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Hand Hygiene for Health Promotion

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by

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Abstract

For many years public health organizations, such as The World Health Organization (WHO) and The Centers for Disease Control and Prevention (CDC), have stressed the need for proper hand hygiene. Proper hand hygiene requires a prescribed process to rid the hands of potentially infecting organisms by using soap and water (handwashing) or hand sanitizer (sanitizing). These processes need to be performed at critical times to promote infection prevention. Many studies have shown that hand hygiene is a learned behavior that becomes habitual over time, and behavior change mechanisms in addition to education are needed to affect a long-term change in hand hygiene habits.

This project, performed in a small community setting, offered education and support for behavior change to create improved hand hygiene habits. Recognizing behavior change as a key to sustained practice, the project asked participants to identify persons who provided encouragement and support for behavior change and barriers to performing hand hygiene in a pre-education survey. The education provided focused on the best methods for performing hand hygiene, identified critical times to perform hand hygiene, identified barriers that inhibit performance, and methods for overcoming the barriers. After receiving the education, participants were able to discuss personal barriers to performing hand hygiene and troubleshoot solutions in a virtual group setting.

The project results indicated that education and support can influence a behavior change. Before receiving education, 46% of participants performed hand hygiene at least 10 times per day; 4-weeks after the education 65% of participants washed at a higher daily frequency. Project results also indicate more intentional hand hygiene techniques that included washing between fingers, under nails, and around wrists. The majority of

participants indicated support of a significant individual contributed to the change in behavior.

Keywords: hand hygiene, hand washing, behavior change, health promotion, infectious disease, infections, infection prevention

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Introduction

Healthcare professionals are trained and monitored to perform thorough handwashing to decrease the incidence of hospital-acquired infections. Infectious illnesses originate from sources other than healthcare settings, therefore; the general public should be provided knowledge and taught the skills needed to avoid these occurrences in their everyday life. Maintaining proper hand hygiene is a defense mechanism that can be used globally to decrease the incidence of infectious illnesses. Recent history has shown a correlation between performing frequent handwashing and decreasing the incidence of infectious illnesses that can lead to pandemic situations. This project aimed to improve hand hygiene performance and intention in a small community setting.

Problem Identification

A combination of hygiene practices that includes handwashing as a priority is necessary to break the chain of infection. According to the International Scientific Forum on Home Hygiene (IFH) “there is increasing evidence to show that good hygiene practices in the home and community prevents not only the spread of foodborne infections but also has an important role in preventing the spread of other common infections” (IFH, 2015, p. 1). According to data gathered by Aiello et al. (2008) “handwashing can reduce the rates of gastrointestinal illness by 31% and respiratory illness by 21%” (p. 1376).

According to the Centers for Disease Control and Prevention (CDC, n.d.-a) hand hygiene education in the community:

- Reduced the number of people who get sick with diarrhea by 23-49%;

- Reduces diarrhea illness in people with weakened immune systems by 58%;
- Reduces respiratory illnesses, like colds, in the general population 16-21%; and
- Reduces absenteeism due to gastrointestinal illnesses in schoolchildren by 29-57%. (Stinson, 2018, para 3).

The World Health Organization (WHO) also recognizes the importance of hand hygiene in illness reduction. The CDC has initiated multiple programs in the US and organizations in other countries have done the same. Educational information that stresses the importance of hand hygiene can be found in a multitude of community locations including restaurants, daycares, schools, businesses, and places of worship. The current challenge is "to figure out how best to make safe hygiene practices matters of daily routine that are sustained by social norms on a mass scale" (Curtis et al., 2011, p. 312).

Terms Defined

In an effort to ensure understanding and promote clarity, certain terms used in this paper are defined below.

- **Hand hygiene** is the practice of maintaining clean hands. Hygiene hand is a health-promoting activity that reduces the risk of infectious disease transmission.
- **Hand washing** is the action of cleaning the hands with soap and water to remove visible dirt and non-visible organisms from the hands.
- **Sanitizing** is the process of cleaning the hands with a chemical-based solution. The most common hand sanitizers are alcohol-based. Another commonly used hand sanitizer is benzalkonium chloride.

- **Participant** is a person who took part in the project by completing the pre-education survey and educational session.
- **Respondent** is someone who opened and perhaps answered the pre-education survey but did not complete the educational session and/or the post-education survey.

Problem Statement

A large volume of educational information related to hand hygiene is available in the community, yet there continues to be a lack of consistent handwashing at the appropriate times. This inconsistency allows organism transfer, which leads to the spread of infection. There is a gap between education/knowledge and practice/behavior in the community setting.

Needs Assessment

Multiple studies support a decrease in the spread of gastrointestinal and respiratory illness when hand hygiene is consistent (Bloomfield et al., 2010; Curtis et al., 2011; Hübner et al., 2010; Zivich et al., 2018). Knowledge of the appropriate times for hand hygiene and the correct methods for using soap and water or hand sanitizers is important in breaking the chain of communicable disease transmission. Currently, communities across the globe have heightened awareness of hand hygiene due to the Novel Coronavirus (COVID-19) pandemic. It appears the hand hygiene lessons learned from past respiratory pandemics such as the Avian flu and influenza A/H1N1 did not create a lasting behavior change for long-term infection prevention habits **(**Airborne disease, 2015; Miao & Huang, 2012**).** The challenge is to find methods that create changes for a lifetime.

Observations during Sunday worship services, on separate dates, demonstrated a lack of hand hygiene at appropriate times. Actions noted more than three times during either of the services included a lack of hand hygiene in the following situations: after sneezing into the hands, after blowing the nose, after wiping the face/nose of a child, before and/or after shaking hands with someone, before touching the hands to the face, and before putting food items in the mouth (chewing gums, candy, snacks). Observations of handwashing also revealed gaps in performing soap and water handwashing correctly, based on The Centers for Disease Control and Prevention (CDC) guidelines. A total of nine ladies were observed as they washed their hands after using the bathroom; none lathered and used friction for at least 15 seconds, and there was a lack of attention to washing under the nails, between fingers, and around the wrist. Four of the nine did not follow the sequence of drying hands and obtaining a new paper towel to turn off the water.

The Sunday morning service contains ‘meet and greet moments’ when the members shake hands and give ‘holy’ hugs to one another; during the closing song, everyone is to hold the hand of the person on either side of them. Concerns related to the ‘meet and greet moments’ and the ‘closing song’ each Sunday morning have been communicated to health ministry members. Suggestions to add hand sanitizer stands in the sanctuary or encourage fist bumps instead of handshaking or hugs have been suggested by members who are concerned with the spread of germs.

Identifying the Population

In the African American community, the church is not only the site of religious learning, but it also provides educational information to the congregation. “The black

church is the spiritual and psychosocial staple for binding together the middle class and poor, culturally and religiously. Church-based institutions are prime venues for health promotion trials because many promote healthy lifestyles through health-care ministries" (Bonner et al., 2017, p. 912). Information shared within the walls of the church is trusted by members and the community where the church is located. Perhaps focus within a small, trusted community setting can encourage and support changes in behavior to make hand hygiene habitual.

For this project, a small United Methodist Church in the Triad region of North Carolina is the target population. The church membership is 99% African American, the official membership ranges in age from 5 to 95. At least 30% of the members are over the age of 50. About 60% of the membership work, the remaining 40% are either children, retired, disabled, or unemployed. The income and educational level of the membership is varied; the majority are considered lower to middle class. A large volume of adult membership has completed education beyond the secondary level.

PICOT Statement

Within a small church congregation, what education and support influences appropriate hand hygiene behaviors to create consistency in using proper hand hygiene?

Sponsors and Stakeholders

The members of the health ministry and church members who are concerned with hand-to-hand contact can provide support for this project as sponsors and stakeholders. The pastor, as the spiritual leader and main influencer of the congregation, is a primary stakeholder and sponsor. He confirmed and supported the need for this project and played

a role in the acquisition of resources such as meeting rooms, equipped facilities, and handwashing, and other needed supplies during the project intervention phase.

All members of the church family are stakeholders in the project, as the project may encourage all members to practice routine hand hygiene. The health ministry is part of the Congregational Health Ambassadors (CHA) program sponsored by the Maya Angelou Center for Health Equity (MACHE) at Wake Forest School of Medicine. The mission of MACHE is "to achieve health equity for all by moving scientific discovery to action" (Wake Forest School of Medicine). Through MACHE, the CHA program offers to help with small projects that will improve community health. The CHA program would serve in a sponsor role as they may be able to offer resources, such as educational materials, persons who can serve as observers and/or data collectors. They are stakeholders because they can offer assistance to the Project Leader in the form of guidance for strengthening the intervention and ultimate outcomes of the project.

Organizational Assessment

The mission of this church, referred to here as the organization is "to make disciples of Jesus Christ for the Transformation of the World". Through ministries and affiliations, this organization offers a multitude of services to the community, including a food bank, a grief share program, meals on wheels delivery, serves as a voting poll location, transportation of members (other than for church services), a continuously stocked Community Blessing Box and other projects based on local, regional, or national needs.

Strengths

This organization is small in membership but strong in faith and prayer; giving the pastor and members the ability to accomplish the many projects. This congregation demonstrates eight key passions, one of these is Helping Others. This organization's members always support and become involved in projects that will help self, family, and neighbors live healthier lives. Communication is a core value of the organization; this is a companion to the key passion of helping others and will provide support for the project. The health ministry membership and members of the organization who are healthcare professions also provide strength to the organization by sharing health information and dispelling health myths.

Weaknesses

A weakness within the organization is the number of handwashing facilities. There are a total of six adult bathrooms within the facility: three for men and three for women, each having two sinks. The sinks are close in proximity. This could lead to a weakness for the project during the intervention phase, not enough space to adequately demonstrate and observe. A potential weakness is the availability of meeting space at ideal times. There is limited space available at times when a large volume of members can attend meetings and classes. Arranging adequate space at opportune times for participants to attend sessions may be a challenge. A second potential weakness is the ability of the organization to provide supplies such as soap and alcohol-based hand sanitizers (ABHS) for participants. The Project Leader and team will need to consider additional resources for supplying the needed supplies.

Opportunities

Helping members of the organization improve health is an opportunity that fits with the key areas of Being Together and Helping Others. The organization's affiliation with CHA, congregations in the Western Carolina United Methodist Church Conference, and members of the local community offer an opportunity to increase networking and gain resources for the project.

Threats

Due to the current COVID-19 pandemic and resultant quarantines, church attendance may be negatively affected. Media coverage of COVID-19 continues to provide handwashing encouragement, members may feel they have enough information related to handwashing and may not take part in the project. Another threat would be a change that creates limitations in the use of the organization's physical assets (facilities and material resources) such as printers or projectors becoming non-functional and the organization not able to repair/replace promptly.

Available Resources

Resources needed for this project include people, time, and supplies. People are needed as project participants, team members who will help with the development and progression of the project, assistants with the intervention by helping disseminate the education, observers/data collectors, and data analyzers. Supplies for the project that are readily available from the organization, community resources, or the project lead include:

- Handwashing stations with running water, available in each bathroom (Organization).
- Projector, projector screen, and computer or laptop (Organization).

- Printer (Organization).
- Educational materials for handwashing, such as posters and brochures (public health department, CHA or created by project lead).

Outcomes

The objective of this project is to educated members of the community about appropriate methods and situations that warrant hand hygiene. The use of surveys will help identify how community members can be influenced to meet hand hygiene goals regularly. Based on the objective and ultimate goal there is a list of desired outcomes. Knowing the desired outcomes will most likely not be reached in the time frame of the project, a more realistic list of expected outcomes is supplied.

Desired Outcomes

- Participants will identify the 10 key handwashing times based on CDC guidelines (CDC, n.d.-a).
- Participants can identify when the use of soap and water is preferred over AHBS.
- Participants perform the correct method for washing hands with soap and water, based on CDC guidelines (CDC, n.d.-a).
- Participants perform the correct method for ABHS.
- Participants express the intention to wash hands more in the future (more than reported pre-intervention).
- Participants will report maintaining a supply of soap and ABHS for themselves and their family members' use.
- Handwashing among family members of participants increases.
- Reports of defined illness symptoms decrease.

- Participants report a change in behavior that makes washing hands at the appropriate time routine.
- Participants will share ‘the story’ of the project and its outcomes to the community outside of the church membership. Sharing the Story is one of the key passions.
- Participants expand hand hygiene practices to improve home hygiene practices.
- Participants will report fewer illness symptom occurrences at post-survey than reported compared to pre-survey.

Expected Outcomes

- Participants will identify seven key handwashing times based on CDC guidelines (CDC).
- Participants will report maintaining a supply of soap and ABHS for themselves and their family members' use.
- GloGerm assessment of hands post-intervention will show significant improvement when compared to pre-intervention assessment.
- Participants express the intention to wash hands more in the future (more than reported pre-intervention).
- Participants will be able to describe a plan for washing hands a minimum of ten times per day.

Team Selection

The team members selected for this project have expertise with the subject, serve as leaders in the organization, or share an interest in the objectives of the project. The organization’s leader (paster) should be a member of the team due to his leadership role in the organization. He has legitimate and influential power that will help move the

project forward. The chair and an RN member of the organization's health ministry have agreed to serve on the team. They will be instrumental in supporting the project and encouraging members to take part. A colleague and former co-worker of the Project Leader who serves as the assistant coordinator of congregational nurses in a neighboring county has agreed to serve. This nurse has experience in community and behavioral health nursing, her knowledge in these areas will provide expertise and guidance. A nursing professional development specialist (NPDS), who works with the Project Leader has served as an Infection Preventionist (IP) in the same healthcare system, and has expressed interest in the project and has offered to assist with connections in obtaining supplies for the project. A current IP within the same healthcare system that employees the Project Leader has agreed to consult on the project but does not wish to be a full participant on the team. This IP has been a part of the department for at least a decade and can provide value due to her long-term work with infection prevention and hand hygiene issues. A recently retired nursing professor with expertise in research and writing for publication along with the associate director of MACHE, have agreed to serve on the committee.

Cost/Benefit Analysis

Supplies for the implementation phase of the project are the major cost. Supplies that may have to be purchased and the associated cost of the items are listed below.

- Glo Germ kit for 75-100 observations $50 per kit – contains gel for hands, powder for surfaces, and one LED UV light – begin with two kits = $100.
- Additional LED UV light $25
- Hand Soap for the demonstrations can be liquid or bar soap.

- Liquid Soap: Member's Mark liquid hand soap four-pack, 13 fl. oz. each = $10. Begin with two packs = $20.
- Optional items to purchase if unable to secure from a sponsor include:
  - Individual hand sanitizers to be distributed after the initial survey and handwashing education delivery. Not able to price, supplies are unavailable due to COVID-19.
  - Bar or liquid soap to place at main handwashing station at home (options):
    - Ivory Soap bars, Sam's Club 72 bars (3.1 oz. each) $50
    - 100 mini 1/2oz. hotel Motel white bars $20

If the participants meet the expected outcomes, the cost will be beneficial. If participants have fewer illness symptoms compared to pre-project illness symptoms, the project costs will be well worth the estimated $215 - $300 expenditure.

Scope of Problem

Dr. Ignaz Semmelweiss discovered a "link between handwashing in chlorinated solution before obstetrical exams and a significant decrease in mortality from "childbed fever", or maternal septicemia" (Fishbein et al., 2011, p. 661). Since that time, studies have provided additional evidence to support the need for hand hygiene practices. These practices include understanding when soap and water should be used, the critical times for handwashing, the appropriate method for handwashing for soap and water or ABHS.

Literature Review

To understand the issues related to handwashing, a literature review was conducted focusing on non-healthcare settings. Research conducted in developed

countries was an inclusion factor for information that would support this project; in developed countries clean water, plumbing, soap, and hand sanitizer are available, these resources are different in less developed countries and pose a different set of challenges. Literature related to behavior change and hand hygiene was also included in the search. Databases included: CINAHL complete, ECSCO, Google Scholar, ProQuest, PubMed, SAGE Premier, and Science Direct. Keywords and MESH terms included hand hygiene, infectious disease, pandemic, hand sanitizer, alcohol-based hand sanitizer, community, and influenza.

Background and Overview of Issues

Comparing the effectiveness of soap and water handwashing to the use of ABHS is important to consider when developing community-based education programs. Bloomfield et al. (2007) conducted a systematic review of the literature published from 2002-2007 found on the PubMed database, and data collected over the previous 10 years by the International Scientific Forum on Home Hygiene in the United Kingdom. The focus of this review was to identify the role of hand hygiene in reducing the occurrence of infectious diseases.

From 1980-1992 deaths related to infectious diseases in the US increased by 22%. Two factors that help explain the increase included “the constantly changing nature and range of pathogens to which we are exposed and, secondly, the changes occurring in the community, which affect our resistance to infection...(and) poor hand hygiene” (Bloomfield et al., 2007, p. S28). Since 1980 the number of infecting organisms continued to increase and many infecting organisms that had been rarely occurring, such rotavirus, campylobacter, Legionella, Escherichia coli (E coli) O157, norovirus,

methicillin-resistant Staphylococcus aureus (MRSA), and Clostridium difficile (C. difficile) were becoming more common" (Bloomfield et al., 2007, p. S28).

While hands are not the only source of infectious organism transmission for gastrointestinal, respiratory, or skin infections, there is a high probability of inoculation from the hands to the mucosal surfaces from the hands, therefore, performing handwashing has a high probability of reducing these types of infections. Three types of hand hygiene were suggested: washing with soap, using ABHS, or a combination of handwashing followed by ABHS. The method selected was based on situations in the home and community. Most of the studies did not time handwashing or measure contaminates left on the hands after handwashing; this led Bloomfield et al. (2007) to state the existence of "a paucity of data on the efficacy of handwashing in relation to how people actually wash their hands on a day-to-day basis, both in the duration of handwashing and handwashing technique" (p. S54).

The need for more studies that examine normal home conditions, identify the events that create the transmission of infectious organisms, methods for decreasing risks, and hand hygiene techniques are warranted as a result of this study (Bloomfield et al., 2007). This review conducted more than a decade ago, sounded the warning that "demographic, environmental, and health care trends…are combining to make it likely that the threat of infectious diseases (ID) will increase in coming years, rather than decline" (Bloomfield et al., 2007, p. S58). The recommendations included education to impact the reduction of ID risks through proper hand hygiene practices at the correct time. The discussion of how to create behavior change goes beyond education to

suggesting the development of a framework that included education and addressing barriers.

A meta-analysis done by Aiello et al. (2008) searched electronic databases for methodological articles and systematic reviews published from 1960 to 2007 that studied the relationship of hand hygiene interventions with diagnosed gastrointestinal illness, diagnosed respiratory illness, infectious gastrointestinal, or respiratory illness symptoms that caused absences (Aiello et al., 2008). The final meta-analysis included 30 studies that mostly occurred in developed countries. Aiello et al. (2008) indicated analysis of the data led to these results:

- nonantibacterial soap combined with hand-hygiene education showed the strongest protective effect against gastrointestinal illnesses.
- use of ABHS combined with a hand-hygiene education intervention was not strongly associated with reduced rates of gastrointestinal illnesses or respiratory illnesses.
- benzalkonium chloride-based hand sanitizer was examined showed a large reduction in gastrointestinal illness rate.
- the use of nonantibacterial soap combined with hand-hygiene education showed the strongest protective effect on respiratory illness rates.
- studies provided no evidence to support the use of antibacterial soap as a more effective alternative to nonantibacterial soap for the prevention of either gastrointestinal or respiratory illnesses.

For Aiello et al. (2008) the result related to the use of ABHS was unexpected, given that “alcohol-based antiseptics containing 60%-80% weight per volume have been

shown to be effective against a range of viruses and bacteria, including agents that cause diarrhea or respiratory infections" (p. 1378). The use of ABHS has shown to effective in "preventing healthcare-associated infections, but individuals living in the community likely have very different hand hygiene habits from those of staff in the healthcare setting" (Aiello et al., 2008, p. 1378). The higher efficacy of hand hygiene in preventing gastrointestinal illness compared to respiratory illness may be related to "difference in the frequency and timing…even with consistent education messages that advocate hand hygiene directly after coughing or sneezing, such practices may not be as consistent or as frequent as hand hygiene practices directly after defecation" (Aiello et al., 2008, p. 1378). A final point made by Aiello et al. (2008) was information shared from a study sponsored by the American Society for Microbiology, in their study of "7,836 individuals in five major US cities showed that only 67% of participants washed their hands after using a public restroom. Overall, more women (75%) than men (58%) washed their hands, suggesting gender differences in practices" (Aiello et al., 2008, p. 1378).

A global perspective of hygiene issues was reviewed by Curtis et al. (2011). In this review, Curtis et al. (2011) "gathered facts about the importance of hygiene for public health and explored the scale of the problem" (p.313). Hygiene in this review included clean water, sanitation infrastructure, personal and domestic hygiene, safe food handling, safe stool disposal, surface cleaning, solid waste disposal, fly control, and removal of animal fecal matter (Curtis et al., 2011). Evidence indicated the existence of handwashing issues in developed countries were that only 65% of women and 31% of men washed their hands after using the bathroom at a service station in England, and only 43% of mothers washed their hand with soap after changing a dirty diaper (Judah et al.,

2009 as cited in Curtis et al., 2011, p. 314). From a public health perspective “evidence suggests that hygiene promotion is effective in reducing disease, can be promoted both directly and by mass media programmes with relatively low expenditure per person targeted” (Curtis et al., 2011, p. 314).

Behavior changes and related obstacles were recognized as important factors that affect the performance of hygiene measures. A review of 11 studies supported the existence of three kinds of hygiene behaviors: habitual, motivated, and planned. When studying the factors that are likely to determine hygiene behavior, finding the triggers and cues that can lead to change needs to be studied more extensively (Curtis et al., 2011). Larger-scale, adequately funded trials are necessary to assess the effects of interventions aimed at improving handwashing and other hygiene efforts. Part of the behavior should focus on influence. Curtis et al. (2011) stated that unpublished evidence “suggests that working through schools might have a double advantage: children take up what they are taught and might also take messages home, hence influencing their families” (p. 316).

Coordination of efforts that improve hygiene and reduced infectious illnesses are key and need to be instituted. Curtis et al (2011) stated that a “greater impact could be achieved if the many agencies, donors, nongovernmental organizations, companies, and government and citizen institutions with hygiene in their mandates could agree upon a few simple principles and harmonize their approaches” (p. 316). Additional considerations to improving hygiene include:

- Randomized controlled trials that improve intervention through the use of objective measures like clinical infections or mortality.
- using communication methods that are attention-grabbing and memorable.

- making investments that create sustainable improvements in hygiene.
- finding simple, cheap, and widely applicable methods of measuring hygiene behavior change. (Curtis et al., 2011, p. 318).

Non-Healthcare Settings

The 2015 fact sheet published by the International Scientific Forum on Home Hygiene (IFH) provided hand hygiene issues and needs. In industrialized nations, there has been a shift from caring for patients in the hospital to shorter hospital stays and more patient care in the home. The care and recovery can be compromised by inadequate infection control in the home, creating a population of at-risk persons (IFH, 2015).

> The majority of these people are elderly, with generally lower levels of immunity often exacerbated by other illnesses, such as diabetes mellitus or malignant disease. Other "at-risk" groups increasingly cared for in the home include the very young; patients taking immunosuppressive drugs; patients using invasive systems; and HIV/AIDS patients. A survey of the USA and three European countries (Germany, The Netherlands, and the UK), suggests that 1 in 5 to 1 in 7 of the population belongs to an "at-risk" group (IFH, 2015, p.3)

There is also a rise in community-acquired MRSA, C. difficile, and norovirus, which had been more commonly known as healthcare-acquired infections. All of these can be linked to person-to-person or surface-to-person contact. This organization's research and recommendations further endorsed the need to perform hand hygiene at the right time and in the right. Based on the risk assessment approach by (IFH, 2015, p. 4-5), the most critical situations where hand hygiene is needed are:

- After using the toilet (or disposing of human or animal feces)

- After changing a baby's diaper and disposing of the feces
- Immediately after handling raw food
- Before preparing and handling cooked/ready-to-eat food
- Before eating food or feeding children.

Hand hygiene is also important:

- After contact with contaminated surfaces
- After handling pets and domestic animals
- After wiping or blowing the nose or sneezing into the hands
- After handling soiled tissues
- After contact with blood or body fluids
- Before and after dressing wounds
- Before giving care to an "at-risk" person
- After giving care to an infected person

Studying both hand hygiene methods in controlled conditions revealed that soap and water washing can significantly reduce bacteria and some viruses within 30-60 seconds and ABHS can reduce bacteria within 30-seconds of contact. IFH stressed that these results are likely not met in community settings where attention to accurate performance is the priority. IFH suggested for standard handwashing, situations not specifically regarded as "high risk", the use of either method was acceptable (IFH, 2015, p.8). The method suggested for soap and water mirrored the CDC steps which included rubbing the hands for 15-30 seconds and being sure to include fingertips, thumbs, and between the fingers, and use of clean or disposable towels. The exact method for using

ABHS was not described in detail, only suggesting the use of enough ABHS for a 30-second contact period.

The use of ABHS as an alternative to handwashing is supported by the CDC and felt to be a good measure in avoiding pandemic flu (IFH, 2015, p. 9). The IFH emphasized the importance of hygiene in the home such as cleaning and disinfecting surfaces that are touched frequently is another method for reducing the spread of organisms. Public health campaigns that include marketing, media, and interactive community programs are in use, but "the overall communication strategy should be given careful consideration… success of any public campaign will depend on people learning to practice hand hygiene not only more frequently, but also at the right time and in the right way" (IFH, 2015, p.10).

In the work setting, employee attendance and productivity are important factors to business success, when employees experience illness both of these factors can be negatively affected. Hübner et al. (2010) investigated the use of alcohol-based hand sanitizer (ABHS) in the workplace as a potential factor in decreasing respiratory and gastrointestinal symptoms, and loss of workdays. The economic impact of communicable illness in the workplace led the researchers to conduct a randomized control group study (Hübner et al., 2010). Participants were recruited from the administrative staff at the three locations in Greifswald, Germany (Ernst-Moritz-Arndt University, municipal, and state employees). An exclusion criterion for participation was employees who already used hand disinfection (AHBS) at work. Of the 134 consent and pre-study survey completions, the participants were randomly assigned to either the control or intervention group with 67 participants assigned to each group (Hübner et al., 2010). The intervention participants

were supplied with an alcohol-based hand rub (ABHS) and given these instructions on how to use the rub, when and under what circumstances. Control group participants were given the ABHS and told to use it as needed only at work.

All participants were contacted at least monthly by phone or email and were provided study management contact information. Participants received surveys to collect "data on illness symptoms (common cold, sinusitis, sore throat, fever, cough, bronchitis, pneumonia, influenza, diarrhoea) and associated absenteeism at the end of every month" (Hübner et al., 2010). Hand hygiene data was collected over a 12-month time frame. Results of the study related hand hygiene compliance were considered high with 19% indicating they disinfected (used the ABHS) more than 5 times/day, 59.8% disinfecting 3-5 times/day, and 20.5% disinfecting 1-2 times/day (Hübner et al., 2010). The data indicated that except for sinusitis and bronchitis, hand disinfection lowered the odds of becoming ill (Hübner et al., 2010). The odds ratio (OR) between the control and intervention group were statistically significant. While absent days did not show a significant difference between intervention and control groups, there were fewer absent days among the intervention group. Related to hand hygiene the research team felt they were able to "demonstrate that hand disinfection can easily be introduced and maintained outside clinical settings as a part of the daily hand hygiene" (Hübner et al., 2010). Based on the information provided it appears simple instructions, availability of hand hygiene equipment (soap and hand rub), and monthly follow-up encouraged intervention group participants to use the AHBS at identified times leading to a decrease illness symptoms and absent days which ultimately had positive effects on work productivity.

An open, cluster-randomized intervention trial conducted in Helsinki, Finland between November 2008 – May 2010 supported the use of soap and water handwashing in reducing the frequency of acute respiratory and gastrointestinal infections (Savolainen-Kopra et al., 2012). Employees in six corporations (a total of 21 offices, referred to as clusters) were recruited to take part (Savolainen-Kopra et al., 2012). The study had three trial arms, soap and water arm (IR1), alcohol-based hand rub (IR2), and control group (IR3). Workstations and bathrooms were equipped with both soap and alcohol-based rub (ABR). The IR1 participants received soap and IR2 participants received ABR to use at home, were instructed in handwashing using the product for the arm they were assigned to, and how to "limit the transmission of infections, e.g. coughing, sneezing into disposable handkerchiefs or alternatively the sleeve, and avoiding shaking hands" (Savolainen-Kopra et al., 2012). The control group (IR3) did not receive any instructions. Data collection included weekly self-reported work absences and symptoms of acute respiratory and/or gastrointestinal infections. A nurse on the study team visited each study cluster location weekly to make sure supplies of soap and ABR were available and was available to address issues. Occupational health nurses visited the corporations to collect respiratory and fecal samples each week, the samples could come from study participants or non-study employees. The samples provided the study management team knowledge of infectious illness within the corporation or cluster. The study met with challenges in the summer and fall of 2009 as the influenza A/H1N1 pandemic was present in Finland (Savolainen-Kopra et al., 2012). The presence of the pandemic led to a national hand hygiene campaign. Instead of ending the study, the data collected from the

start of the study to the end of July 2009 was compared to data collected from August 2009-May 2010.

When all results were analyzed the participants in the IR1 group had a 6.7 % reduction in infection episodes, with pre-pandemic episodes being substantially less among the IR1 arm compared to the IR3 arm (Savolainen-Kopra et al., 2012). The IR1 arm had the lowest number of both respiratory and gastrointestinal episodes. The IR3 arm had a significant reduction in illness episodes after pandemic onset compared to the pre-pandemic time frame. While the IR1 arm had fewer infection episodes overall, they reported the highest number of sick leave and absence episodes. Savolainen-Kopra et al. (2012) provided a possible explanation was the initial instructions included information related to the potential for infecting others when experiencing symptoms may have led participants in this group to stay home when experiencing identified symptoms. After the onset of the influenza A/H1N1 pandemic and the resultant national hand hygiene campaign, there were no significant differences in the three trial arms. This study coupled with the simultaneous national handwashing campaign due to the influenza A/H1N1 pandemic suggests that instruction and encouragement of hand hygiene performance are necessary to reduce infection transmission (Savolainen-Kopra et al., 2012).

A systematic review examined the impact of hand hygiene on infectious disease risks in nonclinical office workplaces was conducted with goals to update infection-control policies, identify effective strategies to influence hand hygiene, and highlight gaps in the literature. The studies occurred during various time frames from March 2005 through March 2015 in corporate, government, university, and bank offices in Germany, Finland, and the US. Following the criterion set for this review, 11 studies were included;

eight experimental, two observational, and one simulation-based (Zivich et al., 2018). The experimental designs were randomized control trials, pre/post-test study, observational, and simulation.

For all studies, hand hygiene interventions showed a reduction in infectious illness symptoms. The relationship between the type of hand hygiene intervention, use of soap and water or ABHS, and type of illness symptoms, gastrointestinal or respiratory, varied among studies. The results of one RCT conducted in a US health insurance company showed a statistically significant reduction in the number of hand hygiene preventable health claims in the intervention group as compared with the control group (24.3%; P = .016) (Arbogast et al., 2016 as cited in Zivich et al., 2018). The two observational studies measured the use of the Theory of Planned Behavior (TPB) to predicted hand-washing habits. Both studies found a relationship between TPB constructs and hand hygiene (Zivich et al., 2018). In the simulation study, participant's hands were artificially contaminated to identify where viruses were transmitted and the effect of a hand-washing intervention (Zivich et al., 2018). Using interventions of "increased access to handwashing facilities and surface wipes, paired with a simple educational intervention. The model estimated that the intervention would reduce both rotavirus and rhinovirus infection by 77%" (Beamer et al., 2015, as cited in Zivich et al., 2018, p. 453). In their final analysis, Zivich et al. (2018) stated that hand hygiene interventions "do not have to be extraordinarily intensive. Merely providing easier access to hand-hygiene products can lead to improvements in hand-hygiene compliance" (Zivich et al., 2018, p.453).

How to Wash the Hands

An abundance of studies found during the literature search centered on the frequency of performing hand hygiene, circumstances that warrant handwashing, and when soap and water should be the first choice. Many of the studies discussed self-reporting of handwashing and suggested the need for direct observation and focus on the technique of handwashing. Teaching techniques that are best for decontaminating the hands need to be emphasized. As suggested by Curtis et al. (2011) educating children may be an effective method for improving their health and may influence the actions of family members. Fishbein et al. (2011) assessed the efficacy of a handwashing intervention introduced to pediatric patients and parents "while children and their parents waited for medical attention in a low acuity urgent care within an urban pediatric hospital emergency department" (p. 662). Patient-parent pairs were recruited from the waiting room if the child was between the ages of 8 and 18. Children with "a chronic condition that impaired their handwashing ability or sustained a traumatic injury to the hand or upper extremity" were excluded (Fishbein et al., 2011, p. 662). After obtaining verbal and written consent, the patients and parents were verbally administered a questionnaire that gathered demographic and handwashing habit information. GloGerm was applied to participants' hands, then they were asked to perform handwashing as usual. After washing their hands, the investigator examined the right hand using a black light and scored how well the level of cleanliness (Fishbein et al., 2011). The illumination of the leftover GloGerm on the hands provided a visual cue of how well they had washed their hands. Seven areas of the hand were examined: fingertips, palms, front of the wrist, back of the wrist, nails, knuckles, and between fingers. The "scoring was based on a 4-point

scale (Fishbein et al., 2011, p. 662). The patient-parent pairs were randomly assigned to either the education or no education groups. All participants were scheduled for a follow-up within 2-4 weeks.

The patient-parent pairs in the education group were provided a demonstration of proper handwashing by the investigator who used warm water and washed for while singing “Row, Row, Row Your Boat” or “Happy Birthday” two times as the timing method for 20 seconds (Fishbein et al., 2011, p. 662). Patients practiced after watching the investigator and received an instructional handwashing poster to place in their bathrooms. Sixty patients and 57 parents were originally recruited with 46 (77%) patients and 43 (75%) parents returning for the follow-up. Comparisons of preintervention and postintervention measures included the total handwashing scores, use of warm water, self-reports of handwashing before dinner and after using the bathroom. Parent demographics of those who completed the follow-up were compared between the education and no education group as well as the differences in total handwashing scores. Of the parent demographics compared:

> age, gender, handedness, and average income, the only differences noted between recruited patients and parents were that parents in the hand hygiene education group were, on average, 5 years younger and resided in a zip code with a $3,000 higher average income (Fishbein et al., 2011, p. 663)

All patients significantly improved total handwashing, the difference between the two groups was not statistically significant, the education group mean score was slightly higher than the education group. Parents did not demonstrate a significant difference from preintervention (18.5) to postintervention (19.0). Comparison of the preintervention

and postintervention questionnaire data revealed very small differences. Only one child out of the four who initially reported not washing hands after using the bathroom changed this behavior. Initially, 10 children and four parents reported not washing their hands before dinner; seven children and two parents reported not washing at follow-up. There was no difference between intervention groups for both children and adults concerning improved compliance in washing hands before dinner; the most common reason being "no sink available" (Fishbein et al., 2011).

In reviewing the results of the study Fishbein et al. (2011) felt the use of GloGerm provided children a visual cue as well as inactive fun that helped them improve their handwashing ability. This is supported by the outcome of a significant improvement in both the education and no education groups. Other studies have shown that "demonstration of proper handwashing technique is more effective than education alone, and the duration of the educational intervention does not necessarily improve children's ability to hand wash" (Fishbein et al., 2011). The parent results had very little improvement, Fishbein et al. (2011) stated "parents had a high baseline level of hand hygiene ability, making it more difficult to demonstrate statistically significant improvement. Additionally, the intervention we chose is designed for a pediatric population and this reason is likely not an effective teaching tool for adults" (p. 665). In conclusion, the sample was representative of the population seen in the study hospital and demonstrated that this intervention would be effective in most pediatric office populations (Fishbein et al., 2011). Similar studies using parent-child pairs with the same intervention used in this study along with more information for parents related to the importance of handwashing in breaking the chain of transmission might prove more

successful in improving parent handwashing scores. Perhaps thorough handwashing is not the main issue for parents, knowledge related to when to perform handwashing and whether to use soap and water or hand sanitizer may need reinforcement. Interventions that provide visual cues and education that include when, why, and how to perform handwashing may prove more effective.

Effective handwashing involves specific steps to remove a volume of infection-causing pathogens. The World Health Organization "How to Handrub" technique involves six detailed steps healthcare workers (HCW) should adhere to when using hand sanitizer. This technique was developed to ensure homogenous hand-surface coverage of applied hand hygiene agents. The last step focuses on the fingertips which is the area of the hands with the heaviest bacterial colonization (Pires et al., 2017). Previously conducted studies found HCW did not always complete the technique, therefore less attention is given to the fingertips. Pires et al. (2017) investigated if the use of a modified "Fingertips First" technique would lead to a better bacterial reduction on HCW hands, especially the fingertips. This study was conducted in the University of Geneva Hospitals with 16 healthcare workers (HCW) and supervised by two senior infection control experts. Microbiology examination of the bacteria left on the hands at baseline and after using both the "How to Handrub" and "Fingertips First" techniques. Each participant began by washing their hands with soap and water, then fingers (up to the mid-metacarpals) were soaked in a bacterial solution for 5-seconds, allowed to dry for 3-minutes, then the fingertips of the dominant hand were "rubbed a Petri dish containing 10 mL of tryptone soya broth for 1 minute" this served as the baseline measurement (Pires et al., 2017). The participants were split into two groups with one group of eight performing

the ‘How to Handrub” technique while the other eight performed the “Fingertips First” technique. After using the sanitizer another microbiology sample was obtained on a Petri dish. The entire process was repeated with the participants using the opposite sanitizing technique. Each participant used 3mL of 60% isopropanol hand sanitizer and performed hand rubbing for 30-seconds. Hand surface size, small, medium, or large, was included in the analysis to examine random effects. The participants included: “7 nurses (43.8%) and 9 medical doctors/pharmacists/biologists (56.2%); 10 participants (62.5%) were women. Four participants (25.0%) had small hands, 6 (37.5%) had medium-sized hands, and 6 (37.5%) had large hands” (Pires et al., 2017, methods section).

The reduction of bacteria on the fingertips was higher when performing the “Fingertips First” technique compared with the “How to Handrub” technique. There was no significant difference between the three hand-size categories or between the hand size and gender (Pires et al., 2017). Pires et al. (2017) felt the findings were more important in the clinical setting where “hand hygiene promotion has been on improving compliance and less attention has been devoted to the quality of hand hygiene action” (Pires et al., 2017). Pires et al. (2017) reflected on reports from previous studies that indicated the inadequate performance of the standard WHO technique and suggested the modified techniques could improve the reduction of bacteria by increasing focus on the fingertips when performing hand hygiene. This study involved a small population of HCW with expertise in performing the standard WHO technique, further studies in larger and more diverse groups are warranted. While this study was conducted among HCW, the use of microbiology studies or artificial bacteria, like GloGerm, could be used to study the thoroughness of handwashing in the community settings as well.

Behavior and Behavior Change

The need to perform hand hygiene frequently, especially during pandemic conditions has been established among researchers. Yardley et al. (2011) sighted previous "surveys carried out in the context of both severe acute respiratory syndrome (SARS) and influenza pandemics have found that less than half of those surveyed reported adhering to recommended rates of hand-washing (at least 10 times a day), in both community and higher-risk samples" (p.2). Determining appropriate methods for encouraging the behavior to the general public using low-cost avenues continues to be studied. Using the theory of planned behavior as the framework, Yardley et al. (2011) developed a web-based intervention designed to encourage frequent handwashing at home. The hypothesis for this RCT was "hand-washing rates, and intentions to wash hands more frequently in the future, would be higher in those given access to the intervention than in those who were not given access to it" (Yardley et al., 2011, p. 3). The hypothesis was tested at the 4th and 12th weeks. The control group was divided into two subgroups: "one received the same measurements for attitude and behavior as the intervention group, while the other subgroup only completed attitude and behavior measurements at 4 and 12 weeks. This solution allowed the researchers to estimate intervention effects in the absence of any contamination of control group behavior, and check that intervention effects could not be attributed to mere measurement" (Yardley et al., 2011, p.3).

Participants were recruited from 8,150 adults (18 years and above) listed by nine general practices in Southern England from August to October 2010 (Yardley et al., 2011). The intervention group began with 324 participants and the control group with 179. The intervention group and a subgroup of the control received the initial survey of

attitude and behavior measurements, which assessed handwashing rates and theory of planned behavior cognition and perceive risk. The subgroup was divided to measure behavior change without provoking thoughts about handwashing that the initial survey might cause. The first web-session:

> the need to prevent seasonal and pandemic flu; the link between handwashing and virus transmission; expert recommendations for hand-washing frequency and technique; and instructions for picking up a free supply of hand gel from their local practice. Participants completed a hand-washing plan to promote intention formation with situational cueing. Tailored feedback was provided to help users improve their plans where necessary. Users were encouraged to print, sign, and post up the plan and involve other household members (Yardley et al., 2011, p.3)

During weeks 2-4, the sessions for intervention group participants "reinforced positive attitudes and norms and addressed common negative beliefs identified during piloting" (Yardley et al., 2011, p.3). They also received tailored feedback based on initial responses to "hand-washing frequency, the agreement that hand-washing would prevent virus transmission, and perceived difficulty of carrying out the behavior" (Yardley et al., 2011, p.3). Handwashing rate and intention were significantly higher in the intervention group at 4 and 12-weeks in comparison to the control group. According to Yardley et al. (2011), additional findings included:

- Greater socioeconomic deprivation was associated with slightly higher levels of hand-washing frequency and intentions.
- Greater perceived risk was also associated with higher levels of hand-washing frequency and intentions.

- There was a trend toward higher hand-washing rates and intentions in the intervention group:
    - in both men and women,
    - those of higher and lower socioeconomic status,
    - those with higher and lower levels of perceived risk, and
    - those whose level of handwashing at baseline was less than that recommended.

This study provided evidence that web-based interventions can impact handwashing frequency and intention over time. After receiving weekly encouraging content for 4-weeks, the frequency and intent were higher than at baseline and were maintained at 12-weeks; without additional sessions/information sharing after week 4. The study also validated a positive relationship between web-based information sharing and behavior change.

Stedman-Smith et al. (2012) used the Theory of Planned Behavior (TPB) "to guide the development of a model to understand and predict motivations for performing hand hygiene, and to examine related illness, absenteeism, and presenteeism among employees from 39 bank branches in Ohio" (p. 477). The study had three aims:

> develop an understanding about the knowledge, beliefs, and behaviors concerning hand hygiene; test the validity of a modified version of the TPB to predict hand hygiene practices and health outcomes; and generate information to guide the development of a future hand hygiene intervention with employees working in the public sector (Stedman-Smith et al., 2012, p. 479)

Banking employees were the targeted population due to the almost constant handling of cash and contact with the public, both situations pose a risk of organism transmission. These employees were exposed to illness-causing organisms “after sneezing, coughing, handling money, and sharing keyboards and pens”; these situations “indicate a need for improved hand hygiene practices among these workers” (Stedman-Smith et al., 2012, p. 484). For example, previous studies have demonstrated that “dollar bills in the United States have been found to contain multiple pathogens, including mixed Staphylococcus aureus, Group A hemolytic Streptococcus, Klebsiella pneumoniae, Pseudomonas, and Escherichia coli” ((Abrams & Waterman, 1972; Pope, et al., 2002, as cited by Stedman-Smith et al., 2012).

The survey measured the variables of behavioral, normative, and control beliefs as well as knowledge and the effect of these variables on hand hygiene performance (Stedman-Smith et al., 2012). Knowledge is not a usual variable in the model, but for this study, knowledge was added to measure the influence of choice and gain baseline data from the participants. To measure the relationship of each variable and hand hygiene, the survey questions were divided into five sections: self-reported hand hygiene, beliefs about respiratory and gastrointestinal infection, hand hygiene normative beliefs, hand hygiene control beliefs, and presenteeism.

The constructs of control and knowledge did not indicate a strong relationship. The hand hygiene practices were queried using a Likert Scale, the most frequently occurring instances were after using the toilet or urinal; the lowest reported practices were after sharing a keyboard or keypad and after sharing pens. Illness symptoms were measured by self-report of symptoms in the past 30-days, 96 (60%) of participants

reported at least one symptom related to the common cold, sore throat, sinus infection, nausea, bronchitis, and vomiting (Stedman-Smith et al., 2012). Thirty-one percent of the employees who reported common cold symptoms missing work and those who came to work indicated that the quality of their work was detrimentally impacted by not feeling well (Stedman-Smith et al., 2012, p. 483).

This study provided evidence of a co-existing relationship between behavioral and normative beliefs, hand hygiene behaviors, and workplace outcome; further supporting evidence from other sources regarding the use of education to increase knowledge as an adequate solution to increasing hand hygiene performance; success in changing hand hygiene behaviors is greater with the use of multimodal interventions that include norms and beliefs. Limitations discussed by Stedman-Smith et al. (2012) included no observations of hand hygiene practices; voluntary participation may have only recruited participants who differed in "knowledge, beliefs, performance of hand hygiene, or health status from those who did not participate"; self-reporting of illness symptoms instead of confirmed diagnoses (p. 483).

Hand hygiene is an important infection prevention practice especially in settings where many congregate and share materials such as computers, pencils, books, etc. Schools are prime locations for spreading infectious organisms, in these locations hand hygiene needs to a priority at all times. Chittleborough et al. (2012) explored the factors that affected hand hygiene performance in primary schools in England by conducting a qualitative study within a cluster randomized controlled trial. Chittleborough et al. (2012) used focus groups, interviews, and observations to explore barriers, social norms, and

knowledge among students and teachers in primary school settings to determine influencing factors associated with handwashing.

All primary schools (n = 613) in South West England were invited to participate in a cluster-randomized hand hygiene education study (Chittleborough et al., 2012). Participating schools (n=178) were randomly divided into intervention and control schools (Chittleborough et al., 2012). The intervention schools received the "Hands up for Max" education, which was incorporated into the curriculum (Chittleborough et al., 2012). From these overarching trial schools, 24 schools were randomly selected for this sub-study (Chittleborough et al., 2012). "Student focus groups discussed 'pupils' views on handwashing facilities in the school, and their thoughts on barriers and facilitators to good hand washing." (Chittleborough, 2012, p. 1057). Teacher interviews collected their "views, knowledge, and attitudes about hand hygiene and handwashing facilities in the school" (Chittleborough, 2012, p. 1057). Direct observation used checklists "to assess the number of sinks with hot or warm water and soap and hand drying facilities available" along with "a five-point scale to rate how clean the area looked, smelled" (Chittleborough, 2012, p. 1057). The data analysis involved focus group and interview transcription organized into themes. From the themes, case-ordering allowed for exploration of differences between students and teacher and intervention and control groups. The themes were used to build an explanatory model of factors that might influence handwashing behavior.

Two thematic networks, structural factors and agency emerged from the model (Chittleborough et al., 2012). Agency factors were encouragement and reminders, education and information, awareness and knowledge; structural factors were time,

facilities, and societal norms (Chittleborough et al., 2012, p. 1058). Each set of thematic network factors contained influencing factors, for instance, the factors of encouragement and reminders in the agency network contained influencing factors of visual, verbal, and setting a good example. In the structural network, the facilities factor contained influencing factors of attractiveness, accessibility, soap, water, and drying facilities.

In this qualitative study, there was no difference noted between the students in the control and intervention groups related to understanding "when and how they should wash their hands, and that hand washing contributes to infection control" (Chittleborough et al., 2012, p. 1066). The final results indicated that agency factors alone will not create a permanent behavior change of good handwashing, but if merged with positive structural factors handwashing could become routine. Chittleborough et al. (2012) noted that "gaining an understanding of what children and teachers think and know about handwashing, and the barriers they perceive that exist to prevent good handwashing practice, is necessary for implementing effective strategies to encourage them to wash their hands properly" (Chittleborough et al., 2012, p. 1066).

Discussion

Each source in this review of literature provided support for continued hand hygiene interventions in the community. Several gaps need to be addressed in developed and developing countries, as impacting the behavior of hand hygiene remains a global challenge. Educational interventions that are convenient and/or interactive appear to be more influential. The use of media, especially television and the internet, tends to reach larger and more diverse populations. This was indicated in the results of studies that occurred during various pandemics over the past 20 years.

A limitation noted in many cases was self-reporting handwashing frequency and product use instead of in-person observations of technique, including timing. The content of the education in the majority of the studies focused on the number of times and under what conditions handwashing is performed. Further studies are needed to determine methods for disseminating handwashing techniques and influencing behavior change in all communities. The intervention must do more than provide information, it must provide stimulation and motivation for sustained improvement.

Goal, Objective, and Mission

Goal

The project goal was to change hand hygiene habits in two areas: identify the appropriate circumstances that require hand hygiene and perform hand hygiene based on the CDC's five-step process. Participants will be encouraged to consistently perform appropriate hand hygiene to avoid transmission of infectious illness, promote healthy behavior, and maintain a healthy lifestyle.

Objective

The project objective is to educate members of the community about:

- the relationship between organisms and illness,
- the appropriate frequency of hand hygiene,
- circumstances that necessitate hand hygiene,
- when to use soap and water instead of ABHS,
- identification of barriers to performing hand hygiene, and
- methods to overcome barriers.

Mission Statement

This doctoral project focused on a small target population of active church members that share the passion of helping others and the core value of communication. The importance of hand hygiene in curtailing infectious illness can be promoted through education, support, and understanding of like-minded people who have a desire to be healthy and promote both the physical and spiritual health of family, friends, and community.

Theoretical Underpinnings

Pender's Health Promotion Model

Nola Pender's Health Promotion Model (HPM) "is a middle-range nursing theory that explains and predicts how the complex interaction between perceptual and environmental factors influences health-related choices" (Fournier & Sheehan, 2017). Pender et al. (2006) describes the theory as:

> a framework for integrating nursing and behavior science perspectives on factors influencing health behavior. The framework offered a guide for exploration of the complex biopsychosocial processes that motivate individuals to engage in behaviors directed toward the enhancement of health (p. 47)

Pender's theory considers the intermingling of past experiences, attitudes, obstacles, and desires as the factors that cause a person to change behavior. When these variables are explored, determinants of health behaviors are understood by the nurse or healthcare professional, who can create "behavioral counseling to promote healthy lifestyle changes" (Pender, 2011, p. 2).

Pender's View of the Metaparadigm

The health promotion model demonstrates ties between person, environment, health, illness, and nursing. In this model the person and environment influence each other; "the person is partially shaped by the environment but also seeks to create an environment in which inherent and acquired human potential can be fully expressed" (Pender, 2011, p. 3). In this relationship, the nurse works with the person, "individuals, families, and communities to create the most favorable conditions for all expression of optimal health and high-level well-being" (Pender, 2011, p. 3). The HPM includes health and illness as separate metaparadigm concepts; illness is defined as "discrete events throughout the life span of either short (acute) or long (chronic) duration that can hinder or facilitate one's continuing quest for health" (Pender, 2011, p. 3). Health is "the actualization of inherent and acquired human potential through goal-directed behavior, competent self-care, and satisfying relationships with others while adjustments are made as needed to maintain structural integrity and harmony with relevant environments" (Pender, 2011, p. 3).

Model Overview

Pender's model contains 11 components which are divided into three categories: individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcome. Each category has a set of variables or factors that exert influence on the individual to maintain or change behavior. The first two categories are predictors that directly influence health-related behaviors (Ronis et al., 2006). The HPM is based on seven assumptions that are part of nursing and behavior science. Fourteen theoretical statements guide "investigative work on health behaviors" (Pender, 2011, p.5).

Individual Characteristics and Experiences. This category includes personal factors and prior related behaviors. Personal factors are biological, psychological, and sociocultural characteristics. Specific factors are included based on relevancy to explain or predict the desired behavior and are considered 'innate' or non-modifiable (Pender et al., 2006).

Using HPM to Improve Hand Hygiene in a Small Community Setting. The HPM has complexities as the variables are intermingled and dependent on each other; however, this model can be used to persuade individuals as they flex to meet the health-promoting goal. The Project Leader can assess knowledge, behavior, emotion, and perceptions before and during the project implementation. These assessments will guide the Project Leader's methods for delivering education and facilitating discussion that will the participants' level of confidence and willingness to change behavior. The project implementation, carried out effectively, should reinforce participants' commitment to change even when met with barriers. This project was meant to provide information and education that offers methods for making change without fear or threat. A concept-theory-empirical chart (Appendix A) displays how the theory will be used for this project.

Project Development

The initial implementation plan was met with challenges as the number of positive COVID-19 cases and deaths continued to increase across the state, country, and globe. Executive Order 121, a statewide stay-at-home order went into effect on Monday, March 30, 2020. The stay-at-home order banned gatherings of more than 10 people and directed social distancing of at least six feet apart from anyone you do not live with (DPS: Governor Cooper Announces Statewide Stay at Home Order). The order included

churches until the end of May when restrictions for gatherings were lifted for churches. The number of new cases and hospitalizations continued to increase in North Carolina and Forsyth County; based on local metrics, guidance from the local United Methodist Church Conference Bishop, and the desire to keep the church family safe, the church remained closed for events. Meetings and services were converted to Zoom and Facebook Live activities through the remainder of 2020. Participants were not offered the opportunity to demonstrate hand hygiene techniques in person.

The goal and objective for the project remained the same and only one outcome measure was removed: GloGerm assessment of hands post-intervention will show significant improvement when compared to pre-intervention assessment.

Design

A quantitative quasi-experimental method using a pretest-posttest design was selected for the project. Due to the small target population, there was no division of control and non-control groups. All participants were asked to take part in three phases of the project: complete consent and pre-education survey, virtual educational session, and post-education survey.

Setting and Participants

The target population was the adult members of a United Methodist Church in the southeastern US. After discussion with the Pastor, the decision was made to recruit project participants from the ministries that meet regularly which included: Sunday School, United Methodist Men, United Methodist Women, and Music/Choir. The goal was to recruit 45 adult participants of an estimated 160–170 active church members as of

March 2020 to provide a participation rate of 25.7%. Participants had to be at least 18 years old and have internet/Wi-Fi access.

Participant Protection

Participant recruitment included an emailed copy of the consent, an outline of project steps, and contact information of the Project Leader for questions and concerns to be answered individually. During the questions and answer session, potential participants were able to review the consent, project description, and ask questions of the Project Leader. Potential participants received information about their right to discontinue participation, how data collected during the study would be maintained and how used after the study. The Project Leader received several calls and emails from potential participants, none were related to the consent, but were questions related to the survey and project timeline.

Recruitment

The Project Leader requested time on Ministry agendas to introduce the project, inform church members of the opportunity to participate, review the consent, and answer any questions. Ministry leaders were asked to email a letter that explained the project and consent process before the meeting. Following the meetings, participants received an anonymous link to the project consent in an email sent by the ministry leaders. Participation was estimated to involve 1.5 hours. After reading the consent, if the participant agreed to take part in the study, a link re-directed them to the pre-education survey.

Pre-Education Survey

The pre-education survey was developed by the Project Leader and reviewed by project committee members with experience in research design for validation and clarity. The pre-education survey contained three demographic questions that measured personal and socioeconomic factors of gender, age, and education; questions related to participant knowledge of when and how to perform hand hygiene, identification of personal barriers to performing hand hygiene, and social norms and influences related to performing hand hygiene; and a question focused on self- estimation of the frequency of performing hand hygiene with various circumstances.

Education

Education was provided by the Project Leader virtually using the church's Zoom account. Ministry leaders were asked to email a second letter with the education session link. The link was provided at the end of the pre-education survey as well. The education was developed by the Project Leader using information from the CDC. Videos and informational flyers were displayed during the session. The education session outline is provided in Appendix B.

After each video, the Project Leader discussed the key concepts and provided participants the opportunity to make comments and ask questions. Once the education was delivered, the Project Leader facilitated discussion and addressed any additional questions. The recorded educational session was saved and made available to participants who were not able to attend the live session. Regardless of completing the consent and pre-education survey, the education was available to any church member who expressed interest.

Post-Education Survey

The post-education survey was available for response 4-weeks after the educational session. The post-education survey began with two qualifying questions to determine if the respondent completed the pre-education survey and education. If the respondent answered no to either question, they were taken directly to the end of the survey and thanked for participating. The remaining survey questions were the same questions used on the pre-education survey. Three questions were modified to obtain answers related to potential changes and influence since taking part in the project. One question was added to obtain subjective information related to persons who influence behavior.

Project Budget

The project budget was minimal regarding monetary expenditures. The pretest-intervention-posttest structure of the project was completely virtual. The pre- and post-education surveys and data analysis were completed using the online Qualtrics application, free to the University's students. The organization supporting the project had a Zoom account which was free for the Project Leader to use.

Barriers

Recruitment Issues

The Project Lead reached out to the identified ministry leaders using their church and/or personal email addresses. The Sunday School superintendent was very responsive, willing to allot recruitment time as needed. Other ministry leaders did not respond or did not have a meeting scheduled within the next 2-weeks. Two leaders expressed concern related to forwarding the various letters and links and requested the Project Leader handle

these communications. One leader did not respond to emails or calls, the co-chair was willing to assist, but did not have the full distribution list. After discussion with ministry leaders, the decision was made to set up two question and answer sessions for ministry members to join.

The Project Leader met with the Health Ministry members who were a part of the project committee to discuss assistance with emails. These two committee members agreed to send emails with letters and links to the ministry distribution lists. Two question and answer sessions were scheduled using the church's Zoom account, the invitation and links were distributed as described.

Consent and Pre-Education Survey

The process of getting the consent and the pre-education survey published and securing the anonymous link was multifaceted and took several attempts on the part of the Project Leader and Faculty DNP Chair. After a week of consultations with Qualtrics support, the Director of Institutional Assessment, and the Faculty DNP Chair the consent and pre-education survey were published, and the anonymous link was obtained.

Educational Session

During recruitment with the Sunday School, several members identified conflicts with the scheduled educational session and expressed a preference for a live session. A second session was scheduled. The first session was recorded and used during the second session. Both sessions were well received by participants, they remained muted while each concept was presented and unmuted during identified discussion times. Participants discussed what they did not realize about handwashing and sanitizing. There was a good

discussion about ways to over obstacles to performing hand hygiene at the appropriate time. Many shared personal habits and methods.

Post-Education Survey

Publishing the post-education survey had the same challenges as publishing the pre-education survey. The link distribution followed the same process used with the pre-education survey. The Project Leader received a call because the link said the survey had expired. Upon investigation, the Project Leader was able to extend the survey by changing the due date.

Data

Data Collection Process

Data was collected using a pre- and post-survey method. The pre-education survey was open for 17 days and closed 15 minutes before the first education session began. A total of 39 pre-education surveys were completed and included in data analysis.

The data collection process included steps to maintain participant anonymity and avoid repeat survey submissions by the same person for both the pre- and post-education surveys. Six members reached out and explained to the Project Leader that they had not taken part in the education and were willing to complete the survey. The Project Leader agreed to open the survey for three hours before the second educational session. Only those who said they had not taken part in the first session were given this information. In all recruitment communications, the Project Leader explained that anyone could attend the education or request the recorded content until November 14, 2020.

The post-education survey also included two questions that helped identify those individuals who had not completed the pre-education survey or the educational session.

The survey was opened by 48 individuals, after filtering no responses to questions one and two, there were 34 completed surveys.

Demographic Data

Demographic date of gender, age, and education were collected to describe the participant group and analyze responses. Nine male respondents made up 21.95% of the sample and the 32 female respondents made up 78.05% of the sample. Male respondents ranged in age from 55–74 years and the highest level of education completed ranged from high school completion to doctorate. The 32 females ranged in age from 25–84 years and the highest level of education completed ranged from high school completion to doctorate. The respondent's average age range was 55-64 (41.46%) and over 70% had either a bachelor's (15) or master's degree (15). Figure 1 demonstrates the relationship between gender and the highest level of education. Figure 2 demonstrates the relationship between gender and the age of respondents.

Figure 1

Degree by Gender

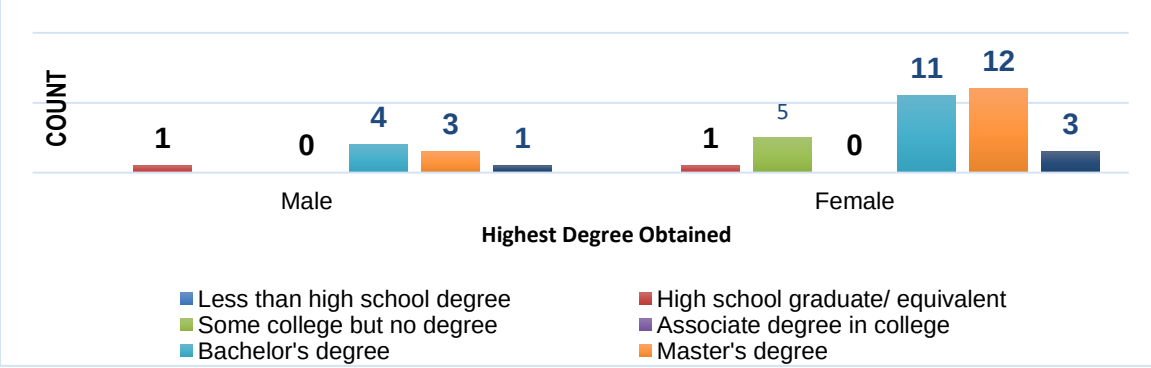
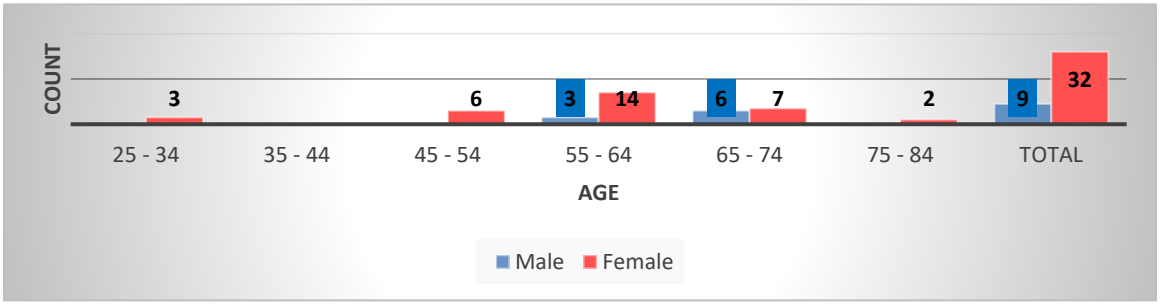


Figure 2

Age and Gender



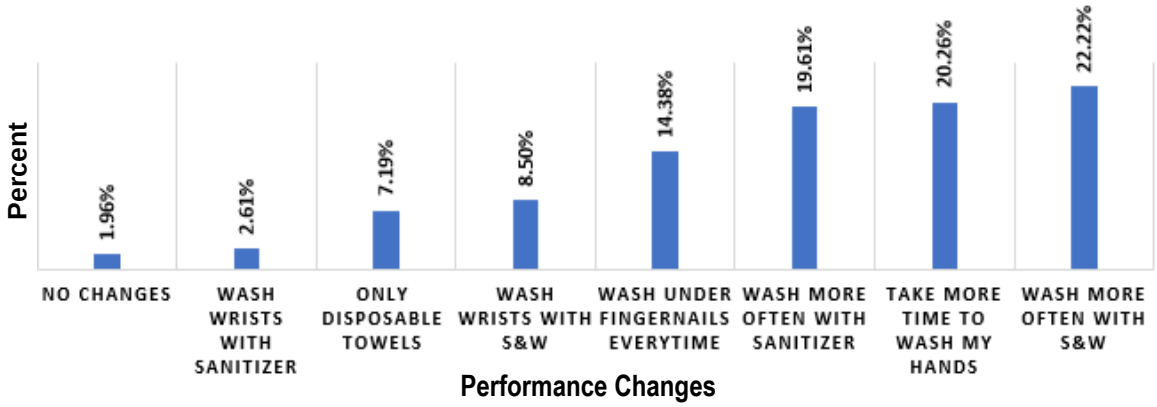
Pre-Education Survey Data

Hand Hygiene Practices

Respondents were asked how their performance of hand hygiene had changed since March 2020, when COVID-19 began to spread across the US. These questions helped determine the thoroughness, or quality, of handwashing since the project did not include visualizing participants perform hand hygiene. Figure 3 lists the areas of handwash changes. Only three respondents (1.96%) indicated no change in how they perform handwashing. Most indicated an increase in the number of times they performed handwashing using soap and water and hand sanitizer, taking more time to wash their hands, and making sure to wash under the fingernails every time. Less than half of the respondents indicated an increase in washing the wrists when using soap and water or hand sanitizer.

Figure 3

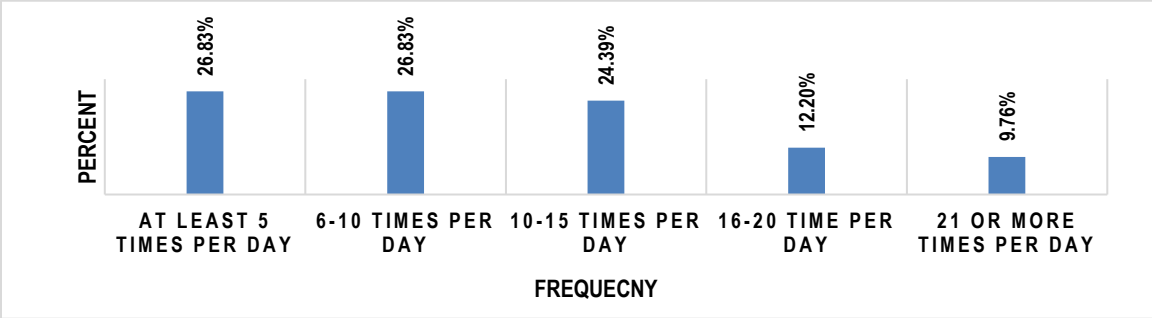
Hand Hygiene Performance Changes March-October 2020



When asked how often hands should be washed in one day, most respondents selected a frequency between 0-15 times compared to higher frequencies. Figure 4 displays participant responses.

Figure 4

Pre-Education: How Often to Wash Hands in a Day



Participants were asked to identify situations that inhibited them from performing thorough hand hygiene. Nine barriers were listed, and an open text area was provided for adding other barriers. The barriers included were:

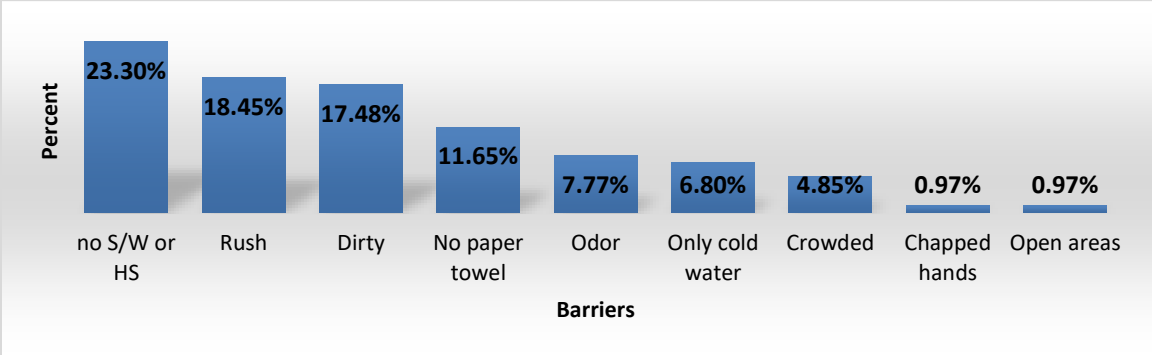
- A bathroom, sink, or handwash station that does not have soap or sanitizer for use
- In a rush/hurry
- A dirty bathroom, especially the sink

- A bathroom, sink, or handwash station that does not have paper towels available
- A bathroom that has an unpleasant odor
- Only cold water available for washing hands
- A crowded bathroom
- Dry/Chapped skin on hands
- Open cuts/scraps on the hand

The response rates for barriers to performing hand hygiene are displayed in Figure 5.

Figure 5

Barriers to Performing Hand Hygiene



Participant consistency with handwashing was self-assessed using a Likert scale matrix design. Respondents were asked to describe how often they performed hand hygiene based on listed situations. The Likert scale selections were: The situation does not apply to me, Never, Sometimes, Often, and Always. Respondents reported Often or Always for most of the CDC-recommended situations. Performing hand hygiene before touching the face had a higher number of “Never” or “Sometimes” responses 28 (70%) than other CDC situations. For the situations that are not a part of the CDC listings, a higher percentage of respondents selected “Never” or “Sometimes” than “Often” or

“Always”. Any of the situations with 25% or more responding “Never” or “Sometimes” was of concern to the Project Leader.

Knowledge and Influence

True/false questions were used to ascertain respondents' knowledge of the relationship between hand hygiene and health. The first question was related to health-promotion and the second was related to the impact of hand hygiene. All respondents answered true to both questions.

Respondents were also asked to identify persons/relationships that influence and support them when making changes. This open text question allowed respondents to list up to four relationships. The four most frequently entered relationships were: Spouse/Partner (n=20 at 21.27%), Child/Children (n=12 at 12.76%), Parent(s) (n=12 at 12.76%), and Friend(s) (n=12 at12.76%). Due to the anonymity of the project, there was no way to determine if the influencing/support person was also taking part in the project.

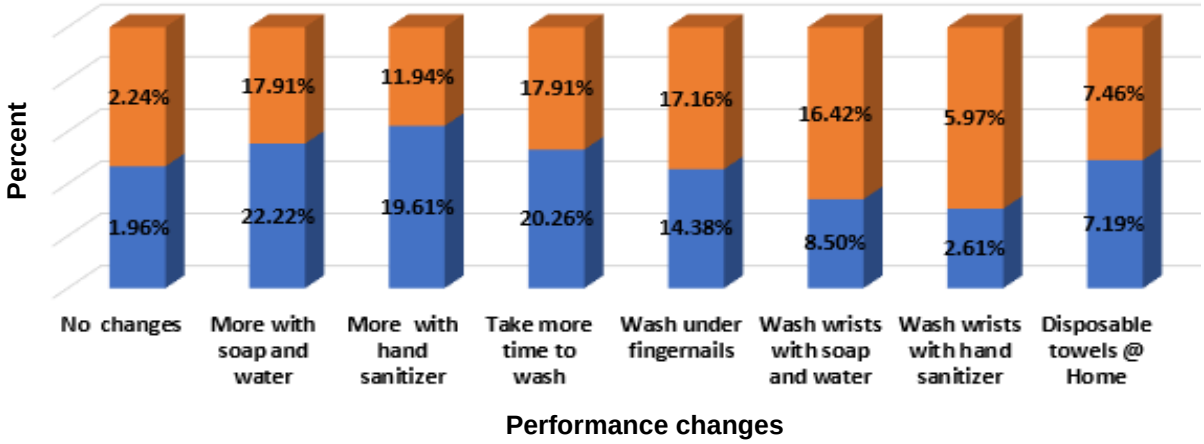
Post-Education Survey Data and Interpretation

Hand Hygiene Practices

Respondents were asked how handwashing performance had changed since attending or viewing the education. Figure 6 provides a comparison of the self-reported practice changes. The results indicated that 94% of post-survey respondents made changes in how they performed hand hygiene.

Figure 6

Change in Hand Hygiene Performance March –October compared to October–December 2020

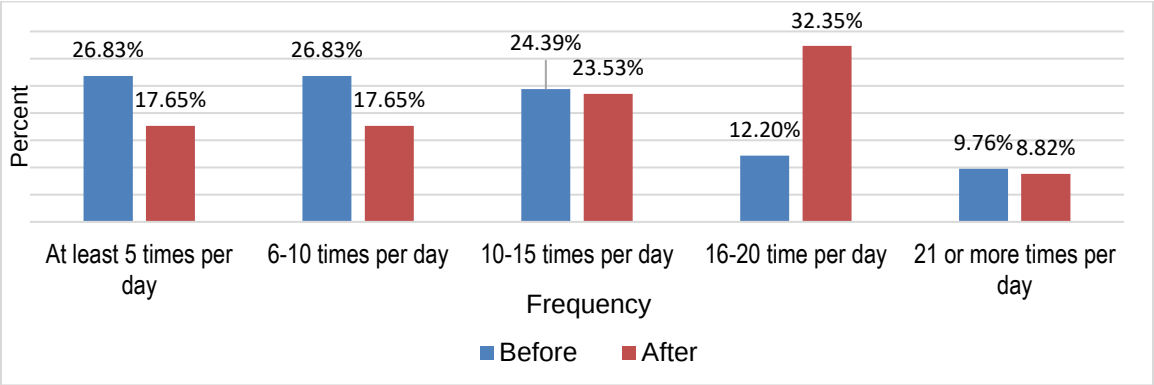


Selecting the number of times hands should be washed in a day demonstrated a shift from lower frequencies on the pre-education survey to selecting a higher frequency on the post-education survey. The percentage of respondents that selected 10–15 and 21 or more times remained almost the same. Figure 7 provides the pre- and post-education survey responses with the post-survey responses indicating an increase in the number of participants who felt handwashing should occur 16-20 times per day. The goal of the project was to increase the number of participants who recognized the need to perform hand hygiene at least 10 times per day. The education stressed the importance of performing hand hygiene based on CDC guidelines. The CDC poster of recommended times was displayed during the education and there was conversation related to items and areas that are commonly touched and would warrant performing hand hygiene. An example shared in the education was passing your mobile device for others to read messages or view pictures; if each person touching the device had not performed hand

hygiene just before touching the device, everyone who touched the phone should perform hand hygiene and the device should be cleaned as well.

Figure 7

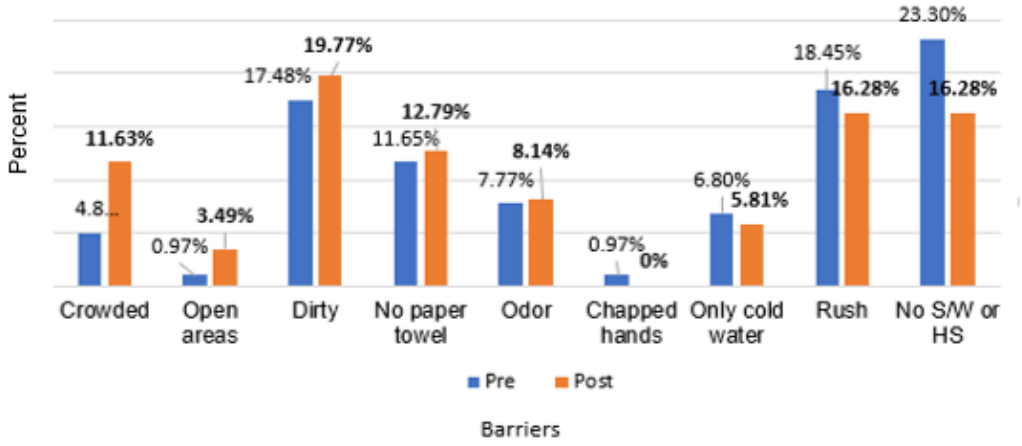
Pre-and Post-Education: How Often to Wash Hands in One Day



A comparison of the barriers to performing thorough hand hygiene had an increase related to five barriers, the largest increase was seen with crowded bathrooms (BR) and the barrier with the most decrease was no soap or sanitizer available at the sink or handwash station. The comparison is displayed in Figure 8. The educational session included discussion on the barriers listed in the pre-education survey and some ideas for overcoming these barriers were provided by the Project Leaders and other participants. Some participants were not aware of the various methods provided and expressed appreciation during the discussion.

Figure 8

Pre-and Post-Education Barriers to Performing Hand Hygiene



Based on CDC situations, a higher percentage of participants self-reported "Always" in each area on the post-education survey than on the pre-education survey. The results indicated participants understood the need to wash their hands more often based on certain situations. One area of concern was before touching the face, while there was an increase in "Often" (20%-20.59%) and "Always" (7.50%-17.65%), this represented a small number of respondents. Perhaps participants were more aware of how often they touch their faces following the education. The CDC video used in the education pointed out that individuals touch their faces an average of 20 times an hour. Educational session participants expressed surprise at this data. Changing this almost automatic action is a difficult behavior change even with education and support, indicating 4-weeks was probably not enough time to make a substantial behavior change.

The situation of performing hand hygiene after shaking hands changed between the pre-education and the post-education survey. Participant responses increased for "Does not apply to me," "Never," and "Always," while selections of "Sometimes" and

"Often" decreased. The potential for spreading germs with handshaking was an impetus for this project. The surge of COVID-19 and the need to socially distance created a different environment for the project population; face-to-face events became virtual gatherings and decreased social interactions where handshaking was the norm for greeting each other. The fist pump and elbow bump are more hygienic methods for greeting one another, decreasing the spread of organisms and these methods are being seen more often in the community (Bin Abdulrahman et al., 2019; Mela & Whitworth, 2014).

Among the additional situations not specifically listed by the CDC, there was an increase in four of six situations. The noticeable change among these situations was performing hand hygiene before touching someone else's electronic devices as this situation had decreased selections for "Always". A shared device that was not discussed in the education was store self-check-out stations. The Project Leader did not include these as an example of frequently touched devices. Further discussion with participants would be needed to understand the reasoning for these selections. The area among these situations with the greatest increase was performing hand hygiene after handling money. During the educational session discussion, participants asked about this situation as it was listed on the pre-education survey. The Project Leader asked participants to consider how many other people had touched money before they received or handled it and indicated there was no way to know for sure. There is potential for multiple organisms to be transferred from money to the hands. Participants agreed this was a new perspective to consider and the post-survey results indicate that the information shared did help some participants make a behavior change.

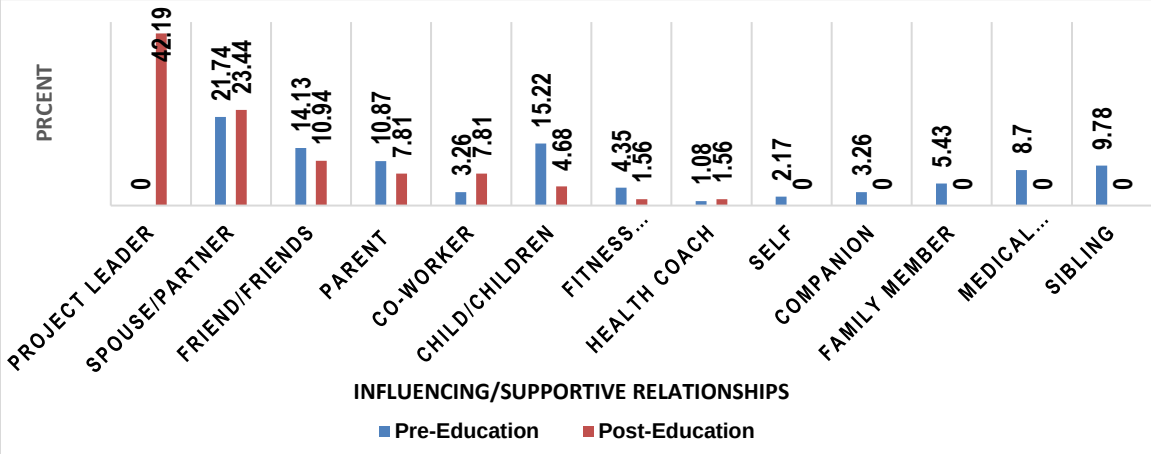
Knowledge and Influence

Respondents already agreed that a relationship between hand hygiene and health existed. When identifying persons or relationships that influenced and supported behavior changes related to hand hygiene, the text responses entered on the pre-education survey were added as options on the post-education survey along with the Project Leader. The Project Leader was identified most often as the person that influenced hand hygiene changes. Figure 9 provides the comparison of pre- and post-education survey responses. When considering behavior change, Pender's Health Promotion Model provides some understanding of the Project Leader being identified as a person who influenced and/or supported the behavior change. According to the model, the expectancy-value theory was used to engage clients in actions to the extent that the outcome of a positive personal value is desired (Pender et al., 2006).

This project was developed and implemented during a time when many were concerned with the increasing number of COVID-19 diagnoses, especially in communities of color. The Project Leader, a member of the community known to the population was trusted by participants; therefore, participants were willing to consider the information being shared. The Project Leader was able to provide information and encouragement to participants in a positive manner to support a change that could impact their health status. The Project Leader accomplished this by expressing genuine interest in the participant's progress and by being available for participants to contact if needed.

Figure 9

Pre- and Post-Education Indication of Support/Influence for Behavior Change



Discussion

The sample size did not meet the original goal of 45 participants. Once survey results were filtered for completion, there were 41 pre-education and 34 post-education respondents. Two educational sessions were facilitated by the Project Leader with 26 participants attending the first session and 35 participants attending the second session. The link to the recorded education was shared with at least 10 members who were not able to attend one of the educational sessions. At least 13 members who viewed the recorded education but did not complete the surveys reached out to the Project Leader to share their thoughts. Of these members there was verbal commitment to be more intentional with handwashing, specifically with scrubbing all areas of the hands for at least 20 seconds before rinsing, being sure to wash under the fingernails, and include the wrist each time they washed their hands. These actions were reflected among survey respondents on the post-education survey as well. While survey responses indicated that participants recognized hand hygiene as important, the self-assessments indicated

inconsistent practices related to how to properly wash hands and the multiple situations that warrant this activity.

Considerations for Future Research

Participant Recruitment

Recruiting participants in a short time frame was difficult. Recruitment was planned for 2-weeks, due to unforeseen issues with getting information to potential participants, the timeframe was almost 3-weeks. Contacting ministry leaders and assuring progress was an unexpected challenge. The pastor and members of the health ministry, who were also a part of the project committee, were instrumental in sending out emails that captured the attention of members. Virtual recruitment presented challenges for ministry members who did not check email regularly and missed the opportunity to take part. Some members were not interested in a virtual project. The original project plan to observe participants demonstrating hand hygiene might have served to entice participation.

Maintaining Confidentiality

To meet the underpinning theory of the project, the Project Leader wanted participants, actual and potential, to reach out with questions and concerns. Several members contacted the Project Leader requesting links to the surveys, to which an explanation of the process had to be given, and the Project Leader either forwarded the contacting person's email to someone who could share the link or the person said they would contact their ministry leader. This process may have been prohibitive to potential participants and caused them not to take part in survey completions. In retrospect, since the Qualtrics platform did not collect email addresses, the Project Leader could have

shared the links and never known who decided to respond to the surveys. This would have given the potential participant a direct route to the survey.

Benefits

This project results indicated that education and support can influence a behavior change. In 4-weeks, 94% of participants self-reported improvements in how they performed hand hygiene, and 64–71% reported an increase in how often they washed their hands and paid attention to washing under the fingernails and around the wrists. Open text responses indicated that respondents were able to figure workarounds with barriers to performing hand hygiene when present.

Limitations

The target population and resulting sample size were limitations of the project. The identified population was small, with less than 200 active members, and the target population of several ministries included persons who were a member of two or more of the targeted ministries. Because of these issues, the pool of potential recruits was smaller than originally thought during the planning phase. The project design of a pre- and post-survey without a control group limited the ability to compare and validate results.

Having to modify the original project plan from in-person demonstrations and phased educational sessions to one virtual education session was viewed as a limitation. Based on the Pender Health Promotion Model, individuals need personalized education and support over time to modify behaviors that have become innate; when healthcare professional becomes a part of the interpersonal environment, influence to change is exerted (Pender et al., 2011).

Recommendations

The small sample and virtual implementation of this project produced some positive results, it warrants modification and implementation as originally planned. This project was conducted amid a pandemic and participants were probably eager to learn ways to protect themselves. Measuring outcomes after 4-weeks was an initial measurement of behavior change. To determine sustained change, participants should be surveyed at longer intervals. As the project results are being analyzed, new cases of the COVID-19 have decreased and COVID vaccines are being distributed. If the trend continues, the concerns of virus prevention may decrease along with hand hygiene performance.

Another project with a longer intervention period along with weekly or bi-weekly sessions to provide education and support hand hygiene practice changes could prove more effective in obtaining substantial behavior change. The use of a control and intervention group would also strengthen the project results. The project could begin with a pre-survey and participant demonstration of handwashing using GloGerm would provide participants a visualization of effective or ineffective hand hygiene. The Project Leader could also provide immediate feedback about the participants' handwashing efforts and measure scrub time, then participants could be divided into control and intervention groups. After 3-months each group would repeat the survey and hand hygiene demonstration.

Conclusion

Literature supports the need to conduct projects in the community to promote consistent hand hygiene practices as an effort to decrease respiratory, gastrointestinal,

and skin infections or illnesses (Moncion et al., 2019). Efforts to implement large-scale community projects have not demonstrated long-term effects. Focusing on small groups in the community may prove to be the best mechanism for effecting long-lasting change. This project led to positive short-term results for a portion of the participants. Hopefully, the participants will keep the education in mind and have persons in their lives who will encourage and support them to maintain and perhaps increase the quality and consistency in hand hygiene practices.

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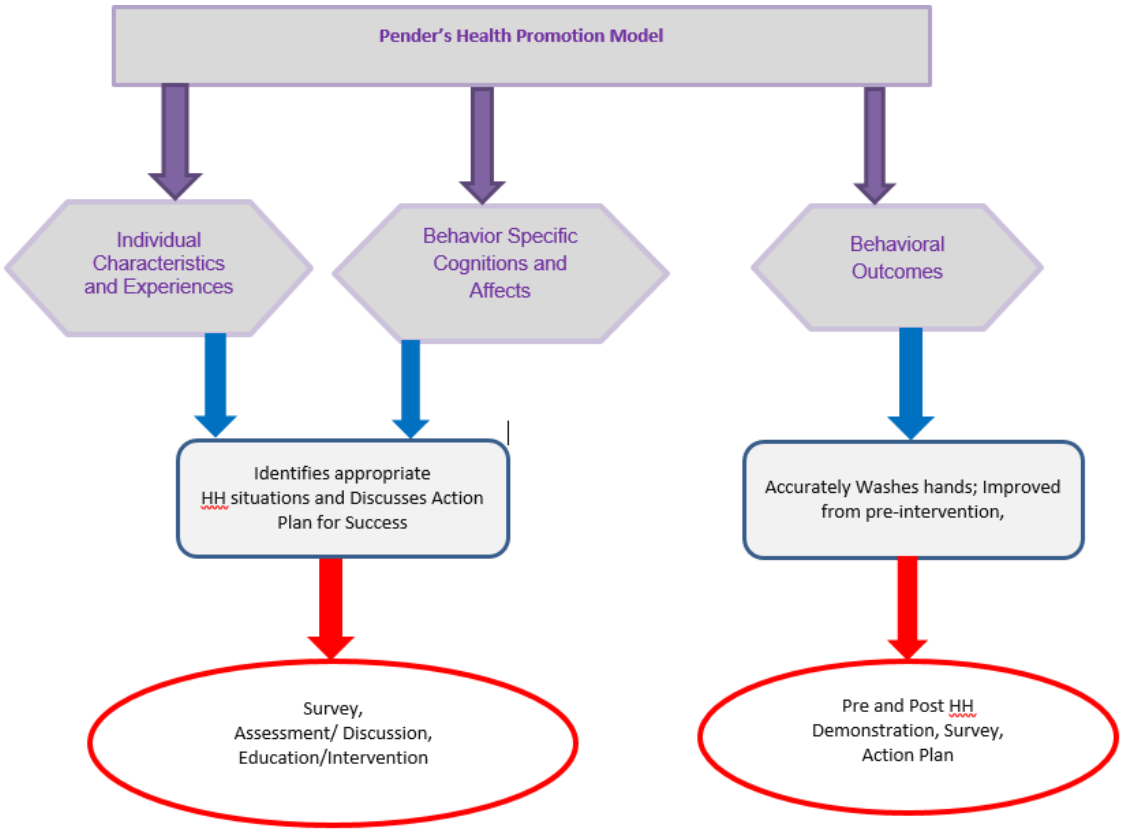
Appendix A

Concept-Theory-Empirical Chart Using Pender's HPM to Guide Hand Hygiene for Health Project



Appendix B

Educational Session Outline

I. Welcome: The project leader will thank everyone for attending, confirm that participants can view the screen, and remind participants that the session will be recorded. The project leader will remind participants to turn off their video feature and to remain muted during the presentation unless they desire to ask a question. The project leader will ask if there are any concerns before the recording begins and inform participants if they are uncomfortable with the recording or any other aspect of the presentation, to simply close their browser at any time.

II. View videos from the CDC:
   a. Fight Germs, Wash Your Hands! (CDC, 2017a).
   b. What you need to know about handwashing (CDC, 2020).

III. Pose thought-provoking questions about the videos for participants to quietly and independently reflect upon:
   a. What new information/insights gained?
   b. Does this change your mindset about washing your hands? How?

IV. Review of key concepts about handwashing with soap and water from the videos:
   a. Handwashing takes longer than 20 seconds. We need to concentrate on the 20-scrub.
   b. Fun Activity: How to know 20 seconds have elapsed: The video says to sing The Happy Birthday song (Remind participants that we sing the Stevie Wonder version at church). This will get us closer to 20 seconds while we scrub**.**
      - Display the words to Happy Birthday Song (traditional version): Sing and time
      - Display the words to Happy Birthday by Stevie Wonder: Sing and time

c. Indicate the importance of turning off the faucet while scrubbing.
d. Using a clean paper towel to turn off the faucet after handwashing is complete.

V. Watch video on using hand sanitizer: 'How to use Hand sanitizer effectively' **(**Babylon Health, 2020).

a. Educate on highlights from the Minnesota Department of Health which includes:
   - Waterless hand sanitizer provides several advantages over handwashing with soap and water. However, they are not effective if organic matter (dirt, food, or other material) is visible on hands.

b. Benefits of waterless hand sanitizer:
   - require less time than hand washing
   - act quickly to kill microorganisms on the hands
   - are more accessible than sinks
   - reduce bacterial counts on hands
   - do not promote antimicrobial resistance
   - are less irritating to the skin than soap and water
   - some can even improve the condition of the skin

c. Other Tips:
   - Do not rinse or wipe off the hand sanitizer before it's dry; it may not work as well against germs.
   - Alcohol is flammable, so be sure your hands are dry (Minnesota Department of Health).

VI. When should we wash our hands?

Display the CDC poster: 'Hand Washing at Home, at Play, and Out and About' (CDC, 2017b)

a. Review the list of circumstances that warrant the performance of hand hygiene

b. Educate on when soap and water should be used versus hand sanitizer

VII. Nail Hygiene: Display the CDC webpage (CDC, n.d.-b)

VIII. Education related to identified barriers, methods for overcoming barriers, and how to maintain hand hygiene practices. Review of handwashing videos.