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Improving Hand Hygiene in a Rural Critical Access Hospital

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Author Note

There are no conflicts of interest to disclose. There has been no financial gain from any part of this quality improvement project.

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Dedication

I dedicate this work to my family. I wish them to always have caring and dedicated nurses who will advocate for their wellbeing. I also dedicate this work to nurses everywhere, who work tirelessly, seek greater knowledge, and never stop caring. My career in nursing has never stopped giving back to me, and for that, I am thankful.

Abstract

Hand hygiene adherence is the single most important infection control practice among healthcare workers in United States hospitals. Hand hygiene is cost effective and adherence to protocols can reduce hospital acquired infections and employee illness. While hand hygiene adherence has been shown through research to improve patient safety and reduce hospital acquired infections, adherence to hand hygiene protocols among healthcare workers is poor and improvement efforts lack sustainability. A potential barrier to performing hand hygiene includes failure of healthcare workers to realize they are carrying microbes on their hands and what proper hand hygiene is, whether using soap and water hand hygiene or an alcohol based hand sanitizer. Healthcare workers may have low adherence because hand hygiene stations are not available, they believe they do not have time, or they have a lack of concern due to insufficient knowledge. Greater awareness and knowledge are needed across the United States. The quality improvement (QI) project implemented multiple methods to increase hand hygiene adherence at a rural critical access hospital over a period of three months and monitored post implementation to evaluate sustainability.

Keywords: hand washing, compliance, adherence, rural, critical access

Improving Hand Hygiene in a Critical Access Hospital

Hand hygiene (HH) is an essential infection prevention activity (McFee, 2009). This practice was recognized by Ignaz Semmelweis, a physician in Vienna during the nineteenth century when he hypothesized that the lack of HH was causing what was then known as childbirth fever resulting in maternal death. Dr. Semmelweis may have initiated the first mandatory HH program when he required hand washing by medical students and physicians when he was assistant chief of obstetrics at Krankenhaus teaching hospital (Kadar et al., 2018). The spread of microorganisms through poor HH continues to cause hospital acquired infections (HAI) (Centers for Disease Control and Prevention [CDC], 2020). .

Hospitals and health care organizations suffer too. A hospital's reputation can be compromised when patient outcomes are poor. Patients who suffer a HAI are less likely to report a satisfactory hospital stay, which can affect a hospital's reputation as well as reimbursement. According to the CDC in 2011, central line associated blood stream infections (CLABSI) result in thousands of deaths and cost billions of dollars each year in the United States (U.S). The avoidable costs for HAIs in the U.S. are estimated to range between $142 million and $4.25 billion dollars annually (Schmier et al., 2016). Globally there are approximately 1.4 million cases of HAI on any given day (Edwards, 2012). One of every four patients who develop a CLABSI dies and the typical cost of a CLABSI is approximately $45,000.00 (Zimlichman et al., 2013). According to CDC data HAIs are the most common cause of an adverse hospital event lengthening hospital stays and causing more than 99,000 deaths annually in the U.S. With the onset of the pandemic caused by the new virus; SARS-CoV-2, commonly referred to as COVID-19, hospitals are looking more closely at infection prevention including HH (CDC, 2020).

Background

The advent of the COVID-19 pandemic caused healthcare organizations to take a close look at safety practices. Although recommendations for personal protective equipment use, inpatient hospital visiting, as well as other foci during the pandemic, HH has been a constant and unchanging recommendation. Semmelweis recognized the value of HH almost 200 years ago (Biddle, 2009). Over forty years ago in U.S. hospitals handwashing was recommended to improve patient safety and reduce HAIs (Vermeil et al., 2019). With the focus on HH over the years and now with a global pandemic, one may assume that all healthcare workers (HCWs) practice regular recommended hand hygiene. However, adherence to HH protocols and policies remains a struggle in healthcare organizations (CDC, 2019).

Burcher et al., (2015) recognized that emergency care providers working in pre-hospital environments such as patient's homes, public areas or at traffic accidents have increased risks of spreading infections. These emergency care providers come into contact with multiple patients throughout the day compounding the risks. Once the patient is within in the emergency room or hospital, HCWs HH practices are poor and result in further transmission of infection and disease. In critically ill patients where registered nurses are the primary healthcare providers of care, poor HH places the patients at increased risk of sepsis and HAI (Fox et al, 2015). In fact, HCWs perform HH approximately half the time when presented with a hand hygiene opportunity (HHO) (CDC, 2019). Zhou et al (2020) detail resulting recommendations found in their study on factors influencing HH among HCWs. Recommendations from this study include how HCWs are observed and assured that the observed practice of HH met all the criteria such as number of seconds cleansing the hands. Observations that were less than 15 seconds were considered non-compliant. Zhou's team determined they would measure the number of adherent hand hygiene

opportunities that follow the CDC HH guidelines divided by the number of hand hygiene opportunities presented. For this quality improvement project the term used for empowering staff to determine to practice HH is adherence, those who practice HH are practicing adherence to good infection prevention. Compliance could indicate that staff are merely complying with what they have been told as a directive, rather than determining for themselves that HH is an evidenced based practice to reduce hospital acquired infections.

The following similar abbreviations are used frequently throughout this paper are summarized here for clarity:

- HH: hand hygiene
- HCW: health care worker
- HHO: hand hygiene opportunity
- HAI: hospital acquired infection
- CAH: critical access hospital
- IP: infection preventionist

Problem Statement

At a rural critical access hospital (CAH) in North Carolina, HH adherence does not meet established quality standards. Hand hygiene is measured daily on both shifts by trained observers. This data is sent regularly to the Infection Preventionist (IP) who compiles the data into a monthly report. The best HH adherence rates occurred in 2020 at the beginning of the COVID-19 global pandemic. In March 2020, HH adherence rates across acute care departments in the hospital were greater than 90%. Since that time there has been a steady decline in adherence to HH protocol across all departments. The parent organization of this hospital

publishes a monthly Quality Report; in August 2020 this report documented 67% adherence with HH protocols in the emergency department (ED), and 80% adherence with HH on the acute medical-surgical unit.

This project asks the following clinical question: What is the impact of a hand hygiene quality improvement effort on healthcare workers' hand hygiene adherence rates in a rural critical access hospital comparing pre-intervention and post-intervention data over a three-month monitoring period? The population is defined as HCWs in the acute areas of the hospital, two units, the ED and the Acute Medical-Surgical Unit, the expected improvement is HH adherence at or greater than 90%, the comparison will the pre-intervention data and the post-intervention data results. The expected outcome is sustained improvement within the three-month monitoring period after the implementation of interventions.

Review of the Literature

The World Health Organization (WHO) first launched the World Alliance for Patient Safety in 2004 with a campaign of clean care is safe care (WHO, 2004). A prominent feature in this campaign was promoting HH (Vermeil et al, 2019). Biddle (2009), in an update on the conditions of nurse anesthetists' workstations, recognized a connection between nurse anesthetists' work areas, including surface areas, and infection rates of patients. Kinston et al., (2016) conducted a systematic review of published articles that focused on hand hygiene. The review included studies conducted in the U.S. and Europe in various clinical settings using multimodal interventions to promote adherence to HH policies. The studies observed the behavior of HCWs when presented with a HHO and whether they elected to engage in HH practices.

The CDC has looked closely at HCWs barriers to HH practices. Barriers include inconvenient or lack of available HH products or stations, a lack of time to perform HH or concern over disease transmission, and the HCW may have skin irritation from frequent HH or the products used. The lack of knowledge regarding the healthcare organization's protocols and policies and the belief that wearing gloves prevents disease transmission are other barriers noted (Pittet, 2001; Marra & Edmond, 2014). Gomez (2018) suggested the focus should change from promoting HH to one of stopping disease transmission, presenting the view that a change in the message may have a greater impact on HCWs.

There are many reasons HCWs skip hand hygiene. Individual beliefs and behaviors are influenced by education and attitudes within the healthcare setting. There must be minimal effort to perform HH and few barriers to practice for an increase in adherence to HH protocols and policies. The awareness of the importance of HH must be present and training in the appropriate methods, location of products and HH stations and skin protection methods is necessary (Alemagno et al., 2010).

Knowledge about when and how to perform HH is available to HCWs (O'Boyle et al., 2001). The WHO (2009) presented a multimodal plan for improving HH, entitled; "*Your 5 Moments for Hand Hygiene"* that lists the moments a HCW should wash their hands. In addition, programs have been designed to increase HH awareness through online learning programs and other methods of training (Alemagno, 2010). De Wandel et al., (2010) reviewed the behaviors that determined when intensive care unit (ICU) nurses were more likely to perform HH. Sadule-Rios & Aguilera (2017) found key barriers to HH were increased workload, reduced staff and lack of time. Achieving HH adherence to protocols and policies continues to be a key challenge

in healthcare organizations (Boyce, 2019). The quality improvement project focuses on evidence-based methods to improve HH adherence rates in a rural CAH.

Theoretical Framework of DNP Project

The theoretical framework selected for the project is Donabedian's Quality Framework. This quality improvement framework has three basic components: the setting, or structure of care environment, the processes or delivery method, and the outcomes (McDonald et al., 2007). The project focused on current HH adherence, the gap to goal, how current processes are affecting the adherence rate of HH, whether small tests of change will have an effect, and the sustainability of the change (Donabedian, 2005).

Donabedian's framework looks at how structure and process impact outcomes (Donadebian, 2005). This framework is ideal for this QI project, which started with an initial survey of HCWs to determine if they have the knowledge base to understand the need for HH and if so what is the proper HH. This addresses the structure of training and the process of practice. The knowledge gained from the pre-intervention survey helped guide the subsequent interventions to allow for the best possible outcome.

Goals, Objectives, and Expected Outcomes

The primary goal of this QI project is to increase HH adherence in the hospital's acute care areas and to sustain this improvement over time. Secondary goals include improvement in staff knowledge of the importance of HH, related organizational policies, the current COVID-19 pandemic safety processes, and improved understanding of staff members' perceived barriers to adherence with HH protocols. Pre-intervention surveys were used to measure staff HH practice understanding, identify the perceived barriers and help guide the interventions phase of the

project. A post-intervention survey measured whether the interventions have been successful.

Table 1 details the objectives of the quality improvement project.

Table 1

Objectives

Pre intervention	SWOT analysis of clinical areas, as described in this paper.
Pre intervention	Presentation of the DNP project proposal to the division of the parent company's Nursing Education and Research Council (NERC).
Pre intervention	Review by The University of South Carolina's Institutional Review Board (IRB).
Pre intervention	Pre intervention survey using the World Health Organization's HH practice questionnaire.
Intervention	Applied determined interventions; education, training, presentations during monthly meetings, posting organizational policies and reminders, additional signage placement and purposeful rounding of leaders directly asking about HH product availability and staff reminders of how to obtain hand hygiene and skin products.
Post intervention	A post intervention survey occurred in September 2021, using the same survey tool with the addition of two questions, these questions can be found under the survey section of this document, to determine if there have been changes in staff considerations regarding barriers to HH policy adherence.
Post intervention	Population of interest will have increased adherence to HH policies and protocols, a higher level of safety, and improved knowledge regarding the transmission of COVID-19 and other infections due to lack of HH. Hospital leaders will have a greater understanding of barriers to HH and what is needed to promote hand hygiene adherence.

Expected Outcomes

The expected outcome is a documented sustained HH adherence rate of greater than 90% in acute care areas over three months post interventions. Outcomes are reported monthly through quality metrics and conveyed to hospital leadership and then to staff through Nursing Town Hall presentations and quality boards on individual units. Interventions began in May 2021 after receiving exempt status from The University of South Carolina IRB. Efforts to capture all members of the population were made through rounding, posting flyers, Nursing Town Hall presentations, and online education. Online education was assigned through the Clinical and Professional Development department in collaboration with the DNP student. The measurement period for the success of interventions was three months, ending on August 31, 2021. A post-intervention survey was performed in September 2021. Sustainable results will continue to be measured through the end of 2021 for the project's purpose.

Project Design

Project Clinical Site

The project was conducted at a rural CAH in North Carolina. The hospital is an affiliate of a national healthcare corporation and is in the North Carolina Division. In the clinical setting, alcohol-based hand sanitizer is at the entrance to every patient room and inside the door in both the acute medical-surgical unit and the ED. These hand sanitizer dispensers were placed during an acute care area remodeling in 2017 and 2018. There are soap and water hand washing sinks located throughout both units. In the ED, hand washing sinks are in every room in addition to the alcohol-based hand sanitizer stations. Hand hygiene monitoring is done by trained observers who report findings to the hospital’s infection prevention staff for analysis.

Hand hygiene products

The clinical site uses soap and water for debris removal at HH stations throughout the hospital's clinical areas and alcohol-based hand sanitizer to reduce microbe transmission at the entrance and exit to each patient room and along the halls and corridors in all clinical areas. Hand sanitizers are also placed outside of offices and key departments such as pharmacy, lab, and therapy services. There are signs on each patient's door reminding those who enter to clean their hands before entering the patient room.

In 2020 the clinical site transitioned to a new vendor for HH products. The decision to change vendors was not related to the COVID-19 pandemic and was made before the pandemic started; the new product allowed for a touchless dispensing of alcohol hand sanitizer in metered doses. The vendor had determined that a certain amount of alcohol hand sanitizer was needed to cover hands sufficiently and had designed a dispenser to deliver this metered dose of product.

Population of Interest

The population of interest is the clinical and non-clinical staff working in acute care areas, which include a 7-bed ED and a 24-bed acute medical-surgical unit. Staff in these areas includes registered nurses, healthcare providers, ancillary staff, housekeeping, dietary, therapy, case management, pharmacy, laboratory staff members, and hospital leaders who round daily on these departments' patients. Staff members range in age from 19 to 68 and 37 are Registered Nurses (RNs). Recruitment, hiring and retention of BSN prepared nurses continue to be a challenge in rural hospitals (Adams, 2016). Table 2 details the number of BSN prepared and specialty certification nurse percentages in each focus department.

Table 2

Nursing Staff educational demographics within the population of interest

Department	Number of RNs	BSN prepared	Specialty Certification
Medical-Surgical Unit	14	4	0
Emergency Department	16	8	3
Administrative supervisors, managers and leaders	6	5	4
Case Manager	1	1	1
Total	37	18	8

There is diverse ethnic makeup including Caucasian, Latino, Indigenous People of America, mixed ethnicities, and European. The project focuses on the acute medical-surgical unit and the ED. Staff in both areas may also work in the outpatient area, cardiac rehab, or in the long-term care facility that adjoins the hospital. It is likely that practice behaviors seen in the two focus units exist when staff float or work in other areas.

Method

This quality improvement project is designed using the Model for Improvement (MFI) developed by the Associates in Process Improvement (apiweb.org, 2020). This model asks three questions:

1. What are we trying to improve?

2. How will we know that a change is an improvement?
3. What change can we make that will result in improvement?

These three questions help guide a project by identifying the aim, measures, and change (IHI, 2009). Process improvement was conducted using Plan-Do-Study-Act (PDSA) test cycles method which aligns with the organization's preferred method for testing changes on a small scale. The PDSA method is a four-step model and one commonly used in quality improvement projects. The planning phase, or first step, includes stating the desired outcomes and predictions. In the second step, the "do" phase, is the plan implementation. Results of the implementation are analyzed in step three known as the "study" phase. Step four is the decision to act based on the analysis of data obtained during the implementation phase. The final step is a decision to adopt, amend, adapt, or abandon the project based on the outcomes of each testing cycle (Christoff, 2018).

Implementation

The pre-implementation and implementation phase for this project began in the first half of 2021. A strength, weakness, opportunity and threats analysis (SWOT) assessed internal and external conditions to determine readiness for implementation. A pre-implementation survey of staff on HH practice knowledge, preferences and barriers using the assistance of clinical education staff assisted in understanding reasons why staff decides not to perform HH. A review and synthesis of the literature helped determine best strategies for implementing a sustainable improvement plan during and post COVID-19 pandemic. Presentations to clinical leaders added to or changed current processes based on PDSA cycles. Education to key stakeholders for the project included HCWs, leadership and patients. With results from the pre-intervention survey and the completion of the strengths, weaknesses,

opportunities, and threats analysis (SWOT), a plan was developed using evidence-based principles to improve HH adherence.

Planned and Executed Interventions

1. Placing the additional signage in the emergency department was completed with signage obtained from infection prevention. This intervention supports the organization's policy.

2. Making the hand hygiene policy available on each unit where education news and unit updates are, allows staff to reference this material as time allows. This intervention supports a secondary goal of the project to improve staff knowledge. CDC literature links a lack of knowledge regarding healthcare organization policies to poor hand hygiene adherence (Pittet, 2001). The policy is in Appendix D.

3. Use of an online training tool provided by clinical education and professional development on hand hygiene and products used at the clinical site. Healthcare worker knowledge on when and how to perform hand hygiene has been identified as a barrier to greater hand hygiene adherence (O'Boyle et al., 2001). The online education tool allowed for a video demonstration and convenient learning and is designed to increase hand hygiene adherence (Alemagno, 2010).

4. Placement of a flyer teaching the five moments for hand hygiene on each targeted unit. The flyer is a model with the organization's logo and presents the WHO's five moments for hand hygiene (WHO, 2009).

5. The hand hygiene flyer and policy were presented at Nursing Town Halls. Verbal presentations reinforcing evidence-based practice were used as a method to promote hand hygiene adherence.

The online education tool was assigned by clinical education and professional development leadership at the clinical site. Clinical education and professional development gave hospital staff through June to complete the online education tool. Clinical education reported 100% completion of the education tool by June 30, 2021.

A post intervention survey was completed in September 2021 to determine the effectiveness of change cycles and education. Table 3 details the implementation timeline of the project.

Table 3

Implementation Timetable

March 2021	• SWOT performed
April 2021	• Project submitted to IRB
May 2021	• Pre intervention survey using WHO questionnaire
May 2021	• Literature review evaluation of potential solutions to identified barriers
May 2021	• Collaboration with Clinical and Professional Development staff and development of strategies to improve HH protocol adherence • Kick-off, with the continued COVID-19 pandemic, focused education on safety and pandemic practices with an emphasis on HH • Reviewed goals for improvement, the continued monitoring of HH and the benefits of proper HH for stakeholders
May through August 2021	• Implementation of interventions • Monitoring for improvement through IP reporting • Provided feedback to stakeholders

	• Use of PDSA cycles to refine implementation and improve gaps, track changes for achievement of goal (HH 90% or greater)
June through August 2021	• Repeat PDSA cycles to improve outcomes
September 2021	• Post intervention survey

The clinical site employs an infection preventionist (IP) who deploys hand hygiene observers who have been trained to use observational techniques to quantify adherence to HH protocols. These trained observers are known to the IP and the Quality Officer. Hand hygiene should be performed before and after patient contact, before donning and after doffing gloves, before an aseptic procedure, and after any contact with body fluids (CDC, 2020). The clinical site is accredited by The Joint Commission (TJC) and has policies that uphold TJC standards. Hand hygiene performed with alcohol hand sanitizer is an acceptable practice except in the care of patients infected with Clostridioides difficile, which requires soap and water HH (Garcia-Houchins, 2019).

Data collection is completed by staff trained by the hospital's IP in observing HHOs and HH practice. These trained staff members maintain their positions and, as an additional duty, observe for HHO and HH. This data collected is mined daily and entered into the facility's HH database by the hospital's IP, a member of the Infection Prevention department in the division. Each HHO is one data point. For example, if a physical therapist (PT) is entering a room to complete a therapy session with a patient, they should stop at the door, use the alcohol hand sanitizer at the entrance to the patient's room; this is one data point. When the therapy session ends and the PT leaves the room, the observer should see the PT stopping at the alcohol hand sanitizing station once again and cleansing their hands; this is another data point. Data is

measured as to the number of observations, the frequency, median, and percentage of HH adherence.

Collected data has been analyzed with the assistance of IntellectusStatistics™ software. Data Files for the pre-intervention and post-intervention surveys were loaded into IntellectusStatistics™ project software for data project management. Project datasets for both surveys were analyzed using descriptive statistics applications. Summary statistics were calculated for each interval and ratio variable. Frequencies and percentages were calculated for each nominal variable.

Data is reported by the organization's informatics department. This department extracts data from the electronic health record (EHR), and allows other departments such as IP and Quality, to enter data. After data has been extracted, this department analyzes and prepares the data and then reports to the various departments, leadership, and councils within the division. The reports include a Microsoft Excel data sheet and formal presentations with dashboards reflecting percentages and gaps in performance or quality. The reports flow from the analytics team to leadership at the individual hospital and the division and are then shared in meetings and posted in individual departments throughout each hospital.

Measurement and Tools

The goal of this quality improvement project was to improve adherence to HH policies, protocols and methods to yield an HH adherence measure of greater than 90% at this rural CAH. The 90% measurement is defined as 90% of all HH opportunities (HHO) that resulted in adherence to established HH protocols. The U.S. Department of Health and Human Services (HRSA) (2011, April) viewed quality improvement from the perspective of the Institute of Medicine (IOM) and noted that how things are done is the system of processes an organization

engages in. To assist organizations in better defining and improving the process, HRSA described four principles needed in quality improvement work, as shown in Table 4.

Table 4

Principles Needed in Quality Improvement

Four Key Principles of Quality Improvement
1. QI work as systems and processes
2. Focus on Patients
3. Focus on being part of the team
4. Focus on use of the data

Current processes used to improve HH adherence are education, both initial during the orientation period and annually, HH trained observers and re-education. The COVID-19 pandemic has brought robust education and focuses on personal protective equipment (PPE) and HH as a means of reducing the spread of the virus among HCWs and patients (Moore, et al., 2021). The process for education and data collection and analysis at the clinical site has remained consistent to the processes prior to the COVID-19 pandemic. For this quality improvement project, measures include pre-implementation and post-implementation surveys, direct observation of HHO and HH adherence.

Surveys

Pre-implementation surveys have been completed by staff with the assistance of clinical and professional development staff. The pre-implementation survey used the WHO HH questionnaire to establish baseline knowledge and perception of HHO and HH practices (WHO,

2009). This survey was taken within a month of implementation to gain as many participants as possible. The results of this survey were used to guide the educational components of the project. The post implementation survey was completed at the end of the monitoring period in September 2021 and included the same questions as the pre-implementation survey with two additional questions. One question that had been added is whether the person taking the survey completed a survey in the past. The second question evaluates the education and methods to increase HH adherence.

Observation

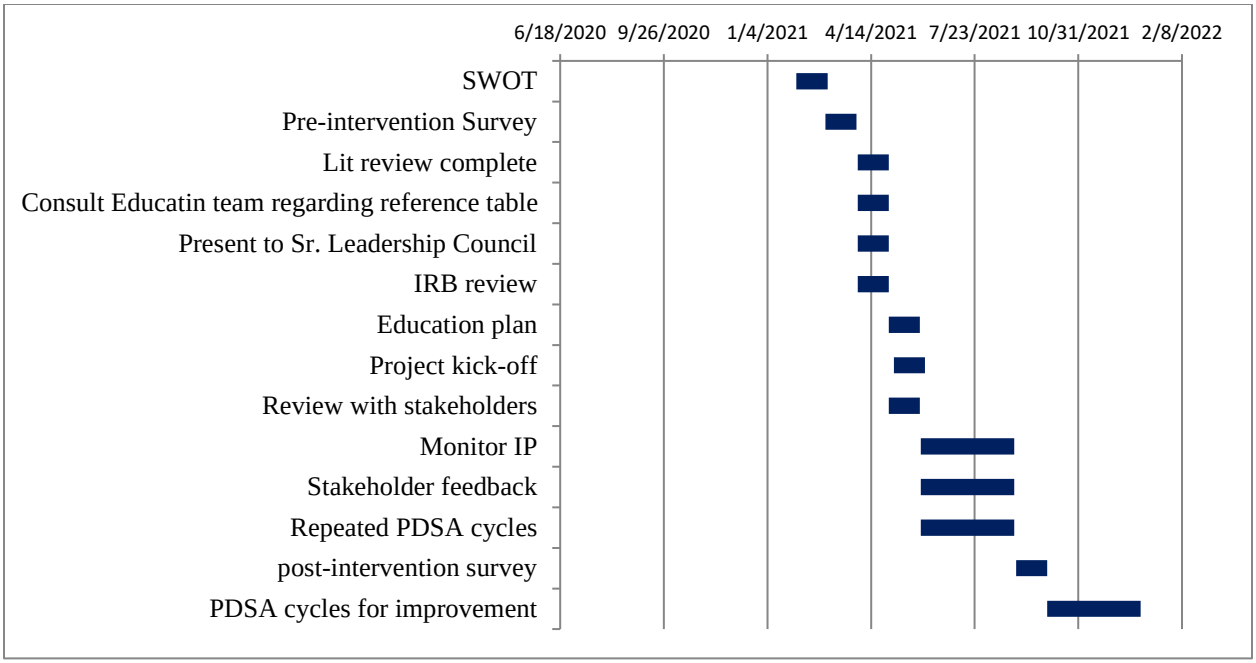
Direct observation is considered the gold standard for the collection of HH data (Kingston, et al, 2016). Direct observation is the process for data collection at the clinical site. Hand hygiene opportunities are considered to be those prior to and post interaction with the patient.

Timeline

The DNP project timeline officially began with the project proposal approval by The University of South Carolina College of Nursing. A Gantt chart with timeline details is provided in figure 1. After the formal DNP project proposal was approved by the College of Nursing, the project plan was submitted electronically to the University's Institutional Review Board (IRB). Time preparing for the project began during the winter of 2020 and spring of 2021 and will conclude in the fall of 2021 with ongoing monitoring of HH adherence.

Figure 1

Timeline/Gantt chart



Budget and Resource Requirements

Resources are the time involved for pre implementation work, surveys, and planning, the clinical and professional development staff's human resources. Costs are incurred for staff survey, education time, materials for HH, education materials, and the project's ongoing sustainability. The largest anticipated resource need for the DNP project is time. The DNP student's time was measured outside of regular work time as time spent directly on the planning, implementation, meeting regarding the project, and the study of results. Time was needed by the DNP student to format and print the WHO survey for use by the clinical and professional development staff for use as the pre implementation survey instrument. A completed review the literature was used along with the pre implementation survey data to determine which interventions to test. It was anticipated that staff education would be required as an intervention employed. The DNP student, preceptor, key stakeholders, IP, and quality officer will invest time in the project directly or indirectly. The quality officer will be able to provide de-identified data on hand hygiene performance and will be able to group the data by job title.

The cost for this project is minimal compared to the costs in time and dollars of even one hospital acquired infection (HAI). According to the CDC (2019) one in 31 hospitalized patients in the U.S. develops an HAI daily. Scott (2009) estimated the annual costs of HAIs in the U.S at approximately $45 billion. The cost of time used by the author was calculated to demonstrate the value of project activities, but does not represent any additional costs to the organization. With the expected outcome of improved HH and lowered risk of HAI, the time investment is justified. Any costs for signs, magnets, stickers or other reminders, if selected as an intervention, will be paid by the clinical site and amount to less than $250.00. These items are on the product availability list through the organizations print shop and can be easily ordered. Items ordered would be billed to the individual cost centers. Table 5 details the operating budget for the project.

Table 5

Budget Details

Project Operating Budget	Amount in dollars using base salary, as hourly amount x the number of hours needed for the project.
DNP Student Project (in-kind donation)	$16,200.00
Consultations with and training by Clinical and Professional Development staff	$1,125.00
IP data collection and reporting	$1,920.00
Reporting and consulting with Quality Officer	$528.00
Miscellaneous: signs, magnets, stickers, & reminders	$250.00
Pre and post implementation surveys (included in student costs)	$0.0
Total Expenses	$20,023.00

Protection of Human Subjects

There is no risk to participants in this quality improvement project. The project was submitted and reviewed by the organization's Nursing Education and Research Council (NERC) to determine its nature and follow its progress as it progressed. NERC determined the project's nature to be a quality improvement project and, as such, would not need to be submitted to the organization's IRB. After successful project defense, the project was submitted to The University of South Carolina's Institutional Review Board and was determined to be exempt. See Appendix A for the IRB letter of exempt status

Results

Pre-intervention and post-intervention surveys were voluntary. Clinical education let staff know surveys were available for those wishing to participate. Participation was voluntary and open to staff members working in either of the acute care areas. Clinical education and professional development made surveys available to hospital staff, providing instructions to place completed surveys in the mailbox for clinical education. Those wishing to participate were able to take a survey from the folder outside the clinical education and professional development office and, once completed, place it in the mailbox. At the end of two weeks, the surveys were collected from the mailbox and reviewed. Of the 45 clinical staff members working in the acute medical-surgical unit and the ED during the pre-intervention survey, 27 surveys were returned for a response rate of 60%.

In the time from the pre-intervention survey to the post-intervention survey, there was staff turnover. The exact number of staff remained the same, with permanent staff replaced with travel staff as new employees were hired and oriented. Travel staff completed post-intervention surveys as all traveling staff completed the same training and education as the permanent staff.

The post-intervention survey was made available during the first whole week in September with the same procedure as the pre-intervention survey. With the same total number of staff members working in each department, totaling 45 staff plus one newly hired RN orienting on the acute medical-surgical unit, 29 post-intervention surveys were returned for review and analysis. With 29 post-intervention surveys completed for a response rate of 64%.

Pre-intervention Survey

Frequencies and percentages were calculated for each nominal variable. Summary statistics were calculated for each interval and ratio variable found in question 2, age.

Frequencies and Percentages

The most frequently observed category of question 1, gender was female (*n* = 19, 70%). The most frequently observed category of question 3, profession was nursing (*n* = 21, 78%). Frequencies and percentages of the categories gender and profession are presented in Table 6.

Table 6

Frequency Table for Nominal Variables gender and profession

Variable	*n*	*%*
Q 1. Gender		
female	19	70.37
male	8	29.63
Q 3. Profession		
nursing	21	77.78
therapy	5	18.52
respiratory therapist	1	3.70

Survey questions 4 through 13 were analyzed for frequencies and percentages—the responses to this group of questions allowed for the identification of barriers and knowledge. The results of questions 4 through 13 are found in table 7.

Table 7

Frequency Table for Pre-Intervention Survey: Questions 4 through 13. N=27

Variable	*n*	*%*
4 Received training in HH in the last 3 years		
Yes	24	88.89
No	3	11.11
5 Use alcohol hand sanitizer?		
Yes	26	96.30
No	1	3.70
6 Are unclean hands a route of cross transmission?		
Yes	24	88.89
No	3	11.11
7 Are unclean surfaces responsible for HAIs?		
Yes	13	48.15
No	14	51.85
8 HH before patient contact prevent germ transmission?		
Yes	26	96.30
No	1	3.70
9 HH after patient contact prevent transmission of germs to the HCW?		
Yes	25	92.59
No	2	7.41
10 Yes/No: Alcohol based sanitizer is more effective than soap and water?		
No	22	81.48
Yes	5	18.52
11 Hand scrub for 20 seconds?		
No	4	14.81
Yes	23	85.19
12 Is alcohol hand sanitizer an acceptable HH after glove removal?		
No	6	22.22
Yes	21	77.78
13 Should artificial nails be avoided?		
Yes	26	96.30
No	1	3.70

Summary Statistics

The observations for question 2 (age) had an average of 39.50 (*SD* = 13.70, SE_M = 2.69, Min = 20.00, Max = 63.00. A total of 27 surveys were received, one survey participant declined to give their age; this is reflected in table 8 with an *n* of 26 for age. Summary statistics on the age of pre-intervention survey participants can be found in Table 8.

Table 8

Summary Statistics Table for Interval and Ratio Variables on ages of staff participating in survey

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
Age	39.50	13.70	26	2.69	20.00	63.00	0.35	-1.22

Hand Hygiene Adherence

Acute Medical-Surgical Unit

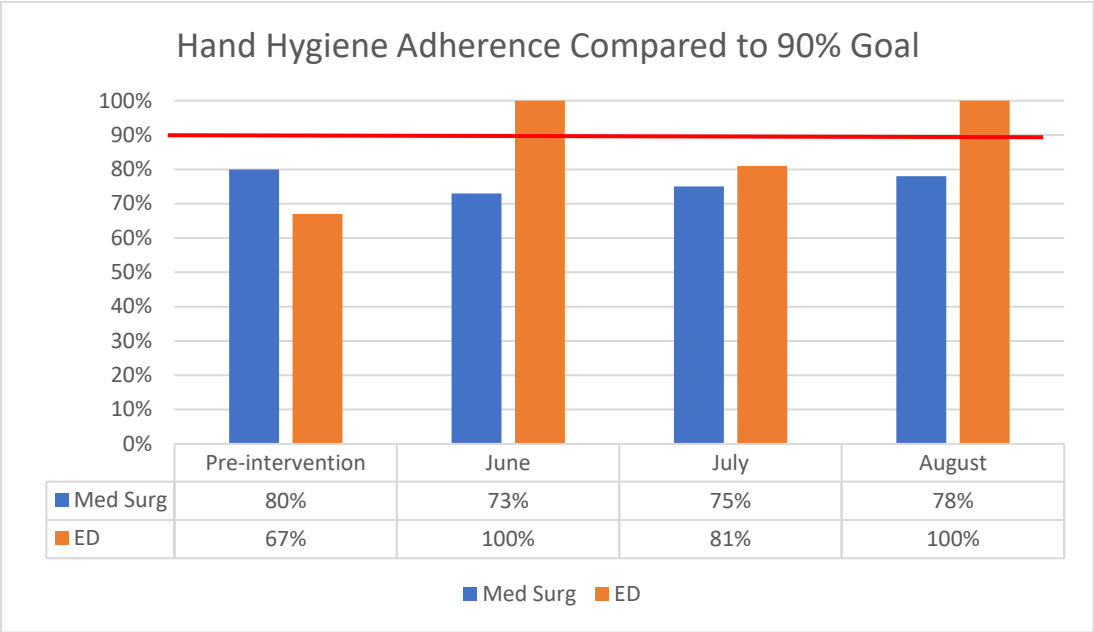
The three-month monitoring period began in June 2021. The baseline data for the acute medical-surgical unit in August 2020 was 80% hand hygiene adherence. During the three-month monitoring period, the adherence rate never met the baseline of 80%. Steady improvement was shown each month, with the highest hand hygiene adherence rate achieved of 78% in August of 2021, well below the goal of 90%.

Emergency Department

The baseline data for the emergency department was 67% hand hygiene adherence in August 2020. The emergency department exceeded goal two of the three months during the monitoring period. During July, the emergency department had a hand hygiene adherence rate of 81%, while not meeting the goal of 90%; this rate is improved over the baseline of 67%. In the other months, June and August, the emergency department had 100% adherence for all observed hand hygiene opportunities. Figure 2 is a bar graph illustrating the hand hygiene adherence of both units.

Figure 2

Hand hygiene adherence across both units



Post-Intervention Survey

A post-intervention survey conducted in September of 2021 included two additional questions asking if the participant had completed a similar survey earlier in the year and if they participated in online education. Did they believe the online education had increased their hand hygiene adherence if they participated in the education?

Additional Questions

A Fisher's exact test was conducted to examine whether Q 1, have you completed a similar survey this year and Q 2, did education in 2021 influence you to increase your HH adherence were independent. There were two levels in Q 1. Have you completed a similar survey

this year: Yes and No. There were two levels in Q 2; if you completed HH education in 2021, did it influence you to increase your HH adherence: Yes and No.

The results of the Fisher's exact test were significant based on an alpha value of 0.05, p = .003, suggesting that staff members who participated in the project as evidenced by taking the pre-intervention survey, were significantly more likely to report that HH education influenced their HH adherence. Table 9 presents the results of Fisher's exact test.

Table 9

Observed and Expected Frequencies

	Have you completed a similar survey this year?			
Did education in 2021 influence you to increase your HH adherence?	Yes	No	OR	*p*
Yes	10[5.83]	3[7.17]	12.77	.003
No	3[7.17]	13[8.83]		

Note. Values formatted as Observed [Expected].

Frequencies and Percentages

The frequency and percentages in questions 1, 3, and 4 through 13 on the post-intervention survey were analyzed using IntellectusStatistics™. The most frequently observed category of question one, Gender, was female (n = 19, 66%). The most frequently observed category of question 3, profession, was a nurse (n = 19, 66%). This finding is consistent with similar findings in the pre-intervention survey. On the post-intervention survey, there was an increase in the diversity of professions that participated. Presented in Table 10 are the frequencies and percentages for the variables gender and profession.

Table 10

Frequency Table for Nominal Variables Gender and Profession

Variable	*n*	*%*
Q 1 Gender		
Female	19	65.52
Male	10	34.48
Q 3 Profession		
Therapist	6	20.69
Technician	3	10.34
Nurse	19	65.52
Provider	1	3.45

Frequency and percentages for questions 4 through 13 statistics are found in table 11.

Table 11

Frequency Table for Post-Intervention Survey: Questions 4 through 13. N=29

Variable	*n*	*%*
4 Received training in HH in the last 3 years?		
Yes	28	96.55
No	1	3.45
5 Use alcohol hand sanitizer?		
Yes	28	96.55
No	1	3.45
6 Are unclean hands a route of cross transmission?		
Yes	26	89.66
No	3	10.34
7 Are unclean surfaces responsible for HAIs?		
Yes	24	82.76
No	5	17.24
8 Does HH before patient contact prevent germ transmission?		
Yes	28	96.55
No	1	3.45
9 Does HH after patient contact prevent transmission of germs to the HCW?		
Yes	28	96.55
No	1	3.45

10 Yes/No: Alcohol based sanitizer is more effective than soap and water?		
No	25	86.21
Yes	4	13.79
11 Hand scrub for 20 seconds?		
Yes	17	58.62
No	12	41.38
12 Is alcohol hand sanitizer an acceptable HH after glove removal?		
Yes	23	79.31
No	6	20.69
13 Should artificial nails should be avoided?		
Yes	29	100.00

Summary Statistics

The observations for question 2 (age) had an average of 42.52 (*SD* = 13.50, SE_M = 2.51, Min = 23.00, Max = 63.00. The average age on the post-intervention survey was higher by 3 years. The summary statistics can be found in Table 12.

Table 12

Summary Statistics Table for Interval and Ratio Variables

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
Q 2. Age	42.52	13.50	29	2.51	23.00	63.00	-0.07	-1.36

Discussion

A SWOT analysis, available in Appendix B, was completed before the pre-intervention survey. The SWOT analysis allowed the author to view the problem and relate the considered interventions to the project's framework. Viewing the setting, structure, and processes are valuable to the project and follow Donabedian's framework (McDonald et al., 2007). In completing the SWOT, an immediate opportunity was identified to add additional signage in the ED, reminding staff to cleanse their hands. The SWOT provided valuable information for the

project's first PDSA cycle, discussing with clinical and professional development staff and consulting with quality staff.

In May 2021, the clinical education and development department assigned an online education tool featuring the new touchless hand sanitizer dispenser. This education tool provides training on hand hygiene that are aligned with the organization's hand hygiene policy and products, CDC recommendations and cites the WHO (2009) plan entitled; "*Your 5 Moments for Hand Hygiene".* The total time involved in this training was approximately 45 minutes and included a post-education exam to assure clinical knowledge regarding hand hygiene. Unfortunately, the touchless dispenser did not increase the adherence to hand hygiene, and the baseline adherence rates support this observation.

In June 2021, during PDSA cycle one; staff completed the assigned online hand hygiene module. The emergency department exceeded the goal for hand hygiene adherence with 100% hand hygiene adherence. For the same month, the acute medical-surgical unit reached 73% hand hygiene adherence. This result for the acute medical-surgical department is less than the baseline hand hygiene adherence of 80%.

In July 2021, a second PDSA cycle was developed to improve the acute medical-surgical unit's hand hygiene adherence and sustain the emergency department's achievement with the first month's outcomes. Clinical leadership included hand hygiene adherence as a topic during daily clinical rounds. The unit leadership reviewed hand hygiene goals during daily clinical huddles on acute care attended by providers, pharmacy staff, case management, nursing leadership, and assigned respiratory and nursing staff. Other PDSA elements included the author reviewing hand hygiene goals, the five moments of hand hygiene, and the organization's policy at Nursing Town Halls. The second PDSA cycle began in July 2021 with all elements initiated. To reinforce the

elements of PDSAs, the author presented hand hygiene evidence-based practice reminders at the August 2021 Nursing Town Hall. In July, hand hygiene adherence on the acute medical-surgical unit improved to 75%, and in the ED dropped to 81%. During July, nursing leadership included hand hygiene reminders during face-to-face staff one-on-one meetings to improve hand hygiene. PDSA cycle two continued through the end of the monitoring period, ending in August 2021. The final month saw the highest hand hygiene adherence for both units. The ED returned to 100% hand hygiene adherence, and the acute medical-surgical unit achieved 78% hand hygiene adherence of observed hand hygiene opportunities.

A post-intervention survey was completed in September 2021 with a higher percentage of participation than the pre-intervention survey, 64% vs. 60%, respectively. The post-intervention average age was higher by three years over the pre-intervention survey. During the post-intervention survey, several travel staff members had joined the acute medical-surgical team as permanent staff had resigned or retired in the time since the pre-intervention survey. Due to the staff turnover, an additional question was added to the survey asking if the survey participant had completed a similar survey during 2021. An additional question was added related to staff's perception, asking if they had participated in education, and had the education improved their adherence to hand hygiene. A Fisher’s exact test was completed on the two additional questions presented to survey participants. This statistical test indicated a higher likelihood of hand hygiene adherence if the survey participant completed the pre-intervention survey, p .003.

During the time of this quality improvement project, the COVID 19 pandemic continued. There were frequent reminders at the clinical site regarding hand hygiene, and the staff was reminded of the risk of SARS-CoV-2 virus transmission which causes COVID 19 disease. The clinical site's surge plan had been activated and resolved several months before the start of the

interventions. Despite the awareness of the danger of transmission of this deadly virus, hand hygiene adherence achieved on the acute medical-surgical unit never obtained the goal of 90%. Pittet et al. (1999) found that lower hand hygiene compliance can occur during times of heavy workload. The IOM (2004) recommended empowering nurses to speak up when quality is in danger. The COVID 19 pandemic has created high workload situations globally (Grimm, 2021). If this project had been completed at another time outside a pandemic, the outcomes could have been different. The pandemic made social interaction and face-to-face discussion and training more complicated; this may have impacted the results.

Limitations

There were several limitations to the project. The project focused on one clinical site instead of multiple sites. Larger sample size may have created different focuses for the second PDSA cycle. Rural critical access hospitals staff often wear many hats and taking part in a voluntary survey may have been more time-consuming than some staff wished to spend. Turnover in staff resulted in a change in participants from the pre-intervention to the post-intervention survey. It is unknown to what extent the change in participants affected the results. Time was a limiting factor. It is possible that with a third PDSA cycle, there may have been a more significant improvement.

This project took place during a global pandemic when everyday processes changed and changed frequently. The COVID-19 pandemic caused frequent changes in visiting hours, workload, and social distancing, causing decreased contact with colleagues. Staff changes caused a break from an ordinary day to work enough that the project's focus may have had a lower impact on the target population.

Conclusion

This quality improvement project was conducted to improve patient and staff safety and health, reducing opportunities for hospital-acquired infections by improving hand hygiene adherence to 90% or greater at the clinical site. The project plan collaborated with the DNP committee and the Quality and Clinical Education departments, who shared the project's goal. During the COVID-19 pandemic, hand hygiene and other infection prevention activities have received much attention (Moore et al., 2020). However, the baseline hand hygiene at the clinical site was well below goal metrics. This project was needed to promote safety and health and was timely due to the COVID 19 pandemic.

Sadule-Rios & Aguilera (2017) completed a study on nurses' perceptions of low hand hygiene adherence and found increased workload, lack of adequate staff, and lack of time to be the primary barriers. Access to sinks and inappropriately placed alcohol hand sanitizer was found to be additional barriers.

Inappropriately placed hand hygiene equipment is not a barrier at the clinical site. During 2017 and 2018, the emergency department and the acute medical-surgical unit underwent renovations. Hand sanitizer dispensers are placed on the outside and immediately on the inside of each room on both units. The alcohol hand sanitizer dispensers are located along hallways throughout the hospital and outside each office, pharmacy, lab, and therapy area. Each room in the emergency department has a hand hygiene sink. At the acute medical-surgical unit nurses' station, there is a hand hygiene area with a sink and on the inside of each soiled utility room.

The online education was informative and was specific to the type of alcohol hand sanitizer at the clinical site. It did not improve hand hygiene adherence in the acute medical-

surgical unit. It did not yield sustained results in the emergency department, as evidenced by the second month of the monitoring period's rate dropping to 81%. With the implementation of the pre-intervention survey, there was an immediate rise in adherence in the emergency department.

A third cycle PDSA would include a proposal to place signs in all patient rooms encouraging patients and their families to ask each person who enters the room if they had cleaned their hands before entering the room. Other considerations to encourage staff hand hygiene would be a poster presentation during the annual nurses' week celebration on developing a practice discipline for hand hygiene.

In the IOM's (2011) report on the future of nursing, experts comment that the nursing profession has the potential capacity to make changes in the practice and delivery of healthcare. Nurses have constant contact with patients and their families, along with the scientific knowledge to provide care. Nursing and other HCWs must decide to incorporate hand hygiene as part of their professional practice. Hand hygiene is an excellent practice discipline to develop.

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Appendix A

UNIVERSITY OF SOUTH CAROLINA

OFFICE OF RESEARCH COMPLIANCE

INSTITUTIONAL REVIEW BOARD FOR HUMAN RESEARCH
DECLARATION of NOT RESEARCH

Katherine Miller RN, MSN
University of South Carolina
College of Nursing
Columbia, SC 29201

Re: **Pro00110403**

Dear Katherine Miller:

This is to certify that research study entitled ***Improving Hand Hygiene in a Rural Critical Access Hospital*** was reviewed on **5/28/2021** by the Office of Research Compliance, which is an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB). The Office of Research Compliance, on behalf of the Institutional Review Board, has determined that the referenced research study is not subject to the Protection of Human Subject Regulations in accordance with the Code of Federal Regulations 45 CFR 46 et. seq.

No further oversight by the USC IRB is required. However, the investigator should inform the Office of Research Compliance prior to making any substantive changes in the research methods, as this may alter the status of the project and require another review.

If you have questions, contact Lisa M. Johnson at lisaj@mailbox.sc.edu or (803) 777-6670.

Sincerely,

Lisa M. Johnson
ORC Assistant Director and IRB Manager

Appendix B

Strengths, Weaknesses, Opportunities, Threats Analysis

Strengths	**Weaknesses**
• Low Staff turnover • Part of larger health enterprise • High patient satisfaction as evidenced by Press Ganey Guardian award • Adequate hand hygiene supplies • Appropriate signage	• Lack of staff awareness of problem • Lack of leadership example • Recent policy upgrade left staff without access to policies for extended period of time • Possible lack of adequate education and follow up on education • Current hand hygiene adherence is less than 90%
Opportunities	**Threats**
• Greater staff awareness through surveys and education • Adding hand hygiene reminders at huddle times during implementation phase • Having staff report when elements of hand hygiene are unavailable	• HAIs • Staff illness and call ins from work • Increased cost for staff coverage • Longer length of stay for patients • Decreased reimbursement

Appendix C

2021 Hand Hygiene Survey for pre intervention for DNP project. Post intervention will add 2 questions; if a survey was completed before and if they completed online education in 2021 do they believe the education influenced them to improve their hand hygiene adherence.

Hand Hygiene Knowledge Questionnaire for Health-Care Workers

Tick **only one answer** to each question.

Please read the questions carefully before answering. Your answers will be kept confidential.

Short Glossary:

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.
Facility: health-care setting where the survey is being carried out (e.g., hospital, ambulatory, long-term facility, etc).
Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).
Handwashing: washing hands with plain or antimicrobial soap and water.
Service: a branch of a hospital staff that provides specified patient care.
Ward: a division, floor, or room of a hospital for a particular category or group of patients (it corresponds to the smallest segmentation of the health-care facility; one service can include multiple wards)**.**

Date: _____

1.Gender: ☐ Female ☐ Male

2. Age: ☐ years

3.**Profession** ☐ Nurse ☐ Auxiliary nurse ☐ APP ☐ Medical doctor

☐ Technician ☐ Therapist ☐ Nurse Student

Note: For the purpose of this survey PCTs should check auxiliary nurse and EVS should check technician. Therapist includes RT, PT, OT and Speech professionals.

4. Did you receive formal training in hand hygiene in the last three years? ☐ Yes ☐ No

5. Do you routinely use an alcohol-based handrub for hand hygiene? ☐ Yes ☐ No

6. Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? (*tick one answer only*)

a. ☐ Health-care workers' hands when not clean

b. ☐ Air circulating in the hospital

c. ☐ Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)

d. ☐ Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

7. What is the most frequent source of germs responsible for health care-associated infections?
(tick one answer only)

a. ☐ The hospital's water system

b. ☐ The hospital air

c. ☐ Germs already present on or within the patient

d. ☐ The hospital environment (surfaces)

8. Which of the following hand hygiene actions prevents transmission of germs *to the patient*?

a.	Before touching a patient	☐ Yes	☐ No
b.	Immediately after a risk of body fluid exposure	☐ Yes	☐ No
c.	After exposure to the immediate surroundings of a patient	☐ Yes	☐ No
d.	Immediately before a clean/aseptic procedure	☐ Yes	☐ No

9.Which of the following hand hygiene actions prevents transmission of germs *to the health-care worker*?

a.	After touching a patient	☐ Yes	☐ No
b.	Immediately after a risk of body fluid exposure	☐ Yes	☐ No
c.	Immediately before a clean/aseptic procedure	☐ Yes	☐ No
d.	After exposure to the immediate surroundings of a patient	☐ Yes	☐ No

10.Which of the following statements on alcohol-based handrub and handwashing with soap and water are true?

a.	Handrubbing is more rapid for hand cleansing than handwashing	☐ True	☐ False
b.	Handrubbing causes skin dryness more than handwashing	☐ True	☐ False
c.	Handrubbing is more effective against germs than handwashing	☐ True	☐ False
d.	Handwashing and handrubbing are recommended to be performed in sequence	☐ True	☐ False

11. What is the minimal time needed for alcohol-based handrub to kill most germs on your hands?
(tick one answer only)

a. ☐ 20 seconds

b. ☐ 3 seconds

c. ☐ 1 minute

d. ☐ 10 seconds

12. Which type of hand hygiene method is required in the following situations?

a.	Before palpation of the abdomen	☐ Rubbing	☐ Washing	☐ None
b.	Before giving an injection	☐ Rubbing	☐ Washing	☐ None
c.	After emptying a bedpan	☐ Rubbing	☐ Washing	☐ None
d.	After removing examination gloves	☐ Rubbing	☐ Washing	☐ None
e.	After making a patient's bed	☐ Rubbing	☐ Washing	☐ None
f.	After visible exposure to blood	☐ Rubbing	☐ Washing	☐ None

13. Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs?

a. Wearing jewellery ☐ Yes ☐ No

b. Damaged skin ☐ Yes ☐ No

c. Artificial fingernails ☐ Yes ☐ No

d. Regular use of a hand cream ☐ Yes ☐ No

Thank you very much for your time!

Appendix D

This document has been de-identified for the organization of origin.

Hand Hygiene Policy

MANUAL: Infection Control: Infection Prevention		POLICY NUMBER: 1IC.IP.0010
TITLE: Hand Hygiene		PAGE NUMBER: 47 of 63
ORIGINATION DATE: May 27, 2015	REPLACES POLICY DATED: January 10, 2018	REVISION DATE: April 24, 2019 (reviewed 5/4/2020)
CONTENT MANAGER: Infection Prevention Specialist		
APPROVED BY: Director, Infection Prevention Senior Vice President, Chief Medical Officer Executive Director, Nursing Practice, Education and Research Senior Vice President, Patient Care Services		
The above individuals have reviewed this document and certified their approval of said document via an electronic approval system considered equivalent to an actual signature on paper.		

APPLIES TO:

Individuals employed by entities, including contracted staff, who work in patient care settings.

POLICY:

Hand hygiene is part of the foundation of patient safety and infection prevention in healthcare. It is the single most important measure in preventing the transmission of infectious agents. Gloves should never replace hand hygiene. The Centers for Disease Control and Prevention (CDC) recommends a comprehensive evidence-based approach that consists of hand washing with soap and water when the goal is to remove visible debris; alcohol hand rub for reducing microbial counts; and gloving when people have contact with blood and other body fluids in accordance with standard precautions. Health System, Inc. follows CDC and World Health Organization (WHO) Hand Hygiene recommendations.

This policy is applicable to *member entities* and participating affiliates.

Health provides services in varying settings, potentially including (1) inpatient, acute care services, and other related services; (2) hospital-based outpatient department or ambulatory services; (3) physician practices or clinics that may include rural health clinics or federally qualified health care centers; (4) other outpatient medical services (such as laboratory services), and/or (5) post-acute care settings, including but not limited to, inpatient rehabilitation, Hospice, PACE, home health and long term care. This policy applies to services provided by staff members in each of these settings.

PROCEDURE:

A. HAND HYGIENE
1. Hand hygiene is performed either by washing with soap and water or by using an alcohol-based hand rub. An alcohol-free hand sanitizer has been approved for use in behavioral health units.
2. Hand hygiene should be performed frequently to prevent the spread of germs. Examples of opportunities for hand hygiene include:
   a. When entering a patient's room, exam room, or procedure room
   b. Before donning (sterile or non-sterile) gloves
   c. Before inserting invasive devices such as a urinary catheter, peripheral vascular catheter or central intravascular catheter
   d. After contact with patient's intact skin (i.e. taking a pulse or blood pressure, or lifting a patient)
   e. After contact with body fluids or excretions, mucous membranes, non-intact skin or wound dressings
   f. When moving from a contaminated body site to clean site during patient care
   g. After contact with inanimate objects (including medical equipment) in immediate vicinity of the patient
   h. After handling trash
   i. After removing gloves
   j. When leaving a patient's room
3. How to properly wash hands with soap and water:
   a. Wet hands with warm water
   b. Apply soap to hands
   c. Rub hands together for 15 seconds covering all surfaces of hands and fingers
   d. Rinse hands with warm water with fingertips pointing down
   e. Dry thoroughly with a disposable towel
   f. Use disposable towel to turn off water faucets
   g. To avoid dermatitis do not use hot water and ensure hands are dry before donning gloves.
4. How to properly use an alcohol-based hand rub:
   a. Apply an adequate volume of alcohol-based product to the palm of one hand. (An adequate volume should take 15-20 seconds to dry on hands.)
   b. Rub hands together, covering all surfaces of hands and fingers, until hands are dry.
   c. Health care personnel (HCP) with larger hands may need to dispense two dollops of product when performing hand hygiene. Those with smaller hands may require less.
5. Alcohol-based hand sanitizers kill most germs, but do not remove grime and resistant pathogens from hands; certain instances require washing hands with soap and water. In these situations, soap and water (not alcohol-based hand rub) should be used to clean hands:
   a. When hands are visibly dirty or soiled with blood or other body fluid
   b. Before eating
   c. After using the restroom
   d. If exposed (or suspected exposure – i.e. diarrhea of unknown etiology) to or caring for patient with: *Clostridium difficile*, norovirus, *Bacillus anthracis*, or any spore forming

bacteria.

6. Only facility-approved hand hygiene products should be used. This may include soap, hand lotion, surgical scrub products, and hand sanitizer. An alcohol free hand sanitizer has been approved for use in behavioral health units.

B. FINGERNAIL MAINTANENCE
   1. Staff who have direct or indirect contact with patients are not allowed to wear artificial fingernails or extenders (i.e. acrylic nails, tips, wraps made of silk, linen, fiberglass, shellac, gels or gel nail polish/powder, glues and mixtures of these products).
   2. Keep natural fingernail tips less than ¼ inch long.
   3. Fingernail polish may be worn if it is not chipped.

C. JEWELRY
   1. Specialty patient care areas may have further restrictions to wearing jewelry.
   2. If jewelry is allowed, limit the number of rings and wrist jewelry worn so as not to interfere with hand washing.
   3. If ring(s) are worn, move them around on hands as hand hygiene is performed in order to clean all areas of the hands.

D. GLOVE USE
   1. Wear gloves when it can be reasonably anticipated that contact with blood or mucous membranes, other potentially infectious material, or non-intact skin will occur.
      a. Refer to Exposure Control Plan and Standard Precautions policy for more information on the proper use of PPE.
   2. Change gloves during patient care if moving from a contaminated body site to a clean body site and perform hand hygiene between glove changes.
   3. Remove gloves after caring for a patient. Do not wear the same pair of gloves for care of more than one patient.
   4. Do not wash or apply hand sanitizer to gloves between patients.
   5. Hands should be thoroughly dried before donning gloves to prevent irritation.

E. HAND LOTIONS
   1. Use only hospital approved water-based hand lotion in order to minimize hand irritation that may be associated with hand washing or hand antisepsis.

F. SURGICAL PROCEDURES
   1. When performing surgical procedures use either the specific alcohol based hand rub or antimicrobial soap for surgical hand antisepsis before donning sterile gloves.
   2. Refer to the Surgical Hand Scrub policy for details on surgical hand antisepsis.

G. RING DOSIMETERS
   1. Ring dosimeters must be cleaned both before and after use in sterile field cases, just as hands are washed thoroughly before and after glove use.
   2. Prior to cases, ring badges must be thoroughly wiped with facility approved surface disinfectant wipes and be allowed to sit wet for the contact time of the product. To prevent possible skin irritation, rings must be rinsed to remove chemicals and dried before putting on ring and donning sterile gloves.
   3. After cases are complete, ring dosimeters must be cleaned with facility approved surface

disinfectant wipes and be stored appropriately.

H. STORAGE AND DISPENSING OF HAND CARE PRODUCTS
1. Liquid products will be stored in closed containers.
2. Disposable containers of liquid soap will be used for all wall-mounted dispensers.
3. Containers will not be topped off, refilled or re-used.
4. Containers of alcohol-based hand rub will be stored in approved areas for flammable products.

I. HAND HYGIENE COMPLIANCE MONITORING
1. Hand hygiene is monitored at each facility via direct observation.

REFERENCES:

Centers for Disease Control and Prevention (CDC). Hand hygiene. CDC website. 2013. Retrieved from http://www.cdc.gov/handhygiene/.

Hass, J. (2014). Hand Hygiene. In *APIC Text of Infection Control and Epidemiology 4th ed.* (Chapter 27). New York: the Association for Professionals in Infection Control and Epidemiology.

World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health Care. WHO website. 2009. Retrieved from https://www.who.int/gpsc/5may/tools/9789241597906/en/.

Appendix E
Individual Evidence Table

PICOT: Do healthcare workers in a rural critical access hospital who participate in surveys, training and education on hand hygiene have an improved hand hygiene adherence compared to those in other rural critical access hospitals who have not participated in the intervention within a three-month monitoring period?

Reference, Type of Study, Quality Rating	Methods	Threats to Validity/Reliability	Study Findings	Conclusions
Article 1 Institute of medicine (IOM) (2011), The Future of Nursing: Leading Change, Advancing Health. *The National Academies Press* Washington, DC **Evidence Level 1** **Quality High**	**Article 1** An examination of the nursing workforce in the U.S. including the delivery of nursing care, the capacity for the nursing education system and institutional policies related to nursing practice. **Design**: Expert Review **Sample**: N/A **Setting**: U.S **Framework**: Not stated	**Article 1** The RWJF approached the IOM to partner and respond to the need to transform the nursing profession in the U.S. The work's cornerstone was to provide recommendations regarding the transformation of nursing to better serve the U.S. public.	**Article 1** The role of nursing needed to be re-conceptualized to reduce the shortage, reduce turnover, embrace technology, improve public standing, increase the capacity of nursing schools, and elevate nursing education to produce well prepared nurses who are able to meet the healthcare demands of the U.S.	**Article 1** Nursing must be transformed to address the limitations of nursing practice, and nursing must translate evidence into practice.
Article 2 Institute of Medicine (IOM) (2004).	**Article 2** This work builds on the 1999 IOM publication "To	**Article 2** Further examines the Quality Chasm and ways we can	**Article 2** Patients in hospitals are sicker than we	**Article 2** Encourages nurses to question issues

Keeping Patients Safe: Transforming the Work Environment of Nurses. *The National Academies Press.* **Evidence Level: 1** **Quality: High**	Err is Human" which sparked the 100 thousand lives campaign. **Design**: Expert review **Sample**: N/A **Setting**: U.S. **Framework**: Not stated	reduce the clinical errors in hospitals and nursing homes.	have ever experienced. Sicker patients means more vulnerable to HAI.	that lead to a less safe environment. Recommends the empowerment of the nursing workforce to speak up when quality is in danger.
Article 3 World Health Organization: WHO Hand Hygiene for Healthcare (2009). **Evidence level: 1** **Quality: High**	**Article 3** Reviews worldwide hand hygiene efforts and barriers Makes recommendations on how to improve global hand hygiene. **Design**: Expert review **Sample**: N/A **Setting**: Global **Framework**: Not stated	**Article 3** Focuses on improving patient safety.	**Article 3** Recommendations on setting, personnel and water quality.	**Article 3** Gives information on what communities are facing worldwide.
Article 4 World Health Organization (2004). World alliance for patient safety. **Evidence level: 1** **Quality: High**	**Article 4:** Indicates hand hygiene as the most effective patient safety measure	**Article 4:** No threats to validity. Presents a global perspective for patient safety and focuses on basic	**Article 4:** Seeks to demonstrate need for collaboration to improve patient safety.	**Article 4**: WHO is source for broad perspectives in patient safety

	Design: Expert review **Sample**: N/A Setting: global perspective **Setting**: Global **Framework**: Not stated **Measures**: N/A	practices such as hand hygiene.		and advocacy for clean water and hand hygiene.
Article 5 Centers for Disease Control and Prevention (2019). Hand hygiene in healthcare settings. **Evidence Level: I** **Quality: High**	**Article 5** Examines the U.S. compliance with hand hygiene recommendations. **Design**: Expert review **Sample**: N/A **Setting**: U.S healthcare facilities **Framework**: Not stated **Measures**: N/A	**Article 5** The media and sectors in society have challenged CDC sources and recommendations and criticized the CDC's handling of some health situations.	**Article 5** General findings are that in the U.S. hand hygiene is not a top of mind practice for healthcare workers.	**Article 5:** Reveals that healthcare workers perform hand hygiene less than necessary to reduce the risk of hospital acquired infections.
Article 6: Centers for Disease Control and Prevention (2020). Types of healthcare acquired infections. **Evidence Level: I** **Quality: High**	**Article 6** Examines the types of HAIs and the impact of these infections for patients and hospitals in the U.S.	**Article 6** Data supports that HAIs are a leading cause of prolonged hospitalization and death in the U.S.	**Article 6** Findings include that 1 in 4 patients develops a HAI and hand hygiene is a contributor to the spread of disease and	**Article 6** Indicates the problem is worse than what may be commonly known.

	Design: Expert review and data collection. **Sample**: Hospitals within the U.S. **Setting**: hospitals **Framework**: none stated, use of descriptive statistics		microbe transmission.	
Article 7 McDonald, K.M., Sundaram, V., Bravata, D.M., Lewis, R., Lin, N., Kraft, S.A., McKinnon, M., Paguntalan, H., Owens, D.K. (2007). Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies (Vol. 7: Care Coordination) Rockville (MD). Agency for Healthcare Research and Quality (US); 2007, June Report No. 04(07)-0051-7. **Evidence level: I** **Quality: High**	**Article 7** Comprehensive book reviewing care coordination yielding quality outcomes. **Design**: covers multiple systematic reviews. **Sample**: N/A **Setting**: multiple **Framework**: expert opinion **Measures**: N/A	**Article 7** Seminal work studying various quality improvement strategies for best outcomes.	**Article 7** Expert opinion on what may work to achieve the best outcomes.	**Article 7** Conclusion: excellent guidance for anyone who is studying quality improvement and looking to improve outcomes. A comprehensive how to.
Article 8 Adams, S.L. (2016). Influences of turnover, retention, and job embeddedness in the nursing workforce literature. *Rural Nurse Organization (16)*2. **Evidence level: I** **Quality: High**	**Article 8** Article addresses why rural nurses leave their hospital setting. Reviews what literature has reported on rural	**Article 8** Doctoral work by author published in rural health journal. Details the reality of working in rural health.	**Article 8** Well researched and speaks to the issues in rural health in modern day post ACA realism.	**Article 8** Conclusion: excellent work on what RNs, providers and administration are struggling with every day

	health nursing and puts it in a modern day perspective when nationally in the U.S. many rural hospitals are closing and unable to find staff.			in rural U.S. hospitals.
Article 9 Moore, L.D., Robbins, G., Quinn, J. & Arbogast, J.W. (2021). The impact of COVID-19 pandemic on hand hygiene performance in hospitals. American Journal of Infection Control (49)1, 30-33. **Evidence level: II** **Quality: A**	**Article 9** Behavioral analysis of COVID 19 effects on healthcare worker's hand hygiene practice **Design**: Longitudinal observation **Sample**: 120 RNs in acute and critical care units **Framework**: None stated. **Setting:** U.S. Hospital. **Measures**: Structural equation modeling	**Article 9** COVID 19 continues to cause many changes in behavior and protocols within nursing units and hospitals.	**Article 9** Hand hygiene observations greater than 1000 with 70% adherence to protocols for cleansing hands	**Article 9** Possible link to intensity of work rather than personal hygiene behaviors as to whether the RNs will perform hand hygiene
Article 10 O'Boyle, C.A., Henly, S.J., Larson, E. (2001). Understanding adherence to hand hygiene recommendations. The theory of planned	**Article 10** **Design:** longitudinal, observationa **Sample**: 120 RNs	**Article 10** This study has been used for studies related to what ICU RNs may do in the	**Article 10** Findings regarding self-reporting of hand hygiene and observed behavior.	**Article 10** Concludes ICU RNs may adhere to hand hygiene more

behavior. American Journal of Infection Control (29)6, 352-360. **Evidence level: II** **Quality: A**	**Setting**: ICUs in NY and Minneapolis **Framework**: Use of the theory of planned behavior **Measures**: descriptive statistics	COVID 19 pandemic. See article by Moore, et al.		when intensity is high
Article 11 Pittet, D. (2001). Improving Adherence to Hand Hygiene Practice: A Multidisciplinary Approach. *Emerging Infectious Diseases, (7)*2, 234-240. **Evidence level: II** **Quality: A**	**Article 11** Seminal work on emerging strategies to improve hand hygiene. **Design**: random survey design **Sample**: large hospital wide, included multiple types of HCWs **Setting**: large tertiary U.S. hospital **Framework:** Not stated, recommended change framework to hospitals desiring change	**Article 11** Includes multiple disciplines within the healthcare setting. Author notes that approaches to hand hygiene should be multidisciplinary and multimodal, however, these methods are not proven.	**Article 11** Notes that education plays a part in adherence to hand hygiene protocols. Institutional culture should be considered when attempting to improve hand hygiene rates.	**Article 11** Concludes that hand hygiene can be improved, however there needs to be broad education on the importance and methods of hand hygiene for greater understanding across all disciplines.

	Measures: multivariate analysis			
Article 12 Vermeil, T., Peters, A., Kilpatrick, C., Pires, D., Allegranzi, B., Pillet, D. (2019). Hand hygiene in hospitals: Anatomy of a revolution. *Journal of Hospital Infection (101)*3, 383-392. **Evidence level: II** **Quality: A**	**Article 12** What we must do to move the efforts of hand hygiene forward for improved adherence. **Design**: examination of changes over time **Sample**: cites multiple references on hygiene and examines the history of hygiene from ancient times **Framework**: N/A **Setting**: Examines multiple settings **Measures**: N/A	**Article 12** This article provides excellent background on how healthcare has progressed in its recognition of hand hygiene as important to health and safety	**Article 12** Article is a review of changes in attitudes toward hand hygiene from ancient times to the present, specifically the past 20 plus years.	**Article 12** Concludes that we are still not performing hand hygiene to optimum levels in modern times.
Article 13 Bucher, J., Donovan, C., Ohman-Strickland, P., McCoy, J. (2015). Hand washing practices among emergency medical service providers. *Western Journal of Emergency Medicine (16)*5, 727-735. **Evidence level: II** **Quality: A**	**Article 13** **Design**: online survey/Systematic review. **Setting**: Variety of settings globally, most	**Article 13** Studies demonstrated a positive correlation after the adoption of WHO guidelines.	**Article 13** Improvement in hand hygiene compliance is shown following the adoption of a multimodal	**Article 13** Provides valuable evidence

	studies in the U.S. or Europe **Sample:** 16 facilities worldwide with 1494 responses to survey **Framework**: Not stated. **Measures**: descriptive statistics and MANOVA		approaches to hand hygiene.	
Article 14 Kinston, L., O'Connell, N.H., Dunne, C.P. (2016). Hand hygiene-related clinical trials reported since 2010: A systematic review. *Journal of Hospital Infection (92)*4, 309-320. **Evidence level: II** **Quality: A**	**Article 14** **Design**: systematic review of multiple studies **Setting**: multiple **Sample**: global **Framework**: not stated **Measures**: not stated	**Article 14** Gathers multiple studies and presents their findings.	**Article 14** Review of multiple studies that have occurred globally since 2010. Compares findings that have improved hand hygiene	**Article 14** Excellent review of multiple studies the majority of them in the U.S.
Article 15 Fox, C., Wavra, T., Drake, D.A., Mulligan, D., Bennett, Y.P., Nelson, C., Kirkwood, P, Jones, L., Bader, M.K. (2015). Use of a patient hand hygiene protocol to reduce hospital acquired infections and improve nurses' hand washing. American Journal of Critical Care (24)3, 216-224. **Evidence level: II** **Quality: A**	**Article 15** **Design**: preexperimental study design **Setting**: 27 bed CV and medical ICU in a 498 bed hospital. **Sample**: patients admitted to ICU	**Article 15** Nursing hand hygiene adherence rates along with other interventions used to reduce HAIs.	**Article 15** Findings studied whether RNs who performed hand hygiene and performed other means to reduce HAIs such as CHG baths, when caring for patients	**Article 15** Conclusion: The use of a hand hygiene protocol is associated with lowered HAIs.

	received interventions to prevent HAIs such as CHB baths daily. **Framework**: not stated **Measures**: descriptive statistics analyzed using SPSS version 21.		in turn had a lower rate of HAIs for those patients, when using the hand hygiene protocol.	
Article 16 Alemagno, S.A., Guten, S.M., Warthman, S., Young, E., & Mackay, D.S. (2010). Online learning to improve hand hygiene knowledge and compliance among health care workers. The Journal of Continuing Education in Nursing (41)10, 463-471. **Evidence level: III** **Quality: A**	**Article 16** Online education for hand hygiene as an emerging tool to promote hand hygiene and reduce HAIs. **Design**: Online survey **Sample**: 256 healthcare workers participating in online education on hand hygiene. **Setting**: two hospitals in Ohio, U.S. **Framework**: self-assessment post	**Article 16** Assessed online learning of healthcare workers. No other types of education were evaluated in this study.	**Article 16** Findings include improved hand hygiene awareness and performance after online education per online survey.	**Article 16** Conclusion include that online education is valuable and may assist healthcare organizations in the improvement of hand hygiene adherence.

	training. No formal framework. **Measures**: univariate statistics and dependent *t* tests			
Article 17 Boyce, J.M. (2019). Current issues in hand hygiene. *American Journal of Infection Control (47)*3, A46-A52. **Evidence level: III** **Quality: A**	**Article 17** Recognizes achievements towards improved hand hygiene and acknowledges the difficulty many healthcare organizations face in achieving success with hand hygiene. **Design**: literature review **Sample**: cites multiple studies and ongoing reviews **Setting**: per study cited **Framework**: none stated **Measures**: results from other research articles.	**Article 17** Focuses on improvements made and what can improve compliance for the future. Concern over adequate alcohol hand sanitizer amount.	**Article 17** Discussion on what is needed to promote greater adherence to hand hygiene protocols. Uses review from articles by same author in 2002 and evidence since then.	**Article 17** Conclusions include there is a lack of focus on reducing the spread of microbes and therefore a lack of concern for hand hygiene in this pre COVID 19 article.
Article 18	**Article 18**	**Article 18**	**Article 18**	**Article 18**

DeWandel, D., Maes, L., Labeau, S., Vereecken, C., Blot, S. (2010). Behavioral determinants of hand hygiene compliance in intensive care units. American Journal of Critical Care (19)3, 230-239. **Evidence level: III** **Quality: A**	Examines behavior of ICU RNs **Design**: survey questionnaire based on a behavioral theory model **Setting**: ICU in teaching hospital **Sample**: 140 RNs **Framework**: not stated **Measures**: descriptive statistics	No interventions were applied before or after each survey.	Sought to find predictive behaviors on what motivates RNs to perform hand hygiene.	Found no predictive behaviors associated with whether the RN would or would not practice hand hygiene.
Article 19 Christoff, P., (2018). Running PDSA cycles: Current problems in pediatric and adolescent health care. American Academy of Pediatrics (48)8, 198-201. **Evidence level: V** **Quality: A**	**Article 19** Article is an advanced how-to for PDSA cycles. **Design:** literature review.	**Article 19** No interventions, this is a how-to and literature review.	**Article 19** Sought to enhance knowledge for others performing quality improvement projects.	**Article 19** Conclusion: excellent article for planning PDSA cycles in a quality improvement project.
Article 20 Biddle, C. (2009) Semmelweis Revisited: Hand hygiene and nosocomial disease transmission in the anesthesia workstation. American Association of Nurse Anesthetists (77)3, 229-237. **Evidence level: V** **Quality: B**	**Article 20** Discusses how microbes in the anesthesia work area can spread microbes and contribute to HAIs.	**Article 20** Limited to the practice of anesthesia. Does not discuss details of microbe transmission.	**Article 20** Shows heightened awareness of providers that the work they do can contribute to HAIs. Hand hygiene is known	**Article 20** Contributes to the providers perspective on hand hygiene. It goes to what is being discussed and

	Design: literature review **Setting**: acute care hospital surgical area, specifically anesthesia work areas **Sample:** N/A, not specific **Framework**: none stated **Measures**: literature review		to be not top of mind and this is discussed in relation to patient care and safety.	thought by providers of anesthesia.
Article 21 Gomez, N.J. (2018). Hand washing adherence – is that really our goal? Nephrology Nursing Journal (45)4, 393-394. **Evidence level: V** **Quality: B**	**Article 21** Specialty setting where hand hygiene is a goal for the reduction of microbe transmission and the contamination of supplies in dialysis. **Design**: Not stated **Sample**: none **Setting**: none **Framework**: none **Measures**: opinion	**Article 21** This article is the opinion of the author based on their experience as a nephrology nurse	**Article 21** Brings the argument that we should look at prevention of disease spread and microbe transmission rather than a metric to measure.	**Article 21** Concludes that metrics are not the goal, the goal is patient and staff safety and health