. It not only highlights what needs improvement, but also explains the relationships among the factors to help understand how to improve (Stone, Brown, Smith, & Jacobs, 2018). To facilitate an understanding of the differences between leadership and management, the model organizes these 12 factors into two main categories: transformational and transactional factors (Spangenberg & Theron, 2013; Burke & Litwin, 1992) (see Appendix A).

Burke and Litwin believe that "climate results from transaction and culture change requires transformation" (Burke & Litwin, 1992, p. 533). Transformational factors are more closely associated with leadership while transactional factors are associated more with

management (Stone et al., 2018). The transformational factors include external environment, leadership, mission and strategy, organizational culture, and individual and organizational performance (Burke & Litwin, 1992). The transactional factors include management practices, structure, systems, work unit climate, task and individual skills, motivation, and individual needs and values (Burke & Litwin, 1992). Each of these factors were analyzed to gain an understanding of the CAH's culture and climate and to assess their readiness for change.

A variety of strategies were taken to gather information for this assessment. These strategies included attending a variety of meetings (both unit staff meetings and leadership meetings), observing and interviewing individual staff members, observing new-hire orientation, shadowing and interviewing various departmental leaders across the organization, shadowing and interviewing the Chief Clinical Officer (CCO), reviewing both the organization's strategic plan and business plan, and reviewing organizational performance data. The CCO and the Director of Quality and Infection Prevention assisted the DNP student with a focused assessment on hand hygiene by providing hand hygiene performance and surveillance data from previous years.

Ethics and Human Subjects Protection

In order to uphold ethical considerations for the protection of human subjects for this DNP project, an application was submitted to the Grand Valley State University (GVSU) Human Research Review Committee for Institutional Review Board (IRB). The GVSU IRB determined this project did not meet the definition of research according to current federal regulations and was approved (see Appendix B). The organization where the DNP project was implemented does not have an IRB, but permission was obtained to do a QI project at their organization from their CCO (see Appendix C). Neither organization required a formal presentation for the ethics review board. All data analyzed was de-identified of any patient sensitive information.

Stakeholders

Key stakeholders at the CAH include patients, healthcare providers, ancillary staff members, and administrative staff. The primary stakeholders for this project included patients, healthcare providers, including physicians, advanced practice providers (APPs), registered nurses (RNs), and ancillary staff such as unit techs, medical assistants, nurse aides, respiratory therapists, case managers, social workers, dietitians, physical therapists, pharmacists, registration specialists, and environmental technicians. Patients are extremely important stakeholders, as the care provided at the CAH impacts their overall health outcomes and length of stay (LOS). Healthcare providers and ancillary staff members are also important key stakeholders, as they have frequent interaction with patients. Even slight change to their current hand hygiene practices will have an impact on daily workflow. Lastly, administrative staff of the CAH are also key stakeholders, as their support is essential to successful and sustainable change.

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

A SWOT analysis is an assessment tool that can be used to evaluate internal and external attributes and threats to a phenomena of interest (Moran, Burson, & Conrad, 2017). A SWOT analysis was performed on the CAH to assess their capacity and readiness for a multimodal hand hygiene intervention (see Appendix D).

Strengths. The CAH is an independent organization that has not been acquired by a larger health system. This gives the leadership team the ability and flexibility to make organizational changes that align with their goals and needs rather than those that fall under the umbrella of a larger organization. In addition, the small size of the organization allows interventions to be implemented faster and easier. Another strength of the CAH is that the overall HAI rate (i.e. *MRSA* and *C. Diff*) is extremely low. Even with these low rates, the leadership team is highly committed to and supportive of a targeted hand hygiene intervention.

Another strength of the organization is that the CCO has a DNP as an educational degree. DNP-prepared leaders have the education and training to address challenges in the healthcare landscape, which will help facilitate the application of evidence into practice (Sherrod & Goda, 2016). In addition, the organization has both a Nurse Educator and a Director of Quality and Infection Prevention, who are highly supportive of a hand hygiene intervention. Lastly, the staff at the organization are highly committed to providing the best care to facilitate successful patient outcomes.

Weaknesses. A weakness of the CAH is compliance with hand hygiene practices. While improvements have been made over the past year, the organization still falls routinely short of its targeted goals. Another weakness is staff morale and anxiety as a result of recent change. In addition to a new staffing model, the rural CAH is pursuing Provider Based Rural Health Clinic (PBRHC) status, which has caused anxiety and a sense of low morale among staff at the CAH. Another weakness is that while the small size of the organization will help facilitate a quicker implementation of the project, it also results in limited physical and human resources. Lastly, there is no organization-wide hand hygiene policy at the rural CAH.

Opportunities. The CAH is currently in the process of transitioning to PBRHC, creating a great opportunity to collaborate across both the hospital and clinic settings to reach a standardized approach to hand hygiene. The CAH has the opportunity to improve hand hygiene compliance rates, hardwire behavior, and strategically place hand hygiene materials across the entire organization prior to a visit by a Centers for Medicare and Medicaid Services (CMS) surveyor. In addition, the increased focus on hand hygiene practices by The Joint Commission (TJC) and the CMS also provides an opportunity to place attention on the current hand hygiene practices in the CAH and locate areas that may need improvement. In addition, the implementation of a hand hygiene intervention presents an opportunity for the CAH to have a

direct positive impact on the health and safety of their patients and members of their community. Lastly, the presence of a DNP student in the organization offers the CAH an additional resource to implement evidence-based interventions into their organization.

Threats. The CAH is located in a highly saturated healthcare area, with nine direct competitors competing for the CAH's primary and secondary service areas. This could impact the amount of patients that choose the CAH over another healthcare facility. Another threat to the organization is the pause in CMS billing processes once the organization begins the CMS survey process to gain PBRHC status. This has the ability to significantly impact the financial status of the CAH during this time period, which could in turn impact any funding that may be needed for a multimodal hand hygiene project. Another threat is the increase in staff workload since the new staffing model was implemented. This has resulted in increased time demands on staff, and they may react poorly to being asked to invest more time in hand hygiene practices. In addition, employee illness related to influenza A and influenza B has significantly impacted the amount of employee call-offs, which has further exacerbated time demands on staff. Lastly, engagement of all staff at the CAH posed a threat to the project.

Clinical Practice Question

This DNP scholarly project sought to answer the clinical question: Does a multimodal hand hygiene intervention, compared to current practice, improve compliance with hand hygiene practices among healthcare professionals?

Review of the Literature

An extensive review of the literature was undertaken to determine the best approaches to improve compliance with hand hygiene practices among healthcare professionals. The review aimed to answer two questions. First, what strategies or interventions can improve compliance with routine hand hygiene practices among healthcare professionals? Second, which combination

of interventions are best at increasing compliance and sustainability of routine hand hygiene practices among healthcare professionals?

Review Method

The Fineout-Overholt, Melnyk, Stillwell, and Williamson (2010) Hierarchy of Evidence for Intervention Studies guided the literature review (see Appendix E). A comprehensive electronic search was conducted of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed databases. Due to the vast amount of hand hygiene literature available, the search was limited to reviews in the English language during the publication period of 2013 to 2018. The search was further limited to clinical trials and reviews to obtain the highest levels of evidence available. Keywords included hand hygiene, handwashing, hand washing, multimodal, compliance, and adherence. Similar search terms were listed by using Boolean operators (OR, AND) to broaden the search to include all relevant articles.

For this review, all healthcare professionals working in a hospital or an acute care setting were included. This includes, but is not limited to, nurses, physicians, advanced practice providers (APPs), nurse assistants, medical assistants, respiratory therapists, physical therapists, occupational therapists, environmental service technicians, and administrative staff. Articles involving any setting outside of acute care (e.g. community settings, schools, primary care) were excluded. In addition, articles that examined the effects of surgical hand disinfection or surgical scrubbing were excluded, as their aims differ from hand hygiene practices in other clinical areas.

Reviews that involved any intervention intended to improve compliance with hand hygiene practices were included. This included both multimodal and single-component interventions. Reviews that did not state the components of multimodal interventions were excluded. Articles chosen for this review compared results of hand hygiene compliance before and after implementation of an intervention(s). Outcome measures included in this review were

hand hygiene compliance, measured either through direct observation or a proxy indicator (e.g. hand hygiene product use), and the incidence rates of HAIs as a result of these interventions.

PRISMA

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were used as a framework for this review (Moher, Liberati, Tetzlaff, & Altman, 2009). The flow of information through the identification, screening, eligibility, and inclusion phases of the review are shown in Appendix F.

The original search yielded 96 articles. Two additional articles were identified through review of references from these articles, for a total of 98 articles. After removal of duplicates, reference review, and in-depth screening based on inclusion and exclusion criteria, nine articles were included in this review. These nine articles consisted of five systematic reviews, two randomized control trials (RCTs), one integrative review, and one meta-analysis. In total, these articles represent approximately 223 separate studies on hand hygiene interventions (Gould et al., 2017; Doronina, Jones, Martello, Biron, & Lavoie-Tremblay, 2016; Luangasantatip et al., 2015; Kingston et al., 2016; Alshehari, Park, & Rashid, 2018; Neo et al., 2016; Schweizer et al., 2014; Stewardson et al., 2016; and Rodriguez et al., 2015). A summary of these nine articles are available in Appendix G.

Summary of Results

A key finding from this literature review is that multimodal hand hygiene interventions can improve compliance with hand hygiene practices among healthcare professionals in the acute care setting. However, the degree to which HAI rates will be reduced as a result of multimodal hand hygiene interventions is less clear. All of the studies included in this review provided evidence to support the implementation of multimodal interventions to improve hand hygiene compliance among healthcare professionals (Gould et al., 2017; Kingston et al., 2016;

Luangasanatip et al., 2015; Alshehar et al., 2018; Rodriguez et al., 2015; Doronina et al., 2017; Schweizer et al., 2013; Stewardson et al., 2016; Neo et al., 2016). The most common combinations of successful multimodal interventions included components of visual cues and reminders, education, feedback, leadership and accountability, and proper hand hygiene product placement.

Direct observation was the main method of data collection. Some of the strengths of direct observation is that it allows for the observation of all hand hygiene opportunities as well as for opportunities to assess hand hygiene technique. Direct observation also allows for immediate feedback when an opportunity is missed. In addition, direct observation is considered the “Gold Standard” in measuring compliance (Kingston et al., 2016). However, direct observation is vulnerable to bias from the Hawthorne effect (Kingston et al., 2016). The Hawthorne effect is a behavior change due to the awareness of being observed, and is thought to raise hand hygiene compliance rates measured by direct observation (Srigley, Furness, Baker, & Gardam, 2014). In fact, over half of improvements in hand hygiene have been attributed to the Hawthorne effect (Alshehari et al., 2018). According to the Association for Professionals in Infection Control and Epidemiology (APIC) (2016), when healthcare providers know they are being watched, they are twice as likely to comply with hand hygiene guidelines. In addition to the Hawthorne effect, direct observation is costly (it is labor intensive and requires proper training of staff), and is subject to selection and observer bias.

Proxy measures, such as measuring hand hygiene product volumes, also has some strengths and weaknesses. Some of the strengths of measuring hand hygiene product volumes is that it is not subject to the Hawthorne effect, it is not subject to selection or observer bias, and it is inconspicuous. In addition, hand hygiene product dispensers may be placed in optimal locations to assist with hand hygiene practices, such as directly outside of patient rooms and near

employee entrances and exits. However, this measure relies on accurate usage data, which could be easily compromised. For example, it would be difficult to distinguish which hand hygiene opportunities the product was used for or who used the product. This leads to further concerns regarding the accuracy of the data collected using hand hygiene product usage as a measure for hand hygiene compliance.

While the WHO recommends that hand hygiene should be performed before patient contact, before an aseptic technique, after exposure to bodily fluids, after patient contact, and after contact with a patient's surroundings, it can be difficult to gather accurate data during all five moments without bias due to the Hawthorne effect or causing violations to patient privacy. Simplifying direct observation of hand hygiene opportunities into before patient room entry and after patient room exit (WHO moments 1, 4 and/or 5) may be a viable solution and serve as an adequate measurement for the entire patient encounter (Ellingson et al., 2014). Although this measurement technique may be criticized for leaving out all opportunities for hand hygiene, it does highlight the importance for reducing cross-contamination of pathogens in healthcare, which accounts for a large portion of HAI transmission (Ellingson et al., 2014; Sickbert-Bennett et al., 2016).

Evidence to be Used for Project

In order to successfully improve compliance with hand hygiene practices among healthcare professionals, a multimodal approach is considered the best strategy for implementing sustainable hand hygiene improvement programs (APIC, 2015). Based on the literature review, this project will utilize a five-component approach to improve hand hygiene compliance at the rural CAH. Project components will consist of visual cues, education, feedback, accountability from leadership, and adequate placement of ABHR dispensers., as these components have demonstrated the most success in the literature (Gould et al., 2017; Kingston et al., 2016;

Luangasanatip et al., 2015; Alshehar et al., 2018; Rodriguez et al., 2015; Doronina et al., 2017; Schweizer et al., 2013; Stewardson et al., 2016; Neo et al., 2016). Measurement will consist of hand hygiene compliance gathered through direct observation for two moments of hand hygiene: washing in prior to entering a patient room, and washing out prior to exiting a patient's room as well as hand hygiene product use.

Conceptual Models

The aim of this project was to design and implement a tailored multimodal hand hygiene intervention throughout the entire rural CAH. The Health Belief Model (Rosenstock, 1974) was used as the framework to help understand the phenomenon of hand hygiene compliance in healthcare. The Model for Improvement (Langley et al., 2009; IHI, 2018b) was used to guide the implementation of the intervention.

Model to Examine Phenomenon: The Health Belief Model

The Health Belief Model (HBM) was originally developed in the 1950s to understand health behavior and possible reasons for non-compliance with recommended health action (Hayden, 2009). Originating from psychological and behavioral theory, the HBM has foundation in two components of health-related behavior: 1) the desire to avoid illness, and 2) the belief that a specific health action will prevent an illness (LaMorte, 2016). The HBM suggests that an individual's belief in a personal threat of an illness or disease together with their belief in the effectiveness of the recommended health behavior or action will predict the likelihood the individual will adopt the behavior (LaMorte, 2016).

The HBM is composed of six major constructs. The four original constructs of the model focus on perception: perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers (Hayden, 2009). As the model evolved, three additional constructs were added (see Appendix H). For the purposes of this DNP project, the WHO's "Perception Survey for

Healthcare Workers” will be used to assess each of the constructs of the HBM and how they play a role in an individual’s likelihood of performing hand hygiene.

Perceived Seriousness. The construct of perceived seriousness refers to an individual’s belief or feelings about the seriousness or severity of contracting an illness or disease (Hayden, 2009). While this is often based upon previous knowledge, it may also stem from beliefs an individual has about the difficulties a disease would create or the effects it would have on their life (Hayden, 2009). For the purposes of this project, understanding the perceived risk of acquiring a HAI among rural CAH employees may help explain why they do or do not engage in proper hand hygiene practices.

Perceived Susceptibility. The construct of perceived susceptibility refers to an individual’s subjective perception of the risk of acquiring an illness or disease (LaMorte, 2016). The greater the perceived risk, the greater the likelihood of engaging in behaviors to decrease the risk (Hayden, 2009). However, when individuals believe they are not at risk or have a low risk of susceptibility, unhealthy behaviors tend to result (Hayden, 2009). If rural CAH employees do not see a direct relationship in engaging in hand hygiene practices to reduce their personal risk of acquiring or transmitting a HAI, then the likelihood of practicing good hand hygiene will be impacted.

Perceived Benefits. The construct of perceived benefits refers to an individual’s opinion of the effectiveness or value of the various actions available to decrease the threat of illness or disease (Hayden, 2009). The course of action an individual takes in preventing illness or disease relies on consideration and evaluation of both perceived susceptibility and perceived benefit, such that the individual would accept the recommended health action if it were perceived as beneficial (LaMorte, 2016). Therefore, individuals are more likely to adopt healthier behaviors when they believe the new behavior will decrease their chances of developing a disease (Hayden,

2009). If rural CAH employees perceive engaging in proper hand hygiene benefits their patients, their organization, and themselves, they may be more likely to perform proper hand hygiene.

Perceived Barriers. The construct of perceived barriers refers to an individual's feelings on the obstacles to performing a recommended health action (LaMorte, 2016). According to Hayden (2009), perceived barriers are the most significant variables in determining behavior change. In order for a new behavior to be adopted, an individual needs to believe the benefits of the new behavior outweigh the consequences of continuing the old behavior (Hayden, 2009). This enables barriers to be overcome and the new behavior to be adopted (Hayden, 2009). Gaining an understanding of perceived barriers to hand hygiene among the rural CAH's staff will allow for targeted interventions to overcome such barriers and hopefully improve hand hygiene compliance.

Motivating Variables. The construct of motivating variables was added more recently to the HBM than the four major constructs of perception listed above (Hayden, 2009). Motivating variables are an individual's personal factors that affect whether the new behavior is adopted (Hayden, 2009). This could include factors such as culture, education level, past experiences, skill, or motivation (Hayden, 2009).

Cues to Action. The construct of cues to action are events, people, or things that move people to change their behavior (Hayden, 2009). According to LaMorte (2017), cues to action are the stimulus needed to trigger the decision-making process to accept a recommended health action. Examples include advice from friends and family members, the media, illness of a friend or family member, or internal cues from the signs or symptoms of a disease or illness (Hayden, 2009; LaMorte, 2017). For the purposes of this project, the components of visual cues, feedback, education, access to ABHR, and leadership accountability will be assessed to illustrate which cues encourage engagement in hand hygiene practices.

Self-Efficacy. The construct of self-efficacy is the most recent addition to the HBM (Hayden, 2009). Self-efficacy is the belief in one's own ability to do something or perform a behavior (Hayden, 2009). Generally speaking, people do not try to do something new unless they think they can do it (Hayden, 2009). If someone believes a new behavior is useful but does not think they are capable of doing it, it is likely that the new behavior will not be tried (Hayden, 2009). If rural CAH staff believe they have the ability and self-confidence to perform infection control practices at the right times, every time, to reduce HAI transmission, they could be more likely to engage in hand hygiene.

Implementation Model: The Model for Improvement

The implementation model used to guide this project was the Model for Improvement. Developed in the 1980s, the Model for Improvement is a framework for improvement efforts based on an iterative, trial-and-learning approach (Langley et al., 2009). By encouraging early testing of ideas in a specific environment of interest, the Model for Improvement allows an intervention to gradually be modified and then optimized to the uniqueness of the system where implementation is taking place (Langley et al., 2009). The IHI recommends using the Model for Improvement to move work forward in healthcare organizations, and has been used successfully by numerous healthcare organizations to improve a variety of quality improvement initiatives, including hand hygiene (IHI, 2006). The Model for Improvement consists of two main components: three fundamental questions and the plan-do-study-act (PDSA) cycle, which are described in detail later in this paper (see Appendix I).

Project Plan

Purpose of Project with Objectives

The purpose of this DNP scholarly project was to implement a multimodal hand hygiene intervention into a rural CAH in order to improve compliance among healthcare professionals.

The literature supports a tailored, multimodal approach to improve hand hygiene compliance among healthcare professionals. All staff of the CAH were invited and encouraged to participate in this initiative.

Objectives for this DNP project were aimed at promoting and sustaining hand hygiene practices in an effort to improve compliance. The multimodal hand hygiene intervention included five main components derived from the WHO-5: visual cues, education, feedback, leadership and accountability, and adequate hand hygiene products (see Appendix J). The objectives of this DNP project included:

- Identification of the current knowledge and perception of hand hygiene and HAI transmission among healthcare professionals of the CAH;
- Identification of the facilitators and barriers to hand hygiene practices at the CAH;
- Modification of the current hand hygiene data collection process to reflect a more accurate representation of hand hygiene practices at the organization; and
- Implementation of practice changes to improve hand hygiene compliance throughout the organization.

Design for the Evidence-Based Initiative

The design for planning, implementation, and evaluation of the evidence-based initiative was based on the Model for Improvement's three fundamental questions and are described below.

“What are we trying to accomplish?”. The first fundamental question in the Model for Improvement assists with setting goals or aims (IHI, 2018b). According to the model, an organization will not improve without a clear and firm intention to do so (IHI, 2018b). For this project, the goal was set to improve and sustain hand hygiene compliance among healthcare professionals at the CAH. While 100% compliance was the ultimate goal, this was not feasible or

realistic. A monthly goal of 80% compliance was used for this DNP project, although any improvement in hand hygiene compliance was considered an accomplishment. A secondary goal of this project was to improve the CAH's process for collecting hand hygiene observation data to provide a more accurate reflection of hand hygiene practices throughout the organization.

“How will we know that a change is an improvement?”. This question in the Model for Improvement assists in establishing measures for any given project (IHI, 2018b). For this project, measures included hand hygiene compliance data and hand hygiene product consumption. Organizational hand hygiene compliance data was collected from January 2018 to August 2018 and used as a baseline. According to this data, hand hygiene compliance was at an average of 53.85% across the organization. Data collected during the implementation phase was compared to baseline data to identify any improvements as a result of the intervention. Following project implementation, any value above 53.85% was considered an improvement in hand hygiene compliance.

“What changes can we make that will result in improvement?”. According to the IHI (2018b), while all changes do not lead to improvement, all improvement requires change. For this project, the changes made included increased awareness through visual cues, accountability from leadership, increased feedback by displaying monthly hand hygiene performance data in staff breakrooms, providing focused education on hand hygiene and HAI transmission, and placing ABHR dispensers in strategic locations in the organization, including employee entrances and exits and the cardiac rehab hallway.

Setting & Participants

This DNP project took place at an independently owned, rural CAH in Southwest Michigan. The project was enacted across the entire organization, which included both inpatient, outpatient, emergency, and clinic settings. The participants for this project included all staff

members of the CAH. This included a wide variety of multidisciplinary staff, including but not limited to, registered nurses, respiratory therapists, nursing assistants, medical assistants, advanced practice providers, physicians, administrative staff, registration staff, and environmental service technicians.

Implementation Model: PDSA Cycle

The implementation model for this project was the PDSA cycle (IHI, 2018b). The four cycles of the PDSA cycle include plan, do, study, and act.

Plan. The first step in the plan phase is to state the question that needs to be answered and make a prediction about what will happen (IHI, 2017). The question for this QI project was: “Will the implementation of a multimodal hand hygiene intervention, consisting of components of visual cues, education, feedback, leadership commitment and accountability, and hand hygiene product placement, lead to an increase in hand hygiene compliance among healthcare professionals?” The DNP student made three predictions. First, with an increased focus on hand hygiene practices, there will be an increase in compliance in hand hygiene practices among healthcare professionals at the CAH. Second, the new data collection process will provide a more accurate representation of hand hygiene compliance at the CAH. Lastly, organizational HAI rates will remain unchanged due to the short timeframe of the DNP project.

The second step in the planning phase is to develop a plan and test the change, including who, what, when, and where (IHI, 2017).

Who. The DNP project will impact the entire CAH, including staff from both the main clinic and hospital settings.

What: Visual cues/reminders in the form of posters from the CDC and doorframe magnets with the words “wash in” “wash out”, were gathered, developed, and displayed throughout the entire organization by the DNP student. Computer screen savers

displaying hand hygiene reminders are also in the process of being implemented to provide an additional visual reminder. Formal hand hygiene education was provided to CAH staff in the form of an educational poster presentation given over a two-day period during the organization's annual skills fair.

To assist with data collection, hand hygiene observation responsibilities were removed from the Float Charge nurses and given to the leadership team at the CAH. This was done to reduce observer bias and provide a more accurate reflection of hand hygiene practices at the organization. An electronic hand hygiene data collection tool, iScrub[®], was also tested early in the implementation phase of the project. This tool was discarded two weeks after its trial as it did not fit well into the workflow of the leadership team.

Feedback was provided to staff by displaying monthly hand hygiene data in the form of bar graphs in each departments' employee breakroom. Lastly, additional ABHR dispensers are in the process of being implemented at employee entrances and exits, as well as near the new pulmonary function testing room in the cardiac rehabilitation hallway.

When: The implementation period began on September 4, 2018 and concluded on November 2, 2018.

Where: The QI project took place at the CAH in both hospital and clinic settings.

The third step in the planning phase is to identify what data will need to be collected (IHI, 2017). The data collected during the implementation period included hand hygiene observation data, ABHR consumption, and employee knowledge and perception data gathered via pre- and post-implementation surveys. Hand hygiene observation data were gathered through direct observation and included 20 hand hygiene observations each month across all departments. ABHR consumption was reflected through product order history of 8 oz. desktop hand sanitizers

and wall dispenser refill units. ABHR consumption was compared to order history for these products at the same time last year. Hand hygiene observation data was compared to baseline data described earlier.

Do. The next step in the cycle is to carry out the intervention (IHI, 2017). All components of the multimodal intervention (visual cues, education, feedback, leadership commitment and accountability, and product placement) were implemented, observed, and analyzed from September 4 through November 2, 2018.

Study. Upon completion of the implementation period, the DNP student reviewed the hand hygiene data collected, analyzed the results, and compared them to the predictions made.

Act. If the multimodal intervention is successful, the changes will be adopted into the remainder of the organization. If the intervention needs to be adapted, changes will be made and a repeat PDSA cycle will take place as needed. If the intervention is unsuccessful, it will be analyzed then discarded.

Implementation Strategies & Elements

Powell et al. (2015) provide 73 evidence-based implementation strategies that can be used in isolation or combination during the implementation process. For this DNP project, seven of these strategies were utilized:

- 1. Assess for Readiness and Identify Barriers and Facilitators.** This strategy involves assessing various aspects of an organization to determine its degree of readiness to implement, barriers that may impede implementation, and strengths that can be used in the implementation effort (Powell et al., 2015). The organizational assessment of the CAH and the SWOT analysis was completed in April 2018 and supported organizational readiness for the implementation of a multimodal hand hygiene intervention.

- 2. Stakeholder Engagement.** Support from administration and organizational buy-in are critical strategies for the success of any project. This strategy involves including existing governing structures in the implementation effort (Powell et al., 2015). For this DNP project, the student involved the leadership team of the CAH by providing reports of hand hygiene activities and compliance data at leadership meetings, including the Safety and Quality Committee and Leadership Team meetings.
- 3. Audit and Provide Feedback.** This strategy involves the collection and summarization of clinical performance data over a specified time period (Powell et al., 2015). This strategy also provides a means to monitor, evaluate, and modify behavior related to hand hygiene practices at the CAH. The DNP student performed an audit of retrospective hand hygiene surveillance data by collecting de-identified hand hygiene surveillance data from January 2017 to August 2018. This data provided the baseline for hand hygiene compliance rates for the CAH prior to the implementation of the project.

During project implementation, hand hygiene surveillance data were collected for the months of September 2018 and October 2018. Measures included direct observation and ABHR product consumption. The goal for the number of hand hygiene observation audits performed each month was set at 20. Following the implementation period, the DNP student collected, analyzed, and summarized all data and compared it to the baseline data to determine if the project impacted hand hygiene compliance. Feedback was provided by displaying hand hygiene compliance data in all staff break rooms and updated on a monthly basis. Data were displayed in bar graph form and included organizational wide compliance rates from January 2018 to present.

- 4. Workflow Modifications.** This strategy involves the evaluation of current workflow configurations and adapt, as needed, the physical structure and/or equipment to best

accommodate the targeted innovation (Powell et al., 2015). To meet this objective for the DNP scholarly project, an evaluation was performed by the DNP student to assess hand hygiene product placement and then modified to fit the needs of staff of the CAH.

Additional ABHR dispensers are in the process of being installed.

- 5. Dynamic Training.** This strategy involves the delivery of information to cater to different learning styles and work contexts (Powell et al., 2015). This strategy was key in the delivery of hand hygiene educational materials to staff members of the CAH. To meet this objective, education and training materials were provided prior to and during the project implementation period from September 2018 to November 2018. An educational and demonstration booth on hand hygiene was provided by the DNP student at the CAH's annual Skills Fair on October 1 and 2, 2018. A demonstration of proper hand washing utilizing the GlitterBuddy™ hand washing kit was used to reinforce areas that are commonly missed during hand washing with soap and water.
- 6. Small Tests of Change.** This strategy involves performing small tests of change before taking changes system wide (Powell et al., 2015). The results of the tests of change were then studied for insights on how to do better, and this process is continued, with refinement added each cycle (Powell et al., 2015). To meet this strategy, the DNP project was first rolled out on the hospital and main clinic settings at the organization. Based on the results of this project, components will be modified as needed, and then implemented in the remaining clinics and other outpatient settings of the CAH until the change is taken system-wide.
- 7. Reminder Systems.** This strategy involves the development of reminder systems to help clinicians or prompt them to use the clinical innovation (Powell et al., 2015). This strategy is also supported by the WHO's "Guide to the Implementation of the WHO

Multimodal Hand Hygiene Improvement Strategy” (WHO, 2009). According to the WHO (2009), reminders in the workplace are key tools to prompt and remind healthcare workers about the importance of hand hygiene and about the appropriate indications and procedures for performing it.

To meet this objective, the DNP student developed and displayed visual reminders for hand hygiene throughout the facility. This included wash in/wash out signage outside each patient room and hand hygiene posters placed throughout the facility. In addition, a “Hand Hygiene Pledge” was created by the DNP student, signed by all staff members of the CAH, and displayed in the front lobby of the organization to foster accountability and serve as a visual reminder. To assist with keeping the visual cues fresh and effective, the DNP student recommends having the posters rotated on a quarterly basis. To assist with this, a content calendar was created by the DNP student to serve as a reminder to the CAH leadership team as to when to refresh hand hygiene posters and other hand hygiene content (see Appendix K).

In addition to these seven implementation strategies, the DNP student also developed a hand hygiene policy for the organization. Prior to this project, the rural CAH lacked an organization-wide hand hygiene policy. The DNP student modified the existing clinic hand hygiene policy and developed an organization-wide hand hygiene policy based on this policy (see Appendix L).

Evaluation & Measures

A key component of any strategy to improve compliance with hand hygiene practices is the evaluation and repeated monitoring of indicators reflecting hand hygiene practices, infrastructures, and the knowledge and perception of hand hygiene practices (WHO, 2009). For this project, evaluation and measures included a pre- and post-implementation survey, direct observation of hand hygiene practices, organizational hand hygiene compliance data, hand

hygiene product use indicators, and informal interviewing. Project objectives were measured by comparing data before and after project implementation.

Pre and Post-Implementation Surveys. The DNP student administered pre- and post-implementation surveys to quantify the knowledge and perceptions of hand hygiene practices and HAI transmission among the rural CAH staff (Appendix M). The pre- and post-surveys were used to assess any knowledge gained or changes in perception of hand hygiene practices and HAI transmission as a result of the multimodal project. The pre-implementation survey was administered two weeks prior to the implementation of the project. The post-implementation survey was administered two weeks following the educational component of the project given during the facility's annual Skills Fair.

The pre-implementation survey consisted of 16 questions designed to assess a baseline knowledge and perception of hand hygiene practices and its impact on HAI transmission among staff at the rural CAH. The pre-implementation survey included three demographic questions and 13 questions related to hand hygiene practices and its impact on HAIs (Appendix M). The post-implementation survey included the same 16 questions as the pre-implementation survey with an additional seven questions to evaluate the opinion of rural CAH staff members of the strategies and tools that were used to promote hand hygiene practices during the project (Appendices M & N). The surveys were delivered via email using SurveyMonkey® software.

Direct Observation. As mentioned previously, the “Gold Standard” for collecting hand hygiene data is through direct observation (Kingston et al., 2016). The rural CAH practiced this method of data collection prior to the DNP student's project. Hand hygiene compliance data were gathered through direct observation for two moments of hand hygiene: 1) Washing in prior to entering a patient room and 2) Washing out prior to exiting the patient room. For this project, “washing in” and “washing out” were defined as either using ABHR or soap and water for hand

hygiene. This practice was also consistent with the rural CAHs' method of gathering hand hygiene data prior to the DNP student's project. To reduce the likelihood of observer bias during the data collection process and promote standardization across the organization, hand hygiene observations were changed to the responsibility of the CAH's leadership team and the DNP student rather than the Float Charge group that was previously responsible for collecting this data. Each department leader was responsible for collecting 20 direct observations in their departments each month, an increase from the previous required observations of 15 each month.

Hand Hygiene Compliance Data. Prior to project implementation, a retrospective review of organizational hand hygiene surveillance data was collected and analyzed by the DNP student from January 2018 to August 2018 and served as the baseline compliance for this project. Following project implementation, data were collected during the months of September and October 2018 and compared to baseline data to assess any changes in hand hygiene compliance as a result of the project. A retrospective review of organizational hand hygiene data from January 2017 to December 2017 was also gathered and analyzed by the DNP student. This information was used for comparative purposes.

Hand Hygiene Product Use. Although not a direct measure of hand hygiene compliance, hygiene product consumption provides additional and readily available information on trends in hand hygiene compliance, and therefore complements direct observations (Haubitze et al., 2016). The DNP student obtained the rural CAHs purchase history of ABHR, including wall units and desk pumps from January 2018 through October 2018. These data were used to assess any changes in hand hygiene product use as a result of the project. Retrospective review of the purchase history of these products from January 2017 through October 2017 were also gathered for analysis and comparative purposes.

Informal Interviewing. The DNP student also conducted evaluation of the multimodal hand hygiene through informal interviewing of staff members to gain an understanding of their thoughts on the components of the project and if they had any additional questions or suggestions for improvement. The purpose of the informal evaluation process was to assess whether staff felt the project was helpful in assisting them to routinely incorporate hand hygiene practices into their daily workflow.

Analysis Plan

Descriptive statistics and QI methodologies were used to evaluate this QI project. As discussed previously, pre-and post-implementation surveys were administered to all employees of the rural CAH. The purpose of these surveys was to assess any changes in hand hygiene and HAI knowledge and perception as a result of this project. Monthly hand hygiene compliance data was gathered for the months of September 2018 and October 2018 and compared to the baseline hand hygiene data to assess any changes in hand hygiene compliance as a result of the project. Lastly, hand hygiene product order history, including ABHR hand sanitizer desk units and ABHR hand sanitizer foam refills, were collected from January 2018 to October 2018 to assess any changes in product use as a result of the project. Comparisons were also made between product order history from January 2017 to October 2017 and associated hand hygiene compliance with order history from January 2018 to October 2018 and associated hand hygiene compliance to assess any correlations with product order history and hand hygiene compliance.

Resources & Budget

The biggest resource required for this DNP scholarly project was time. Time was needed by the DNP student to create and evaluate pre- and post-implementation surveys, provide education to all CAH staff members at the facility's two-day annual skills fair, and gather, design, and display visual cues. Time was also invested at meetings held by the DNP student

with key stakeholders, including the directors from perioperative services, laboratory, infusion center, acute care, radiology, emergency department, quality and infection prevention, facilities, nursing informatics, and the CCO. Time was also required from the director of quality and infection prevention to provide the student with de-identified organizational hand hygiene data. In addition, time was required from the Chief Compliance Officer to educate the DNP student on the CAH's safety and quality reporting system where the hand hygiene data were entered. The DNP student also met informally with frontline CAH staff members to discuss the hand hygiene project.

The pre- and post-implementation surveys were based off of the WHO's "Perception Survey for Health-Care Workers" and created using SurveyMonkey® software already owned by the rural CAH. A variety of professions completed the surveys, which took approximately five minutes each to complete. A total of 74 rural CAH employees completed the pre-implementation survey. Twenty-seven (27) rural CAH employees completed the post-implementation survey. Final costs of the survey included the cost of SurveyMonkey® software, the number of respondents from each profession who completed the surveys, as well as time spent completing the surveys for each profession.

Other items requiring resources for this project included educational and awareness materials (e.g. paper and colored ink for flyers, signs, and compliance data displays). In addition, the funding of \$244 for magnets displaying "Wash In" "Wash Out" reminders in patient care area doorframes was obtained from the rural CAH's Foundation. In addition, a one-time in-kind donation of \$79 was provided by the DNP student for the cost of the hand hygiene pledge and accountability photo frame and signing pens. A detailed budget is included in Appendix O.

Timeline

A visual representation of the DNP project activities and the associated timeline are provided below in Table 1.

Table 1

Project Activity	Timeline
Application for Project Advisory Team Submitted	April 11, 2018
Project Prospectus Submitted	April 12, 2018
Organizational Assessment Completed and Submitted	May 23, 2018
IRB Approval Obtained	June 1, 2018
Literature Review Finalized and Submitted	August 2, 2018
Project Proposal Defense. Approval for DNP project Obtained from Project Advisory Team.	August 7, 2018
Initial Informal Meeting with CAH Leadership Team to Discuss Project Components	August 30, 2018
Pre-Implementation Survey Sent to CAH staff	August 14, 2018
Pre-Implementation Survey Closed. Data Analyzed.	August 28, 2018
Implemented Hand Hygiene Visual Cues (magnets, posters)	September 4, 2018
Began Hand Hygiene Observation Data Collection and Informal Evaluation Process. Trial iScrub [®] Hand Hygiene Phone App for Data Collection	September 4, 2018
Update Meeting with CAH Leadership Team to Discuss Project	September 13, 2018
Meeting with Chief Compliance Officer to Review and Streamline Hand Hygiene Data Entry into CAH's Reporting System	September 18, 2018
End iScrub [®] Hand Hygiene Phone App Trial for Data Collection (discarded use). Education to CAH Leaders on Data Entry Directly into Reporting System through Smart Phone	September 19, 2018
Project Update Communication Email Sent to Entire CAH staff	September 25, 2018
Hand Hygiene Educational Presentation at Skills Fair - Hand Hygiene Accountability Signatures Collected	October 1-2, 2018
Meeting with Director of Facilities Regarding Placement and Installation of Additional ABHR Dispensers	October 2, 2018
Post-Implementation Survey Sent to Staff	October 19, 2018
Post-Implementation Survey Closed. Data Analyzed.	November 2, 2018

Final Results of QI initiative disseminated to Key Stakeholders	November 15, 2018
Final Project Defense	November 26, 2018
Project Submitted to ScholarWorks	December 2018

Table 1. DNP Project Activities and Timeline

Results

For this QI project, rural CAH staff hand hygiene and HAI knowledge and perception, hand hygiene compliance, and hand hygiene product use was assessed before and after the implementation of the multimodal hand hygiene intervention. The results of the project include participant demographics, pre- and post-implementation survey responses, organizational hand hygiene compliance data, and organizational hand hygiene product order history as a reflection of hand hygiene product use.

Participant Demographics.

A total of 72 out of 414 possible CAH staff members participated in the pre-implementation survey for a response rate of 17.39%. Of these 72 participants, 87.5% were female (n=63) and 12.5% were male (n=9). A variety of age groups participated in the pre-implementation survey. There were no participants under age 18. The biggest response rates were from the 30-44 (n=22) and 45-59 (n=31) age ranges (see Table 2).

A total of 27 out of 414 possible CAH staff members participated in the post implementation survey, for a response rate of 6.52%. Of these 27 participants, 88.89% were female (n=24) and 11.11% were male (n=3). Similar to the pre-implementation demographics, the largest age group participation rates were from the 30-44 (n=13) and 45-59 (n=9) age groups (see Table 2).

Table 2

Age Range of Participants

Age Range	Pre (n)	Percentage of Respondents	Post (n)	Percentage of Respondents
<18	0	0.00%	0	0.00%
18-29	9	12.5%	3	11.11%
30-44	22	30.56%	13	48.15%
45-59	31	43.06%	9	33.33%
60+	10	13.89%	2	7.41%
Total	72		27	

There was a variety of occupations that responded to the pre-implementation survey. The participants included RNs (n = 21), nursing assistants (n=1), medical assistants (n=1), physicians (n=1), advanced practice providers (n=5), physical and occupational therapy (n=2), administration (n=12), and others (n=29). Professions who responded “other” included environmental services, speech pathology, dieticians, registration staff, information technology (IT) staff, security, lab technicians, pharmacy, and billing (see Table 3).

There was also a similar variety of occupations that responded to the post-implementation survey. The participants included RNs (n=7), medical assistants (n=1), physicians (n=1), advanced practice providers (n=1), physical and occupational therapy (n=1), administration (n=6), and others (n=10). Professions who responded “other” included radiology, speech therapy, support services, dieticians, food service, environmental services, registration, and billing (see Table 3).

Table 3

Participant Population

Occupation	Pre (n)	Percentage of Respondents	Post (n)	Percentage of Respondents
Registered Nurse	21	29.17%	7	25.93%
Nursing Assistant	1	1.39%	0	0.00%

Medical Assistant	1	1.39%	1	3.70%
Physician	1	1.39%	1	3.70%
Advanced Practice Provider	5	6.94%	1	3.70%
PT/OT	2	2.78%	1	2.70%
Administration	12	16.67%	6	22.22%
Other	29	40.28%	10	37.04%
Total	72		27	

Pre- and Post-Implementation Survey Questions

The pre- and post-implementation surveys were sent to all CAH employees via SurveyMonkey® in an email link. In addition to the three demographic questions listed above, the pre-implementation survey consisted of 13 questions related to hand hygiene, hand hygiene practices, HAIs, and the perception of hand hygiene and HAI transmission. The post-implementation survey contained an additional seven questions to assess the effectiveness of the project's components.

When asked if formal hand hygiene training had taken place in the last three years, 79.17% of the pre-implementation participants answered “yes” while 20.83% answered “no”; 85.19% of the post-implementation participants answered “yes” and 14.81% answered “no” (see Figure 1).

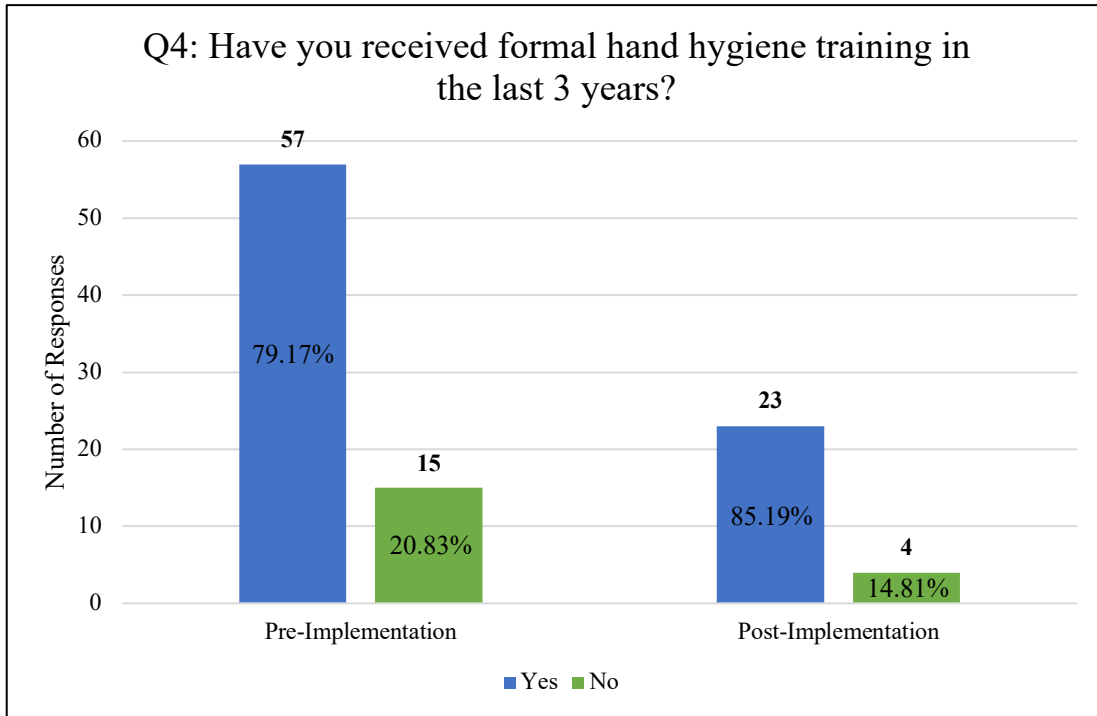


Figure 1. Assessment of past hand hygiene training.

Participants were also asked about their use of hand hygiene products in their daily practice. When asked if ABHR was used routinely in their practice 87.50% (n=63) of pre-implementation survey participants answered “yes” and 12.50% (n=9) answered “no” (see Figure 2). When asked the same question on the post-implementation survey, 74.07% of participants answered “yes” while 25.93% answered “no” (see Figure 2).

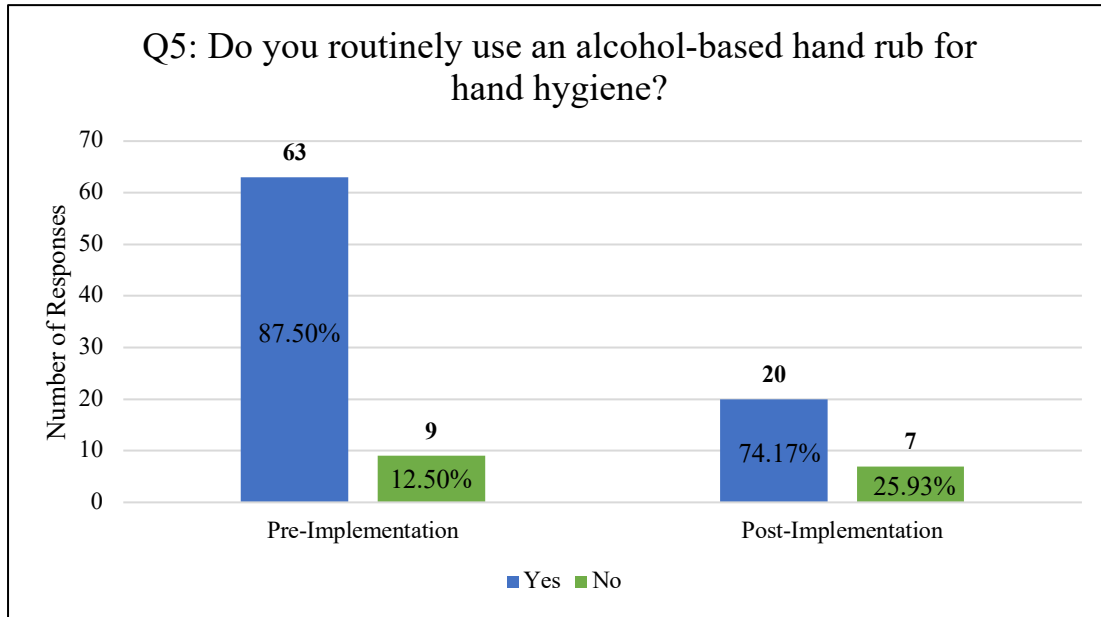


Figure 2. Assessment of routine use of ABHR in daily practice.

When asked to rate the impact of a HAI on a patient's clinical outcome on a scale of 1 to 5 (1 = very low and 5 = very high), 6% of pre-implementation respondents answered "1" or "very low" (n=4), 7% answered "2" or "low" (n=5), 8% answered "3" or "neither low nor high" (n=6), 27% answered "4" or "high" (n=19), and 52% answered "5" or "very high" (n= 37) (see Figure 3). Seventy-nine percent of the pre-survey sample believed that HAIs have a high or very high impact on patients' clinical outcome.

When asked the same question on the post-implementation survey, none of the respondents answered "1" or "very low", 11.11% answered "2" or "low" (n=3), 18.52% answered "3" or "neither low nor high" (n=5), 22.22% answered "4" or "high" (n=6), and 48.15% answered "5" or "very high" (n=13) (see Figure 3). Seventy percent of the post-survey sample believed that HAIs have a high or very high impact on patients' clinical outcomes. This a decrease of 9% from the pre-survey sample.

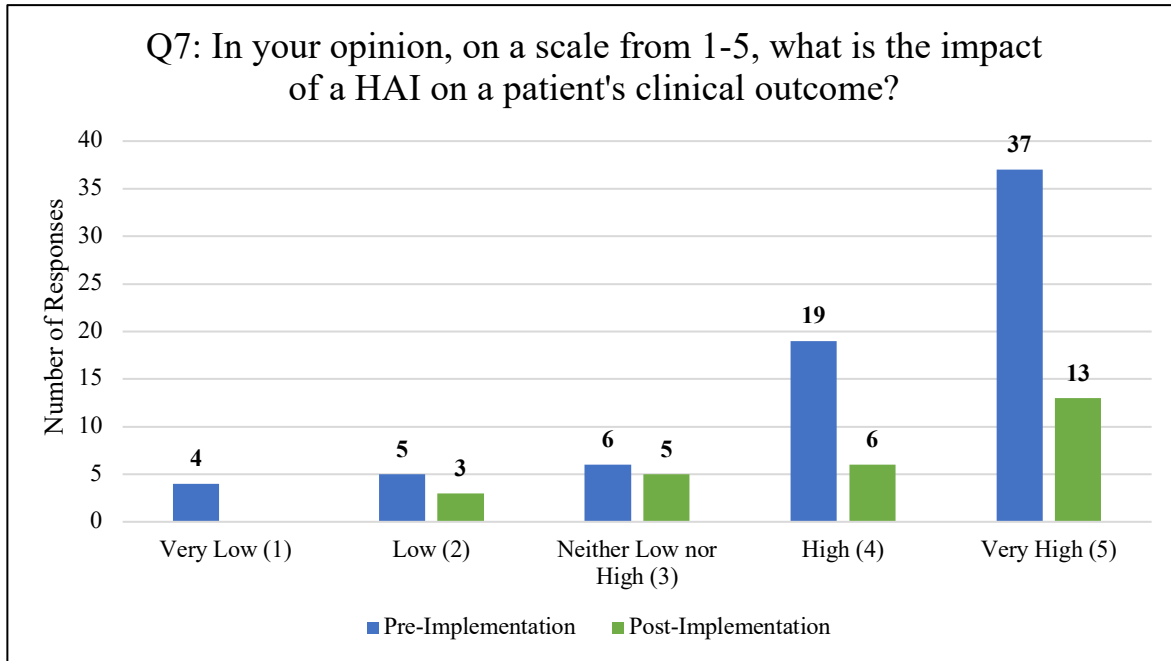


Figure 3. Staff perception of HAIs on clinical outcomes.

When asked to rate the effectiveness of hand hygiene in preventing HAIs on a scale from 1 to 5, with “1” meaning “very low” and “5” meaning “very high”, 0% of pre-implementation respondents said “1” or “very low” (n=0), 3% of respondents said “2” or “low” (n=2), 3% said “3” or “neither low nor high” (n=2), 6% said “4” or “high”, and 89% said “5” or “very high” (see Figure 4).

When asked the same question on the post-implementation survey, respondents answered either “4” or “high” (n=4) or “5” or “very high” (n=23) (see Figure 4). One-hundred percent of the post-survey sample believed hand hygiene has a high or very high effectiveness in preventing HAIs. This is a 12% increase from the pre-survey sample, where 78% believed hand hygiene has a high or very high effectiveness in preventing HAIs.

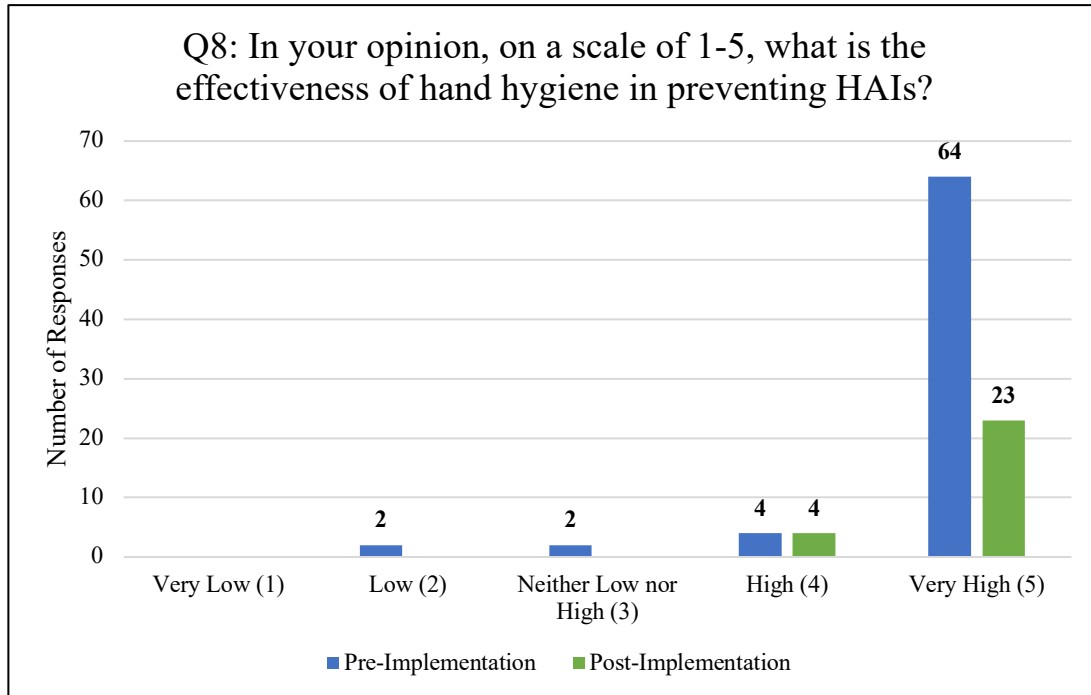


Figure 4. Staff perception of hand hygiene in preventing HAIs.

When asked to rate their opinion of the importance of hand hygiene as a patient safety issue at their organization on a scale of 1 to 5 with 1 meaning “very low priority” and 5 meaning “very high priority” (N=71), 1% of pre-implementation participants answered “1” or “very low priority” (n=1), 0% answered “2” or “low” (n=0), 6% answered “3” or “neither a low nor high priority” (n=4), 17% answered “high priority” (n=12), and 76% answered “5” or “very high priority” (see Figure 5). Ninety-three percent of the pre-survey sample believed hand hygiene has a high or very high importance among all patient safety issues throughout the organization.

When asked the same question on the post-implementation survey (N=27), 29.63% answered “4” or “high priority” (n=8) and 70.37% answered “5” or “very high priority” (n=19) (see Figure 5). One-hundred percent of the post-survey sample believed hand hygiene has a high or very high importance among all patient safety issues throughout the organization. This is a 7% increase from the pre-survey sample.

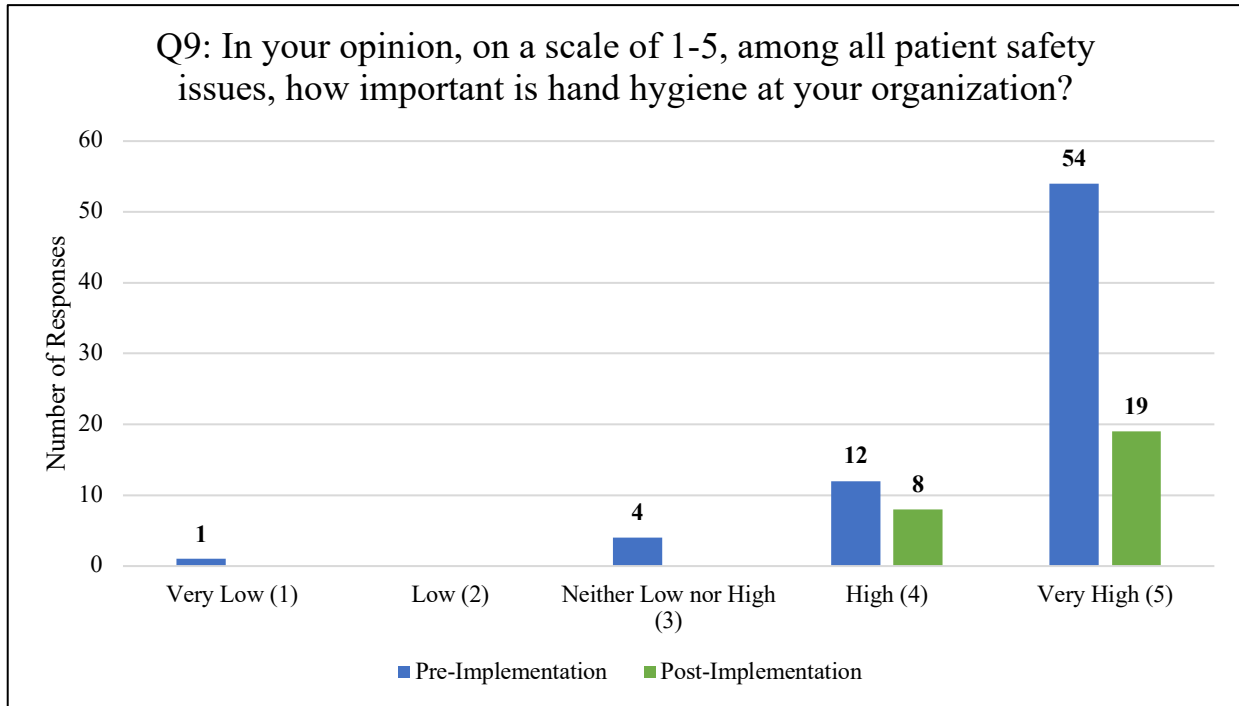


Figure 5. Staff perception of hand hygiene importance at rural CAH

Participants were also asked to rate their opinion of how effective eight different actions might be to improve hand hygiene performance at their organization from 1 to 5 (1 = not effective and 5 = very effective). Actions included “Leaders and senior managers support and openly promote hand hygiene”, “The healthcare facility makes ABHR always available at the point of care”, “Hand hygiene posters are displayed at the point of care as reminders”, “Each healthcare worker receives education on hand hygiene”, “Clear and simple instructions for hand hygiene are made visible for every healthcare worker”, “Healthcare workers regularly receive feedback on their hand hygiene performance”, “You always perform hand hygiene as recommended (being a good example for your colleagues)”, and “Patients are invited to remind healthcare workers to perform hand hygiene”. Pre-implementation responses (N=72) are shown below in Figure 6 and post-implementation responses (N=25) are shown in Figure 7.

These findings were both expected and surprising. It was not surprising that 88.9% of pre-survey sample and 83.3% of the post-survey sample believed having ABHR available at the

point of care was an effective or very effective intervention to improve hand hygiene in the organization. This is also supported by the literature, where multimodal interventions including the component of access to ABHR resulted in improvement in hand hygiene compliance (Gould et al., 2017; Kingston et al., 2016; Luangasanatip et al., 2015; Alshehar et al., 2018; Rodriguez et al., 2015; Doronina et al., 2017; Schweizer et al., 2013; Stewardson et al., 2016; Neo et al., 2016). The biggest surprise was the decrease in the post-survey responses to the effectiveness of visual cues displayed at the point of care as reminders. Seventy-six point four percent of the pre-survey sample found visual cues at the point of care effective or very effective whereas only 44.4% of the post-survey sample found this intervention effective or very effective. According to APIC (2015), one of the most valuable components of a promotional hand hygiene campaign is the use of effective reminders in the work place. Further research is recommended to assess this finding.

It is also worth noting that 77.5% of the pre-survey and 84.6% of the post-survey samples believed inviting patients to remind healthcare workers to perform hand hygiene would be an effective or very effective intervention. This intervention aligns with the CDC's current campaign "Clean Hands Count", which encourages patient empowerment. This intervention could be added to the current multimodal campaign to further improve hand hygiene in the future. Eliciting feedback and incorporating frontline staff's beliefs on effective hand hygiene interventions is important to foster engagement and partnership at all levels of the organization, which will help enrich and improve the sustainability of an effective hand hygiene program at the rural CAH.

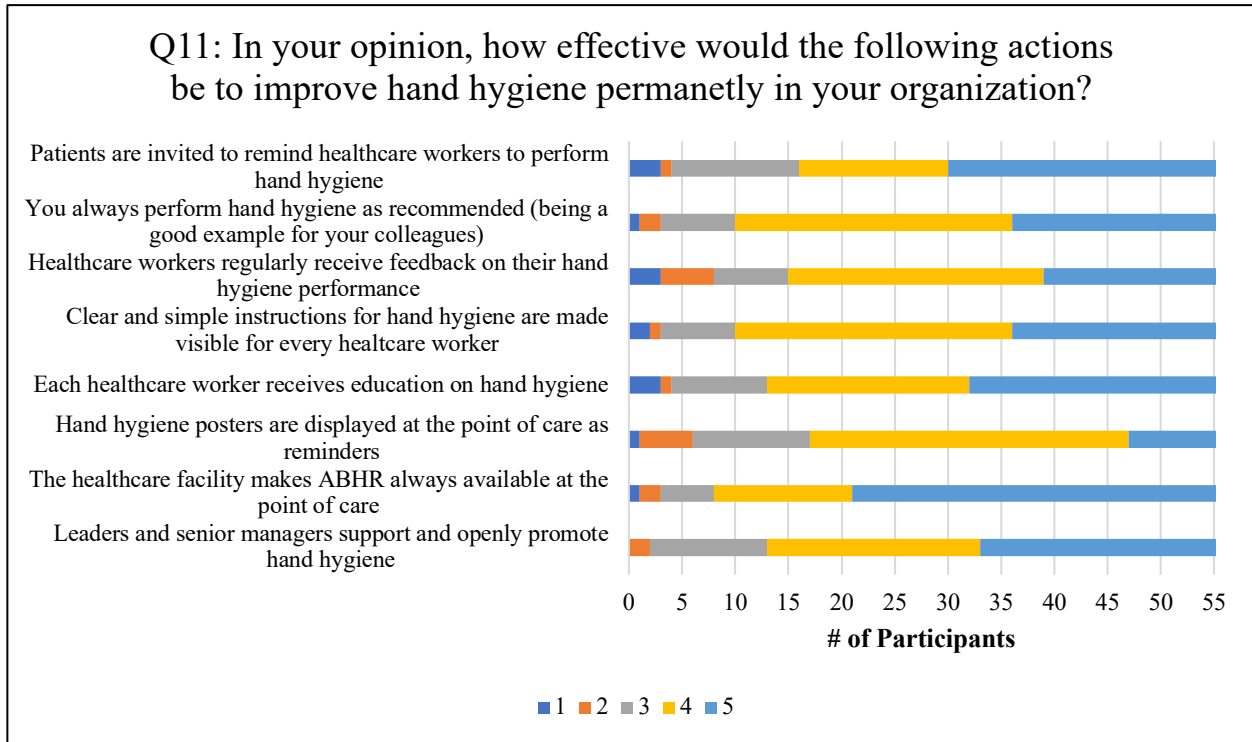


Figure 6. Pre-Implementation staff perception of effectiveness of hand hygiene interventions.

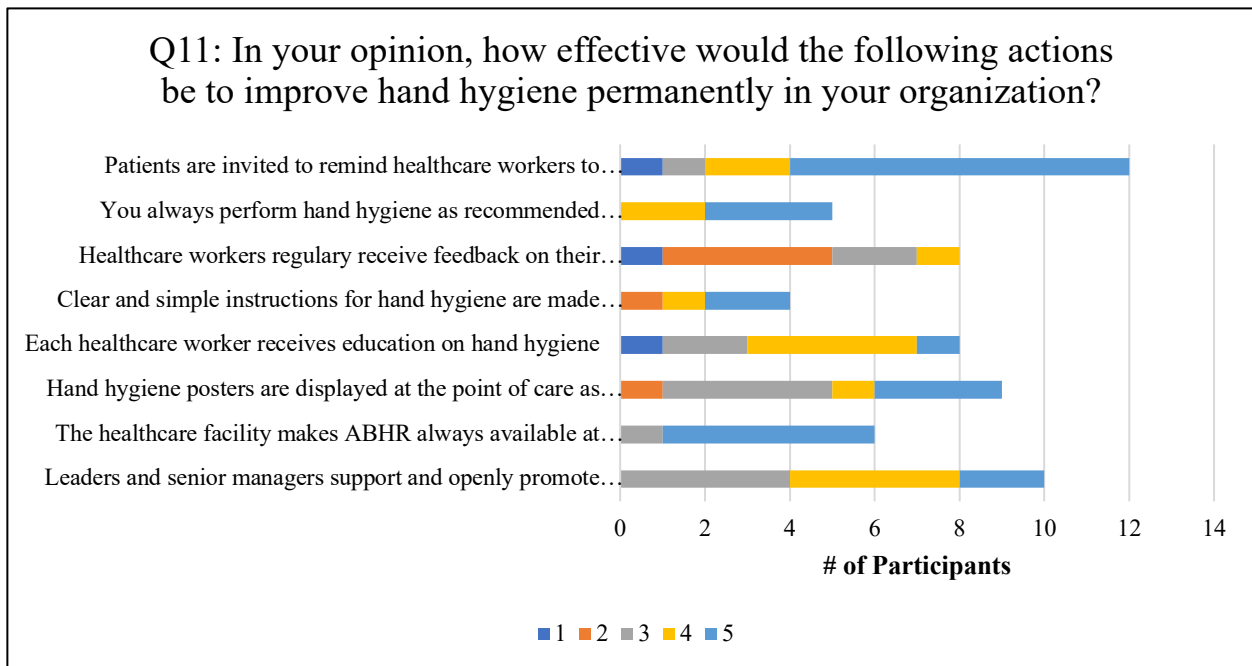


Figure 7. Post-Implementation staff perception of effectiveness of hand hygiene interventions.

On the pre-implementation survey (N=68), when asked to rate the importance the head of each department attaches to individual performance of optimal hand hygiene on a scale from 1 to 5 (1 = no importance, 5 = very high importance), 2.94% answered “1” or “no importance” (n=2), 10.29% answered “2” or “somewhat important” (n=7), 16.18% answered “3” or “important” (n=11), 20.59% answered “4” or “high importance” (n=14), and 50% answered “5” or “very high importance” (n=34) (see Figure 8). This means that 70.6% of the pre-survey sample believed their department leaders place importance or very high importance of performing optimal hand hygiene.

When asked the same question on the post-implementation survey (N=25), no respondents answered “1”, 4% answered “2” or “somewhat important” (n=1), 16% answered “3” or “important” (n=4), 24% answered “4” or “high importance” (n=6), and 56% answered “5” or “very high importance” (n=14) (see Figure 8). This means that 80% of the post-survey sample believed their department leaders place importance or very high importance of performing optimal hand hygiene, which is a 9.4% increase from the pre-survey sample.

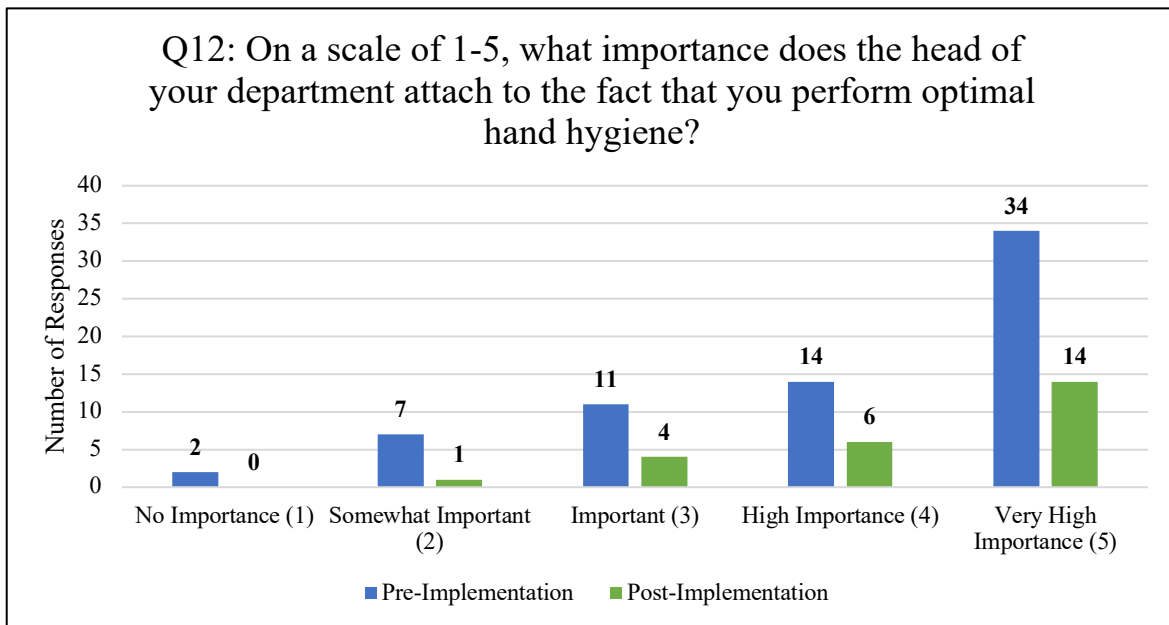


Figure 8. Staff perception on the importance department leaders place on staff hand hygiene.

On the pre-implementation survey (N=68), when asked to rate the importance participant’s think their colleagues attach to the fact that they perform optimal hand hygiene on a scale of 1 to 5 (1=no importance, 5 = very high importance), 4.41% answered “1” or “no importance” (n=3), 8.82% answered “2” or “somewhat important” (n=6), 14.71% answered “3” or “important”, 23.53% answered “4” or “very important” (n=16), and 48.53% answered “5” or “very high importance” (n=33) (see Figure 9). This indicates that 72.1% of the pre-survey sample believed their colleague’s perception plays an important or very important role in performing hand hygiene.

When asked the same question on the post-implementation survey (N=26), 3.85% answered “1” or “no importance”, 7.69% answered “2” or “somewhat important”, 19.23% answered “3” or “important”, 34.62% answered “4” or “very important”, and 34.62% answered “5” or “very high importance” (n=9) (see Figure 9). This indicates that 69.2% of the post-survey sample believed their colleague’s perception plays an important or very important role in performing hand hygiene.

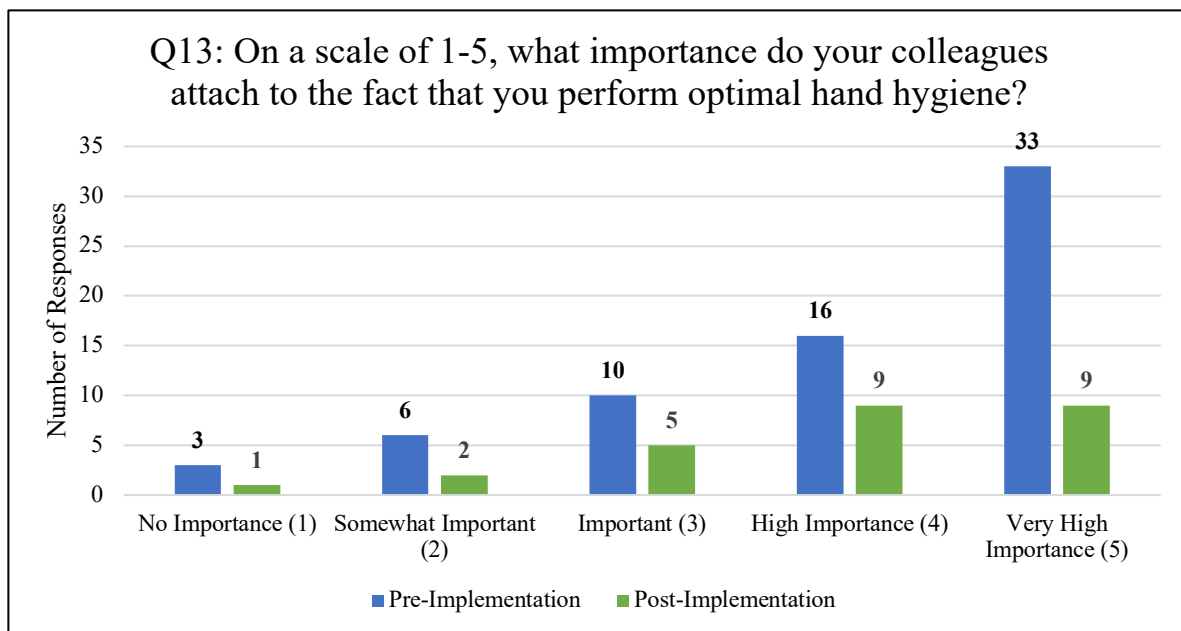


Figure 9. Staff perception of the importance of hand hygiene in the eyes of their peers.

On the pre-implementation survey (N=66), when asked their opinion of how patients perceive the importance of caregivers performing optimal hand hygiene on a scale of 1 to 5 (1=no importance, 5 = very high importance), 7.58% of respondents answered “1” or “no importance” (n=5), 3.03% answered “2” or “some importance” (n=2), 15.15% answered “3” or “important” (n=10), 22.73% answered “4” or “high importance” (n=15), and 51.52% answered “5” or “very high importance” (n=34) (see Figure 10). Eighty-nine point four percent of employees believed that patients perceived caregiver hand hygiene as important to very high importance. On the post-implementation survey (N=26), 3.85% of respondents answered “1”, 3.85% answered “2”, 11.54% answered “3”, 15.38% answered “4”, and 65.38% answered “5” (see Figure 10). Eighty point eight percent of the post-survey sample believed that patients perceived caregiver hand hygiene as important to very high importance.

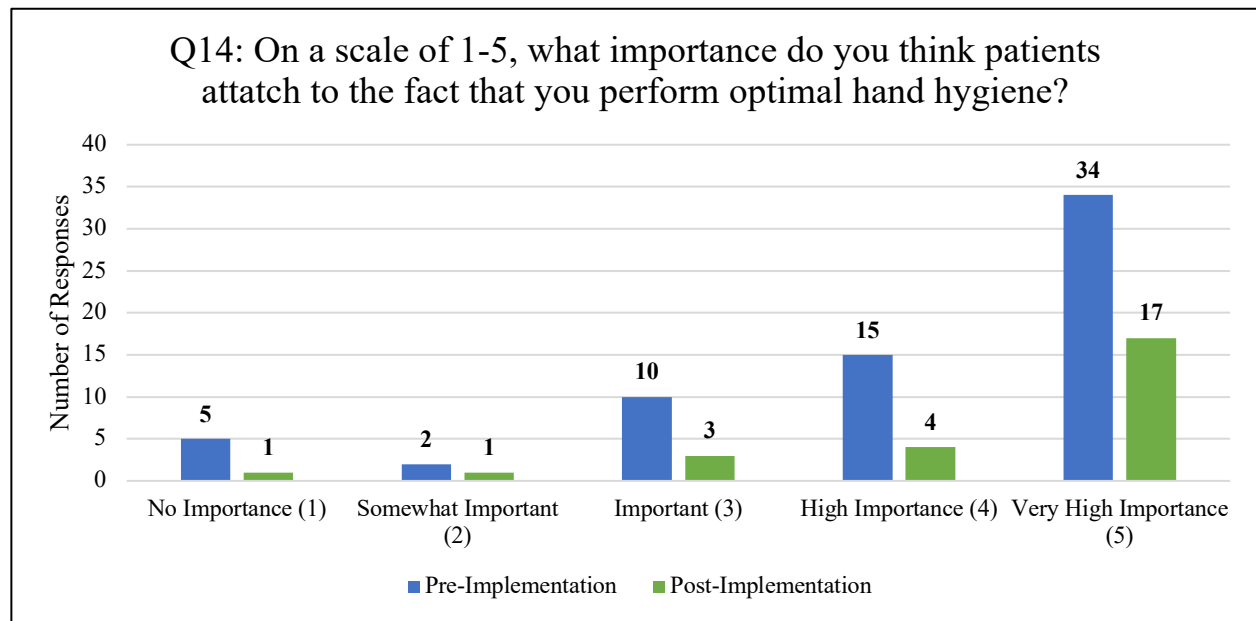


Figure 10. Staff perception on importance of hand hygiene in the eyes of their patients.

On the pre-implementation survey (N=64), when asked to rate how much effort it takes for them to perform good hand hygiene when caring for patients on a scale of 1 to 5 (1=no effort, 5=a tremendous effort), 18.75% answered “1” or “no effort” (n=12), 12.5% answered “2” or

“some effort” (n=8), 10.94% answered “3” or “neither no or a tremendous amount of effort” (n=7), 3.13% answered “4” or a “lot of effort” (n=2), and interestingly, 54.69% answered “5” or “a tremendous amount of effort” (n=35) (see Figure 11). On the post-implementation survey (N=26), 19.23% responded “1” (n=5), 7.69% responded “2”, 11.54% responded “3”, 26.92% responded “4”, and 34.62% responded “5” (see Figure 11).

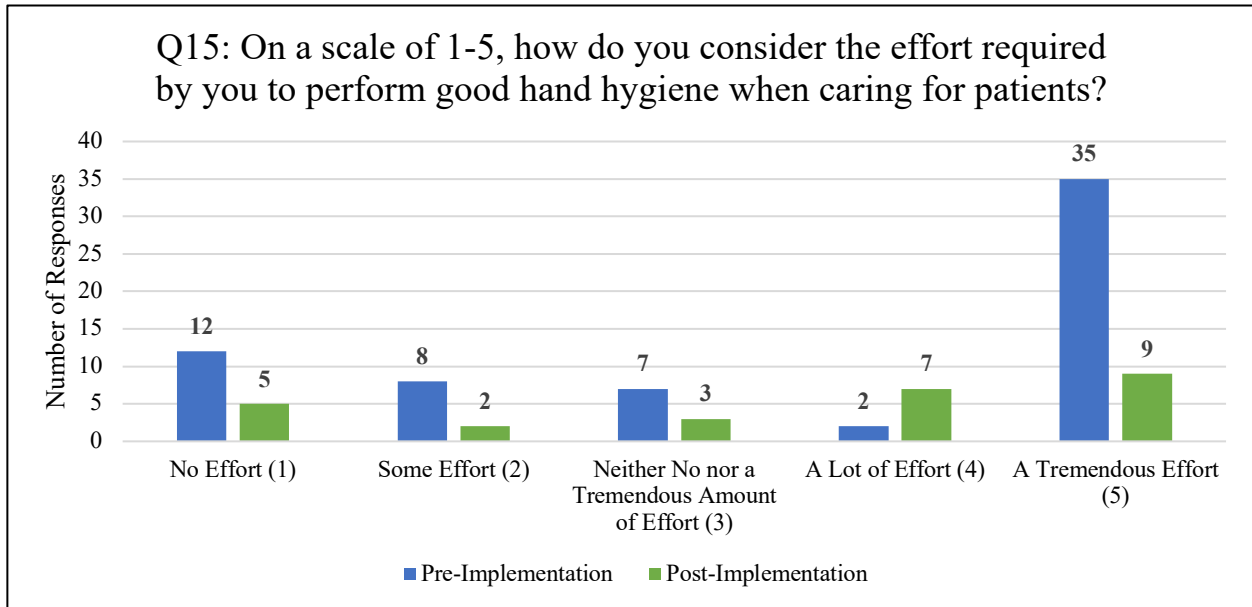


Figure 11. Staff perception on the amount of effort good hand hygiene requires.

There were also three open-ended questions on both the pre- and post-implementation surveys. Each question had a variety of responses. On the pre-implementation survey (N=71), when asked their opinion of what the average percentage of hospitalized patients that will develop a HAI (between 0% and 100%), responses varied from as low as 4% to as high as 100%. When asked the same question on the post-implementation survey (N=26), responses varied from as low as 0% to as high as 75%.

On the pre-implementation survey (N=72), when asked what percentage of situations requiring hand hygiene do their colleagues actually perform hand hygiene (between 0% and 100%), responses varied from as low as less than 10% to as high as 100%. When asked the same

question on the post-implementation survey, responses varied from as low as 35% to as high as 100%. Lastly, when asked what percentage of situations requiring hand hygiene do they actually perform hand hygiene (between 0% and 100%), responses varied from a low of 65% to a high of 100% on the pre-implementation survey (N=70) and from a low of 60% to a high of 100% (N=26).

Additional Post Implementation Survey Questions

There were seven additional questions asked on the post-implementation survey to assess the staff's opinion of the effectiveness of the components of the multimodal hand hygiene project. All questions were Likert-style and are describe below.

The first question was designed to gain an understanding of the staff's perception of the availability of hand hygiene products at the point of care and its impact on performing hand hygiene. Participants were asked if the use of an ABHR made hand hygiene easier to practice in their daily work. Answers were rated on a scale of 1 to 5, with "1" or "not at all", "2" or "somewhat easier", "3" or "neutral", "4" or "easier", or "5" meaning "much easier". All 27 post-implementation survey participants responded, with 3.70% answering "1" (n=1), 3.70% answering "2" (n=1), 18.52% answering "3", 25.93% answering "4" (n=7), and 48.15% answering "5" (n=13) (see Figure 12). According to the responses, ABHR has made it easier to practice hand hygiene in the rural CAH's daily workflow, with .74.1% of the sample indicating ABHR has made it easier or much easier to practice hand hygiene in their daily work. This was congruent by staff's indication that an effective intervention to improve hand hygiene compliance was that "the healthcare facility makes ABHR always available at the point of care" (refer to Figures 6 & 7).

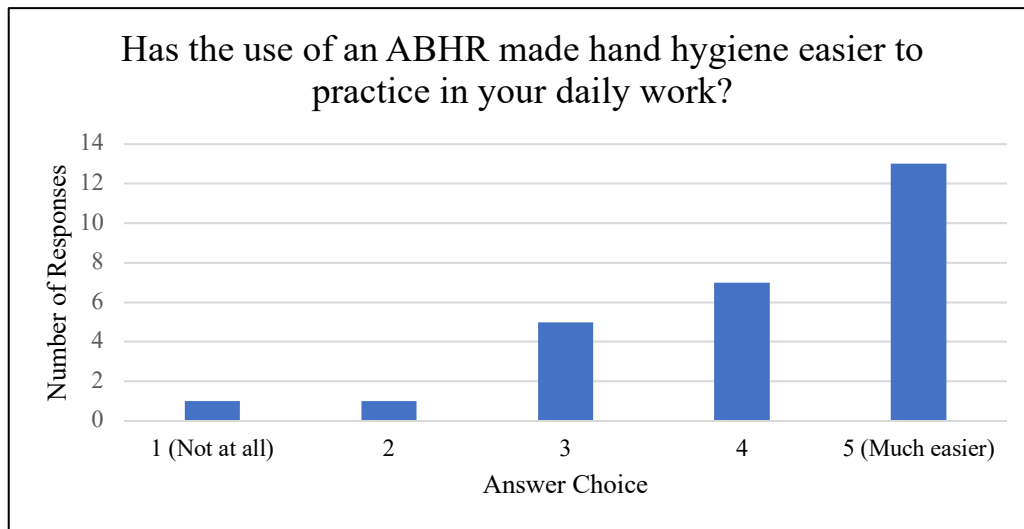


Figure 12. Assessment of if the availability of ABHR makes it easier to perform hand hygiene.

The second question addressed one of the common reported barriers to hand hygiene: skin irritation from hand hygiene products. To assess if this barrier was also experienced at the rural CAH, participants were asked if the use of ABHR was well-tolerated by their hands. Answers were rated on a scale of 1 to 5, with 1 meaning “not at all” and 5 meaning “very well”. Just over 11% of participants selected “1” or “not at all” (n=3), 11% answered “2” of “somewhat tolerated” (n=3), 25.93% answered “3” or “neutral” (n=7), 33.33% “4” or “tolerated” (n=9), and 18.52% responded “5” or “very well tolerated” (n=5) (see Figure 13). The results indicate that ABHR still present a barrier to performing hand hygiene, as 22% of participants indicated ABHR is somewhat or not at all tolerated by their hands.

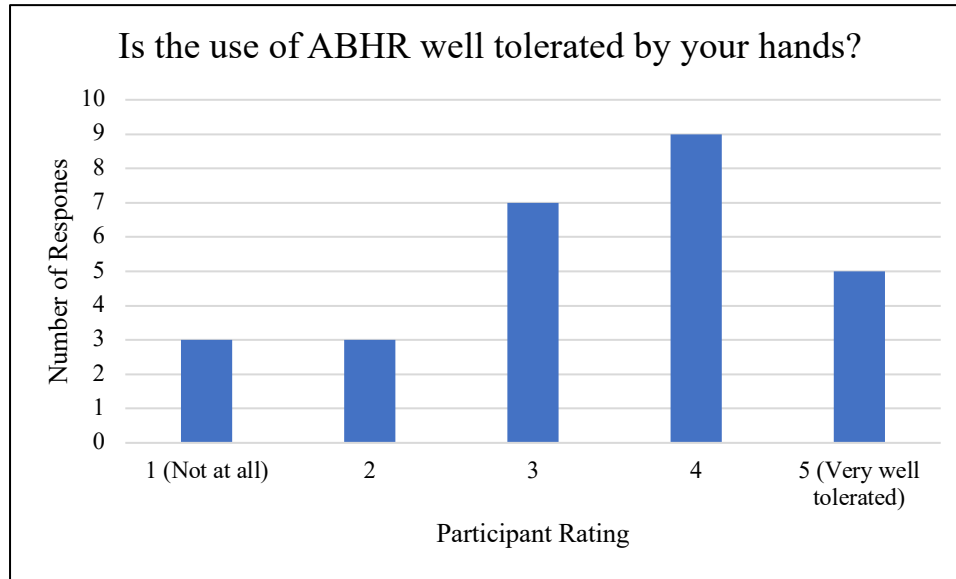


Figure 13. Assessment of staff tolerance of ABHR.

The third question assessed the intervention component of feedback by asking post-implementation survey participants if knowing the results of hand hygiene observation on their units helped to improve hand hygiene practices (N=24). Just over 4% of participants (n=1) responded “1” or “not at all”, 8.33% responded “2” or “somewhat” (n=2), 29.17% responded “3” or “neutral” (n=7), 33.33% responded “4” or “yes (to some degree)” (n=8) and 25% of participants responded “5” or “yes (very much)” (n=6) (see Figure 14). This finding indicates a somewhat neutrality in the effectiveness of feedback, which is in contrast to other hand hygiene studies in the literature, which indicate that feedback of hand hygiene performance facilitates the improvement of hand hygiene behavior (APIC, 2015).

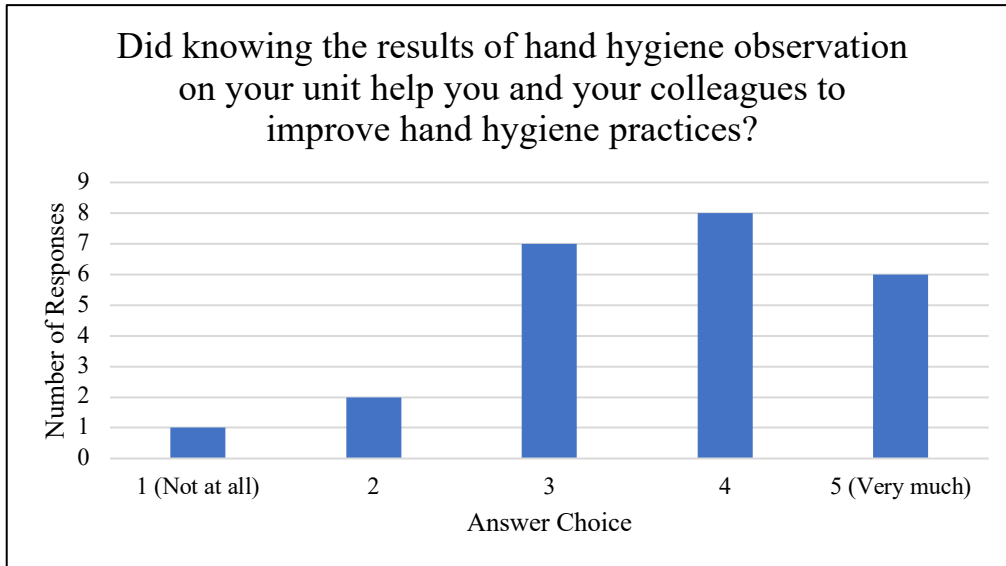


Figure 14. Assessment of feedback component used in multimodal intervention.

The fourth question addressed the staff’s perception of the impact of the Hawthorne Effect on hand hygiene practices. Post-implementation survey participants were asked to rate on a scale of 1 to 5 if knowing they were being observed impacted their hand hygiene practices, with 1 meaning “not at all” and 5 meaning “very much”. Eight percent of survey respondents answered “1” (n=2), 16% answered “2” or somewhat (n=4), 24% answered “3” or neutral (n=6), 28% answered “4” or a lot, and 24% answered “5” or very much (n=6) (see Figure 15).

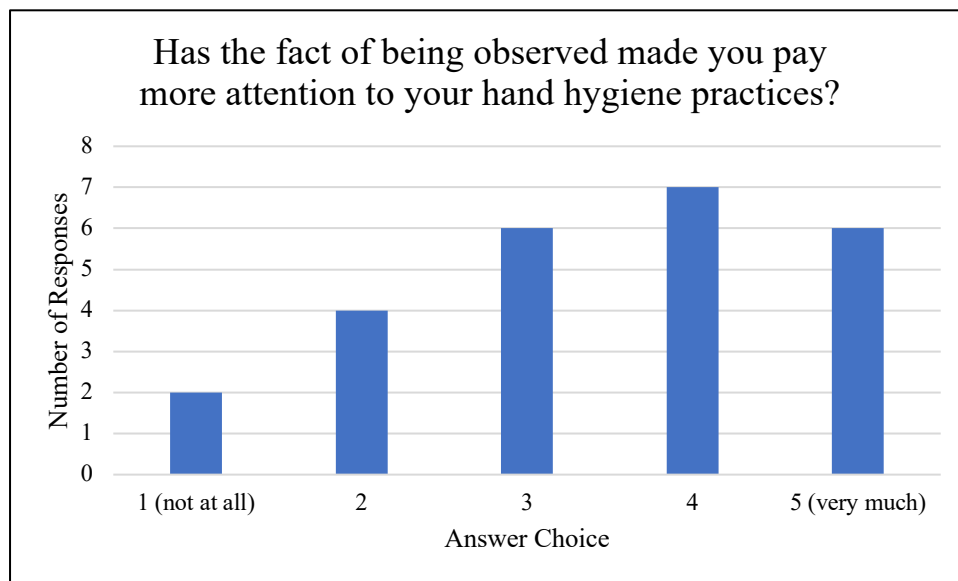


Figure 15. Post-survey assessment of staff perception of Hawthorne Effect.

The fifth question addressed the intervention component of education by asking participants to rate on a scale of 1 to 5 if the educational activities they participated in at the annual skill’s fair were important to improve their hand hygiene practices. All 27 participants responded, with 7.41% answering “1” or not at all (n=2), 3.70% answering “2” or somewhat (n=1), 14.81% answering “3” or neutral (n=4), 25.93% answering “4” or important (n=7), and 48.15% answering “5” or very important (n=13) (see Figure 16). This finding is supportive of the importance of the component of education in multimodal hand hygiene interventions.

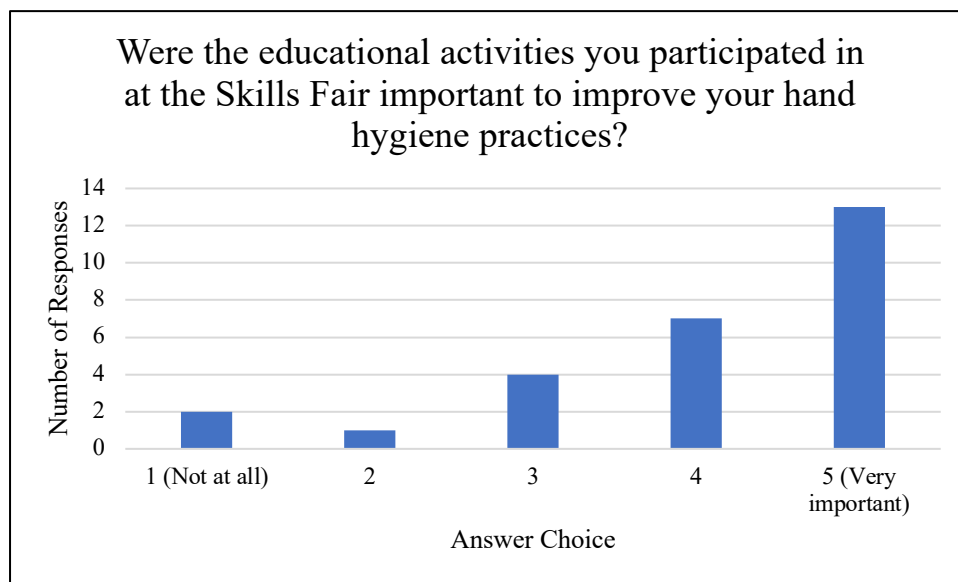


Figure 16. Assessment of staff’s perception of the importance of the education component of the multimodal intervention.

The post-implementation survey also addressed the CAH staff’s perception of their leadership’s team in supporting hand hygiene improvement. Participants were asked to rate on a scale of 1 to 5 if they considered that the administrators in their institution are supporting hand hygiene improvement. No respondents answered “1” or “2” or “not at all” or “slightly”, respectively (n=0). Approximately 7.41% of participants responded “3” or “neutral” (n=2), 33.33% answered “4” or “somewhat supportive”, and 59.26% answered “5” or “very much

supportive” (n=16) (see Figure 17). This finding is supportive of the component of accountability from leadership in a multimodal hand hygiene intervention. According to APIC (2015), firm commitment from the organization’s leaders is paramount to the success of hand hygiene initiatives.

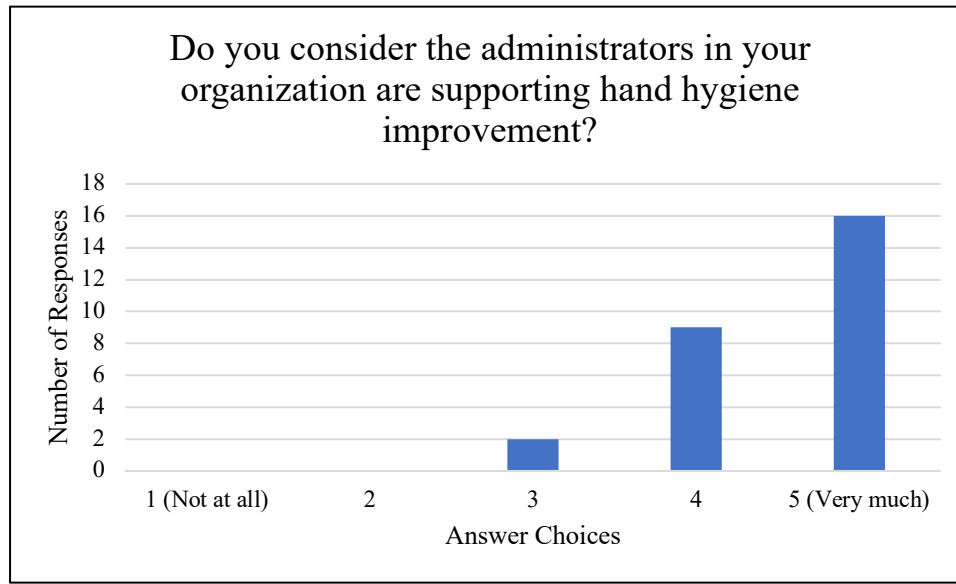


Figure 17. Assessment of leadership component of multimodal intervention.

Lastly, post-implementation survey participants were asked if their awareness of the role of hand hygiene practices and its impact on HAI has increased during the hand hygiene promotional campaign. All 27 participants responded, with 3.70% responding “1” or “not at all” (n=1), 3.70% responding “2” or “slightly” (n=1), 25.93% responding “3” or “neutral” (n=7), 25.93% responding “4” or “increased” (n=7), and 40.74% responding “5” or “very much increased” (n=11) (see Figure 18). This finding supports the use of multimodal intervention to reinforce the importance of proper hand hygiene to reduce HAI transmission and improve compliance with hand hygiene practices.

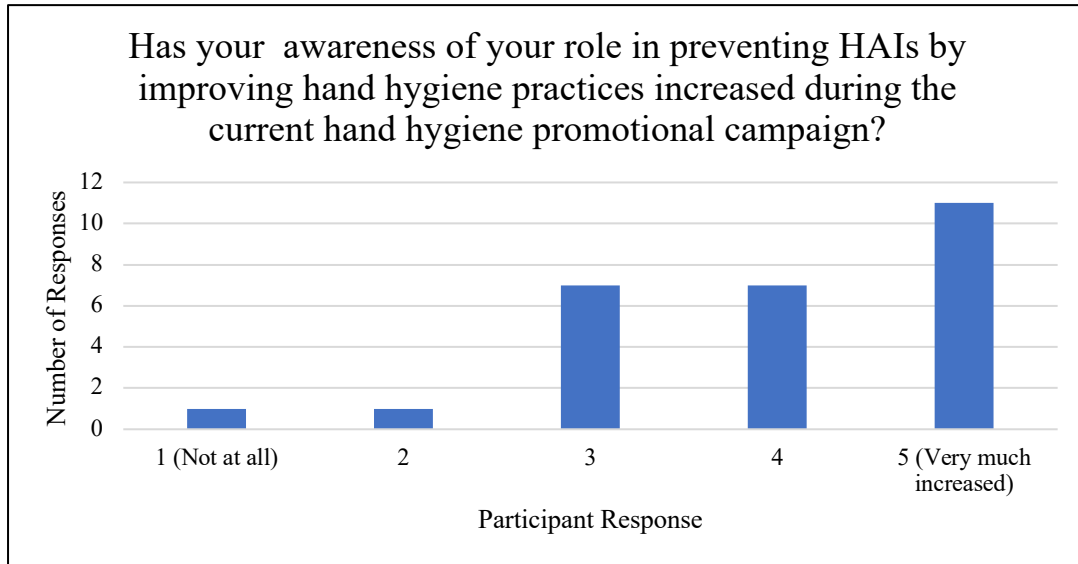


Figure 18. Assessment of overall impact of multimodal hand hygiene intervention.

Hand Hygiene Compliance

Prior to project implementation, the mean hand hygiene in compliance in 2018 was 53.85% (see Figure 19). Following implementation of project components, monthly hand hygiene compliance increased to 60.19% in September 2018 and to 89.37% in October 2018 (see Figure 20). The increased performance in September and October increased the mean organizational compliance from 53.85% to 58.03% (see Figure 21).

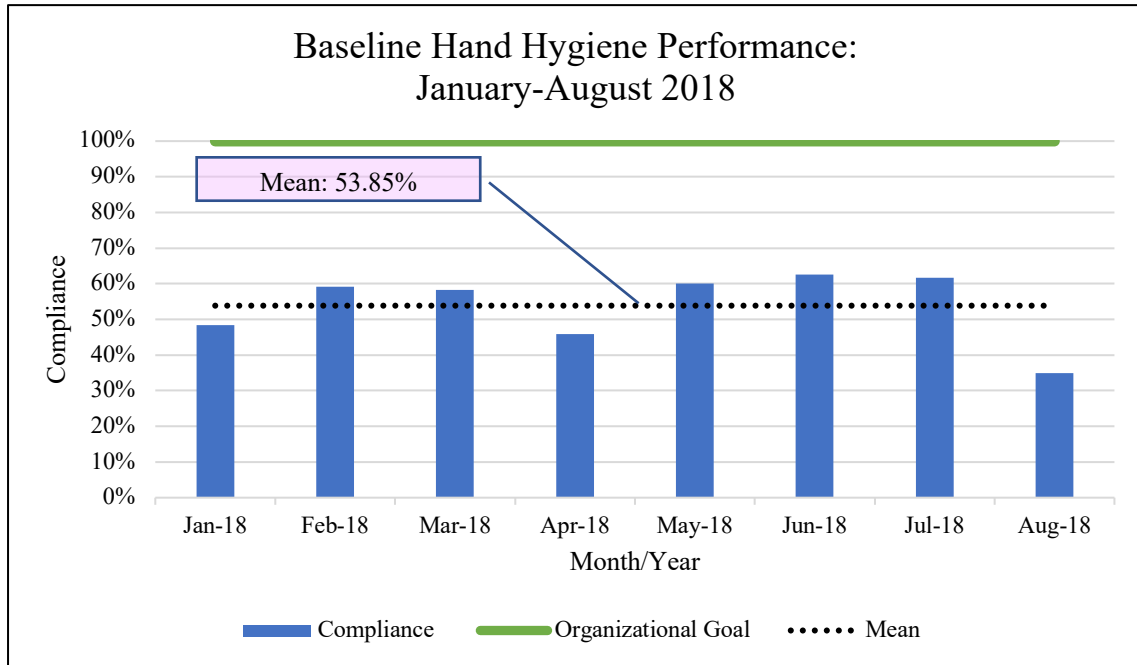


Figure 19. Baseline hand hygiene compliance

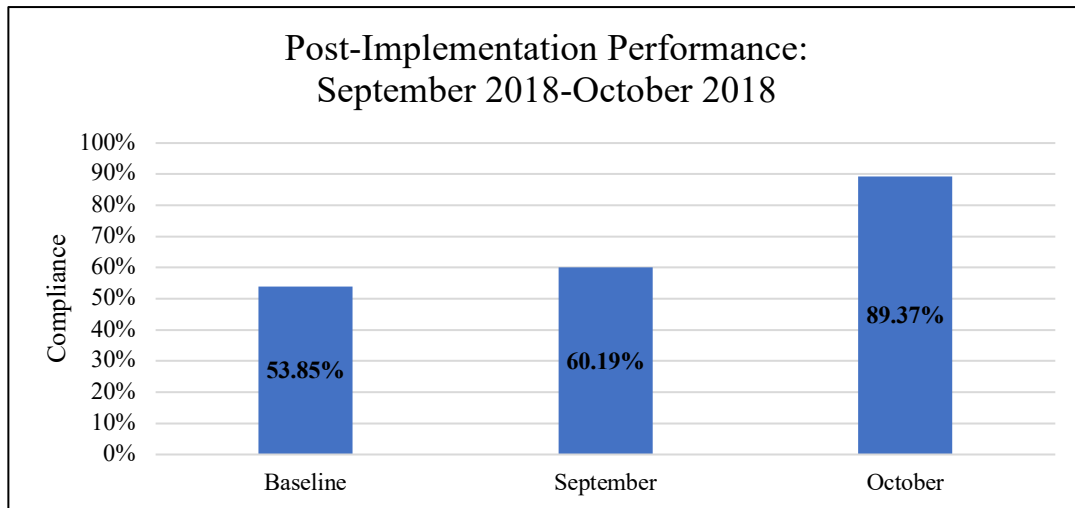


Figure 20. Post-implementation performance

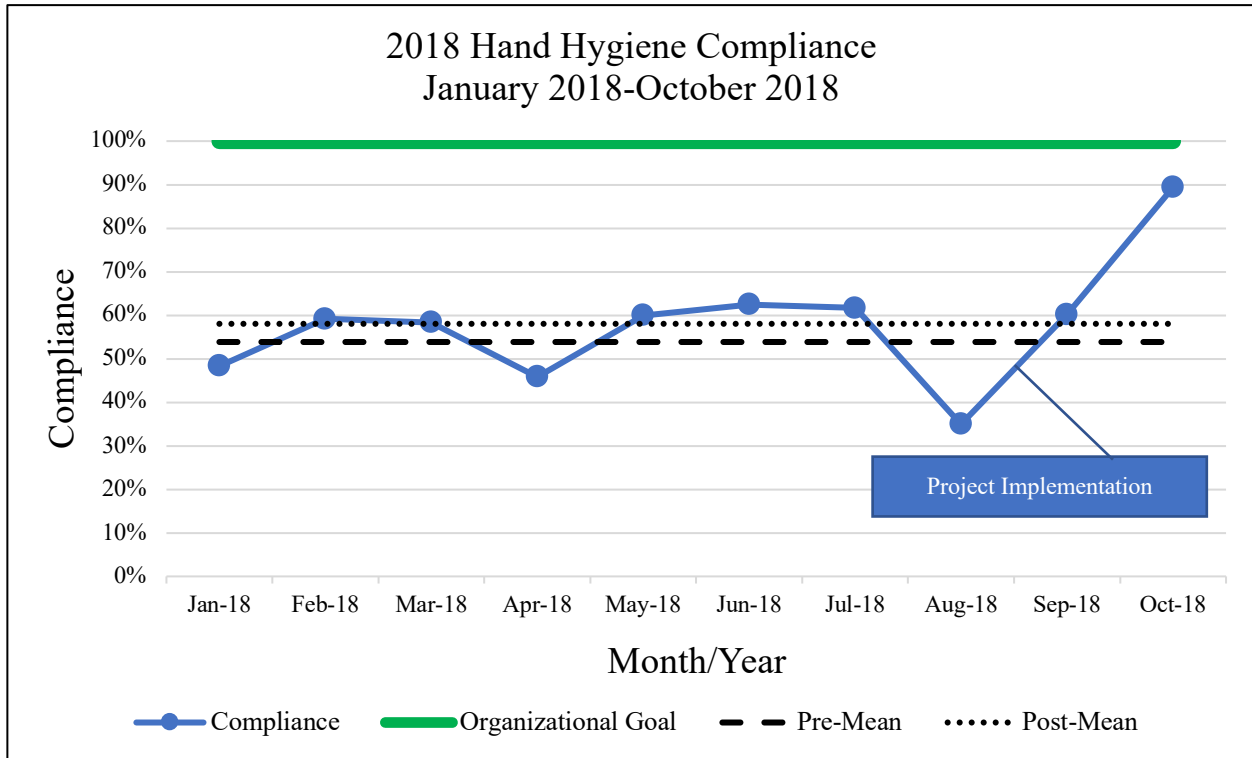


Figure 21. Overall hand hygiene performance year to date via run chart

Hand Hygiene Product Use

The purchase history of 8 oz. bottles of hand sanitizer for the rural CAH indicates there were a total of 46 bottles ordered between September and October 2018 (33 and 13 bottles, respectively). The purchase history of wall unit foam refills indicates a total of 22 cases were ordered between September 2018 and October 2018 (11 each month) (see Figure 21). According to retrospective data, this is fewer product than was ordered last year at this time, with 73 bottles of 8 oz. hand sanitizer and 36 cases of wall unit foam refills purchased between September 2017 and October 2017 (see Table 4).

As mentioned previously, hand hygiene product consumption provides complimentary information on hand hygiene practices (Haubitz et al., 2016). The order history for hand hygiene products provide a glimpse of hand hygiene product consumption and hand hygiene compliance at the rural CAH. Interestingly, at the same time last year, more hand hygiene products were

ordered and hand hygiene compliance was also higher. Although this could be due to a variety of reasons, it is congruent with the Haubitz et al. (2016) study that found hand hygiene compliance rates correlated with handrub product consumption. Further research is recommended to explore this correlation at the rural CAH.

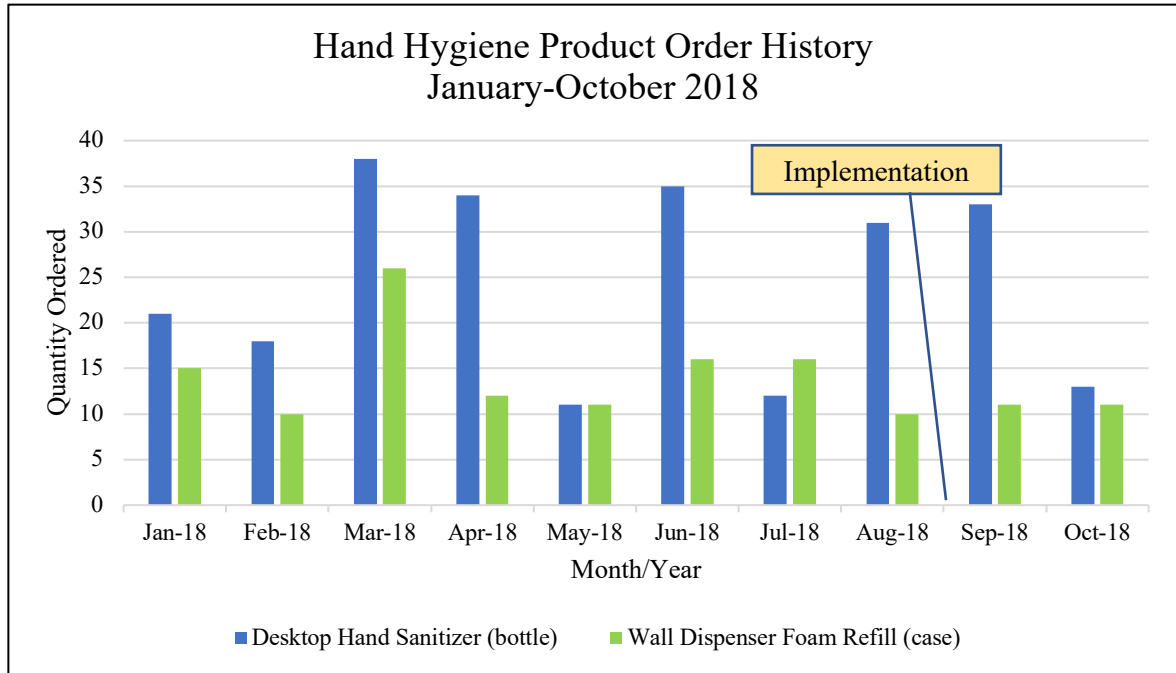


Figure 21. 2018 Hand hygiene product order history

Table 4

	January-October 2017	January-October 2018	Total
Hand Sanitizer Foam Refill	181	138	319
Hand Sanitizer 8 oz. Bottle	295	246	541
Total	476	384	860

Table 4. 2017-2018 Hand hygiene product order history

Discussion

Hand hygiene is one of the single most effective practice for preventing and reducing the transmission of HAIs (APIC, 2015). The purpose of this DNP scholarly project was to formally design, implement and evaluate a multimodal hand hygiene intervention to improve compliance with hand hygiene practices at a rural CAH. There were four objectives set for this project, including 1) the identification of the current knowledge and perception of hand hygiene and HAI transmission among healthcare professionals of the CAH, 2) identification of the facilitators and barriers to hand hygiene practices at the CAH, 3) modification of the current hand hygiene data collection process to reflect a more accurate representation of hand hygiene practices at the organization, and lastly 4) implementation of practice changes to improve hand hygiene compliance throughout the organization. In addition to these objectives, three predictions were made by the DNP student: 1) There will be an increase in hand hygiene compliance at the organization, 2) The new data collection process would provide a more accurate representation of hand hygiene compliance at the CAH, and 3) Organizational HAI rates will remain unchanged due to the short timeframe of the DNP project. All three of these predictions were correct.

The results of this project indicate an improvement in hand hygiene compliance at the rural CAH as a result of this intervention. This finding aligns with results from other hand hygiene initiatives consisting of similar intervention components that found improvements in hand hygiene compliance (Gould et al., 2017; Kingston et al., 2016; Luangasanatip et al., 2015; Alshehar et al., 2018; Rodriguez et al., 2015; Doronina et al., 2017; Schweizer et al., 2013; Stewardson et al., 2016; Neo et al., 2016).

Following implementation of this project, hand hygiene compliance increased by 35.52% from baseline. This boost in compliance increased the mean hand hygiene compliance of the organization by 4.18%, resulting in a mean overall compliance of 58.03%. Although overall

compliance is still below the organizational goal of 100%, there are signs of improvement during the months of September through October 2018. Therefore, the objective set by the DNP student to implement practice changes to improve hand hygiene compliance was met for the short term.

In addition to the knowledge gained from the pre- and post-implementation surveys, informal rounding with frontline staff members provided valuable information regarding barriers to hand hygiene practices at the CAH. For example, one staff member stated that the foam hand hygiene that the organization currently uses in the wall dispensers causes irritation to her hands. This is congruent with other studies that have identified skin irritation as a common barrier to hand hygiene practices (Chassin et al., 2015).

The staff member went on to say that as a workaround, staff members carry a hospital-approved gel hand sanitizer in their pockets that is not irritating to their skin, and used this as their method of washing in and washing out. However, this may contribute to the perception of a “missed” hand hygiene opportunity if the leadership team member responsible for observing hand hygiene performance does not know this information. Similarly, on the clinic side of the organization, another staff member reached out to say that the staff prefer to wash their hands with soap and water inside the patient room, which is not observable as they are behind closed doors to maintain patient privacy. This could also lead to incorrect documentation of hand hygiene practices.

The staff of the rural CAH also commented on other common barriers of hand hygiene practices, including being too busy or having their hands full. Therefore, the information gained from informal rounding in addition to the pre- and post-implementation surveys led the DNP student to meet her objective of identifying common facilitators and barriers of hand hygiene practices at the rural CAH. This information is valuable in the continued modification of the hand hygiene program at the rural CAH.

Another objective of this project was to provide a more accurate representation of hand hygiene practices at the organization. According to Chassin et al., (2015), one of the main causes of hand hygiene failure is hand hygiene compliance data is not collected or reported accurately. Prior to this project, there was significant variability in the number of departments that reported hand hygiene compliance at the rural CAH. After discussion with frontline staff and the leadership team, this may have been due to confusion as to who was the responsible party for collecting hand hygiene data.

To overcome this obstacle, reduce confusion, and provide standardization across the organization, the intervention component of accountability from leadership was critical. This designated the department leaders as the responsible party for collecting hand hygiene observations. Prior to this project, the Float Charge group was the primary party responsible for collecting this information. However, increases in patient care needs over the past year placed an increased workload on the Float Charge group, causing them to shift their focus from managerial tasks to patient care. In addition, there were certain departments in the hospital where the Float Charge group rarely (if ever) rounded, such as radiology, the wound center, the operating room, and the clinic, which may have contributed to low reporting from these departments.

Following the establishment of having the leadership team responsible for hand hygiene observations, the number of departments reporting hand hygiene compliance data increased from three to five reporting departments to seven reporting departments. While there are still additional departments that have yet to report, accountability from leadership seems to have provided the framework for a systematic approach for improvement in documentation of hand hygiene practices. Therefore, the objective to modify the current hand hygiene data collection process to reflect a more accurate representation of hand hygiene practices at the organization was met.

The last prediction made by the DNP student was that there would be no change in organizational HAI rates. Prior to the beginning of the project, the rural CAH already had extremely low rates of MRSA and *C. diff* infections. These rates remained unchanged as a result of this project. This is congruent with other hand hygiene studies that have reported no changes in HAIs as a result of multimodal hand hygiene interventions (Gould et al., 2017).

It is difficult to assess whether or not the multimodal hand hygiene project had a sustainable impact on organizational hand hygiene compliance due to the limited timeframe. Time only allowed for hand hygiene data collection for two months, which made it difficult to determine any trends in improvement. However, hand hygiene compliance did improve following the implementation of the project and continues to show signs of improvement. Continued monitoring and data collection will reveal if the changes made will be sustained. There is optimism that hand hygiene compliance among healthcare workers at the rural CAH will continue to improve as time goes on and the project continues to evolve, with hopes that hand hygiene will one day become ingrained in every workers' daily practice.

Limitations

Time constraints were a major limitation for this project. Once the project was implemented, only two months were available to implement and analyze all components of the project. This provided a narrow window of time to determine any trends, if the components of the hand hygiene project were impactful, or if the changes made were sustainable. In fact, two sub-components of the project, computer screensavers and installing hand hygiene dispensers by the employee badge reader stations and employee entrances and exits, are still in the process of being implemented.

Another limitation to this project was the low response rate of the pre- and post-implementation surveys (17.39% and 6.52%, respectively). However, although only two months

was available to collect data, it may have been wiser to administer the post-implementation survey earlier than was done in this project. This may have resulted in a higher response rate and allowed for additional modification of the project components during the implementation period. In addition, due to the anonymous nature of the survey, there was no way to track whether the same participants completed both the pre-implementation and post-implementation surveys, making it difficult to assess if there was a change in knowledge or perception from the pre-implementation survey participants. Lastly, while the QI project took place across the entire organization, it was still a relatively small QI project and was tailored to fit the unique needs of the rural CAH. Consequently, it may be difficult to apply the results from this QI project to a larger organization looking to improve hand hygiene compliance rates.

Conclusion

The primary purpose of this DNP scholarly project was to formally design, implement and evaluate a QI initiative for improving hand hygiene compliance among healthcare workers. A secondary goal of this project was to provide a means for more consistent and accurate hand hygiene data collection at the rural CAH. Several outcomes were achieved as a result of this QI initiative. These outcomes include the development of an organization-wide hand hygiene policy, an increased awareness of hand hygiene practices and its impact on HAI transmission, improvement in hand hygiene compliance across the entire CAH, and higher compliance and consistency in reporting hand hygiene compliance data across all CAH departments. Continued emphasis on hand hygiene practices and the importance of hand hygiene in reducing the spread of HAIs may lead to further improvements in hand hygiene compliance.

Implications for Practice

Hand hygiene is one of the simplest, most effective solutions to help prevent the transmission of HAIs, maximize patient safety, decrease antimicrobial resistance, and promote

optimal healthcare outcomes (APIC, 2015). The development and implementation of a robust hand hygiene program provides a strong foundation for achieving these goals. Evidence supports the use of tailored, multimodal interventions that work together synergistically to improve hand hygiene compliance among healthcare professionals (APIC, 2015; Gould et al., 2017; Kingston et al., 2016; Luangasanatip et al., 2015; Alshehar et al., 2018; Rodriguez et al., 2015; Doronina et al., 2017; Schweizer et al., 2013; Stewardson et al., 2016; Neo et al., 2016).

This DNP scholarly project added to the growing knowledge and literature of effective hand hygiene interventions. Findings from this QI initiative suggest that multimodal hand hygiene interventions including components of education, visual cues, feedback, accountability from leadership, and hand hygiene product placement, have a positive impact on hand hygiene compliance among healthcare professionals. Further exploration on this topic is recommended to assess whether these interventions result in sustained improvement in hand hygiene compliance among healthcare professionals or have an impact on HAI transmission.

Sustainability Plan

Sustainability refers to locking in the progress made by an improvement initiative; spread occurs when best practices and knowledge about successful interventions are actively disseminated to every available care setting (Moran et al., 2017). The success of any program can be attributed to the pride in ownership felt by those implementing and performing the daily tasks (APIC, 2015). Therefore, involving all levels of CAH staff as well as the CAH leadership team will help create sustainable change in hand hygiene practices by creating a clear and common goal for improved hand hygiene practices across the organization. According to APIC (2015), when everyone is directing attention toward a common goal, program success is inevitable.

A good strategy to further involve frontline staff is to develop hand hygiene champions who encourage compliance, act as role models, and educate their peers on proper hand hygiene. The DNP student will work closely with the Director of Quality and Infection Prevention to identify potential hand hygiene champions prior to the end of the Immersion experience. Another strategy to involve staff is to continue to provide feedback on hand hygiene performance. Continued display of hand hygiene compliance data in staff breakrooms and discussion at staff meetings will maintain awareness of hand hygiene practices and provide motivation if compliance begins to drop.

Engagement from the rural CAH leadership team is also essential for sustained improvement, as they are key in providing resources for supporting hand hygiene practices in the organization. In addition, the leadership team understands the impact improving hand hygiene practices has on disease transmission and overall patient outcomes. From the beginning, this project had strong support from several key stakeholders of the CAH, including the CCO and the Director of Quality and Infection Prevention. This support was also maintained throughout the duration of the project. In order to continue moving progress forward, support from these stakeholders and the other members of leadership team will be critical to maintaining an effective hand hygiene program. Continued display and discussion of organizational hand hygiene compliance at safety and quality committee meetings and clinical leadership team meetings is recommended to keep a raised awareness of hand hygiene practices.

Lastly, another key to the sustainability of programs is ease of use (APIC, 2015). Therefore, a hand hygiene content calendar was created by the DNP student to assist in the transition of the program from the student to the Director of Quality and Infection Prevention. This calendar includes timelines and suggestions for changing out visual cues to keep items

fresh, highlights important national recognitions of hand hygiene to increase awareness, and recommendations for timing of hand hygiene education (see Appendix K).

Dissemination Plan

A key component of the DNP project is the dissemination of the project outcomes. There are several plans for dissemination of this scholarly work. First, the DNP student will present an oral defense of the DNP project to the project advisory team and any interested members of the university's scholarly community. Second, the results of this project will be shared with the leadership team and other key stakeholders at the healthcare organization where the project was implemented. Additionally, this project was submitted to the Michigan Health & Hospital Association (MHA) Keystone Center's 2018-2019 Storyboard Improvement Activity for Critical Access Hospitals. Lastly, this work will also be submitted to Grand Valley State University's ScholarWorks. The dissemination of outcomes from this QI initiative will help address the gaps in knowledge and practice related to hand hygiene compliance among healthcare professionals.

Reflections on DNP Essentials & AONE Essentials

In response to the call to re-conceptualize educational programs that prepare today's health professionals, DNP-prepared nurses bring a high level of scientific knowledge and practice expertise to assure quality patient outcomes (American Colleges of Nursing [AACN], 2017). The American Colleges of Nursing (AACN) focus on eight foundational competencies deemed necessary for all graduates of a DNP program, regardless of specialty or functional focus (AACN, 2006). In addition, the American Organization of Nurse Executives (AONE) offer five competencies that detail the skills, knowledge, and abilities that guide the practice of nurse leaders in executive practice (American Organization of Nurse Executives [AONE], 2015).

The design and execution of this DNP scholarly project are reflective of both the AACN *DNP Essentials* and AONE *Nurse Executive Competencies*. Each of these *Essentials* and

Competencies are discussed below with the purpose of highlighting evidence of enactment of each of these essentials and competencies by the DNP student during the course of the DNP scholarly project.

Essential I: Scientific Underpinnings for Practice

As described by the AACN, the first essential requires “the ability to analyze and evaluate knowledge and information from multiple sources and disciplines to improve the provision of healthcare to patients and populations” (AACN, 2006, p. 9). This is also reflective of the AONE competency of leadership, as one of the foundational thinking skills is to “apply critical analysis to organizational issues after a review of the evidence” (AONE, 2015, p. 8). This QI project utilized science-based theories and concepts to assist with organizational analysis, phenomenon of interest, evidence-based initiative, and provided the implementation bases for guiding change.

In addition to investigating the nursing literature, the DNP student explored resources from other disciplines as well, including the behavioral sciences and business literature. This practice is reflective of the AONE competency of leadership, which encourages using resources from other paradigms (AONE, 2015). By doing so, this allowed the DNP student to gain a greater understanding of the climate and culture of the organization and provided insight as to which evidence-based hand hygiene interventions best fit with the needs of the organization. Therefore, *Essential I* and the AONE competency of leadership were fulfilled by the DNP student through conducting an organizational assessment and performing an extensive review and extraction of relevant hand hygiene literature to improve upon the hand hygiene practices and data collection processes at the rural CAH.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

In order for DNP graduates to carry out meaningful change for current and future populations, certain skills are required in order to navigate complex healthcare organizations and systems. *Essential II* prepares the DNP student to “use communication skills to lead quality improvement and patient safety initiatives in health care systems” and “employ principles of business and finance for system-wide practice initiatives to improve the quality of care delivery” (AACN, 2006, p. 11). This *Essential* was enacted on by the student during the project through consistent communication with organizational leaders and staff members to improve hand hygiene practices and processes at the organization. In doing so, the DNP student enacted upon the AONE competency of communication and relationship building. In addition, a budget was designed for the project that not only considered cost effectiveness, but also demonstrated an understanding of the rural CAH’s organizational culture and climate in order to “ensure accountability for quality of health care and patient safety” (AACN, 2006, p. 10). By conducting a SWOT analysis and organizational assessment, developing a project budget inclusive of revenue and expenses, and determining the financial implications improved hand hygiene compliance would have on the organization, the student enacted the AONE competency of business skills.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

According to the *DNP Essentials*, key activities of DNP graduates include “the application of the translation of research into practice and the dissemination and integration of new knowledge” (AACN, 2006, p. 11). *Essential III* was attained by the student through the critical appraisal of existing literature on the phenomenon of hand hygiene compliance in healthcare in order to determine best practice. In addition to applying the knowledge gained from the organizational assessment, the literature review revealed that the best practice was to customize a multimodal intervention to fit the needs of the organization. This is also reflective of

the AONE competency of business skills, as conducting an organizational assessment and SWOT analysis are critical components of strategic planning. Finally, the results of this scholarly project will be disseminated through presentations at the rural CAH and GVSU, publishing in ScholarWorks, and possible future replication of this work by another student or organization. This is reflective of the AONE competency of leadership, as the dissemination of outcomes will help others learn from setbacks and failures as well as successes of the project.

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care

The AACN states, “DNP graduates are distinguished by their abilities to use information systems/technology to support and improve patient care and healthcare systems” (AACN, 2006, p. 12). The DNP student demonstrated skill in *Essential IV* by utilizing the organization’s safety and quality reporting system (SQSS) to extract data and develop reports to assist in the evaluation of the efficacy of the project interventions. Hand hygiene observation data were also entered into SQSS. Utilizing this technology is also reflective of the AONE competency of business skills, as the technology of the data reporting system allows for the tracking of data and identification of trends in hand hygiene compliance. This knowledge can then be used to inform and modify hand hygiene interventions as needed to improve compliance.

Essential V: Health Care Policy for Advocacy in Health Care

Commitment to policy development is central to professional nursing practice (AACN, 2006). Prior to the DNP student’s QI project, the rural CAH lacked an organizational-wide policy. While department-specific hand hygiene policies could be found, they were difficult to locate, were outdated and were not inclusive of the entire organization. The DNP student fulfilled *Essential V* by creating an organization-wide hand hygiene policy that incorporated the most recent evidence-based practices as recommended by the WHO, APIC, and CDC. By doing

so, the DNP student also enacted the AONE competency of knowledge of the health care environment, which states, “written organizational clinical policies and procedures are reviewed and updated in accordance with evidence-based practice (AONE, 2015, p. 6).

Essential VI: Interprofessional Collaboration for Improving Population Health Outcomes

With the intention to achieve the Institute of Medicine’s (IOM) directive for “safe, timely, effective, efficient, equitable, and patient-centered care in a complex environment”, healthcare professionals must function as highly collaborative teams (AACN, 2006, p. 14).

Essential VI highlights the importance and necessity of collaboration among multiple professions in order to achieve optimal health outcomes. The DNP student met *Essential VI* through collaborating and communicating with different professions throughout the organization in order to improve hand hygiene compliance across the entire facility. The DNP student collaborated and communicated with nurses, environmental service technicians, physicians, advanced practice providers, respiratory therapists, medical assistants, administrative professionals, plus many others in the development and implementation of the multimodal hand hygiene intervention to promote practice change at the rural CAH. In the post-implementation survey, feedback was elicited from all staff members of the CAH to assess their opinions on what worked well, what did not work well, and how to improve hand hygiene practices in the future. AONE competencies of communication and relationship building, leadership, and professionalism were all enacted on by the DNP student throughout this process.

Essential VII: Clinical Prevention and Population Health for Improving the Nation’s Health

Essential VII focuses on the DNP graduate’s ability to analyze scientific data in order to “address and improve individual, aggregate, and population health” (AACN, 2006, p. 15). This *Essential*, as well as AONE competencies of knowledge of the healthcare environment,

professionalism, and leadership, were met by the DNP student by providing a population lens in which to view the burden of HAI transmission as a result of inadequate hand hygiene practices. In addition, the project focused on the positive impact hand hygiene has not only on the rural CAH but on the overall healthcare system as well, including better patient outcomes, healthier communities, and reduced healthcare costs. Lastly, the DNP student capitalized on opportunities to promote good hand hygiene practices throughout the organization, served as a role model for hand hygiene practices, and provided education to CAH staff and the members of the community at several educational events.

Essential VIII: Advanced Nursing Practice

DNP graduates have the ability to conduct comprehensive and systematic assessments in complex situations; design, implement, and evaluate interventions; develop and sustain relationships to facilitate optimal care; demonstrate advanced levels of systems thinking and accountability; and guide others through complex health and situational transitions (AACN, 2006). With this in mind, each of the five AONE competencies of knowledge of the healthcare environment, communication and relationship building, professionalism, leadership, and business skills are inclusive of this Essential.

The DNP student fulfilled *Essential VIII* and each of the five AONE competencies were fulfilled throughout the duration of the project. Gaining an understanding of the organization prior to the project was critical in the development and implementation of the intervention components, as they needed to be reflective and inclusive of the culture, climate, and history of the rural CAH in order to be sustainable. The DNP student also evaluated the project to determine any change in hand hygiene practices as a result of the multimodal interventions and elicited feedback from the rural CAH staff for improvements and modifications. Lastly, the DNP

student also served as an educational and expert resource for rural CAH staff and leadership team throughout the duration of the project to help them navigate through the new processes.

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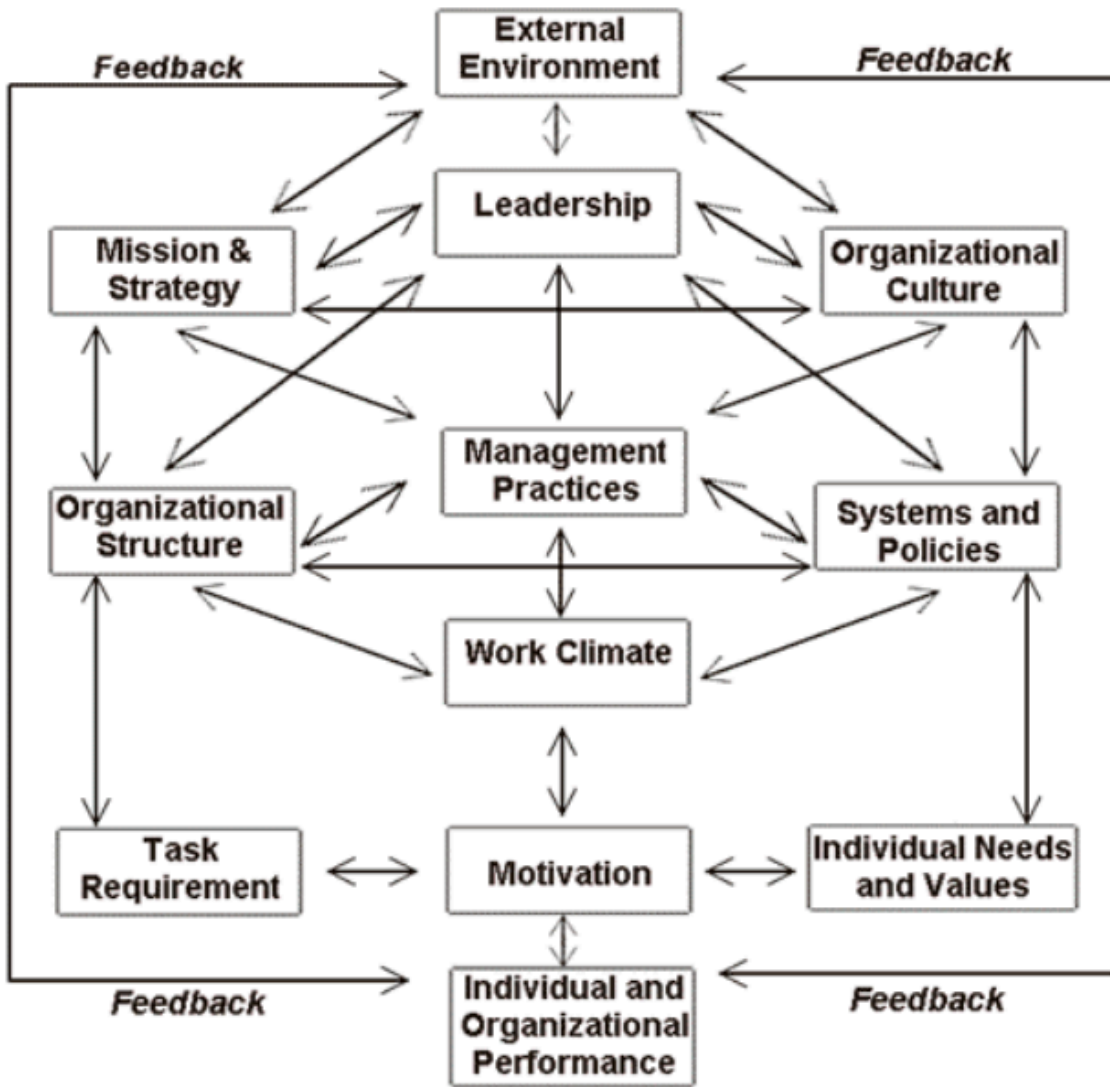
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Appendix A

The Burke Litwin Model



A model of organizational performance and change. Adapted from “A Causal Model of Organizational Performance and Change,” by W. W. Burke and G. H. Litwin, 1992, *Journal of Management*, 18, p. 528. Copyright by Southern Management Association. Used with permission.

Appendix B

IRB Determination Letter



DATE: June 01, 2018

TO: Jean Barry
 FROM: HRRC
 STUDY TITLE: Implementation of a Multimodal Hand Hygiene Intervention at a Rural Critical Access Hospital
 REFERENCE #: 18-291-H
 SUBMISSION TYPE: HRRC Research Determination Submission

ACTION: Not Research
 EFFECTIVE DATE: June 01, 2018
 REVIEW TYPE: Administrative Review

Thank you for your submission of materials for your planned scholarly activity. It has been determined that this project does not meet the definition of research* according to current federal regulations. The project, therefore, does not require further review and approval by the Human Research Review Committee (HRRC).

A summary of the reviewed project and determination is as follows:

The purpose of this project is to improve and sustain hand hygiene compliance among healthcare professionals at Allegan General Hospital through the implementation of a multimodal hand hygiene intervention. The study is systematic, but is not generalizable since this project is only being carried out to improve processes at a single location. It is not designed to contribute to generalizable knowledge.

An archived record of this determination form can be found in IRBManager from the Dashboard by clicking the "_ xForms" link under the "My Documents & Forms" menu.

If you have any questions, please contact the Office of Research Compliance and Integrity at (616) 331-3197 or rci@gvsu.edu. Please include your study title and study number in all correspondence with our office.

Sincerely,
 Office of Research Compliance and Integrity

*Research is a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge (45 CFR 46.102 (d)).

Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains: data through intervention or interaction with the individual, or identifiable private information (45 CFR 46.102 (f)).

Scholarly activities that are not covered under the Code of Federal Regulations should not be described or referred to as *research* in materials to participants, sponsors or in dissemination of findings.

Appendix C

CAH Letter of Agreement



Allegan General Hospital

555 Linn Street · Allegan, MI 49010

T · (269) 673 8424

ag Hosp.org

Allegan General Hospital
555 Linn Street
Allegan, MI 49010

May 10, 2018

RE: Permission to Conduct a DNP Scholarly Project at Allegan General Hospital

To Whom It May Concern,

Amy Hopp is a Doctor of Nursing Practice (DNP) student at Grand Valley State University. As part of her studies, she will be conducting a scholarly project at Allegan General Hospital. I am familiar with Ms. Hopp's proposal for a multimodal hand hygiene quality improvement (QI) project, which will begin March 2018 and continue to December 2018. The title of the project is "Implementation of a Multimodal Hand Hygiene Intervention at a Rural Critical Access Hospital". I understand Allegan General Hospital's involvement with this project will be to 1) Be the healthcare facility where this project will occur, and 2) To provide de-identified hand hygiene-related data to assist with this project. This QI project will be based on the World Health Organization's "5 Moments for Hand Hygiene" and will assess current hand hygiene practices at our facility as well as identify gaps between evidence-based practice and current practice at our facility. The goals of the proposed project will be to improve and sustain compliance with hand hygiene practices among all healthcare professionals and to reduce the transmission of hospital acquired infections (HAIs).

I understand this QI project will be carried out following sound ethical principles and that participant involvement is strictly voluntary and provides confidentiality for any generated data. Therefore, as a representative of the critical access hospital, I agree that Amy Hopp may continue her QI project work at our facility.

Sincerely,

A handwritten signature in cursive script that reads "Kathy Chapman".

Kathy Chapman DNP, RN
Chief Clinical Officer
Allegan General Hospital

Appendix D

SWOT Analysis of Rural CAH

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • Independent organization • Small structure and size • Low HAI rates • Strong support from leadership • New nurse educator • Presence of an infection prevention coordinator • Staff pride in providing the best care for their patients 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Overall low compliance with hand hygiene practices • Low staff morale and high anxiety related to recent change • Increased time demands on staff • Small structure and size • Lack of an organization-wide hand hygiene policy
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • Transition to PBRHC status • CMS focus on hand hygiene practices • Improve health and safety of patients and the community • Presence of a DNP student 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Competition from other healthcare organizations in the area • Pause in CMS billing during transition to PBRHC status • Funding • Time demands from staff • Lack of engagement from all members of the CAH

Appendix E

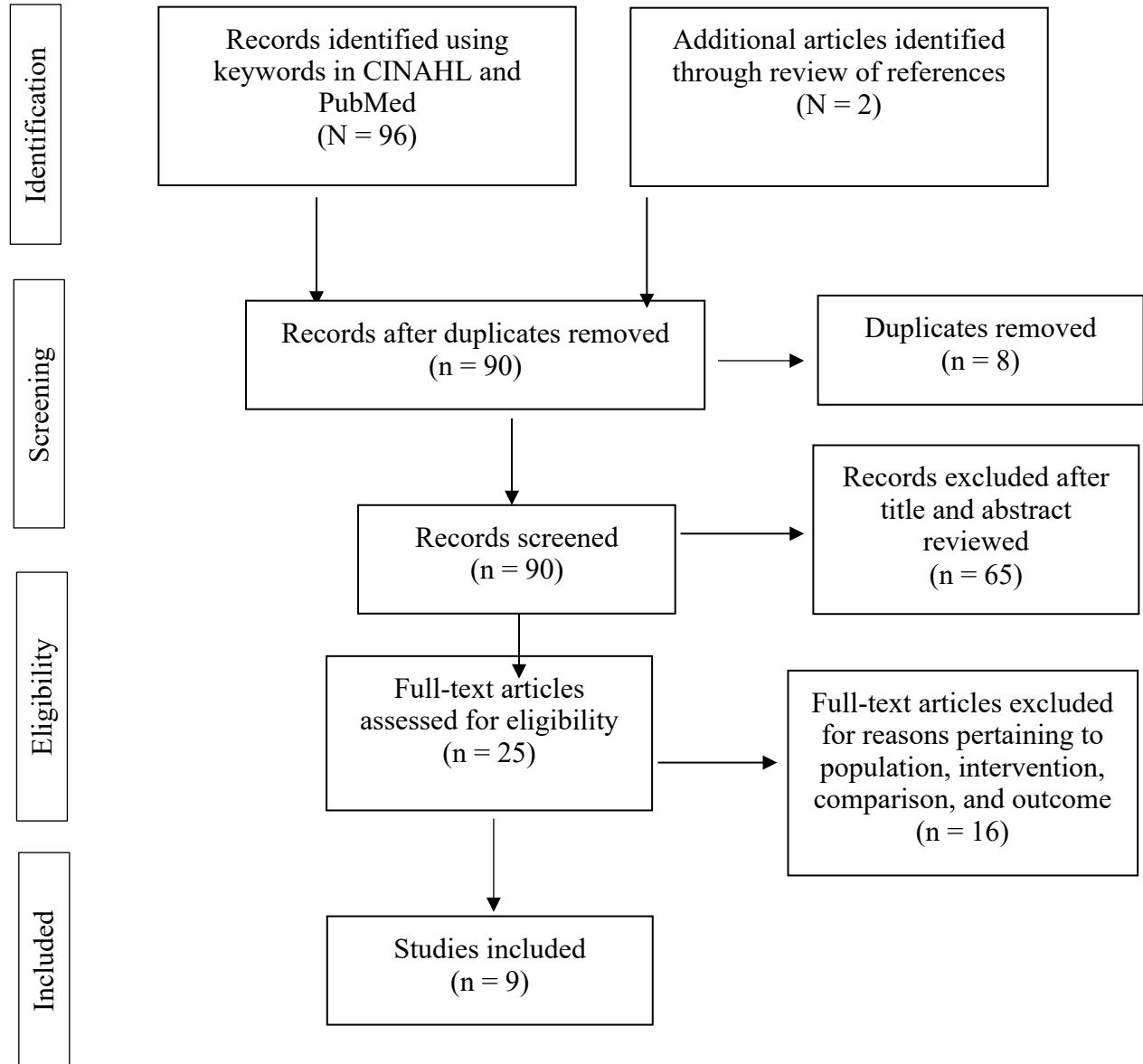
Evidence Hierarchy

Type of Evidence	Level of Evidence	Description
Systematic Review or Meta-Analysis	I	A synthesis of evidence from all relevant randomized controlled trials.
Randomized Controlled Trial	II	An experiment in which subjects are randomized to a treatment group or control group
Controlled Trial without Randomization	III	An experiment in which subjects are non-randomly assigned to a treatment group or control group
Case-Control or Cohort Study	IV	Case Control Study: A comparison of subjects with a condition (case) with those who don't have the condition (control) to determine characteristics that might predict the condition. Cohort Study: An observation of a group(s) (cohort(s)) to determine the development of an outcome(s) such as a disease
Systematic Review of Qualitative or Descriptive Studies	V	A synthesis of evidence from qualitative or descriptive studies to answer a clinical question.
Qualitative or Descriptive Study	VI	Qualitative Study: Gathers data on human behavior to understand why and how decisions are made. Descriptive Study: Provides background information on the what, where, and when of a topic of interest.
Expert Opinion or Consensus	VII	Authoritative opinion of expert committee.

Hierarchy of evidence for intervention studies. Adapted from "Evidence-based practice step by step: Critical appraisal of the evidence: Part I, by E. Fineout-Overholt, B. M. Melnyk, S. B. Stillwell, and K. M. Williamson. Copyright Wolters Kluwer Health. Used with permission.

Appendix F

PRISMA Flow Diagram



Flow diagram of search selection process. Adapted from “Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement,” by D. Moher, A., Liberati, J. Tetzlaff, D. Altman, and PRISMA Group. Copyright 2009 by PLoS Medicine. Used with permission.

Appendix G

Table of Evidence

Author (Year)	Purpose	Design & Evidence Level	Inclusion Criteria	Intervention vs Comparison	Results	Conclusion
Gould et al. (2017)	<p>1. Assess the short-and long-term success of strategies to improve hand hygiene compliance</p> <p>2. Determine whether an increase in hand hygiene compliance can reduce rates of HAIs</p>	<p>Design: Systematic Review (N=26)</p> <p>RCT (n = 14), non-RCT (n = 2), ITS (n = 10)</p> <p>Level: I</p>	<p>Timeframe November 2009 - October 2016</p> <p>Types of studies RCT, non-RCT, CBAs, ITS analyses</p> <p>Participants/Population Nurses, doctors, and other healthcare workers in any hospital, nursing home, long-term care facility or community healthcare setting in any country</p>	<p>- Any intervention to improve compliance with hand hygiene using soap and alcohol-based hand rub, or both;</p> <p>- Varied by study</p>	Multimodal strategies may slightly improve hand hygiene compliance and slightly reduce infection rates.	A variety of single intervention strategies and combinations of strategies (many based on WHO recommendations) led to increased hand hygiene compliance. The certainty of evidence varied from very low to moderate. It remains unclear which strategy/combination of strategies are most effective.
Doronina et al. (2016)	Identify effective interventions that improve hand hygiene compliance among nurses	<p>Design: Systematic Review (N=6)</p> <p>RCT (n = 3), CBA (n = 1), ITS (n = 2)</p> <p>Level: I</p>	<p>Types of studies RCT, CBA, and ITS</p> <p>Types of participants Registered Nurses (RNs), advanced practice (APP) and licensed practical nurses (LPN), nursing assistants (NA), and patient care attendants (PCA).</p>	Varied by study	Multimodal, single, or dual hand hygiene interventions are effective to some extent among nurses	Evidence showed sustainable and greater improvements with multimodal strategies in addition to goal setting, reward incentives, and accountability.

			<p>Types of Interventions Any strategy targeting promotion of hand washing in the hospital setting, including single component and multimodal programs (e.g. education, system change, feedback, workplace reminders, and strategies to improve institutional safety climate, infection control, or universal precautions) were included</p>			
Luangasanatip et al. (2015)	Evaluate the efficacy of the WHO-5 and other interventions to promote hand hygiene among healthcare workers in hospital settings	<p>Design Systematic Review & Meta-analysis (N=41)</p> <p>RCT (n =6), ITS (n = 32), Non-RCT (n =1), CBA (n=2)</p> <p>Level: I</p>	<p>Inclusion Criteria Evaluated 1 or more interventions intended to improve hand hygiene compliance among healthcare workers in a hospital setting; hand hygiene compliance measured with pre-specified indications or used proxies linked to compliance; studies were either RCTs, non-RCT, CBA, or ITS</p> <p>Exclusion Criteria Studies not reported in peer reviewed publications or not</p>	Varied by study	<p>Addition of goal setting to WHO-5 associated with improved compliance (pOR 1.35, 95% CI 1.04 to 1.76; I2=81%).</p> <p>Meta-analysis: WHO-5 is effective. Reported clinical outcomes consistent with clinically</p>	WHO-5 is effective at increasing hand hygiene compliance in healthcare workers. Addition of goal setting, reward incentives, and accountability strategies can lead to further improvements.

			written in the English language		important reductions in infection rates for some hospital pathogens.	
Kingston et al. (2016)	Report the outcomes of published peer-reviewed studies focusing on hand hygiene compliance among healthcare professionals	Design: Systematic Review (N=16) Level: I	Settings Acute, non-acute, long-term care of the elderly and primary care in developed countries and developing economies Measures Hand hygiene compliance measured either by direct observation or electric counters Language Published in the English Language Timeframe 2009-2014	Varied by Study	25% of the studies had positive outcomes after adoption of WHO-5	Adopting a multimodal approach to hand hygiene improvement strategies, whether guided by the WHO framework or another tested multimodal framework, has been shown to achieve slight to moderate improvements in hand hygiene compliance
Alshehari et al. (2018)	Identify effective interventions for increasing hand hygiene compliance among healthcare workers in adult ICUs	Design: Systematic Review (N = 14) Level: I	Participants: Any healthcare worker working in adult ICUs Intervention: Any action(s) implemented for the purposes of promoting hand hygiene compliance	Varied by study	Multimodal and single-component interventions resulted in positive outcomes for all but 1 study.	Available data are inadequate to support or refute a single or set of interventions in improving compliance to near 100%

			<p>Comparison: Data collected at baseline prior to interventions</p> <p>Outcomes: Any increase, decrease, or no change in compliance with hand hygiene practiced.</p>		<p>A combo of administrative support, supplies, education and training, reminders, surveillance, and performance feedback raised the compliance ~30%</p> <p>No set of interventions could improve compliance to near 100% level.</p>	<p>A multimodal approach of education, observation, and improved access and supplies proved to be more effective than any single intervention alone</p>
Stewardson et al. (2016)	Assess the effect of enhanced performance feedback and patient participation on hand hygiene compliance	<p>Design Cluster randomized trial (N=67)</p> <p>Level: II</p>	<p>Setting Hospital wards with lucid adult patients</p> <p>Participants Healthcare workers and patients</p>	<p>Interventions Combinations of enhanced performance feedback, systematic feedback, and patient participation</p> <p>Comparison Baseline hand</p>	<p>Mean hand hygiene compliance increased in the control group (OR 1.41, 95% CI 1.21-1.63), the enhanced performance feedback group (1.61, 1.41-1.84), and in the</p>	<p>Compliance improved in all study groups</p>

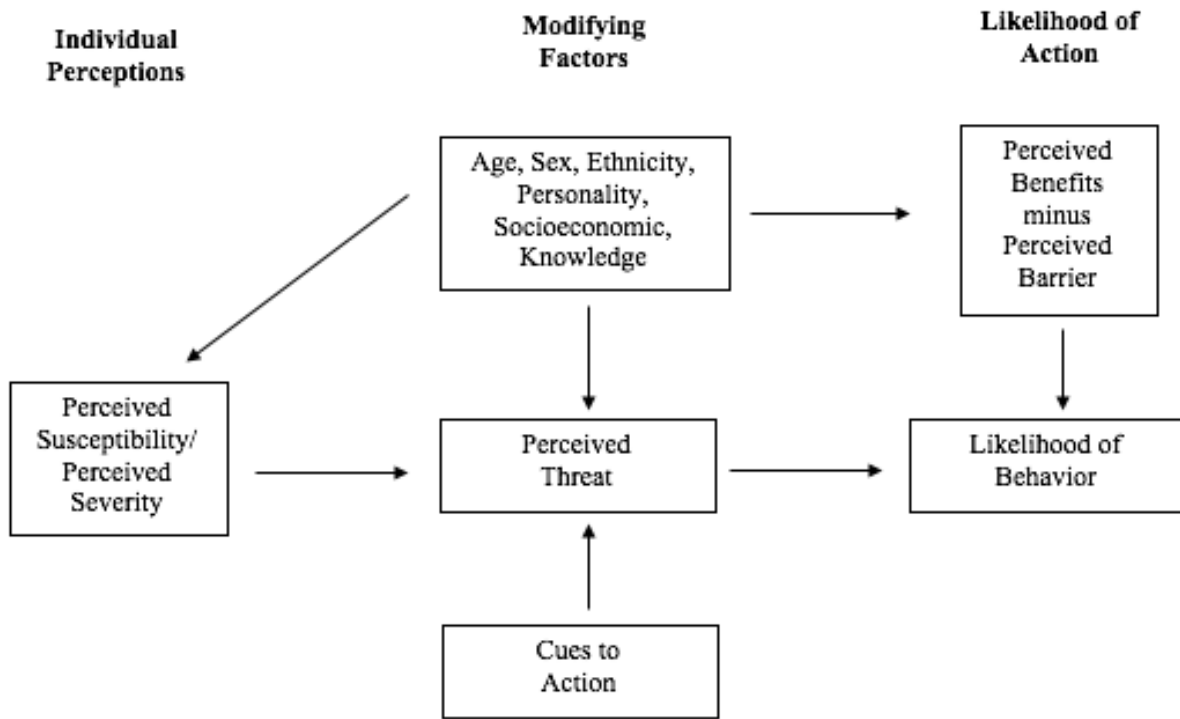
				<p>hygiene compliance data</p>	<p>enhanced performance feedback plus patient participation group (OR 1·73, 95% CI 1·51-1·98).</p> <p>Post-intervention compliance remained higher than baseline in all three groups (OR 1·21 [1·00-1·47]vs1·38 [1·19-1·60]vs1·36 [1·18-1·57])</p>	
<p>Neo et al. (2016)</p>	<p>Provide a comprehensive summary of recently published evidence-based hand hygiene interventions designed to improve hand hygiene compliance</p>	<p>Design Integrative Review (N=73)</p> <p>Level: V</p>	<p>Types of Studies RCTs and non-RCTs with a pre-and post-intervention design with and without a control group published between 2002 and 2015</p>	<p>Varied by study</p>	<p>There are 8 key components to multimodal interventions: replicability, sustainability, education, monitoring systems, visual reminders, interdisciplina</p>	<p>Future research is needed to replicate successful hygiene in other healthcare environments develop reliable hand hygiene compliance monitoring tools, understand caregiver-patient-family interactions, examine ways to sustain compliance,</p>

					ry policies, organization-specific hand hygiene needs, strong leadership and commitment	and use simulated lab environments to refine study designs
Rodriguez et al. (2015)	Estimate the effect of a multimodal intervention on improving healthcare workers' hand hygiene compliance in ICUs	Design: Stepped wedge RCT (N=705) Level: II	Inclusion Criteria - ICUs with programs designed to monitor and prevent HAIs at different levels of progress - hospital >100 beds - HAI program conducted by at least 1 infection control practitioner belonging to the Association of Nurses for Infection Control	Intervention Multimodal (leadership commitment , surveillance of hand hygiene materials, reminders, storyboard of the project, and feedback) Comparison Practice as usual	Compliance improved from 63.8% to 75.2% (p<0.01)	Multimodal intervention was effective to improve hand hygiene in healthcare workers from ICUs with moderate compliance to the practice.
Schweizer et al. (2014)	1. Systematically review all studies on interventions to improve hand hygiene compliance to evaluate existing bundles	Meta-Analysis (N=45) Systematic Reviews (n=6) Quasi-experiment	Inclusion Criteria - Interventions to improve healthcare practitioner hand hygiene in a healthcare setting - Includes a control group - Includes numerator and denominator data on	Varied by study	Bundles of education, reminders, feedback, administrative support, and access to ABHR associated with improved	Bundles associated increased compliance: Bundle 1: Education, reminders, feedback, administrative support, access to ABHR

	<p>2. Identify areas of promise to target high-quality studies.</p>	<p>al studies (n= 39) Level: I</p>	<p>changes in hand hygiene compliance</p>		<p>compliance (pOR, 1.82, CI 95%, 1.69-1.97) Bundles of education, reminders, & feedback associated with improved compliance (pOR, 1.47; 95% CI, 1.12-1.94)</p>	<p>Bundle 2: Education, reminders, and feedback</p>
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Appendix H

The Health Belief Model



The Health Belief Model. Adapted from “The health belief model, by Hayden, J. (2009). In J. Hayden (Ed.), *Introduction to health behavior theory* Copyright Jones and Barlett Publishers.

Appendix I

The Model for Improvement



Plan Do Study Act Model. Langley, G. J., Moen, R. D., Nolan, K. M., Nolan, T. W., Norman, C. L., & Provost, L. P. (2009). *The improvement guide: A practical approach to enhancing organizational performance*, 2nd edition, San Francisco, CA: Jossey-Bass. Used with permission.

Appendix J

Description of Project Components

INTERVENTION COMPONENT	ACTION
VISUAL CUES/REMINDERS	<ul style="list-style-type: none"> • Posters printed from CDC and placed throughout facility • “Wash In”/”Wash Out” magnets placed on the doorframes of patient care rooms throughout facility • Hand Hygiene screensavers on all workstations (<i>in progress</i>)
EDUCATION	<ul style="list-style-type: none"> • Hand hygiene perception surveys to all staff members of the CAH (pre- and post-implementation) • Hand Hygiene poster presentation at employee annual skills fair (October 2018)
FEEDBACK	<ul style="list-style-type: none"> • Hand hygiene surveillance data displayed monthly in each department staff break rooms (overall organization performance)
LEADERSHIP COMMITMENT & ACCOUNTABILITY	<ul style="list-style-type: none"> • Hand hygiene messaging at all meetings • “Commitment to Patient Safety/Hand Hygiene” pledge to be signed by all staff members of the CAH and hung in the main lobby of the facility • Department leaders responsible for collecting 5 hand hygiene observations each week
PRODUCT PLACEMENT	<ul style="list-style-type: none"> • ABHR dispensers placed strategically at employee entrances/exits (<i>in progress</i>)

Appendix K

Hand Hygiene Content Calendar

Quarter	Hand Hygiene Poster & Signage Suggestions
1 st (Jan-March)	Display APIC Hand Hygiene Materials *Hand Hygiene on Nursing Educator's topic calendar for March 2019
2 nd (April-June)	Display WHO "Save Lives: Clean Your Hands" Materials *World Hand Hygiene Day is in May *Display HAI data in staff breakrooms *Change computer screensavers to promote hand hygiene
3 rd (July-September)	Display CDC Clean Hands Count Campaign Materials
4 th (October-November)	Display WHO "My 5 Moments for Hand Hygiene" *International Infection Prevention Week is in October *Display HAI data in staff breakrooms *Change computer screensavers to promote hand hygiene computer *Reinforce hand hygiene education at annual Skills Fair

Appendix L

Organizational Hand Hygiene Policy



POLICY TITLE: Hand Hygiene
SCOPE: Organization Wide

POLICY: The purpose of this policy is to provide guidelines for the removal of debris and transient microorganisms from the hands of all healthcare workers and others to prevent the spread of infection and promote safety throughout all aspects of patient care provided at Allegan General Hospital (AGH) and Allegan Professional Health Service (APHS). Following the lead of the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO), the Infection Prevention Department recognizes that effective hand hygiene is the single most effective way to prevent the spread of infection.

DEFINITIONS:

1. *Alcohol-based hand rub:* An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands.
2. *Aseptic procedure:* Requires the use of various barriers to prevent the transfer of microorganisms from health care personnel and the environment to the patient during a procedure.
3. *Decontaminate:* To reduce bacterial counts on hands by performing antiseptic hand rub or antiseptic hand wash.
4. *Hand hygiene:* A general term that applies to hand washing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis.
5. *Handwashing:* Washing hands with plain soap and water.
6. *Plain (non-antimicrobial) soap:* Refers to soaps that do not contain antimicrobial agents.
7. *Visibly soiled hands:* Hands showing visible dirt or that are visibly contaminated with proteinaceous material, blood, or other body fluids.

PROCEDURE:**A. Responsibility for Appropriate Hand Hygiene**

1. All employees that provide contact with patients and public exposure will adhere to these standards as established by the Infection Prevention Department.
2. Some departments may have more restrictive policies than others. In these cases, departments may create their own Standard of Work that complies with this policy. In areas where departmental Standard of Work are more stringent than those outlined in this policy, the departmental Standard of Work will apply.
3. In order to achieve a high standard of patient care, all staff is encouraged to model hand hygiene practice to peers and leaders in a supportive manner. This includes, but is not limited to, the use of silent handwashing signals when non-compliance is witnessed.



POLICY TITLE: Hand Hygiene
SCOPE: Organization Wide

4. Staff should encourage patients to perform hand hygiene and provide instruction and education on correct hand hygiene technique. Patients should be provided the means to perform hand hygiene.
5. Family and visitors should be encouraged to perform routine hand hygiene and use accessible hand hygiene products.
6. Hand hygiene products should be stored in convenient locations at the point of use. Hand hygiene products that have a low irritancy potential and compatible hand lotions and/or creams will be provided by AGH and APHS.
7. Staff members have a responsibility to inform managers or the appropriate person of relevant areas when hand hygiene products are not immediately accessible, when they need to be refilled, or when they need to be restocked.

B. Basic Principles for Hand Hygiene

The following principles apply to all settings where care may be provided. While this is not an inclusive list, hand washing should be performed:

1. Before starting and leaving your shift.
2. Before entering a patient room and prior to start of care as applicable.
3. Before performing an aseptic procedure.
4. After contact with a patient.
5. Before leaving the patient care area.
6. After handling or touching blood or any other bodily fluid.
7. After touching objects or surfaces in care areas that could be contaminated.
8. Before donning and after proper removal of sterile or non-sterile gloves and other personal protective equipment (PPE).
9. When moving from a contaminated body site to a clean body site when performing patient care.
10. Before and after eating and drinking.
11. After using the restroom.
12. After sneezing or coughing into hands.
13. After handling contaminated material or waste.

C. Technique

1. Alcohol-Based Hand Sanitizer

- a. If hands are not visibly soiled, use of an alcohol-based hand sanitizer rub is acceptable for routine decontamination:
 - i. Dispense product on to hands.
 - ii. Rub briskly on all surfaces of the hands and fingers until dry.
 - iii. Do not rinse or remove product with a towel.

Page 2 of 4

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POLICY TITLE: Hand Hygiene
SCOPE: Organization Wide

2. Washing hands with soap and water

a. Wash hands with soap and water in the following situations:

- i. When hands are visibly dirty.
- ii. After known or suspected exposure to *Clostridium difficile* (*C-diff*).
- iii. Before leaving a special contact isolation room (e.g. *C-diff*).
- iv. Before and after eating and after using the restroom.

b. Technique:

- i. Wet hands first with water, apply the amount of product recommended by the manufacturer to your hands, and rub hands vigorously for **at least 20** seconds, covering all surfaces of the hands and fingers.
- ii. Rinse your hands with water, keeping hands tilted downwards during procedure so that water will run down the sink.
- iii. Use disposable towel(s) to dry hands, and use towel(s) to turn off faucet.

D. Skin and Nail Care

1. Skin Care

- a. Lotions and creams can prevent and decrease skin dryness that occurs from proper hand hygiene.
- b. Avoid using hot water to prevent drying of skin.
- c. Use only AGH and APHS approved lotion to prevent skin dryness associated with hand hygiene, as these products will not interfere with hand sanitizing products.

2. Nail Care

- a. Chipped nail polish is not acceptable. Gel nail polish removable by nail polish remover is acceptable; however, artificial nails are not permissible in patient care areas as this poses an infection prevention risk.
- b. Nails should be neatly trimmed, clean, and of appropriate length for job duties. Employees in direct patient care areas should maintain nail length no longer than ¼ inch.



POLICY TITLE: Hand Hygiene
SCOPE: Organization Wide

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APPROVAL DATE	CHANGED BY	REVISION DESCRIPTION
	Amy Hogg	

Appendix M

Pre- and Post-Implementation Survey

This questionnaire should take you about 10 minutes to complete. Each question has only one answer. Your answers are anonymous and will be kept confidential.

1. Gender

Male Female

2. Age Group

18-25 26-35 36-45 46-55 56+

3. Occupation

Registered Nurse Nursing Assistant Medical Assistant

Physician Advanced Practice Provider

Respiratory Therapy Administration Other

4. Have you received formal training in hand hygiene in the last three years?

Yes No

5. Do you routinely use an alcohol-based hand rub for hand hygiene?

Yes No

6. In your opinion, what is the average percentage of hospitalized patients who will develop a healthcare associated infection (between 0 and 100%)?

_____ % I don't know

7. In general, what is the impact of a healthcare-associated infection on a patient's clinical outcome? (1 = Very Low; 5 = Very High)

1 2 3 4 5

8. What is the effectiveness of hand hygiene in preventing healthcare associated infections? (1 = Very Low; 5 = Very High)

1 2 3 4 5

9. Among all patient safety issues, how important is hand hygiene at your institution? (1 = Very Low Priority; 5 = Very High Priority)

1 2 3 4 5

10. On average, in what percentage of situations requiring hand hygiene do healthcare workers in your hospital actually perform hand hygiene, either by alcohol-based hand rub or washing hands with soap & water (between 0 and 100%)?

_____ % I don't know

11. In your opinion, how effective would the following actions be to improve hand hygiene permanently in your institution? (1=Not effective; 5 = Very Effective)

a. Leaders and senior managers at your institution support and openly promote hand hygiene

1 2 3 4 5

b. The healthcare facility makes alcohol-based hand rub always available at each point of care.

1 2 3 4 5

c. Hand hygiene posters are displayed at point of care as reminders

1 2 3 4 5

d. Each healthcare worker receives education on hand hygiene

1 2 3 4 5

e. Clear and simple instructions for hand hygiene are made visible for every healthcare worker

1 2 3 4 5

f. Healthcare workers regularly receive feedback on their hand hygiene performance

1 2 3 4 5

g. You always perform hand hygiene as recommended (being a good example for your colleagues)

1 2 3 4 5

h. Patients are invited to remind healthcare workers to perform hand hygiene

1 2 3 4 5

12. What importance does the head of your department attach to the fact that you perform optimal hand hygiene? (1 = No Importance; 5 = Very High Importance)

1 2 3 4 5

13. What importance do your colleagues attach to the fact that you perform optimal hand hygiene? (1 = No Importance; 5 = Very High Importance)

1 2 3 4 5

14. What importance do patients attach to the fact that you perform optimal hand hygiene? (1 = No Importance; 5 = Very High Importance)

1 2 3 4 5

15. How do you consider the effort required by you to perform good hand hygiene when caring for patients? (1 = No Effort; 5 = A Tremendous Effort)

1 2 3 4 5

16. On average, in what percentage of situations requiring hand hygiene do you actually perform hand hygiene, either by alcohol-based hand rub or washing hands with soap & water (between 0 and 100%)?

_____ %

Appendix N

Additional Post-Implementation Survey Questions

Part II

1. Has the use of an alcohol-based hand rub made hand hygiene easier to practice in your daily work? (1 = not at all; 5 = Very Important)

1 2 3 4 5

2. Is the use of alcohol-based hand rubs well tolerated by your hands?
(1 = Not at all; 5 = Very Well)

1 2 3 4 5

3. Did knowing the results of hand hygiene observation on your unit help you and your colleagues to improve your hand hygiene practices? (1 = Not at all; 5 = Very Much)

1 2 3 4 5

4. Has the fact of being observed made you pay more attention to your hand hygiene practice? (1 = Not at All; 5 = Very Much)

1 2 3 4 5

5. Were the educational activities you participated at the Skills Fair important to improve your hand hygiene practices? (1 = Not at All; 5 = Very Important)

1 2 3 4 5

6. Do you consider that the administrators in your institution are supporting hand hygiene improvement? (1 = Not at All; 5 = Very Much)

1 2 3 4 5

7. Has your awareness of your role in preventing healthcare-associated infection by improving your hand hygiene practices increased during the current hand hygiene promotional campaign? (1 = Not at All; 5 = Very Much)

1 2 3 4 5

Appendix O

Budget

Doctor of Nursing Practice Project Financial Operating Plan	
Multimodal Hand Hygiene Intervention at a Rural CAH	
Revenue	
Project Manager Time (in-kind donation)	10,666.00
Team Member Time:	
CCO (site mentor)	2,133.00
Director of Quality & Infection Prevention	750.00
Consultations	0.00
Clinical Leadership Team	130.00
TOTAL INCOME	13,679.00
Expenses	
Project Manager Time (in-kind donation)	10,666.00
Team Member Time:	
CCO (site mentor)	2,133.00
Director of Quality & Infection Prevention	750.00
Consultations	
Hospital Staff (Time Spent Completing Questionnaires)	400.00
CAH Clinical Leadership Team	130.00
Survey Monkey online software (annually)	384.00
Cost of print/copy/fax	89.00
Cost of hand sanitizer (2 months)	
8 oz. Bottles (Desktop)	97.28
Foam Refills (Wall Units)	774.84
Miscellaneous: Awareness Magnets (one time cost)	244.00
Miscellaneous: Accountability Signature Photo, Frame, and Pens (x2) (one time cost)	79.00
Miscellaneous: GlitterBug GlitterBuddy Kit with Fold-up Disclosure Center	94.00
TOTAL EXPENSES	15,841.12
Operating Income	(2,162.12)