

Infection Control And Health Care Associated Infection (hcai) In The Nursing Home: A Study To Determine The Impact Of An Educational Video And Pamphlet About Infection Control On Knowledge And Perception Of Hand Hygiene In Certified Nurse Assistants

2012

Kathe Hypes
University of Central Florida

Find similar works at: <http://stars.library.ucf.edu/etd>

University of Central Florida Libraries <http://library.ucf.edu>

 Part of the [Nursing Commons](#)

STARS Citation

Hypes, Kathe, "Infection Control And Health Care Associated Infection (hcai) In The Nursing Home: A Study To Determine The Impact Of An Educational Video And Pamphlet About Infection Control On Knowledge And Perception Of Hand Hygiene In Certified Nurse Assistants" (2012). *Electronic Theses and Dissertations*. 2332.
<http://stars.library.ucf.edu/etd/2332>

This Doctoral Dissertation (Open Access) is brought to you for free and open access by STARS. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of STARS. For more information, please contact lee.dotson@ucf.edu.

INFECTION CONTROL AND HEALTH CARE-ASSOCIATED INFECTIONS IN THE
NURSING HOME: A STUDY TO DETERMINE THE IMPACT OF AN EDUCATIONAL
VIDEO AND PAMPHLET ABOUT INFECTION CONTROL ON KNOWLEDGE AND
PERCEPTION OF HAND HYGIENE IN CERTIFIED NURSE ASSISTANTS

by

KATHE L. HYPES
BSN University of Central Florida, 1982
MSN University of Florida, 1991

A thesis submitted in partial fulfillment of the requirements
for the degree of Doctor of Nursing Practice
in the College of Nursing
at the University of Central Florida
Orlando, Florida

Spring Term
2012

Major Professor: Christopher Blackwell

© 2012 Kathe L. Hypes

ABSTRACT

The impact of an education program on perception, knowledge, and infection rate was evaluated in this study. The educational intervention consisted of a video on infection control and a World Health Organization (WHO) pamphlet for hand hygiene. The study was conducted in one nursing home in the Southeastern United States. The survey sample consisted of 66 certified nurse assistants (CNAs). A pre- and post-intervention design was employed using the WHO's Hand Hygiene Knowledge Questionnaire and the WHO Perception Survey. Friedman's test and central tendencies showed no statistical relationship between the educational intervention and the overall knowledge scores of the sample. There also were no statistical differences in perception of hand hygiene in the CNA sample. Infection frequency was reduced with a percent change of -42%. While results of knowledge and perception surveys were not statistically significant, multiple conclusions were derived to suggest that educational opportunities may impact hand hygiene practice in CNAs and lead to a decrease in infection.

ACKNOWLEDGMENTS

I wish to thank my committee, Dr. Christopher Blackwell, Dr. Maureen Covelli, and Dr. Mark Winton for their encouragement and support through this process. Through the years Dr. Blackwell has always been available for help and encouragement.

I thank the employees of the nursing home that were willing to take the time to learn and complete the survey process. The administration of the facility was very helpful and supportive.

Most importantly, I thank my husband Steve, my children Robert and Seth, and my sister Jane, all of whom have helped and offered great words of encouragement.

TABLE OF CONTENTS

LIST OF FIGURES	vii
LIST OF TABLES	viii
CHAPTER 1: INTRODUCTION	1
HCAI.....	1
Hand Hygiene	2
CNA	3
The Use of Education in Prevention of HCAs	6
Purpose of the Study	8
Research Questions	8
Operational Definition of Terms.....	9
Assumptions.....	9
CHAPTER 2: LITERATURE REVIEW	10
Introduction.....	10
Impact of HCAs.....	10
Infection Control.....	12
Nursing Home Infection Control	13
WHO Guidelines.....	16
CNA Transmission: Hand Hygiene	17
Education of the CNA.....	22
Educational Video Use	24
Theoretical Framework.....	25
CHAPTER 3: METHODOLOGY	31
Setting and Sample	31
Protection of Human Participants	32
Procedure and Data Collection	33
Instrumentation	34
Treatment of Data	35
CHAPTER 4: RESULTS	36
Introduction.....	36
Demographic Characteristics	36
Knowledge Scores	38
Research Question 1	39
Perception Scores.....	40
Research Question 2	41
Research Question 3	44
Other Analysis	46
Summary	47
CHAPTER 5: DISCUSSION.....	48
Introduction.....	48
Research Question 1	48
Research Question 2	50
Research Question 3	52
Other Analysis	52

Limitations	53
Implications for Future Research.....	54
Implications for Policy Development	55
Summary	55
APPENDIX A: ADULT CONSENT FORM	57
APPENDIX B: UCF IRB APPROVAL FORM	60
APPENDIX C: LETTER TO ADMINISTRATION OF NURSING HOME	63
APPENDIX D: LETTER TO IRB FROM NURSING HOME	65
APPENDIX E: HAND HYGIENE KNOWLEDGE QUESTIONNAIRE FOR HEALTH CARE WORKERS	67
APPENDIX F: PERCEPTION SURVEY FOR HEALTH CARE WORKERS	71
APPENDIX G: EDUCATION PAMPHLET	76
APPENDIX H: FOLLOW-UP PERCEPTION SURVEY	84
LIST OF REFERENCES	90

LIST OF FIGURES

Figure 1. The Theory of Planned Behavior (Ajzen, 1985)	27
Figure 2. Histograms of the Three Knowledge Scores	39
Figure 3. Infection Frequency and Infection Prevalence	45
Figure 4. Histogram of Frequency of CNAs Reading Pamphlet	46

LIST OF TABLES

Table 1. Sample Characteristics Continuous Variable	37
Table 2. Sample Characteristic Categorical.....	37
Table 3. Central Tendencies for Three Knowledge Tests.....	38
Table 4. Friedman Test Knowledge Score.....	40
Table 5. Friedman Test for Perception of Percent HCAI in patients.....	41
Table 6. Friedman Test for Perception of Impact HCAI in Patients	42
Table 7. Friedman Test for Perception of Effective of HH on Prevention of HCAI in Patients ..	42
Table 8. Friedman Test for Perception of Importance of Hand Hygiene to the Institution.....	43
Table 9. Friedman Test for Percentage of Actual Hand Hygiene Performance	44
Table 10. HCAI Rate	45

CHAPTER 1: INTRODUCTION

Healthcare-associated infections (HCAIs) are an important patient safety issue and a concern in the healthcare community (Allegranzi et al., 2007). Increased morbidity and mortality rates due to these infections is evidenced in the literature (Klebens et al., 2007; Koch, Eriksen, Elstrom, Aavtisland, & Harthug, 2008). HCAIs are a burden to nursing homes (Strausbaugh & Joseph, 2000; Koch et al., 2008; Arias, 2010; Cardo et al., 2010). Nursing homes in the United States have reported rates of infections ranging from 1.6- 32.7 infections per 100 residents per month (Arias, 2010). The reported incidence rate ranges from 10.7% to 20.7% per 1,000 resident days. There are 1.6 million to 3.8 million estimated infections per year in nursing homes (Arias, 2010). The resulting morbidity and mortality continues to impact this population. Many of these HCAIs result in hospitalization (Koch et al., 2008). The number of HCAIs in the hospital as reported through the National Nosocomial Infections Surveillance System (NNIS) was 1.7 million in 2002. Of these, 98,987 died (Klebens et al., 2007). There were 35,967 deaths from pneumonia, 30,665 from bloodstream infection, 13,088 from urinary tract infection, 8,205 from surgical site infection, and 11,062 from other sources (Klebens et al., 2007). The rate of new infections continues to rise (Biddle, 2009), and with it is increasing mortality.

HCAI

The term HCAI has replaced “nosocomial” in terminology by the Centers of Disease Control and Prevention (CDC) (Horan, Andrus, & Dudeck, 2008). An HCAI is an infection in a patient that is not present on admission or prior to admission to a healthcare facility (Umscheid et al., 2011). Common HCAIs include catheter-associated bloodstream infection (CABSI), ventilator-associated pneumonia (VAP), healthcare-acquired pneumonia (HCAP), catheter-

associated urinary tract infection (CAUTI), urinary tract infection (UTI), skin and soft tissue including surgical site infection (SSI), upper respiratory infections (URI) including sinusitis and influenza, lower respiratory infection (LRTI) including pneumonia, conjunctivitis, and viral or bacterial gastroenteritis (Smith et al., 2008; Umscheid, et al., 2011). As of 2008 Medicare stopped reimbursement to hospitals for those HCAs considered to be “reasonably preventable” (p. 101). These include CABSIs, CAUTIs, and SSIs, all of which are seen in nursing homes (Wald & Kramer, 2007; Umscheid et al., 2011). The transmission in the nursing home of potentially harmful pathogens by contaminated hands of healthcare workers continues to contribute to these HCAs (Biddle, 2009; Huang & Wu, 2008).

Nursing homes are facilities providing custodial and skilled nursing care to individuals who do not require hospitalization, but need care that cannot be provided at home. There are about 15,700 nursing homes in the United States, with about 676 of them in the State of Florida (Cowles, 2009). About 1.5 million Americans are in these facilities, with 90% of them considered “frail elderly” (Strausbaugh & Joseph, 2000). With the baby boomers turning 65, the nursing home population is estimated to swell to 5.3 million by 2030 (Strausbaugh & Joseph, 2000). In the nursing home, care is primarily provided by certified nurse assistants (CNAs) (Pfeifferle & Weinberg, 2008).

Hand Hygiene

Hand hygiene is defined as hand washing with soap and water or the use of alcohol-based rubs (ABRs). It is viewed as the single easiest method to prevent HCAs (Trunnell & White, 2005; Gould, 2010). Compliance with hand hygiene is at an unacceptable rate (Pittet, et al., 2000; Kampf & Kramer, 2004; Pittet & Donald, 2005; Kac et al., 2006; Erasmus et al., 2010;

Gould, 2010). The average compliance rate is viewed at about 50% among health care workers (Institute for Healthcare Improvement, 2008). This has been viewed as such a significant patient safety issue that the World Health Organization (WHO) developed guidelines to address the problem. Hand hygiene has become a major worldwide campaign (WHO, 2009).

Hand hygiene is a simple, cost-effective method to prevent HCAs (Gould, Chudleigh, Dry, Moralejo, 2007). Barriers to good hand hygiene have been found to be related to work load, lack of supplies, perceived risk, lack of education, or behavioral patterns of the staff (Maskerine & Loeb, 2006). While this lack of compliance has been the focus of many research studies (Gould, 2010), there has been a paucity of research specifically targeting the certified nurse assistant (CNA) in the nursing home. This is such an important topic that the Agency of Healthcare Research and Quality has now focused on hand washing as one of their top research agendas (Biddle, 2009).

CNA

The certified nurse assistant (CNA) is a healthcare worker that plays a vital role in nursing home care (Pennington, Scott, & Magilvy, 2003). With increasing numbers of chronically ill elderly patients, CNAs are increasingly called upon to care for the frail and elderly patient (Noelker, 2001). Although the CNA staff usually comprises only 43-65% of actual nursing home staff, CNAs have been estimated to deliver 90 percent of care (Pfiefferle & Weinberg, 2008).

This level of worker has limited education and most did not attend college (Sengupta, Harris-Kojeten, & Ejaz, 2010). The lack of CNA education has become a concern for researchers trying to improve care in nursing homes (Lerner, Resnick, Galik, & Russ, 2010). A United States

(US) survey of 3,017 CNAs indicated the majority of CNAs had an education level of high school or lower, with 43.8% having received a high school diploma, 18.2% a graduate equivalency diploma (GED), and 12.4% less than 12 years of schooling. While there were 20% of respondents admitting to 1-3 years of college, only 5% of CNAs surveyed had earned a college degree (Squillace et al., 2009).

CNA minimum education requirements were established as part of the Omnibus Budget Reconciliation Act (OBRA) of 1987 (Menne, Ejaz, Noelker, & Jones, 2007). Included was the requirement for CNAs to have at least 75 hours of educational training with 16 of these hours to be supervised clinical training in a lab or clinical setting. The subject matter covered includes basic nursing skills, personal care, restorative services, patient rights, infection control, and safety or emergency procedures. Once the CNA student finishes a program, a state-specific certification examination is completed.

After completing the examination successfully, the CNA is employed by a nursing home or other healthcare employer within the field. A period of orientation is completed in the nursing home that can vary from one facility to another with different expectations depending on the patient population. As part of their role, CNAs in the nursing home setting will undoubtedly care for patients with some type of infection (Huang & Wu, 2007).

The amount of time required for infection control education in a CNA program or orientation is not specified, and the content of the infection control information given to potential CNAs can vary from one school to another (Cherry et al., 2007). There also is no minimal standard for the level of information given to students (Lerner, Resnick, Galik, Russ, 2010). Subsequently, CNAs function at the bedside with varying levels of knowledge and skill. In a survey by the Office of the Inspector General, 90% of responding nursing homes felt CNA

training was inadequate and did not fully meet the needs of the residents (US Department of Health and Human Services, 2002). Further details of the survey included suggestions for increasing CNA training to include in-service education on infection control, end-of life care, cognitive disorders, catheter care, and teamwork.

In reaction to disparity of care concerns brought by consumers and survey results, the Para-Professional Healthcare Institute (PHI) developed recommendations and identified key areas of education missing from CNA training programs. One recommendation to the Centers of Medicare and Medicaid Services (CMS) and to states was to increase the federally mandated 75 hours of training to 160 (Nakhnikian, Wilner, & Hurd, 2002). The organization believed CNAs do not get enough formal training and subsequently lacked the skills to care for nursing home residents. They also recommended standardizing training programs between states to allow ease of relocation for CNAs and also ensure adequate training. Despite these recommendations, the majority of states are still mandating just 75 hours of CNA training.

Despite the risk of potential transmission of infection, there is still a lack of CAN-centered infection control education (Nakhnikian, Wilner, & Hurd, 2002). The role of healthcare workers in the transmission of HCAs is well-documented in the literature (Kampf & Krammer, 2004; Won, et al., 2004; Biddle, 2009; Arias, 2010; Mathai, Allegranzi, Kilpatrick & Pittet, 2010). The transmission of an infectious disease requires three parts: an agent, a host, and a conducive environment. The agent can be bacteria, fungi, viruses, or other microorganisms. These microorganisms can be transferred by hand carriage, clothing, or other contaminated items by the CNA to other patients. Once an agent has been introduced to a host, conditions have to be conducive for infection to occur—the patient has to be susceptible. Most patients in nursing homes are susceptible due to decreased immunity, protein malnutrition, and other chronic

medical conditions, which place them at higher risk to infectious agents (Makeis, Moragn, Gaber, Richter, & Rubino, 2000).

All healthcare workers should have an understanding of transmission, especially those that are in frequent direct contact such as the CNA (Lin, Yang, Lu, & Kao 2008). With limited education and lack of understanding of transmission, the CNA may become an agent for infection. In some nursing homes, CNAs often do not know why a patient is isolated or even what type of infection a person has. This misunderstanding may lead to faulty isolation procedures and increased risk of HAIs (Lin et al., 2008). The CNA also may not actually perceive a risk of infection to themselves or to the patient due to this lack of understanding. Therefore, the CNA is thought to be one of the main staff members to target to decrease transmission of HCAs in nursing homes (Huang & Wu, 2007).

For the person who resides in a nursing facility, the surroundings and available accommodations become his or her home. In society, people that live at home do from time to time develop an infection, but the main difference between the two is the frailty and debility of residents in long-term care. These patients have a worse functional status, which places them at higher risk for infection or colonization from many microorganisms, including those that are multi-drug resistant (MDR). Therefore, prevention of HCAs in the elderly nursing home patient is paramount in the overall care of the institutionalized elderly.

The Use of Education in Prevention of HCAs

The development of a good infection prevention program is acknowledged to be the key to decreasing the risk of infection (Rao et al., 2009). There are guidelines developed by the Society of Healthcare Epidemiology of America (SHEA) and Association for Professionals in

Infection Control and Epidemiology (APIC) (Smith et al., 2008) in place, but many nursing homes still fall short of these recommendations. British researchers reported that 27% of nursing homes did not meet the British minimal standards for infection control and hygiene in 2005 (Rao, et al., 2009). By developing a focused educational program for CNAs and determining its effectiveness, the reduction of serious infections may occur.

There is a global consensus that the WHO guidelines set the standard and are the most effective in approach to hand hygiene (WHO, 2009). The program developed by WHO is voluntary and includes a packet of information that can be used in the hospital or nursing home setting. Included in the WHO guidelines are recommendations to increase staff awareness and education. Education used to supplement infection surveillance and current infection control programs is one method to help prevent infections in the healthcare setting (Lin, Yang, Lu, Kao, 2008). Understanding the role played by contact and use of contaminated items may benefit the patient and CNA. Advantages of an educational program for the CNA include increased patient safety, improved clinical practice, and increased job satisfaction of staff. Ultimately, the benefit is reduced infection rates in frail, elderly patients residing in nursing homes.

In summary, a significant problem in the nursing home industry is HCAs. In the nursing home HCAs have the potential for detrimental effects on the organization, the patient, and the staff. Research regarding the prevention of HCAs has maintained the need for education and a well-developed infection control program. The role of the CNA as primary care-giver for patients is well-established, but the exact role CNAs have in transmission has not been well studied in nursing homes. However, the consensus is that due to frequent contact between the patient and CNA, there is a higher risk of contamination when infection control guidelines are not followed (Koch et al., 2008). Due to the limited education of CNAs, a clear understanding of

these guidelines has not been established. Subsequently, an educational program focused on the CNA is one way to help prevent HCAs in nursing homes.

Purpose of the Study

The purpose of this quasi-experimental study is to determine the impact of viewing an educational video on infection control and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of hand hygiene and the incidence of HCAs in the nursing home.

The independent variables are an educational video and the WHO informational pamphlet (2009) focused on infection control and hand hygiene for the CNA. The dependent variables include infection rate, as measured by chart surveillance at the nursing home, and knowledge and perception of hand hygiene, as measured by the WHO Hand Hygiene Knowledge Questionnaire and the Perception Questionnaire for Health-care Workers (2009).

Research Questions

This study was designed to investigate the following questions:

- 1 Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase post-test scores on the Hand Hygiene Knowledge Questionnaire for Health Care Workers by CNAs in the nursing home?
- 2 Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase the perception of hand hygiene of CNAs as evidenced by the WHO Perception Questionnaire for Health Care Workers?
- 3 Will viewing an educational video and reading the WHO informational pamphlet about infection control statistically decrease the number of HCAs?

Operational Definition of Terms

- Certified Nurse Assistant (CNA): An employee of a nursing home who gives direct patient care and is currently certified by the State of Florida.
- Nursing home: An institution licensed by the State of Florida to provide 24-hour skilled nursing and rehabilitation services.
- Educational video: A program that includes all guidelines from the CDC and current practice standards. Specifically used was a DVD titled “Infection Control” by Pamela J. Carter (2006) distributed by Lippincott®.
- Health-Care Associated Infection (HCAI): An HCAI is an infection in a patient that is not present on admission or prior to admission to a healthcare facility. These include catheter-associated bloodstream infection (CABSI), ventilator-associated pneumonia (VAP), healthcare-acquired pneumonia (HCAP), catheter-associated urinary tract infection (CAUTI), urinary tract infection (UTI), skin and soft tissue including surgical site infection (SSI), upper respiratory infections (URI) including sinusitis and influenza, lower respiratory infection (LRTI) including pneumonia, conjunctivitis, and viral or bacterial gastroenteritis.
- Hand hygiene: The actual practice of cleansing of the hands by CNAs with an alcohol-based gel product provided to the CNA.

Assumptions

1. The CNA can comprehend and write American English.
2. Infection records on cases of HCAs are accurate at the nursing home.

CHAPTER 2: LITERATURE REVIEW

Introduction

The purpose of this study is to investigate the impact of an educational video on infection control, and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of hand hygiene and incidence of HCAs in the nursing home. The review of literature will include an evaluation of the impact of HCAs in the elderly nursing home resident. The role of the CNA in regard to transmission and hand hygiene will also be presented. An explanation of the WHO’s guidelines on hand hygiene is provided. Education requirements of the CNA will also be reviewed. The use of video-based education in adult learning will also be discussed. Finally an exploration of the use of increased knowledge to change behavior will be detailed using the Theory of Planned Behavior (TPB). A model that further defines the TPB and suggested use with the CNA will be presented.

Impact of HCAs

There is both a financial and health-related impact of HCAs on nursing homes in the US. The financial burden to US nursing homes of HCAI is estimated to exceed several billion dollars annually (Strausbaugh & Joseph, 2000). There have been few direct attempts to specify actual total costs to the healthcare system. Most studies generally target specific areas of an infection and specific types of facilities, which makes extrapolation difficult (Strausbaugh & Joseph, 2000). The real effect of infection on direct costs is seen in the complex cascade of events surrounding the frail elderly nursing home population. With infection comes the cost of antibiotics, diagnostic testing, and frequently transference of the patient to a hospital setting. The cost of hospital care for treatment of HCAI can range from four to six thousand dollars per episode (Strausbaugh & Joseph,

2000). A survey of 11 nursing homes revealed antibiotic costs to be over 200,000 dollars per year (Mylotte & Keagle, 2005). Indirect costs, including nursing care, environmental cleaning, and the use of additional supplies for infection control, are also factored in to the total cost for HCAI in nursing homes.

The amount of morbidity and mortality caused by HCAI places a burden not only on the nursing home but society as well. HCAI is a major source of debility, hospital admission, and death in the elderly nursing home patient (Makris et al., 2000). In an effort to determine rates of increased debility, transfers to hospital, and number of deaths of nursing home patients with HCAI, a Norwegian study followed patients in six nursing homes for a six-month period. Patients with an infection were twice as likely to become debilitated and had increased hospitalization and increased risk of death compared to patients without infection (Koch et al., 2008).

With the continued rise of healthcare costs and loss of life, the impact of HCAs has become increasingly salient (Cardo et al., 2010). HCAs have become a global issue with the focus on prevention and elimination (WHO, 2009). In 2010, an initiative between the Association for Professionals in Infection Control and Epidemiology (APIC), the Society for Healthcare Epidemiology of America (SHEA), the Infectious Disease Society of America (IDSA), the Association of State and Territorial Health Officials (ASTHO), the Council of State and Territorial Epidemiologists (CSTE), the Pediatric Infectious Disease Society (PIDS), and the CDC formulated a call to action. The proposed elimination of HCAs was detailed in a white paper they produced (Cardo et al., 2010). The clear and concise determination of all these organizations was that elimination can begin with the use of evidenced-based practice, development of financial incentives, use of surveillance systems to assess progress, increased education, and the closure of knowledge gaps.

In summary, the impact of HCAI on nursing homes and the healthcare industry is well documented (Cardo et al., 2010). Increased morbidity, debility, and mortality are detrimental to elderly nursing home patients. The financial cost to nursing homes continues to increase with more patients developing multi-drug resistant infections. Nursing home staff need to look for ways of preventing these illnesses to protect both themselves and patients.

Infection Control

The concept of infection control is actually thousands of years old and is seen in ancient Jewish writings. Anything that came into contact with a dead animal would be cleaned, and society even tried to isolate people with leprosy. In the 1800s Florence Nightingale actually brought recognition to control of diseases such as typhus with her thoughts on nursing. Semmelweis, a Viennese obstetrician in the 1840s, found 20% of females giving birth died of febrile illness. He proposed that medical staff wash their hands, but was seen as a zealot and branded a lunatic. His work was later verified by the works of Koch, Pasteur, and Lister. Currently Semmelweis' principles of hand hygiene are the backbone of infection control (Biddle, 2009).

Historically, infection control programs in nursing homes have not been well-established (Nicolle, 2001). The same infectious patterns seen in hospital-acquired infections are present in nursing homes (Smith et al., 2008). However, nursing homes are different from hospitals in that they do not have easy access to X-rays and do not have an in-house laboratory. Therefore, infection control programs that work in hospitals do not necessarily work in nursing homes.

The increasing incidence of new drug-resistant organisms and multi-drug resistant organisms (MDROs) in nursing homes has made the need for infection control more urgent (Spaulding, 2006). There are higher rates of clostridium difficile (CD), Methicillin-resistant staphylococcus

aureus (MRSA), Vancomycin-resistant enterococcus (VRE), and extended spectrum beta-lactamases (ESBLs) that require a well-established infection control program to reduce transmission in nursing homes (Zoutman, Ford, & Gauthier, 2009). MRSA is specifically challenging due to the increasing colonization seen in nursing home residents (Gould, 2011). MRSA carriage in 10 nursing homes in Orange County, California was found to be 31% versus 6% in hospitals in that same region (Reynolds, et al., 2011).

Nursing Home Infection Control

During the last two decades there has been increased recognition of the need for development of infection control in nursing homes (Smith et al., 2008). This increase in surveillance and infection control was brought about by a publication by the Association for Professionals in Infection Control and epidemiology (APIC) in 1991 and later updated in 1997. This position paper focused mainly on standards for infection prevention and control in nursing homes (Smith & Rusnak, 1997). In 2009, the Department of Health and Human Services (DHHS) and the Centers of Medicare and Medicaid (CMS) developed new standards for nursing home infection control programs. Each year nursing homes are subject to inspection by the Agency for Health Care Administration (AHCA). This state survey team enforces regulations made by the CMS. A nursing home can be cited and fined if the proper regulations are not followed. As detailed by CMS F441, “the facility must establish and maintain an infection control program designed to provide a safe, sanitary, and comfortable environment and to help prevent the development and transmission of disease and infection” (DHHS, 2009, p. 3).

In an effort to control infection in nursing homes, an effective infection control program should be implemented that has the following elements as recommended by the Society of Healthcare Epidemiology of America (SHEA) and APIC (Smith, et al., 2008):

1. Surveillance: Some type of data collection to specifically identify infections in patients
2. Outbreak control: The nursing home would have a system in place for detection, investigation, and control of different infectious diseases
3. Isolation: An isolation procedure to reduce transmission
4. Policies and procedures: Clear and standard policies for employees, families, and patients in regards to infectious diseases
5. Education for staff and patients
6. Resident health program
7. Employee health program
8. Antibiotic stewardship: Program for antibiotic review and control
9. Disease reporting to public health agencies
10. Facility management: Environmental control, cleansing, and sterilization
11. Performance improvement
12. Preparedness planning

An evaluation of the effects of a comprehensive infection control program on the incidence of infections in nursing homes was the focus of a study by Makris et al. (2000). These researchers used eight free-standing private nursing homes in New Jersey. Four control sites received no intervention. Test sites were provided with a three-part modular infection control education program presented two to three weeks apart. Results supported the use of a

comprehensive educational infection control program in the nursing home setting with the number of infections in the control site decreasing by 122 (Makris et al., 2000).

Even though there are standards for infection control programs in nursing homes, these programs can vary greatly. A Canadian study to determine the prevalence of infection control programs and type of practitioners available in nursing homes revealed 87% of facilities had an infection control program with a committee, 91% had 24-hour registered nurse coverage, and 84% had on-site infection control staff (Zoutman, Ford, & Gauthier, 2009). The mean number of full-time equivalent infection-control professionals per 250-bed nursing home was 0.6 and only 8% of these were certified through the Board of Infection Control and Epidemiology. One-fifth of the nursing homes had a physician or doctoral-prepared provider devoting time to the infection control program. Recommendations resulting from the survey were an increase in infection-control programs with increased physician involvement and an increase in the number of infection control practitioners (Zoutman, Ford, & Gauthier, 2009).

The need for adequate infection control is well-established in the literature (Pyrek, 2002; Smith, et al., 2008; Cardo, et al., 2010). One British study focusing on infection control involving all nursing home staff members evaluated 12 nursing homes and their current infection control practices. The goal of the research was to determine the effectiveness of an enhanced infection control program on staff hygiene, waste disposal, and environmental cleanliness. Six nursing homes received an intervention that included increased staff education and availability of infection control nurses. Researchers found improvement in the overall infection control in 11 out of the 12 nursing homes. One control facility had a decline in infection control adherence. Data results indicated no statistical difference between the control facilities and the intervention

group for hand hygiene, waste disposal, or environmental cleanliness. The researchers could not explain this occurrence and recommend further research (Rao et al., 2009).

These data support the use of an infection-control educational program to CNAs working in nursing homes. Programs that stress the guidelines as developed by SHEA and APIC are needed in long-term care.

WHO Guidelines

In the fall of 2004, the WHO began development of guidelines for hand hygiene (HH). A set of guidelines based extensively on review of the literature, data collection, and pilot testing worldwide was ultimately authored by a group of over 100 experts. Entitled “Guidelines on Hand Hygiene in Health Care,” the WHO guidelines include current details available on hygiene products, clinical relevance, and systems to encourage HH compliance.

This guideline has become the basis for research and development of interventional programs in HH worldwide. With sections outlining scientific data, outcome measures, and ways to promote HH, the WHO has devolved a system to facilitate improvement in patient safety. Implementation strategies that have been shown to be generally effective include educational outreach programs, reminders, audit and feedback, and general facility reminders (WHO, 2009).

At the center of the guidelines is the overall need for improving the HH of all healthcare workers (Eramus, et al., 2011). Compliance within the healthcare setting with HH guidelines is seen as a preventive measure and should be used in a stepped manner. HH is considered the most important way to decrease HCAI (WHO, 2009; Eramus et al., 2011).

CNA Transmission: Hand Hygiene

For the continued well-being of nursing home patients, the CNA has to be well-trained and able to provide safe care to each patient. A review of literature about transmission indicates most HCAs can be transmitted by direct contact (Pyrek, 2002; Lam, Lee, & Lau, 2004; Spaulding, 2006; Creamer, et al., 2009). This highlights the importance of HH to prevent transmission. It should be stressed to healthcare workers given that it is the single most important factor in the prevention of disease (Kampf & Krammer, 2004; Erasmus et al., 2010).

HH opportunities in healthcare are mandated as five separate occasions by WHO (2009). These “five moments for hand hygiene” are as follows:

1. Before touching a patient
2. Before a clean or aseptic procedure
3. After body fluid exposure
4. After touching a patient
5. After touching a patients’ environment

These five areas provide opportunities for measurement of compliance. The compliance to HH remains relatively low with some areas below 50% (Erasmus et al., 2010). There have been many studies looking at compliance in healthcare workers (Hugonnet, Perneger, & Pittet, 2002; Kac, et al., 2005; Gould et al., , 2007; Gould, et al., 2008; Huang & Wu, 2008; Aiello, et al., 2009; Biddle, 2009; Hanna, Davies, & Dempster, 2009; Gould, 2010; Gilbert, et al., 2010; Erasmus et al., 2010).

Mcguckin and associates (2010) followed the guidelines established in 2005 by WHO. The researchers used a one-year multicenter framework to determine if a monitoring and feedback program would increase compliance with HH. The study was open to all healthcare centers in the US. The establishment of benchmarks by the researchers was done through literature review and

previous research. Data reported after one year of monitoring product uptake indicated that staff compliance in intensive care units (ICUs) increased from 26% to 37% ($p=.119$). For non-ICUs the rate increased from 36% to 51% with ($p<.001$). This information was used as a baseline to develop further HH programs and showed that the use of measuring product uptake is a viable solution to monitoring compliance of HH in healthcare workers (McGuckin, Waterman, & Govednik, 2010).

The use of education is also a method explored to improve compliance. However, after review of the literature, research aimed at HH and infection control education in CNAs caring for the elderly nursing home patient is lacking (Aiello et al., 2009). One educational focused study by Huang and Wu (2008) examined the effects of a training program in three Taiwanese nursing homes. CNA knowledge and compliance of HH was evaluated. Participating CNAs underwent an educational program consisting of one hour in-service with 30 minutes of hands-on training. Infection rate was also measured prior to the in-service and then for a three-month period after the in-service. Knowledge was subsequently tested at one month and three month intervals after intervention. Results from the data collection showed a significantly higher level of knowledge by the CNA from a score of 13.82 to 15.41 ($p<0.001$), and better compliance from 9.34 % to 30.36 % ($p<0.001$) than before the intervention. The researchers also found a reduction in facility infection rates from 1.74% to 1.52% ($p< 0.001$) (Huang & Wu, 2008).

Whether knowledge, beliefs, and perceptions influence compliance with HH has been a question for researchers trying to develop methods for improvement. Aiello and associates (2009) completed research in four nursing homes using CDC HH guidelines. Results indicated health care workers (HCWs) with a better perception of HH were more likely to practice good glove techniques. Knowledge of fingernail traits (i.e. long nails or artificial nails) and the role in infection transmission were positively associated with good fingernail hygiene and limited use of

artificial nails. Conclusions by the researchers were that positive perceptions and beliefs related to infection control in nursing homes led to increased use of gloves and positive fingernail characteristics. Recommendations for further research included developing an intervention program targeting education in-services in the nursing home setting.

Takahashi and Turale (2010) reported that factors associated with compliance of HH in Japanese nursing homes were “willingness to practice standard precautions” and “attendance at seminars” (p. 130). The researchers did not find a singular factor that was particularly related to compliance with hand-washing procedures (Takahashi, & Turale, 2010).

Not only has compliance, or lack thereof, been an issue, but the type of product used for HH has been scrutinized. Oughton, Loo, Dendukuri, Fenn, & Libman (2009) compared several different methods of cleansing hands including warm water with soap, cold water with soap, warm water and antibacterial soap, cold water and antibacterial soap, alcohol wipes, and alcohol cleanser. Evaluation of all hand-washing methods led researchers to determine that the protocol of using warm water and soap had the greatest adjusted mean reduction of clostridium difficile bacteria. The prevailing recommendation from their study is to use warm water and soap.

A similar study conducted by Lucet et al. (2002) compared different HH techniques including washing with antimicrobial soap, regular soap, antiseptics (betadine and chlorhexidine), and washing with an alcohol rub. The subjects all used different methods of HH after patient contact, and cultures of hands were taken after washing with each different method. Results of the study revealed a greater decrease in pathogen count with just regular soap and water.

Kac and associates (2005) compared hand washing with soap and water and hand rubbing with alcohol-based rubs (ABR). During a six-month period, HCWs were randomly assigned using a crossover design to complete hand washing with soap and hand rubbing with ABR.

After each HH method, imprints of palms and fingertips were taken before and after HH. The number of microbiological colonies was counted and the pathogens were documented. The results revealed a statistical difference, with hand rubbing producing a greater reduction ($p < 0.001$ for palms and $p = 0.003$ for fingertips). The researchers determined that hand rubbing with ABR was more efficacious than hand washing (Kac et al., 2005).

A comprehensive analysis of an epidemic outbreak of keratoconjunctivitis by Dominguez-Berjon, Hernando-Briongos, Arroyo, Echevarria, & Casas (2007) was completed. They concluded early and adequate increases in worker hygiene can aid in stopping transmission.

Transmission by hand contact has been evaluated. Further evidence of this was found by researchers evaluating hospital HCWs. Results of one study showed 5% of healthcare worker fingertips were contaminated with MRSA. There was a 6% rate after clinical contact, 10% after contact with a patient's environment, and 4% after a non-specific contact. This data supports the premise that, transmission can occur if HH is not completed after contact (Creamer et. al, 2010).

Despite a great deal of evidence to support the use of adequate HH, compliance is the key problem (WHO, 2009), and methods to evaluate and measure staff compliance have been developed. One such method traditionally known as the "gold standard" has been direct observation. Direct observation requires researchers to visually view staff while performing HH and document occurrences or lack of occurrences on a flow sheet. Studies that use this method can be very labor intensive (Gould, Drey, & Credon, 2011), and concern about a "Hawthorne effect" has been the biggest threat to this method (Whitby & McLaws, 2007; Gould, 2010): Because staff know they are being evaluated, they will comply with the required behavior. Gould and colleagues (2007) evaluated data collection methods of 42 separate studies on HH and found methods used to report data and data collection by observations were poorly described.

The conclusion made by these researchers was that current available studies on HH was limited in scope and have questionable validity due to the difficulty in direct observation. Two other concerns were related to ethical and time considerations in the direct observation method. For example, the ethical dilemma of this data collection method is observing staff while they are performing personal hygiene on patients to ensure the staff member performs HH after care is completed (Gould et al., 2007).

The alternative to this method of auditing is tracking the use of product uptake, which requires the researcher to develop a way to measure the amount of HH product used by staff. Advantages to monitoring and auditing staff HH by use of product uptake are that this method is very inexpensive, does not disrupt normal day-to-day clinical activity, and produces continuous data collection (including all shifts). This method of auditing HH is gaining popularity and has been used in multiple studies (Earl, Jackson, & Rickman, 2001; Bitner, Rich, Turner, & Arnold, 2002; Gould, Drey, & Creedon, 2011). An example of research using product uptake was completed in a hospital-based study by Pittet et al. (2000) to determine the effectiveness of a hospital-wide HH program. The investigators used an educational intervention and a pre- and post- intervention model. In order to measure HH compliance, the amount of hand sanitizer ordered and used by hospital staff was measured and tracked. The program was considered a success with increased product uptake. Over a five-year period, the amount of hand sanitizer used rose from 3.5 liters per 1,000 patient days prior to the program in 1993 to 15.4 liters per 1,000 patient days in 1998. In conclusion, the use of HH audits is well-established in the literature to monitor staff compliance and is one feasible way to audit staff.

In summary, transmission of infection by HCWs is an established problem. Lack of adequate HH in the nursing home can have consequences for staff and patients. Addressing the

problem in the nursing home is essential for all staff. The use of education as a tool for the CNA to prevent infection may help to reduce transmission.

Education of the CNA

In addition to required initial hours of educational training, a CNA must fulfill additional yearly in-service training mandated by each state. This number varies from state-to state. In Florida, CNAs are required to earn a minimum of 12 hours of in-service training every year. Every two years they must complete in-service training to include HIV/AIDS, infection control, medical record documentation, domestic violence, patient rights, medical error prevention safety, and Cardio-Pulmonary Resuscitation (CPR) skills (Florida Department of Health).

In 2004, the National Nursing Assistant Survey (NNAS) was administered to over 3,000 CNAs in 769 different nursing homes nationwide (Sengupta, Harris-Kojentin, & Ejaz, 2010). The purpose was to gather information from the CNA perspective on educational training, job history, family life, demographics, job satisfaction, workplace environment, work-related injuries, and organizational commitment. The survey showed in-service training for the CNA was provided at employees' facilities 93% of the time. However, only two-thirds of the CNAs reported they felt they had adequate training (Sengupta, Harris-Kojentin, & Ejaz, 2010).

Evidence that CNAs benefit from increased training is found in the literature (Huang & Wu, 2008). Several studies show that increasing a CNA's knowledge level improves patient outcomes (Thomas & Burke, 1998; Nakhikian, Wilner, & Hurd, 2002; Lin, Yang, Lu, & Kao, 2008). One such program was developed to facilitate a caring attitude and develop a more positive view of the elderly nursing home patient. CNAs were presented with information and participated in a role-playing game. Survey results after the program indicated CNAs who

attended the program had gained knowledge and were more sensitive to the needs of the elderly (Thomas & Burke, 1998).

The need to further educate the CNA to benefit patient care is also evidenced by Weitzel and colleagues (2005). Impact of hospitalization on the elderly patient was determined to increase both debility and decline in function. Therefore, a program for the CNA was developed to include advanced training in actives of daily living, sleep patterns, incontinence, falls, immobility, and overall loss of function due to illness. The outcomes of an educational program led to increased job satisfaction for the CNA, decreased length of stay for hospitalized patients, and fewer discharges from hospital to a nursing home (Weitzel, Robinson, Henderson, & Anderson, 2005).

An in-depth CNA educational program targeting behavior problems in patients with dementia was developed by Burgio, Stevens, Burgio, Roth, Paul, and Gerstle, (2002). The focus of the program was to educate the CNA in behavior management and a goal was to increase the CNA skill level in managing patients with behavior problems. CNAs who received formal training were more effective in communication than the control group. Also noted by the researchers was a decrease in overall resident agitation in the patients cared for by the CNAs with formal training. This change in knowledge was maintained at follow-up with the formal training program (Burgio et al., 2002).

CNA knowledge was evaluated by Lerner, Resnick, Galik, and Russ (2010) using a 12-item multiple-choice test covering topics presented in a day-long training program. The mean score prior to the educational intervention was 6.08 correct; the post-test mean score was 8.18. A matched t-test showed statically significant improvement. The CNA contingent requested they

be given more educational information in regards to infection control and dementia (Lerner, Resnick, Galik, & Russ, 2010).

The use of an educational program to change behavior and increase compliance is possible in a nursing home setting (Thomas & Burke, 1998; Burgio et al., 2002; Weitzel, Robinsion, Henderson, & Anderson, 2005; Lerner et al., 2010). Using education to reduce HCAI in nursing homes can be a goal not only in the US but also worldwide.

Educational Video Use

The standard delivery of continual clinical education though the use of face-to-face lecture is costly and time consuming (Lee, Boyd, & Stuart, 2007). In comparison, the use of high-technology methods for learning with Digital Video Disc (DVD) or computer-based learning has been shown to be effective (Jones, Handley, Whitfield, Newcombe & Chamberlain, 2007; Lee, Boyd, & Stuart, 2007). Many studies support use of these technological methods for cognitive knowledge transfer (Jones et al., 2007; Lee, Boyd, & Stuart, 2007; Armstrong, Idriss, Kim, 2011).

The use of DVD for teaching clinical skills was the focus of a study by Lee, Boyd and Stuart (2007). A mixed medical and nursing group was used. DVD instructional use was found to be superior to face-to-face lecture. Similar results were found by researchers evaluating methods to teach CPR. This group consisted of persons with high school level to two years of college (Jones, et al., 2007).

The CNA is an adult learner. An adult learner has different experiences and needs than a younger learner. Knowles (1996) reported adult learners want to know why they should be learning and enter into learning experiences with a task oriented focus (Heden, Raines, & Barton,

2010). The WHO (2009) has determined the best way to teach HH is with a multi-modal approach. Therefore, in addition to the DVD, an educational pamphlet will be used. In 2009 WHO created an educational tool-kit to inform HCWs the correct way to proceed with HH. The pamphlet has been circulated worldwide.

Support for the use of educational pamphlets was found in a survey study of 644 direct care workers consisting of CNAs across Ohio. Menne and associates (2007) found that 80% of direct care workers prefer learning with the use of printed materials they can read on their own.

Theoretical Framework

The rate of HH compliance is the targeted behavior for use of an educational DVD intervention. Behavior has been shown to be linked with a person's knowledge and attitudes (Ajzen, 1985). Therefore, the theoretical framework for this study revolves around the Theory of Planned Behavior (TPB) (Ajzen, 1985).

TPB has been selected as a framework to identify the specific behaviors leading to compliance with HH. TPB was specifically chosen for use in this study because it has been successfully applied in the understanding of other healthcare behaviors (O'Boyle, Henly, & Larson, 2001; Burns, 2009). While on the job, CNAs are expected to behave in a certain manner. There are strict job expectations that are important for the CNA and he or she is must make certain adjustments to meet those expectations.

Attempting to understand a person's reasons for performing a certain behavior has been the topic of several studies (Mullen & Wong, 2006; Poulter & McKenna, 2010; Clayton & Griffith, 2008). By understanding behavior, the goal for researchers has been to facilitate ways to

improve compliance with certain positive behaviors, especially those behaviors that impact health and well-being.

Understanding why a CNA meets certain different job expectations and may not meet standards in others is important for improving care. For a CNA caring for the frail elderly in the nursing home setting, the importance of infection control behaviors is vital to the safety and well-being of the patient and staff. Therefore, understanding these behaviors or lack thereof would help in facilitating a behavioral education model to aid with changing staff behaviors and increasing compliance with job expectations.

The literature regarding different methods to formulate health-related behavior change is quite vast and includes multiple different approaches including operant conditioning, modeling, self-management, and cognitive behavioral approaches (Hardeman et al., 2002). Most of these deal with actual behavior and do not include any model or formulation to try to explain the intentions of a person prior to the behavior (Hardeman et al., 2002). One theory that does include intentional and is very well-accepted in the social science field is TPB (Ajzen, 1985).

TPB is a theory of behavior that uses a linear framework depicting causality of behavior. The central factor in the theory is the individual's intent to perform a given behavior (Ajzen, 1991). Described by Ajzen (1991) intentions are the indications of the amount of effort or how hard a person is willing to try to complete a certain behavior. The general thought is that a person with a strong intention to engage in a behavior is more likely to complete that behavior. In Ajzen's TPB, three independent determinates of intention (Figure 1) are outlined.

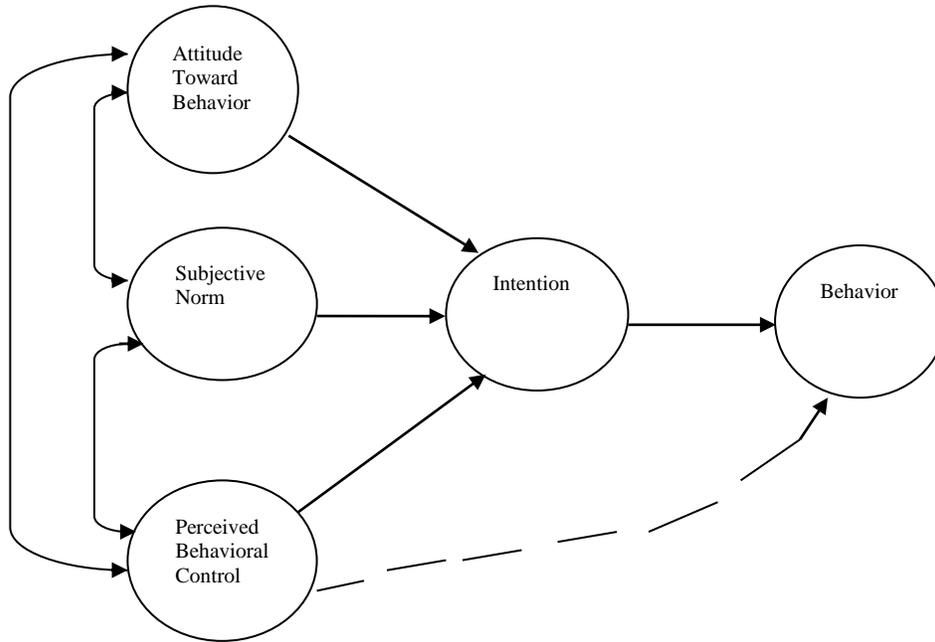


Figure 1. The Theory of Planned Behavior (Ajzen, 1985)

The first concept is attitude toward behavior. This concept consists of the level or degree to which any person feels about a certain behavior—essentially addressing if a person has a positive or negative understanding of the behavior in question. If a CNA has had a negative experience with a certain infection control behavior then he or she would have less intention of performing that behavior; for example, a CNA who has experienced hand dryness from repeated hand washing with soap and water may decide to skip this step in infection control.

Normative beliefs or subjective norms are the next concept in the model of TPB (Ajzen, 1985). Subjective norms are those perceived social pressures to comply with a certain behavior. When a person is presented with an expected behavior, the person is more likely to comply when social pressure is applied. For instance, a person would be more likely to wear a gown in someone’s room if they understand “everyone is doing it” and it is expected of them.

Perceived behavioral control is sometimes viewed in the same frame as self-efficacy (Ajzen, 1985). This concept refers to the ease or difficulty the chosen behavior is to perform. For a behavior to occur, a person has to have the skills and education needed to complete that required behavior. A person's past experience and education level would impact the behavior at this point. For example, if a CNA does not fully understand the need for putting on a gown and gloves, he or she may view the behavior as not necessary and then bypass the expected behavior.

All three of the above concepts impact intention. A person's intention is the motivation to actually complete a certain behavior. In accordance with the TPB, if people have a very high level of confidence in their ability to perform a task or behavior, their intention to complete that task is high as well. Subsequently the task is completed.

The TPB deals with the antecedents of intention and behavior in an effort to try to explain that behavior and not by necessarily predicting it. However, there have been several studies done using this theory to try to predict and explain a person's behavior. In an effort to predict behavior, Mullan and Wong (2009) used the TPB to predict hygienic food handling behaviors. The participants were 109 first-year psychology students. Questionnaires were administered in regards to their attitudes, perceived behavioral control, subjective norms, intentions, and past behaviors. Results indicated past behavior and habits were a strong predictor of behavior. The researchers concluded interventions to change behaviors need to focus on habits and perception of control over their environment (Mullan & Wong, 2009).

To evaluate the efficacy of the TPB, Armitage and Conner (2001) completed an analysis of 185 studies published through 1997. According to reviewers, the TPB accounted for 27% of variance in behavior and 37% of variance in intention. When the subjects had to self-report, the TPB accounted for 11% more of the variance in behavior. Conclusions also included that

attitude, subjective norm, and perceived behavioral control explained more of the variance in the individual's behavior than intentions or self-predictions (Armitage & Conner, 2001).

Hardeman et al. (2002) evaluated the application of the TPB. Thirty studies were assessed that described 24 different interventions. The TPB was mainly used to predict behavior. The most common behavior change methods were informational, persuasional, and educational to increase skill level and goal setting. The majority of results indicated interventions were effective in changing behavior about two-thirds of the time (Hardeman et al., 2002).

In an effort to apply the TPB to health issues, Burns looked at behaviors of persons required to take oral anticoagulation therapy (OAT) (Burns, 2009). The assessment was made that person requiring OAT made significant lifestyle changes to be compliant with therapy. There are frequent lab tests, changes in diet, and precautions to mitigate risk of bleeding. In an effort to facilitate the behavior change, the researcher applied the TPB to facilitate an intervention. Recommendations for increasing compliance to the behavioral change included addressing barriers such as negative attitude, beliefs, and further education about risk and benefits (Burns, 2009).

The TPB as it is applied assumes that human beings are rational agents and the consequence of conscious decision-making results in a particular behavior. This is very useful framework for the studying of human behavior. In healthcare, certain behaviors are deemed necessary for the safety of patients. The application of the TPB to healthcare-related behaviors has the potential to provide a great deal of information related to understanding behaviors and subsequently developing interventions to modify behaviors (Ajzen, 1991). Therefore, the use of this theory for health-related issues is recommended and demonstrated in the literature.

In summary, the goal of any practice change or improvement plan is to first understand the intentions behind the behavior in an effort to change that behavior. The TPB provides a framework that can be used to determine underlying complexities of CNA behavior. These concepts can be used to evaluate attitudes of CNAs toward certain behavior.

CHAPTER 3: METHODOLOGY

The purpose of this quasi-experimental study was to determine the impact of viewing an educational video on infection control and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of HH and incidence of HCAs in the nursing home.

Setting and Sample

This study was conducted in one nursing home in the Southeastern US. This nursing home is in an urban setting with a metropolitan population in excess of one million. The nursing home provides custodial and skilled nursing care to individuals who do not require hospitalization but need care that cannot be provided at home. The nursing home characteristics include being in an urban environment (greater than 1,000,000 population) with a facility size of 120 beds, and having administrative stability defined as having the same leadership team for greater than one year.

Participants were all chosen from one nursing home. This particular nursing home has three nursing units and all three were involved in the study. The CNAs are assigned to each unit; there was no effort to randomize. The sample was considered a convenience sample. The participants chosen for this study included all CNAs involved in patient care. There were 66 CNAs invited to participate. There was no control group. As there is limited literature in this field to extrapolate a sample size from, the sample size was calculated according to Cohen (1992). To achieve a medium effect size 0.5 with a one-tailed T-test with a power of 0.80 and alpha at 0.05, the sample size should be 64. An effect size of 0.3 would be achieved if a sample

of 71 CNAs participated calculated with G-power 3.1 system analysis. Therefore, this was a large enough sample to demonstrate statistical difference between pre-and post-test participants.

The invitation period lasted two weeks prior to the first data collection period. Only CNAs able to read and write in English were asked to participate. Exclusion criteria included CNAs that were not available to complete the intervention due to vacation, illness, or unavailability.

A listing of all CNAs that met criteria was obtained from the Director of Nursing (DON) of the nursing home involved in the study. Invitation began with an introduction by the DON in a formal staff meeting. Subsequently, all staff were given the Adult Consent Form (Appendix A) authorized by the Institutional Review Board (IRB) of the University of Central Florida (UCF) with their paycheck. Assurances to all staff that results are confidential and no one but the investigator would see data prior to analysis was stressed. CNAs were informed of the time period in which the intervention was to be delivered.

Protection of Human Participants

Informed consent was obtained from the institution and from participants. Refusal did not prejudice any participant's potential relationship with the employer. Participants were free to withdraw at any time. Names or other identifiers did not appear in any part of the final report. The investigator maintained a list of the names of those that are enrolled in the study to ensure the intervention was completed prior to the second survey. The first, second, and third survey were number-coded to correctly match the participant. All identifiers were destroyed after data analysis. Participants were advised they may receive results of the study once it was complete.

Procedure and Data Collection

Data collection occurred after IRB approval from UCF (Appendix B). The nursing home chosen does not have a separate IRB. A document detailing the study and methodology was presented to the administrator (Appendix C). A verbal consent and written letter of consent provided by the administrator served as approval to collect data (Appendix D).

One week prior to the planned intervention, CNAs that agreed to participate completed the WHO Hand –Hygiene Knowledge Questionnaire for Health Care Workers (Appendix E) as well as the Perception Survey for Healthcare Workers (Appendix F). Both instruments are based on the WHO guidelines for HH. In an effort to make the study convenient for all CNAs, a separate room away from the work area was provided. The Hand Hygiene Knowledge Questionnaire and WHO Perception Survey took about 15-30 minutes to complete. The staff was offered light refreshments. During the survey time the researcher served as proctor. There was no discussion among colleagues allowed to ensure privacy for each participant. The investigator returned to the facility multiple times over the week to ensure all shifts were covered. The initial survey time was one week.

During the time period of the initial questionnaire the CNAs were all given a numerical code that was theirs to use as an identifier. This same numerical code was used to match pre-and post-intervention questionnaire results. This was the only CNA identifier used.

After the initial survey period, an educational intervention was provided to the staff. For a period of one week, an educational video lasting 30 minutes was made available for viewing by the CNAs. The video is Module 2 in the Lippincott® video series for CNAs titled “Infection Control.” Formulated by Pamela Carter, author of many CNA textbooks, this video was chosen due to its specificity for the CNA. The video was viewed in a separate room away from the work

area. After the video was completed the CNA was given the WHO educational pamphlet (Appendix G). The CNA was instructed to read the material on his or her own time. The CNAs that did not watch the video were dropped from the study. Only one CNA did not watch the video. Therefore, there was a final sample of 65 to continue to the next phase of survey. Once the educational process was completed, a repeat knowledge questionnaire and follow-up perception survey (Appendix H) was administered at two weeks and four weeks post intervention. The same procedure was followed for giving the initial survey. Any CNA that did not complete the two-week follow-up was not included in the four-week follow-up. Only one CNA did not complete the two-week follow-up. The remaining 64 was the sample for the four-week post-intervention data collection. During the four-week follow-up, one CNA moved and one other did not complete the survey. There was a final total of 62 CNAs that completed all phases of the study.

Infection information was gathered for the month of September and October 2011. Information regarding HCAI was documented and stored for comparison. Follow-up information from December 2011 and January 2012 was also obtained. All HCAs were categorized as to the site of the infection and listed separately. These measurements are considered to be the pre-and post-intervention HCAI rates.

Instrumentation

Instruments used for this study include the Hand Hygiene Knowledge Questionnaire (Appendix E), the Perception Survey for Healthcare Workers (Appendix F), and the Follow-up Survey for Perception (Appendix H). These instruments were developed after extensive review of the literature by WHO. They both have been used worldwide and are considered valid and reliable for usage with healthcare workers (WHO, 2009).

Infection surveillance data are generated by the nursing home. Each patient with an infection is listed by type and source. The surveillance information includes the location of the infection and whether it was present on admission. Only HCAs were recorded. Infections present on admission to the facility were not included in this study. This information was gathered pre- and post-intervention. The information was recorded on a separate table for ease of comparison.

Treatment of Data

Demographic data, pre- and post-test questionnaire scores, and pre- and post-intervention infection rates all were coded and entered into the statistical package for the social sciences (SPSS) 18.0. Friedman's test was used to evaluate scores of the knowledge questionnaires pre- and post-intervention. This is a non-parametric test indicated for use with repeated measures from the same population (Pett, 1997). The answers to the perception survey were evaluated with Friedman's test and the use of central tendencies. Measures of central tendency were used to describe the CNA sample. Evaluation of the CNA perception was evaluated by both central tendency and Friedman's test. Percent change was used to determine HCAI change. Unless otherwise noted, all statistical tests were conducted at the ($p \leq 0.05$) level of significance. Infection rates were calculated and compared using percent change. All HCAI total infection pre- and post-intervention was evaluated.

CHAPTER 4: RESULTS

Introduction

The purpose of this quasi-experimental study was to determine the impact of viewing an educational video on infection control and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of HH and incidence of HCAs in the nursing home. The dependent variables include infection rate measured by chart surveillance at the nursing home and CNA knowledge and perception of HH as measured by the WHO Hand Hygiene Knowledge Questionnaire and Perception Questionnaire for Healthcare Workers (WHO, 2009). The independent variables are an educational video and the WHO informational pamphlet (WHO, 2009) focused on infection control and HH for the CNA. The study results are presented in the following manner:

1. A description of the demographic characteristics of the sample
2. Knowledge testing scores with comparisons to pre- and post-intervention
3. Perception results with comparison to pre and post-intervention
4. HCAI rates
5. Other analyses

Demographic Characteristics

The participants in this study consisted of 66 CNAs employed at one nursing home. The age of the sample ranged from 19 years to 63 years, with the mean age of 36.4 (Table 1). The sample was 86.4 % female and 13.6 % male. The highest level of education for 30.3% of the sample was high school, 12.1% had some college, 21.2% had a college degree, and 36.4% of the cases had missing data (Table 2).

Included in the demographic question section were two survey-type questions.

Participants were asked if as CNA any additional education was received in the past three years and if the CNA routinely used ABR for hand hygiene. Out of the 66 CNAs, 97% reported “yes” they participated in additional education and 3% reported “no” they did not. Eighty-five percent of CNAs reported they routinely used ABR, while 3% did not; 2% were two missing data.

Table 1. Sample Characteristics Continuous Variable

	N	Missing	Mean	Median	SD
Age	54	21	36.4	34.5	11.84

Table 2. Sample Characteristic Categorical

	Frequency	Percent	Valid Percent	Cumulative Percent
Gender				
Female	57	86.4	86.4	86.4
Male	9	13.6	13.6	100.0
Education				
High School	20	30.3	47.6	47.6
Some College	8	12.1	19.0	66.7
College Degree	14	21.3	33.3	100.1
Missing Data	12	36.4		
Received Additional Education				
Yes	64	97.0	97.0	97.0
No	2	2.0	3.0	100.0
Use ABR Routinely				
Yes	56	84.8	87.5	87.5
No	8	12.1	12.5	100.0
Missing Data	2	3.0		

Knowledge Scores

The WHO Hand Hygiene Knowledge Questionnaire consists of eight questions with some questions having more than one part; there is the possibility of a perfect score of 14. The questionnaire was scored from 0-14 and missing answers were counted as wrong. The initial pre-intervention questionnaire was given to 66 CNAs with a mean score of 7.36; this is an average of 53%. The minimum score was 1.5 (1% correct) and the maximum was 11.5 (82% correct). The post-intervention questionnaire was given to 64 CNAs; a mean score of 7.52 or 54% was calculated. The minimum score was 2.5 (2% correct) and the maximum was 11.5 (82% correct). The four-week post intervention was completed by 62 CNAs; a mean of 7.88 or 56% correct was calculated. The four-week minimum score was 2.5 (2% correct) with a maximum of 12 (86% correct). There were no perfect scores. The number of participants taking the questionnaire at different times did not statistically significantly change. The mean, median, and mode are presented below in Table 3. A histogram comparison can be seen in Figure 2.

Table 3. Central Tendencies for Three Knowledge Tests

	N	Mean	Median	Mode
Pre-test	66	7.36	7.50	6.00
Two-week post	64	7.52	8.00	8.00
Four-week post	62	7.88	8.00	8.00

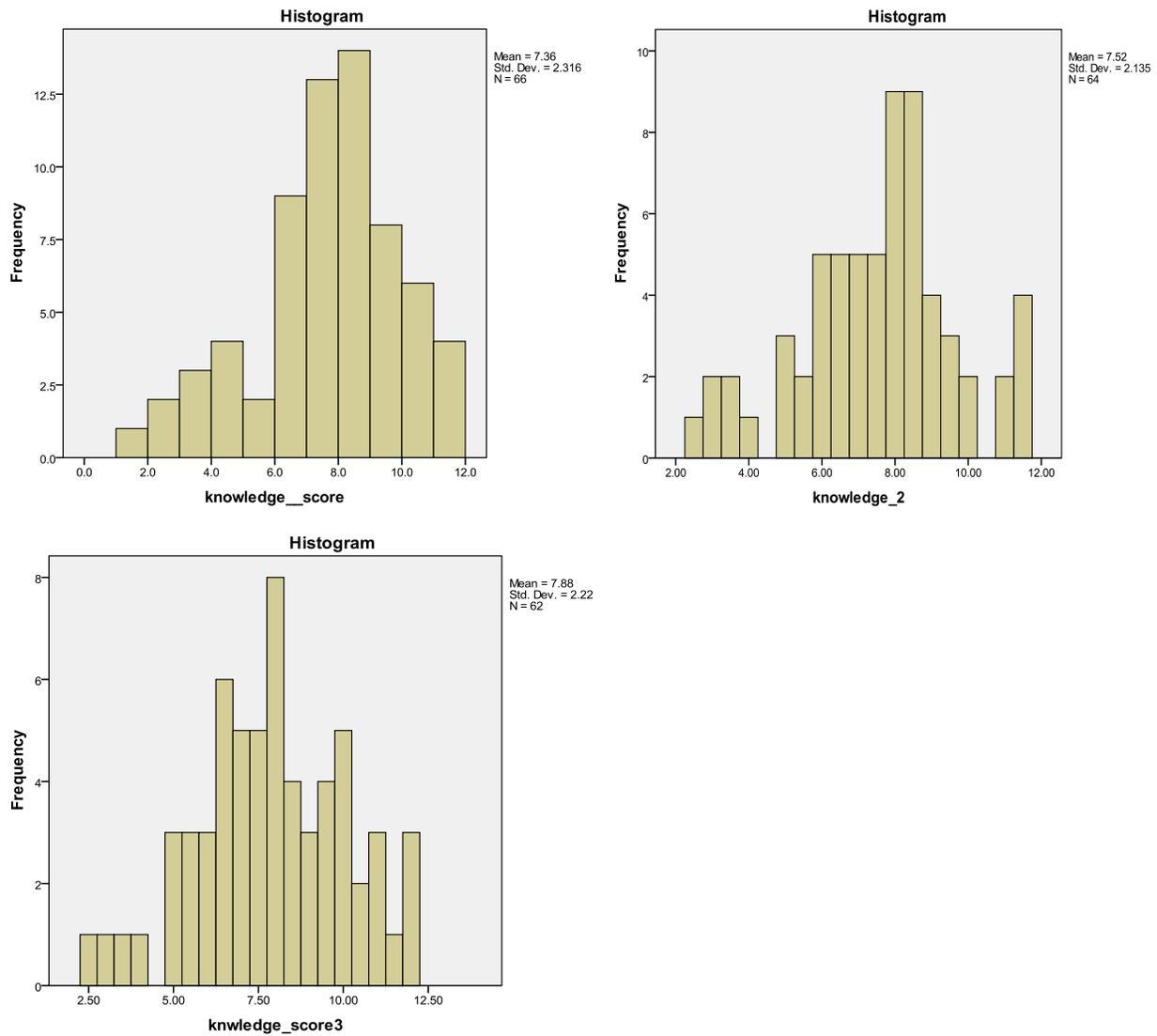


Figure 2. Histograms of the Three Knowledge Scores

Research Question 1

Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase post-test scores on the HH knowledge questionnaire for healthcare workers by CNAs in the nursing home?

To answer this question, the mean and median of the three knowledge tests were statistically compared using Friedman's test. The sample size of 62 was used to answer this question. A Chi-square was determined to be 3.239, *df* 2, with a ($p = 0.198$). The results are illustrated in Table 4.

Table 4. Friedman Test Knowledge Score

	N	Mean	Median	SD
Pre-test	62	7.44	7.75	2.27
Two-week post	62	7.52	8.00	2.50
Four-week post	62	7.88	8.00	2.50

Test Statistics: N = 62; chi-square = 3.329; df = 2; significance = 0.198

Perception Scores

To measure the perception of the CNAs, the WHO Perception Survey for Health-Care Workers along with the Follow-up Perception Survey was used. The initial survey consisted of 13 questions with some having multiple parts. Three of the questions asked the CNA to give a percent or an "I Do Not Know" answer. The CNAs that did not give a percent were classified as missing data. The other 10 questions were scored on a Likert scale. Three of the questions were scaled 1-4 with the number 1 being the lowest rank and 4 the highest. The remaining seven questions were scored on a 1-7 scale with 1 being the lowest rank and 7 the highest.

The follow-up survey had the same 13 questions as the initial and the CNA was asked to answer a second part. The second part included an additional 11 questions, all scored on a Likert scale with 1-7 ranking; the number 1 was the lowest rank and number 7 was the highest.

Research Question 2

Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase the perception of HH for CNAs as evidenced by the perception questionnaire for healthcare workers?

In an effort to answer this question, different parts of the perception survey were evaluated with central tendencies and Friedman's test. Each CNA was asked "What is the average number of hospitalized patients who develop HCAI?" Out of the initial 66 CNAs, only 39 answered this question with a percentage; the remaining left a blank or reported they did not know. Of the sample that answered, the perception by the CNA was a mean 58.9 percent and a median ranging from 20 to 30 percent. There was a low of 15% and a high of 100%. To evaluate this question before and after the intervention, the three samples were compared. Only a sample of 15 answered all three surveys. A Chi-square was determined to be .522, *df* 2, with a ($p = .770$). The results are listed in Table 5.

Table 5. Friedman Test for Perception of Percent HCAI in patients

	N	Mean	Median	SD
Pre-test	15	63.13	20.00	27.67
Two-week post	15	62.66	30.00	20.17
Four-week post	15	66.66	20.00	23.58

Test Statistics: N = 15; chi-square = 0.522; df = 2; significance = 0.770

Another question to evaluate the perception of the CNA was, "What is the impact of a HCAI on a patient's outcome?" Out of the initial 66 CNAs, 58 answered this question with the Likert scale; the remaining were left blank. Of the sample that answered, the perception by the CNA was a mean score of 2.85. There was a low of 1 and a high of 4. To evaluate this question

before and after the intervention, the three samples were compared. Only a sample of 37 answered all three surveys. A Chi-square was determined to be .545, *df* 2, with a ($p=0.761$). The results are listed in Table 6.

Table 6. Friedman Test for Perception of Impact HCAI in Patients

	N	Mean	Median	SD
Pre-test	37	2.70	3.00	.845
Two-week post	37	2.73	3.00	.804
Four-week post	37	2.78	3.00	.672

Test Statistics: N = 37; chi-square = 0.545; df = 2; significance = 0.761

An additional question of importance to evaluate the CNA perception was, “What is the effectiveness of hand hygiene in preventing HCAI?” 61 out of the initial 66 answered this question with the Likert scale; the remaining were left a blank. Of the sample that answered, the perception by the CNA was a mean score of 3.31. There was a low of 1 and a high of 4. To evaluate this question before and after the intervention, the three samples were compared. Only a sample of 38 answered all three surveys. A Chi-square was determined to be 1.848, *df* 2, with a ($p= 0.397$). The results are listed in Table 7.

Table 7. Friedman Test for Perception of Effective of HH on Prevention of HCAI in Patients

	N	Mean	Median	SD
Pre-test	38	3.16	3.00	.855
Two-week post	38	3.08	3.00	1.09
Four-week post	38	3.21	3.00	.664

Test Statistics: N = 38; chi-square = 1.848; df = 2; significance = 0.397

Further evaluation of the CNAs perception of HH was completed by evaluating the question, “Among all patient safety issues, how important is hand hygiene at your institution?”

Out of the initial 66 CNAs, 61 answered this question with the Likert scale; the remaining were left blank. Of the sample that answered, the perception by the CNA was a mean score of 3.59. There was a low of 1 and a high of 4. To evaluate this question before and after the intervention, the three samples were compared. Only a sample of 38 answered all three surveys. A Chi-square was determined to be .1.921, *df* 2, with a ($p=0.383$). The results are listed in Table 8.

Table 8. Friedman Test for Perception of Importance of Hand Hygiene to the Institution

	N	Mean	Median	SD
Pre-test	38	3.58	4.00	.722
Two-week post	38	3.58	4.00	.919
Four-week post	38	3.45	4.00	.602

Test Statistics: N = 38; chi-square = 1.921; df = 2; significance = 0.383

Two other areas of perception were evaluated. The first question was, “On average, in what percentage of situations requiring hand hygiene do HCWs in your hospital actually perform hand hygiene?” Out of the initial 66 CNAs, only 43 answered this question with a percentage; the remaining left a blank or reported they did not know. Of the sample that answered, the mean percentage reported by the CNA was 82.4%. There was a low of 20% and a high of 100%. The second question was, “On average, what is the percentage of situations requiring hand hygiene for which you actually perform hand hygiene?” Fifty-three out of the initial sixty-six answered this question with a percentage; the remaining left a blank or reported they did not know. Of the sample that answered, the mean percentage reported by the CNA was 89.2%. There was a low of 25% and a high of 100%. To evaluate this question before and after the intervention, the three samples were compared. Only a sample of 41 answered all three surveys. A Chi-square was determined to be 5.59, *df* 2, with a ($p=.064$). The results are listed in Table 9.

Table 9. Friedman Test for Percentage of Actual Hand Hygiene Performance

	N	Mean	Median	SD
Pre-test	41	89.54	90.00	17.30
Two-week post	41	93.78	90.00	10.03
Four-week post	41	92.76	90.00	15.61

Test Statistics: N = 41; chi-square = 5.494; df = 2; significance = 0.064

To better understand the perception of the CNA in regards to HH, another question was evaluated: “Is the use of ABR well-tolerated by your hands?” Out of the initial 66 CNAs, 61 answered this question with the Likert scale; the remaining were left blank. Of the sample that answered, the perception by the CNA was a mean score of 5.72 with a SD of 1.56. There was a low of 1 and a high of 7.

Research Question 3

Will viewing an educational video and reading the WHO informational pamphlet about infection control statistically decrease the number of HCAIs?

The number of infections in the nursing home is recorded by the infection control nurse. This data is kept in the facility for evaluation by the infection control team each month. For this study, the data from September 2011 and October 2011 was used as the pre-intervention data. Since the intervention occurred during the month of November, the infection data from that month is included, but not calculated in percent change. Data from the month of December 2011 and January 2012 are the post- intervention data. The frequency of infections is listed in Table 10. The prevalence rate was calculated using the average daily census in the nursing home.

Percent change was calculated using the two months prior to the intervention and the two-month period after the intervention. The percent change in infection rate was -42%. See Figure 3 for prevalence rates of infection.

Table 10. HCAI Rate

Month	Frequency	Average Daily Census	Prevalence
September	22	110	20%
October	23	113	20%
November	11	111	9%
December	10	104	9%
January	16	114	14%

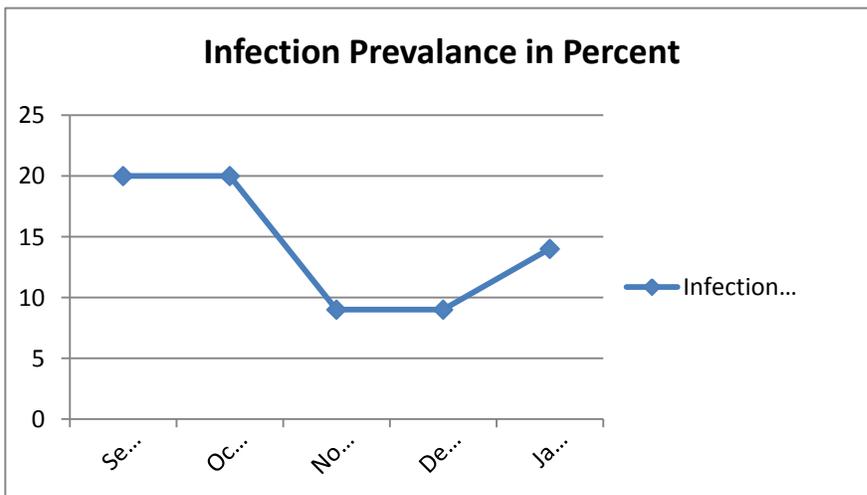
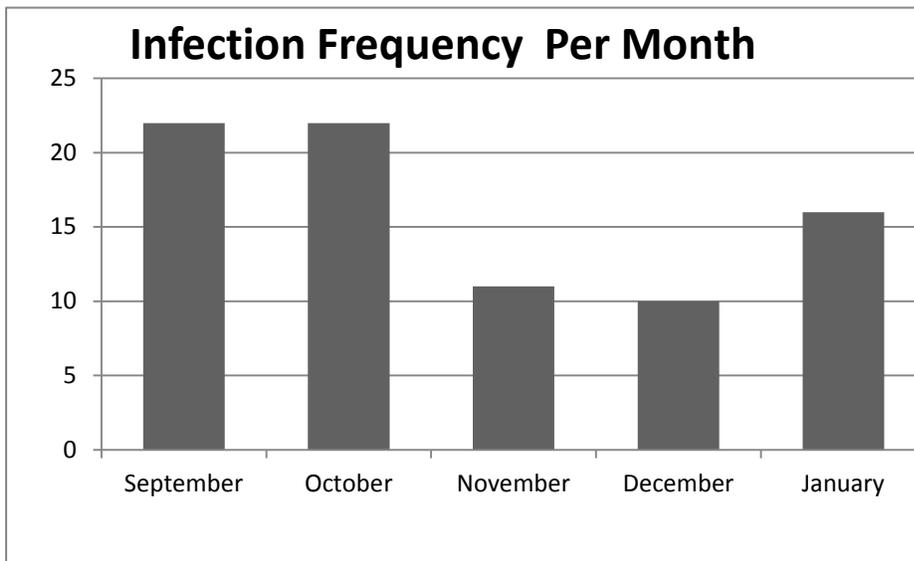


Figure 3. Infection Frequency and Infection Prevalence

Other Analysis

Other data gleaned from the perception survey was the rating of effectiveness of the educational video and the educational pamphlet. The CNA was asked to rate the effectiveness of the educational video at the two- and four-week post intervention survey. The sample of CNAs that rated the video was 60. The mean score was 6.25 with SD .967 on a Likert scale of 1 to 7. The lowest score was 3 and the highest was 7. The pamphlet effectiveness was rated at the two- and four-week post intervention as well by 61 out of the 62 post- intervention CNAs. There was a mean score of 5.90 with SD of 1.39. There was a low of 1 and high of 7.

The number of CNAs reporting they read the pamphlet was 59. Two CNAs reported they read it very little, while 24 CNAs reported that read it a lot. Overall the majority of CNAs reported they had read the pamphlet. See Figure 4 for frequency histogram.

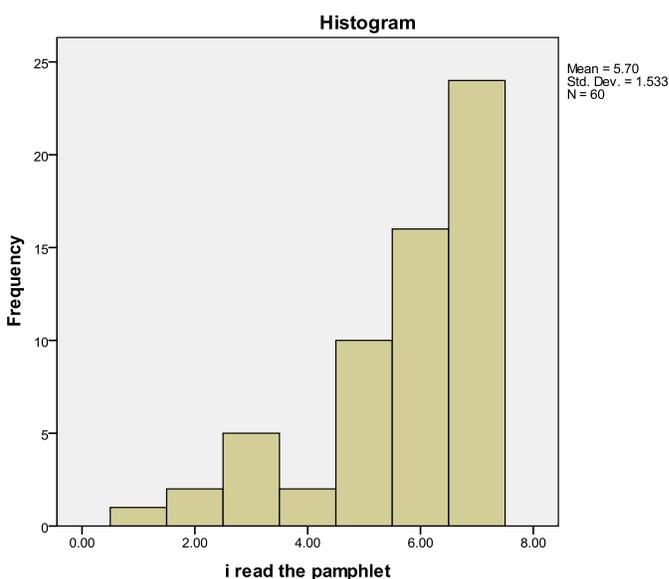


Figure 4. Histogram of Frequency of CNAs Reading Pamphlet

Summary

Results of data analysis revealed a sample, the majority of which were female, with an average age of 36. The majority of the CNA sample had some level of college education with 33.3 % indicating they had graduated from college. The majority of participants had received additional education on HH in the last three years and 56 out 66 reported they routinely used ABR.

Research questions were answered using Friedman's test and central tendencies. There were no significant differences found between the pre- and post-intervention knowledge or perception scores. Further data analysis did show that the CNAs believed the video and the pamphlet to be effective and that the majority read the pamphlet. However, this did not significantly improve post-test scores or change post-intervention perception.

CHAPTER 5: DISCUSSION

Introduction

The purpose of this quasi-experimental study was to determine the impact of viewing an educational video on infection control and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of HH and incidence of HCAs in the nursing home. The theoretical framework for the study was based on Azjen’s TPB. TPB was selected as it is based on evaluating behavior by examining a person’s knowledge and attitude towards behavior (Ajzen, 1985). In this study the dependent variables include CNA knowledge and perception of HH as measured by the WHO Hand Hygiene Knowledge Questionnaire and the Perception Questionnaire for Health-care Workers (2009), and the infection rate as measured by chart surveillance at the nursing home. The independent variables were the educational video and pamphlet given to the CNA sample.

A sample of 66 CNAs participated initially with the study. Out of this initial population only 62 CNAs completed the educational opportunity and all three surveys. The research questions were formulated to determine impact of the educational opportunities.

Research Question 1

Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase post-test scores on the HH knowledge questionnaire for HCWs by CNAs in the nursing home?

The results of analysis were not statically insignificant. The viewing of the educational video, even though the CNAs reported that the video was a useful educational tool, did not statically improve test scores as measured by the WHO Hand Hygiene knowledge questionnaire.

However, even though the education activity did not impact results significantly, the survey did reveal a knowledge deficit in the CNA population. The initial evaluation of knowledge in this population indicated a lack of understanding about HH with a mean test score of 53%. This lack of understanding can be used for future development of an adequate educational tool for CNAs.

Additional training of CNAs has been reported to increase their knowledge of a variety of topics (Lerner, Resnick, Galik, & Russ, 2010). Therefore, the lack of statistically significant findings in this sample was surprising. Reviewing the literature on successful programs revealed studies that showed improvement in knowledge had a hands-on component and some encompassed an entire day of training (Lee, Boyd, & Stuart, 2007; Lin, Yang, Lu, & Kao, 2008), indicating that the one 30-minute DVD with a self-read pamphlet may not be sufficient to increase knowledge in this population.

In an effort to further explain the lack of statistical impact, an additional evaluation of the tool to measure knowledge was undertaken. The researcher noted many questions that the CNAs left blank or did not complete. Even though the tool was well-studied and verified by the WHO, the CNAs may have not understood the question structure. The tool could be further studied in the nursing home environment to determine this answer. Also, race or ethnicity was not elicited with this tool. This lack of cultural information makes it difficult to ascertain if there was a language barrier resulting in the wrong answers for the questionnaire. Further studies should take this into account and may consider eliciting this information.

Research Question 2

Does viewing an educational video and reading the WHO informational pamphlet about infection control statistically increase the perception of HH in CNAs as evidenced by the perception questionnaire for healthcare workers?

In the TPB, a person's attitude towards a behavior can impact if the person performs that behavior. Therefore, how the CNA perceives the practice of HH is important to understand. The more we understand the perception, the more we can develop interventions to impact that perception. Perception was measured by the WHO Perception and Follow-up Perception survey. There were no statistically different findings in any of the various perceptions evaluated for this study. The video and the educational pamphlet had no measured impact on this CNA population.

Even though there were no statistical differences found, the survey revealed information regarding CNA perceptions that may prove helpful to future research. In a sample of 66, 39 believe that the infection rate of a hospitalized patient is 58.9%. The actual rate is between 20-40%, so this number is on the high end. However, if this is what CNAs truly believe, then an educator can build a program on this assumption to teach CNAs prevention. The CNAs were asked on a Likert scale about the impact of HCAI on a patient's outcome. A sample of 58 answered this question and the mean score was 2.85 out of a 1-4 scale, indicating that the average CNA thought HCAs have a high impact on patient outcome. Again, if the CNA understands that HCAs are a problem and occur frequently, then developing a plan to reduce HCAs would be something a future researcher could complete.

The CNA's perception was evaluated by asking the question, "What is the effectiveness of HH in preventing HCAI?" 61 out of the 66 CNAs responded to this question using a Likert scale. There was a low of 1 and a high of 4, with a mean score of 3.31. This result indicates that

CNAs believe good HH is effective in preventing HCAI. CNAs also responded that they believe the institution they are working for views HH as a high priority safety issue. With 61 out of the 66 CNAs responding, a mean value of 3.59 on a 1-4 Likert scale was reported. From this the researcher can deduce that the CNA believes in HH, feels the institution sees HH as a safety issue, sees there is a problem with HCAI, and understands HCAs are bad for patients. This reveals that CNAs have a perception of the overall problem but may lack the knowledge to formulate a plan to help the patient.

An important area that was evaluated using this survey process was the question about how often CNAs actually perform HH. For the purposes of this study, HH was not measured. There is a wealth of information about measuring HH, with self-reporting as just one measure. 53 out of the 66 initial CNAs responded to this question. The self-reported percentage was a mean of 89.2% with a low of 25% and a high of 100%. One methodological concern about self-reporting is the tendency of the self-reporter to not want to be viewed in a negative way, leading accuracy to be questioned. Because of this, an additional question was asked about how often CNAs perceived that their coworkers performed HH, and only 43 out of the 66 initial CNAs gave a percentage. There was a low of 20% and a high of 100%, with a mean was 82.4%. This is above the estimated average compliance rate of 50% (Institute for Healthcare Improvement, 2008). There was no statistical difference in the perception of HH before and after the intervention. There is no explanation for the high rate of perceived compliance. Further evaluation could be performed with the observation method or the product uptake method to truly determine HH compliance.

Research Question 3

Will viewing an educational video and reading the WHO informational pamphlet about infection control statistically decrease the number of HCAs?

The overall infection prevalence and frequency of infection occurring in the nursing home decreased. The percent change was -42%. The overall frequency of infection decreased from the pre- intervention time period. The results indicate a significant change in infection and were one of the goals of this study—to impact practice. Even though there was no significant change in knowledge, the infection frequency in this nursing home was impacted. There were no other changes implemented at the time of this study, and there were no concurrent programs being implemented. Therefore, the researcher concluded that infection frequency can be decreased as a result of an educational opportunity.

The reduction of HCAs during the study and following the intervention coincides with the overall literature available on effectiveness of HH on overall HCAI rate. Multiple research studies, mostly in hospitals, have shown reducing infection by increasing HH can be achieved (Pittet, et al., 2000; Won, et al., 2004; Rosenthal, Guzman, Safdar, 2005; Lam, Lee, & Lau, 2004). Whether the improved infection occurrence will continue now that the study has been completed is uncertain. The practice of CNAs may have been altered only due to the presence of the researcher with the focus on HH and infection control. A follow-up study four or six months after the initial survey would give extra data regarding the actual impact on CNA practice.

Other Analysis

This study used both video and reading material for the education intervention. When asked if the educational methods were effective, of the 66 CNAs, 60 reported a mean score of

6.25 on a 1-7 Likert scale. This information indicated a very high level of effectiveness. Even though there was no statistical difference in the knowledge scores, the CNAs felt they had an effective learning experience. The effectiveness of the pamphlet was rated by 61 by CNAs, with a mean score of 5.90 on a Likert scale of 1-7. There was no statistical difference between the perceptions of effectiveness of the video versus the effectiveness of the pamphlet. CNAs were asked if they read the pamphlet, and 59 out of 60 reported that they had. Two CNAs reported they read the pamphlet very little, 33 CNAs reported they had read the pamphlet somewhat to frequently, while 24 CNAs reported that read it a lot.

This information is important to understand the learning capabilities of CNAs. The video was 30 minutes long and all but one CNA viewed the video, giving the impression they believed the video was helpful. The educational pamphlet was read by the majority of CNAs, indicating they felt a need to further their education about HH. WHO guidelines for healthcare education regarding HH advocate the use of a multi-modal approach similar to the one used for this study. However, there was no evidence of an increased knowledge base as measured by the knowledge tool used. This leads the researcher to question if the two-week time period between viewing the video and taking the knowledge test was too long. The knowledge test was not given immediately following the video since the researcher was measuring retained knowledge. Another consideration may be that CNAs did not completely understand the knowledge test.

Limitations

The fact that this study was completed in only one nursing home limits the ability to generalize the results to other nursing homes. This was a small, well-defined population. In this particular nursing home there are no wall-mounted dispensaries of ABR. Staff are encouraged to

use more soap and water for HH. CNAs often would have their own ABR from home. ABR is available through the central supply office if requested by the staff.

The collection of infection data was totally dependent on records kept by the nursing home. The accuracy of these records is not determined, but they are accurate to the nursing staff's best ability.

The survey used for this study did not include evaluation of race or ethnicity. The CNAs that completed the Knowledge Questionnaire may not have fully understood the questions related to English being a second language. This is seen as a limitation in generalizing knowledge scores to other populations.

Implications for Future Research

Healthcare professionals have been called upon to wash their hands to prevent death rates and the spread of disease (Grant & Hoffman, 2011); this is still the case, with research supporting the idea of disease prevention through adequate HH. Future research is still needed to determine a way to both increase knowledge and increase compliance with HH. A replication of this study could be completed using a different population or the whole staff of several nursing homes for comparison.

This study did not show an improvement in knowledge based on a particular tool. Therefore, future research would be needed to incorporate a different knowledge tool or even to further evaluate the tool promoted by the WHO. There is a wealth of information regarding HH; however, there is not one prevailing knowledge instrument to measure CNAs in nursing homes.

HCAIs are a problem in nursing homes. A future study could include a direct measurement of HH compliance either by observation or product uptake. A different educational

program may also be of benefit, perhaps one that would include sign posting and visual reminders for staff. Adult learners of this population might also do better with small group encounters with feedback and demonstration. The video used in this study may not have been fully assimilated by the staff since there was no discussion period or feedback after the video. Research focused on facility staff that uses either interview techniques or small group answer periods could provide different data.

Implications for Policy Development

The impact of health policy on health services for the elderly has been advancing. Health services can include preventive, acute, chronic, or restorative services (Longest, 2006). In the framework of a preventive policy, nursing home policy regarding infection control and HH needs to be established. Policy formation for all these areas can include development of programs based on recommendations from the CDC. There are guidelines (Siegel et al., 2007); however, there are no policies on when and how a nursing home is to monitor staff. While the WHO has developed guidelines, the next step would be to formulate policy from the guidelines. The development of a compliance and observation policy might bring attention to an area of deficit in this population. Policies that would give the employee feedback may encourage compliance.

Health services for the elderly are complex and important to the ongoing care and treatment of this fragile population. In summary, health policy affects all aspects of elderly care. In the future there will be more policy as aging baby boomers demand more services.

Summary

The impact of an education program on perception, knowledge, and infection rate was evaluated in this study. A pre- and post-intervention study was employed using the WHO's Hand

Hygiene Knowledge Questionnaire and the WHO Perception Survey. Friedman's test and central tendencies showed no statistical difference between the educational intervention and the overall knowledge scores of the sample. There also were no statistical differences in perception of HH in the CNA sample. Infection frequency was reduced with a percent change of -42%.

Overall the results of the knowledge questionnaire indicate that added education is needed for the CNA population. With low knowledge scores noted, an appropriate educational intervention to increase knowledge can be explored in the future. A better understanding of the CNA perception of HH may lead to development of programs to enhance compliance. Clearly a continued focus on the problem of HCAI in nursing homes is needed. With multiple future research opportunities, this actually may be the true benefit of studies such as this one.

APPENDIX A: ADULT CONSENT FORM



Infection Control and Health Care-Associated Infections (HAI) in the Nursing Home: A Study to Determine the Impact of an Educational Video and Pamphlet about Infection Control on Knowledge, and Perception of Hand Hygiene in Certified Nursing Assistants

Informed Consent

Principal Investigator: Kathe Hypes
Faculty Supervisor: Dr. Christopher Blackwell
Investigational Site: Life Care Center of Orlando

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being invited to take part in a research study which will include all certified nurse assistants at Life Care of Orlando. You have been asked to take part in this research study because you are a full-time CNA.

I am a doctoral student in the College of Nursing at the University of Central Florida. I am currently conducting a study about infection and infection control in the nursing home. I would like to invite you to help me in this reach project. I am being guided by faculty supervisor Dr. Christopher Blackwell also in the College of Nursing at University of Central Florida

What you should know about a research study:

- Someone will explain this research study to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you.
- Feel free to ask all the questions you want before you decide.

Purpose of the research study: The purpose of this quasi-experimental study is to determine the impact of viewing an educational video about infection control and reading an educational pamphlet, on certified nurse assistant's knowledge, perception, hand hygiene and health care acquired infection in a nursing home.

What you will be asked to do in the study:

- You will be asked to complete a survey
- You will be asked to view an educational video and you will be given a pamphlet to read
- After the video a survey will be completed. This will be done 2 weeks and 4 weeks after the video
- Prior to the video you will be given a bottle of hand rub to use while you work. After one week you will return the un-used portion
- 2 weeks after the video you will again be given a bottle of hand rub to use while you work and again the un-used portion will be turned in.
- 4 weeks after the video you will be given a bottle of hand rub to use while you work for a week. You will again be asked to return the un-used portion.

Location: For survey and video viewing the classroom at Life Care of Orlando will be used.

Time required: The survey will take 20 minutes. The video will take 30 minutes.

Risks: There is no identified risk to participants.

Benefits: Increased personal knowledge, better application of concepts and possible decrease in infection rate.

Study contact for questions about the study or to report a problem: University of Central Florida College of Nursing 407-823-5133

IRB contact about your rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

APPENDIX B: UCF IRB APPROVAL FORM



University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Kathe L. Hypes**

Date: **October 17, 2011**

Dear Researcher:

On 10/17/2011 the IRB approved the following human participant research until 10/16/2012 inclusive:

Type of Review: UCF Initial Review Submission Form
Expedited Review Category # 7
This approval includes a Waiver of Written Documentation of Consent
Project Title: INFECTION CONTROL AND HEALTH CARE-ASSOCIATED INFECTIONS (HAI) IN THE NURSING HOME: A STUDY TO DETERMINE THE IMPACT OF AN EDUCATIONAL VIDEO AND PAMPHLET ABOUT INFECTION CONTROL ON KNOWLEDGE, BEHAVIOR AND HAND HYGIENE OF CERTIFIED NURSING ASSISTANTS
Investigator: Kathe L. Hypes
IRB Number: SBE-11-07885
Funding Agency: None

The Continuing Review Application must be submitted 30 days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at <https://iris.research.ucf.edu>.

If continuing review approval is not granted before the expiration date of 10/16/2012, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., CF IRB Chair, this letter is signed by:

Signature applied by Janice Turchin on 10/18/2011 10:43:20 AM EDT

Jamali M. Tushki

IRB Coordinator

Page 2 of 2

APPENDIX C: LETTER TO ADMINISTRATION OF NURSING HOME



College of Nursing
September 9, 2011
Kathe Hypes, MSN, ARNP Administrator

Dear _____,

You may recall from our conversation at a previous time that I am a DNP student at the UCF College of nursing. I also am an ARNP with Dr. Nagalapadi and Dr. Thomas. As part of the requirements for graduation I am expected to complete a research thesis. My research goal is to determine the impact of viewing an educational video on infection control and reading the WHO informational pamphlet “Hand Hygiene: Why, How and When” on the CNA’s knowledge and perception of hand hygiene, hand hygiene compliance, and incidence of HAIs in the nursing home. I would like to complete this study in your facility. I would like your permission to obtain the following:

1. 20 minutes of time for CNAs to complete a questionnaire
2. 30 minutes of time for CNAs to view an educational video on infection control
3. Infection data collected by staff in your facility
4. Permission to provide alcohol based rub to CNAs for their usage.

There are no known risks to participants. There is no direct monetary benefit to the facility. After I complete this research, I will send you a copy to the abstract with a summary of results and conclusions. If at any time you wish to discuss this research my phone number is _____ Dr. Christopher Blackwell, Assistant Professor at UCF is my chairperson in this project and is also available for questions. Thank you very much for your time and assistance with this research.

Sincerely,

Kathe Hypes, MSN, ARNP, DNP candidate

APPENDIX D: LETTER TO IRB FROM NURSING HOME

UCF IRB
Office of Research and Commercialization
12201 Research pkwy
Suite 501
Orlando, Florida 32816

To whom it may concern:

This is a letter signifying consent for research to be done at _____. Kathe Hypes is a DNP student and she has been given permission to complete this research. She has my permission to do the following:

1. 20 minutes of time for CNAs to complete a questionnaire
2. 30 minutes of time for CNAs to view an educational video on infection control
3. Infection data collected by staff in your facility
4. Permission to provide alcohol based rub to CNAs for their usage.

For any question or concerns please contact me.

Sincerely yours,

_____, Administrator

**APPENDIX E: HAND HYGIENE KNOWLEDGE QUESTIONNAIRE FOR HEALTH
CARE WORKERS**

Hand Hygiene Knowledge Questionnaire for Health-Care Workers

Period Number*

- The knowledge required for this test is specifically transmitted through the WHO hand hygiene training material and you may find the questions more difficult if you did not participate in this training.
- Tick **only one answer** to each question.
- Please read the questions carefully before answering. Your answers will be kept confidential.
- **Short Glossary:**

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

Facility: health-care setting where the survey is being carried out (e.g., hospital, ambulatory, long-term facility, etc).

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Handwashing: washing hands with plain or antimicrobial soap and water.

Service: a branch of a hospital staff that provides specified patient care.

Ward: a division, floor, or room of a hospital for a particular category or group of patients (it corresponds to the smallest segmentation of the health-care facility; one service can include multiple wards).

1. Personal ID**:	<input type="text"/>	2. Date:	<input type="text"/>
3. Facility:	<input type="text"/>	4. Service**:	<input type="text"/>
5. Unit**:	<input type="text"/>	6. City:**	<input type="text"/>
7. Country**:	<input type="text"/>		

8. Gender: Female Male

9. Age: years

10. Profession***: Nurse Auxiliary nurse Midwife Medical doctor Resident

Technician
 Other

Therapist

Nurse student

Medical student

11* To be completed by the data manager.

** **Optional**, to be used if appropriate, according to the local needs and regulations.

*****Technicians**: radiologist, cardiology technician, operating room technician, laboratory technician

Therapist: physiotherapist, occupational therapist, audiologist, speech therapist

Others: dietician, dentist, social worker, etc.

Department (please select the department which best represents yours):

- Internal medicine medical/surgical Surgery Intensive care unit Mixed
- Emergency unit Obstetrics Paediatrics
- Long-term care Outpatient clinic Other

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

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

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

- a. Health-care workers' hands when not clean
- b. Air circulating in the hospital
- c. Patients' exposure to colonised surfaces (i.e., beds, chairs, tables, floors)
- d. Sharing non-invasive objects (i.e., stethoscopes, pressure cuffs, etc.) between patients

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

- a. The hospital's water system
- b. The hospital air
- c. Germs already present on or within the patient
- d. The hospital environment (surfaces)

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

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

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

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

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

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

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

- a. 20 seconds
- b. 3 seconds
- c. 1 minute
- d. 10 seconds

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

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

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

- a. Wearing jewellery Yes No
- b. Damaged skin Yes No
- c. Artificial fingernails Yes No
- d. Regular use of a hand cream Yes No

Thank you very much for your time!

APPENDIX F: PERCEPTION SURVEY FOR HEALTH CARE WORKERS

Perception Survey for Health-Care Workers

Period Number*

You are in direct contact with patients on a daily basis and this is why we are interested in your **opinion** on health care-associated infections and hand hygiene.

- It should take you about 10 minutes to complete this questionnaire.
- Each question has **one answer only**.
- Please read the questions carefully and then respond spontaneously. Your answers are anonymous and will be kept confidential.
- **Short Glossary:**

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

Facility: health-care setting where the survey is being carried out (e.g., hospital, ambulatory, long-term facility, etc).

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Handwashing: washing hands with plain or antimicrobial soap and water.

Service: a branch of a hospital staff that provides specified patient care.

Ward: a division, floor, or room of a hospital for a particular category or group of patients (it corresponds to the smallest segmentation of the health-care facility; one service can include multiple wards).

1. Personal ID**:	<input type="text"/>	2. Date:	<input type="text"/>
3. Facility:	<input type="text"/>	4. Service**:	<input type="text"/>
5. Ward**:	<input type="text"/>	6. City**:	<input type="text"/>
7. Country**:	<input type="text"/>		

8. Gender: Female Male

9. Age: years

10. Profession***: Nurse Auxiliary nurse Midwife Medical doctor Resident

- Technician
 Other
 Therapist
 Nurse student
 Medical student

* To be completed by the data manager.

** **Optional**, to be used if appropriate, according to the local needs and regulations.

*****Technicians**: radiologist, cardiology technician, operating room technician, laboratory technician

Therapist: physiotherapist, occupational therapist, audiologist, speech therapist

Other: dietician, dentist, social worker, etc.

11. Department (please select the department which best represents yours):

- Internal medicine
 medical/surgical
 Surgery
 Intensive care unit
 Mixed
- Emergency unit
 Obstetrics
 Paediatrics
- Long-term/rehabilitation
- Outpatient clinic
 Other

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

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

14. In your opinion, what is the average percentage of nursing home patients who will develop a health care-associated infection (between 0 and 100%)?

% I don't know

15. In general, what is the impact of a health care-associated infection on a patient's clinical outcome?

Very low
 Low
 High
 Very high

16. What is the effectiveness of hand hygiene in preventing health care-associated infection?

Very low
 Low
 High
 Very high

17. Among all patient safety issues, how important is hand hygiene at your institution?

Low priority
 Moderate priority
 High priority
 Very high priority

18. On average, in what percentage of situations requiring hand hygiene do health-care workers in your nursing home actually perform hand hygiene, either by handrubbing or handwashing (between 0 and 100%)?

% I don't know

19. In your opinion, how effective would the following actions be to improve hand hygiene permanently in your institution?

Please tick one "☐" on the scale according to your opinion.

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- f. The health-care facility makes alcohol-based handrub always available at each point of care.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- h. Each health-care worker receives education on hand hygiene.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- i. Clear and simple instructions for hand hygiene are made visible for every health-care worker.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- j. Health-care workers regularly receive feedback on their hand hygiene performance.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- l. Patients are invited to remind health-care workers to perform hand hygiene.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

20. What importance does the head of your department attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

21. What importance do your colleagues attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

22. What importance do patients attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

23. How do you consider the effort required by you to perform good hand hygiene when caring for patients?

No effort

A big effort

24. On average, in what percentage of situations requiring hand hygiene do you actually perform hand hygiene, either by handrubbing or handwashing (between 0 and 100%)?

%

Thank you very much for your time!

APPENDIX G: EDUCATION PAMPHLET



Hand Hygiene: Why, How & When?

WHY?

- Thousands of people die every day around the world from infections acquired while receiving health care.
- Hands are the main pathways of germ transmission during health care.
- Hand hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent health care-associated infections.
- This brochure explains how and when to practice hand hygiene.

WHO?

- Any health-care worker, caregiver or person involved in direct or indirect patient care needs to be concerned about hand hygiene and should be able to perform it correctly and at the right time.

HOW?

- Clean your hands by **rubbing them with an alcohol-based formulation**, as the preferred mean for routine hygienic hand antisepsis if hands are not visibly soiled. It is faster, more effective, and better tolerated by your hands than washing with soap and water.
- **Wash your hands with soap and water** when hands are visibly dirty or visibly soiled with blood or other body fluids or after using the toilet.
- If exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks of *Clostridium difficile*, hand washing with soap and water is the preferred means.

PAGE 1 OF 7

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Revised August 2009

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

HOW TO HANDRUB?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

⌚ Duration of the entire procedure: 20-30 seconds

1a



Apply a palmful of the product in a cupped hand, covering all surfaces;

1b

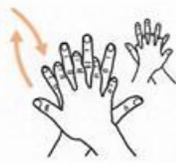


2



Rub hands palm to palm;

3



Right palm over left dorsum with interlaced fingers and vice versa;

4



Palm to palm with fingers interlaced;

5



Backs of fingers to opposing palms with fingers interlocked;

6



Rotational rubbing of left thumb clasped in right palm and vice versa;

7



Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

8



Once dry, your hands are safe.

PAGE 2 OF 7

WHO acknowledges the Hôpitala Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

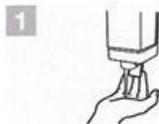
HOW TO HANDWASH?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

⌚ Duration of the entire procedure: 40-60 seconds



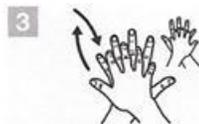
Wet hands with water;



Apply enough soap to cover all hand surfaces;



Rub hands palm to palm;



Right palm over left dorsum with interlaced fingers and vice versa;



Palm to palm with fingers interlaced;



Backs of fingers to opposing palms with fingers interlocked;



Rotational rubbing of left thumb clasped in right palm and vice versa;



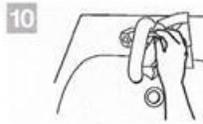
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



Rinse hands with water;



Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

Hand care

- Take care of your hands by regularly using a protective hand cream or lotion, at least daily.
- Do not routinely wash hands with soap and water immediately before or after using an alcohol-based handrub.
- Do not use hot water to rinse your hands.
- After handrubbing or handwashing, let your hands dry completely before putting on gloves.

Please remember

- Do not wear artificial fingernails or extenders when in direct contact with patients.
- Keep natural nails short.

PAGE 3 OF 7

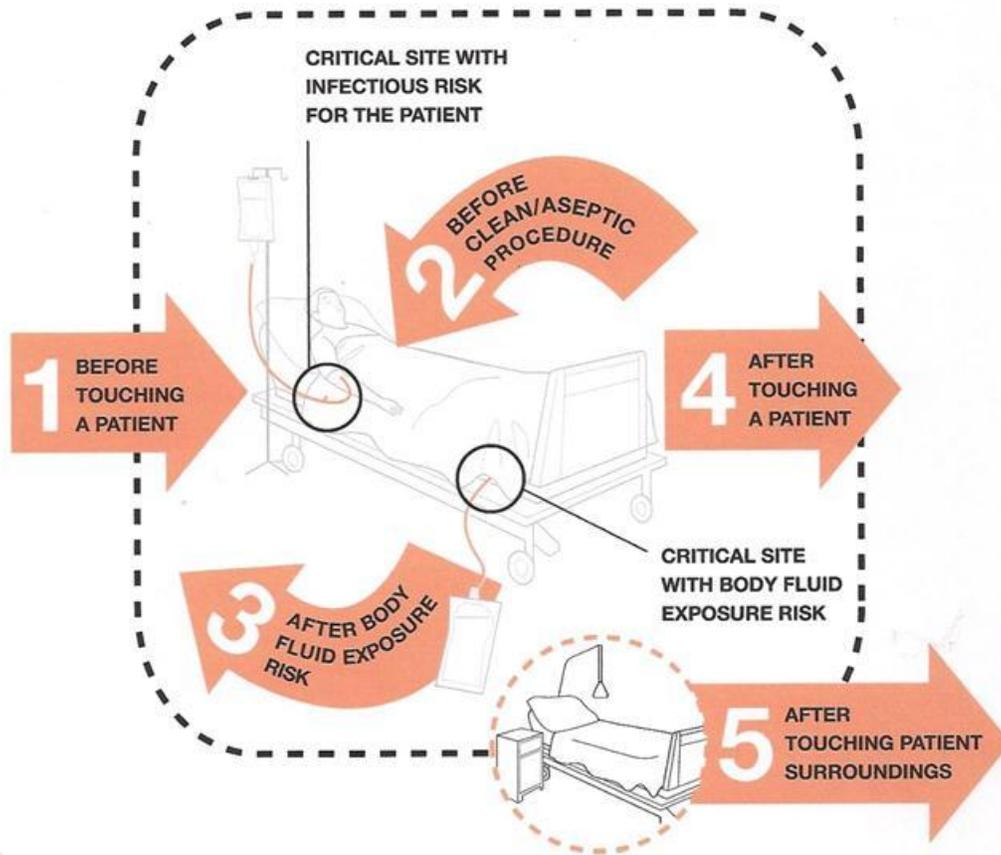
WHO acknowledges the Hôpital Universitaire de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader, in no event shall the World Health Organization be liable for damages arising from its use.

WHEN?

YOUR 5 MOMENTS FOR HAND HYGIENE*



*NOTE: Hand hygiene must be performed in all indications described regardless of whether gloves are used or not.

PAGE 4 OF 7

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

1 Before touching a patient

WHY? To protect the patient against colonization and, in some cases, against exogenous infection, by harmful germs carried on your hands

WHEN? Clean your hands before touching a patient when approaching him/her*

Situations when Moment 1 applies:

- a) Before shaking hands, before stroking a child's forehead
- b) Before assisting a patient in personal care activities: to move, to take a bath, to eat, to get dressed, etc
- c) Before delivering care and other non-invasive treatment: applying oxygen mask, giving a massage
- d) Before performing a physical non-invasive examination: taking pulse, blood pressure, chest auscultation, recording ECG

2 Before clean / aseptic procedure

WHY? To protect the patient against infection with harmful germs, including his/her own germs, entering his/her body

WHEN? Clean your hands immediately before accessing a critical site with infectious risk for the patient (e.g. a mucous membrane, non-intact skin, an invasive medical device)*

Situations when Moment 2 applies:

- a) Before brushing the patient's teeth, instilling eye drops, performing a digital vaginal or rectal examination, examining mouth, nose, ear with or without an instrument, inserting a suppository / pessary, suctioning mucous
- b) Before dressing a wound with or without instrument, applying ointment on vesicle, making a percutaneous injection / puncture
- c) Before inserting an invasive medical device (nasal cannula, nasogastric tube, endotracheal tube, urinary probe, percutaneous catheter, drainage), disrupting / opening any circuit of an invasive medical device (for food, medication, draining, suctioning, monitoring purposes)
- d) Before preparing food, medications, pharmaceutical products, sterile material

3 After body fluid exposure risk

WHY? To protect you from colonization or infection with patient's harmful germs and to protect the health-care environment from germ spread

WHEN? Clean your hands as soon as the task involving an exposure risk to body fluids has ended (and after glove removal)*

Situations when Moment 3 applies:

- a) When the contact with a mucous membrane and with non-intact skin ends
- b) After a percutaneous injection or puncture; after inserting an invasive medical device (vascular access, catheter, tube, drain, etc); after disrupting and opening an invasive circuit
- c) After removing an invasive medical device
- d) After removing any form of material offering protection (napkin, dressing, gauze, sanitary towel, etc)
- e) After handling a sample containing organic matter, after clearing excreta and any other body fluid, after cleaning any contaminated surface and soiled material (soiled bed linen, dentures, instruments, urinal, bedpan, lavatories, etc)

4 After touching a patient

WHY? To protect you from colonization with patient germs and to protect the health-care environment from germ spread

WHEN? Clean your hands when leaving the patient's side, after having touched the patient *

Situations when Moment 4 applies, if they correspond to the last contact with the patient before leaving him / her:

- a) After shaking hands, stroking a child's forehead
- b) After you have assisted the patient in personal care activities: to move, to bath, to eat, to dress, etc
- c) After delivering care and other non-invasive treatment: changing bed linen as the patient is in, applying oxygen mask, giving a massage
- d) After performing a physical non-invasive examination: taking pulse, blood pressure, chest auscultation, recording ECG

5 After touching patient surroundings

WHY? To protect you from colonization with patient germs that may be present on surfaces / objects in patient surroundings and to protect the health-care environment against germ spread

WHEN? Clean your hands after touching any object or furniture when living the patient surroundings, without having touched the patient*

This Moment 5 applies in the following situations if they correspond to the last contact with the patient surroundings, without having touched the patient:

- a) After an activity involving physical contact with the patients immediate environment: changing bed linen with the patient out of the bed, holding a bed rail, clearing a bedside table
- b) After a care activity: adjusting perfusion speed, clearing a monitoring alarm
- c) After other contacts with surfaces or inanimate objects (note – ideally try to avoid these unnecessary activities): leaning against a bed, leaning against a night table / bedside table

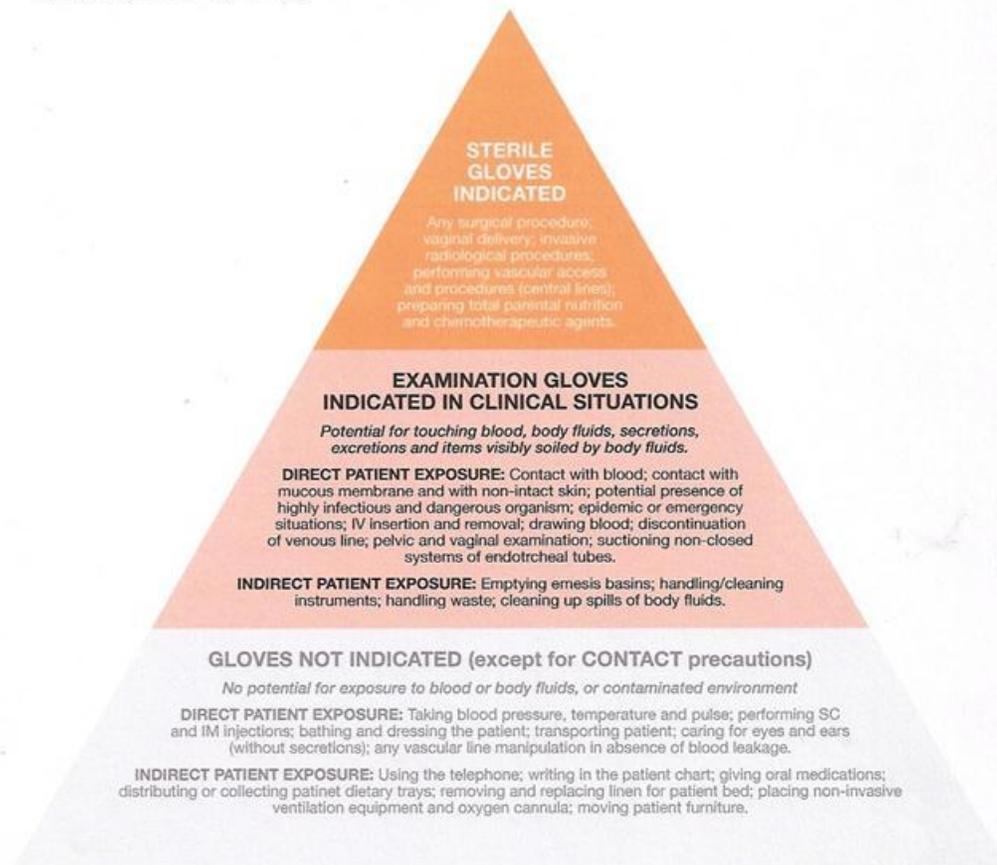
*NOTE: Hand hygiene must be performed in all indications described regardless of whether gloves are used or not.

HAND HYGIENE AND MEDICAL GLOVE USE

- The use of gloves does not replace the need for cleaning your hands.
- Hand hygiene must be performed when appropriate regardless of the indications for glove use.
- Remove gloves to perform hand hygiene, when an indication occurs while wearing gloves.
- Discard gloves after each task and clean your hands – gloves may carry germs.
- Wear gloves only when indicated according to Standard and Contact Precautions (see examples in the pyramid below) – otherwise they become a major risk for germ transmission.

The Glove Pyramid – to aid decision making on when to wear (and not wear) gloves

Gloves must be worn according to **STANDARD** and **CONTACT PRECAUTIONS**. The pyramid details some clinical examples in which gloves are not indicated, and others in which clean or sterile gloves are indicated. Hand hygiene should be performed when appropriate regardless of indications for glove use.



PAGE 6 OF 7

WHO acknowledges the Hôpital Universitaire de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

Glossary

Alcohol-based formulation	An alcohol-containing preparation (liquid, gel or foam) designed for application to the hands for hygienic hand antisepsis.
Body fluids	Blood; excretions like urine, faeces, vomit; meconium; lochia; secretions like saliva, tears, sperm, colostrum, milk, mucous secretions, wax, vernix; exudates and transudates like lymphatic, pleural fluid, cerebrospinal fluid, ascitic fluid, articular fluid, pus (except sweat); organic samples like tissues, cells, organ, bone marrow, placenta.
Clean / aseptic procedure	Any care activity that implies a direct or indirect contact with a mucous membrane, non-intact skin, an invasive medical device. During such a procedure no germs should be transmitted.
Critical site	Critical sites are associated with risk of infection. They either correspond to body sites or medical devices that have to be protected against harmful germs (called critical sites with risk of infection for the patient), or body sites or medical devices that potentially lead to hand exposure to body fluids and bloodborne pathogens (called critical sites with body fluid exposure risk).
Hand care	Actions to prevent skin irritation.
Hand hygiene	Any action of hygienic hand antisepsis in order to reduce transient microbial flora (generally performed either by handrubbing with an alcohol-based formulation or handwashing with plain or antimicrobial soap and water).
Indication for hand hygiene	Moment during health care when hand hygiene must be performed to prevent harmful germ transmission and/or infection.
Invasive medical device	Any medical device that enters the body either through a body opening or through a skin or mucous membrane breaking.

PAGE 7 OF 7

WHO acknowledges the Hôpital Universitaire de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document.

However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. Where error shall the World Health Organization be liable for damages arising from its use.

APPENDIX H: FOLLOW-UP PERCEPTION SURVEY

Follow-Up Perception Survey for Health-Care Workers

Period Number*

You are in direct contact with patients on a daily basis and this is why we are interested in your **opinion** on health care-associated infections and hand hygiene.

- It should take you no more than 15 minutes to complete this questionnaire.
- Each question has **one answer only**.
- Please read the questions carefully and then respond spontaneously. Your answers are anonymous and will be kept confidential.
- This questionnaire is in two parts: **part 1** includes the same questions that you may have answered during the previous evaluation period; **part 2** includes some additional questions to find out your opinion of the strategies and tools being currently used to promote hand hygiene at your institution.
- **Short Glossary:**

Alcohol-based handrub formulation: an alcohol-containing preparation (liquid, gel or foam) designed for application to the hands to kill germs.

Facility: health-care setting where the survey is being carried out (e.g., hospital, ambulatory, long-term facility, etc).

Handrubbing: treatment of hands with an antiseptic handrub (alcohol-based formulation).

Handwashing: washing hands with plain or antimicrobial soap and water.

Service: a branch of a hospital staff that provides specified patient care.

Ward: a division, floor, or room of a hospital for a particular category or group of patients (it corresponds to the smallest segmentation of the health-care facility; one service can include multiple wards).

Part 1

- | | | | |
|-------------------|---------------------------------|-------------------------------|----------------------|
| 1. Personal ID**: | <input type="text"/> | 2. Date: | <input type="text"/> |
| 3. Facility: | <input type="text"/> | 4. Service**: | <input type="text"/> |
| 5. Ward**: | <input type="text"/> | 6. City**: | <input type="text"/> |
| 7. Country**: | <input type="text"/> | | |
| 8. Gender: | <input type="checkbox"/> Female | <input type="checkbox"/> Male | |

9. Age: years
10. Profession***: Resident
- Nurse Auxiliary nurse Midwife Medical doctor
- Technician Therapist Nurse student Medical student
- Other

* To be completed by the data manager

** **Optional**, to be used if appropriate, according to the local needs and regulations.

*****Technicians**: radiologist, cardiology technician, operating room technician, laboratory technician

11. Department (please select the department which best represents yours):

- Internal medicine medical/surgical Surgery Intensive care unit Mixed
- Emergency unit Obstetrics Paediatrics
- Long-term/rehabilitation
- Outpatient clinic Other

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

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

14. According to your knowledge, what is the average percentage of nursing home patients who will develop a health care-associated infection (between 0 and 100%)?

% I don't know

15. In general, what is the impact of a health care-associated infection on patient's clinical outcome?

Very low Low High Very high

16. What is the effectiveness of hand hygiene in preventing health care-associated infection?

Very low Low High Very high

17. Among all patient safety issues, how important is hand hygiene at your institution?

Low priority Moderate priority High priority Very high priority

18. On average, in what percentage of situations requiring hand hygiene do health-care workers in your hospital actually perform hand hygiene, either by handrubbing or handwashing (between 0 and 100%)?

% I don't know

19. In your opinion, how effective would the following actions be to improve hand hygiene permanently in your institution?

Please tick one "☐" on the scale according to your opinion.

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- n. The health-care facility makes alcohol-based handrub always available at each point of care.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- p. Each health-care worker receives education on hand hygiene.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- q. Clear and simple instructions for hand hygiene are made visible for every health-care worker.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- r. Health-care workers regularly receive feedback on their hand hygiene performance.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

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

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

- t. Patients are invited to remind health-care workers to perform hand hygiene.

Not effective ☐---☐---☐---☐---☐---☐---☐ Very effective

20. What importance does the head of your department attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

21. What importance do your colleagues attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

22. What importance do patients attach to the fact that you perform optimal hand hygiene?

No importance ☐---☐---☐---☐---☐---☐---☐ Very high importance

23. How do you consider the effort required by you to perform good hand hygiene when caring for patients?

No effort A big effort

24. On average, in what percentage of situations requiring hand hygiene do you actually perform hand hygiene, either by handrubbing or handwashing (between 0 and 100%)?

%

Part 2

25. Has the use of an alcohol-based handrub made hand hygiene easier to practice in your daily work?

Not at all Very important

26. Is the use of alcohol-based handrubs well tolerated by your hands?

Not at all Very well

27. Did knowing the results of hand hygiene observation in your ward help you and your colleagues to improve your hand hygiene practices?

Not at all Very much

28. Has the fact of being observed made you paying more attention to your hand hygiene practices?

Not at all Very much

29. Were the educational activities that you participated in important to improve your hand hygiene practices?

Not at all Very important

30. Do you consider that the administrators in your institution are supporting hand hygiene improvement?

Not at all Very much

31. Has the improvement of the safety climate (if actually improved in your institution as a result of the recent implementation of the hand hygiene promotion strategy) helped you personally to improve your hand hygiene practices?

Not at all Very much

32. Has your awareness of your role in preventing health-care-associated infection by improving your hand hygiene practices increased during the current hand hygiene promotional campaign?

Not at all Very much

Additional questions for this research

33. In teaching me about hand hygiene, I would rate the effectiveness of the educational video as

Not at all Very much

34. In teaching me about hand hygiene, I would rate the effectiveness of the educational pamphlet as

Not at all Very much

35. I read the educational pamphlet

Not at all Very much

Thank you very much for your time!

LIST OF REFERENCES

- Aiello, A., Malinis, M., Knapp, J., Mody, L. (2009). The influence of knowledge, perceptions, and beliefs, on hand hygiene practices in nursing homes. *American Journal of Infection Control*, 37, 164-167.
- Allegranzi, B., Storr, J., Dziekan, G., Leotsakos, A., Donaldson, L., Pittet, D. (2007). The first global patient safety challenge “Clean Care is Safer Care”: from launch to current progress and achievements. *Journal of Hospital Infection*, 65 (2),115-123.
- Arias, K. (2010). Outbreaks Reported in Long-Term Care Settings. In Arias, K. (Ed) *Outbreak Investigation, Prevention and Control in Health Care Settings* (pp 141-162). Boston: Jones and Bartlett Publishers.
- Armitage, C., Connor, M. (2001). Efficacy of the Theory of Planned Behavior: A meta-analytic review. *British Journal of Social Psychology*. 40, 471-499.
- Armstrong, A., Idriss, N., Kim, R. (2010). Effects of video-based, on-line education on behavioral and knowledge outcomes in sunscreen use: A randomized controlled trial. *Patient Education and Counseling*, 83, 273-277.
- Ajzen, I. (1985). From intention to actions: A theory of Planned Behavior. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Heidelberg: Springer.
- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Process*, 50, 179-211.
- Biddle, C. (2009). Semmelweis revisited: Hand hygiene and nosocomial diseases transmission in the anesthesia workstation, *AANA Journal*, 77 (3), 229-237.

- Bittner, M., Rich, E., Turner, P., Arnold, W. (2002). Limited impact of sustained simple feedback based soap and paper towel consumption on the frequency of hand washing in an adult intensive care unit. *Infection Control and Hospital Epidemiology*, 23, 120-126.
- Burgio, L., Stevens, A., Burgio, K., Roth, D., Paul, P., Gerstle, J.(2002). Teaching and maintaining behavior management skill in the nursing home. *The Gerontologist*, 42 (4), 487-496.
- Burns, S. (2009). Application of the Theory of Planned Behavior to oral anticoagulation therapy. *Nursing and Health Sciences*, 11, 98-101.
- Cardo, D., Dennehy, P., Halverson, P., Fishman, N., Kohn, M., Murphy, C., Whitley, R., (2010). Moving toward elimination of healthcare-associated infections: A call to action. *American Journal of Infection Control*, 38 (9), 671-675.
- Carter, P. (Writer). (2006). Infection Control. Module 2 Lippincott's® Video Series for Nursing Assistants. Lippincott, Williams, and Wilkins DVD.
- Certified Nursing Assistant Continuing Education. Retrieved from <http://www.cnatrainingclass.com/certified-nursing-assistant-continuing-education>
- Cherry, B., Marshal-Gray, P., Laurence, A., Green, A., Valadez, A., Scott-Tilley, D., Merritt, P. (2007). The Geriatric training Academy: Innovative education for certified nurse aides and charge nurses. *Journal of Gerontological Nursing*, 33 (3), 37-44.
- Clayton, D., Griffith, C. (2008). Efficacy of an extended Theory of Planned Behavior model for predicting caterers' hand hygiene. *International Journal of Environmental Health Research*, 18 (2), 83-98.
- Cohen, J. (1992). A power premier. *Psychological Bulletin*, 112 (1), 155-159.

- Cowles, C. (2009). Nursing Home Statistical yearbook. Cowles, CM (Eds). McMinnville, Oregon. Cowles research group.
- Creamer, E., Dorian, S., Dolan, A., Sherlock, O., Fitzgerald-Hughes, D., Thomas, T....
Humphrey, H. (2010). When are the hands of healthcare workers positive for methicillin-resistant staphylococcus aureus? *Journal of Hospital Infection*, 75, 107-111.
- Department of Health and Human Services. (2009). CMS Manual system Pub. 100-07 State Operations Provider Certification. Retrieved from
<http://www.cms.gov/transmittals/downloads/R51SOMA.pdf>
- Dominguez-Berjon, M., Hernando-Briongos, P., Arroyo, P., Echevarria, J., Casas, I. (2007). Adenovirus transmission in a nursing home: Analysis of an epidemic outbreak of Keratoconjunctivitis. *Gerontology*, 53, 250-254.
- Earl, M., Jackson, M., Rickman, L. (2001). Improved rates of compliance with hand antisepsis guidelines: A three-phase observational study. *American Journal of Nursing*, 101,26-33.
- Eramus, V., Daha, T., Brug, H., Richardus, J., Behrendt, M., Vos, M., Van Breck, F. (2010). Systematic review of studies on compliance with hand hygiene guidelines in hospital care. *Infection Control and Hospital Epidemiology*, 31 (3), 283-294.
- Florida Department of Health. 64B9-15.011 Inservice training requirements retrieved from
http://www.doh.state.fl.us/mqa/cna/cna_ceu.html
- Gilbert, K., Stafford, C., Crosby, K., Flemming, E., Gaynes, R. (2010). Does hand hygiene compliance among health care workers change when patients are in contact precaution rooms in ICUs? *American Journal of Infection Control*, 38 (7), 515-517.
- Gould, D. (2010). Auditing hand hygiene practice. *Nursing standard*, 25 (2), 50-56.

- Gould, D., Chudleigh, J., Drey, N., Moralejo, D. (2007). Measuring hand washing performance in health service audits and research studies. *Journal of Hospital Infection*, 66, 109-115.
- Gould, D., Drey, N., Credon, S. (2011). Routine hand hygiene audit by direct observation: has nemesis arrived? *Journal of Hospital Infection*, 77, 290-293.
- Gould, D., Drey, N., Moralejo, D., Grimshaw, J., Chudleigh, J. (2008). Interventions to improve hand hygiene compliance in patient care. *Journal of Hospital Infection*, 68, 193-202.
- Grant, A., Hoffman, D. (2011). It's not all about me: Motivating hand hygiene among health care professional by focusing on patients. *Psychological Science*, XX(X), 1-6
- Hanna, D., Davies, M., Dempster, M. (2009). Psychological processes underlying nurse' hand washing behavior. *Journal of Infection Prevention*, 10 (3), 90-95.
- Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., Kinmonth, A. (2002) Application of the Theory of Planned Behavior in behavior change intervention: A systematic review. *Psychology and Health*, 17 (2), 123-158.
- Heden, T., Raines, S., Barton, A. (2010). Foundations of mediation training: a literature review of adult education and training design. *Conflict Resolution Quarterly*, 28 (2), 157-181.
- Horan, T., Andrus, M., Dudeck, M. (2008). CDC/NHSN surveillance definition of healthcare-associated infection and criteria for specific types of infection in the acute care setting. *American Journal of Infection Control*. 36, 309-32.
- Huang, T., Wu, S. (2008). Evaluation of a training programme on knowledge and compliance of nurse assistants' hand hygiene in nursing homes. *Journal of Hospital Infection*, 68,164-170.
- Hugonnet, S., Perneger, T., Pittet, D. (2002). Alcohol-based hand rub improves compliance with hand hygiene in intensive care units. *Archives of Internal Medicine*, 162, 1037-1043.

- Jones, I., Handley, J., Whitfield, R., Newcombe, R., Chamberlain, D. (2007). A preliminary feasibility study of a short DVD-based distance-learning package for basic life support. *Resuscitation*, 75, 350-356.
- Kac, G., Podglajen, I., gueneret, M., Vaupre, S., Bissery, A., Meyer, G. (2006). Microbiological evaluation of two hand hygiene procedures achieve by healthcare workers during routine patient care: A randomized study. *Journal of Hospital Infection*, 60, 32-39.
- Kampf, G., Krammer, A. (2004) Epidemiological background of hand hygiene and evaluation of the most important agents for scrubs and rubs. *Clinical Microbiology Reviews*, 17(4), 863-893.
- Klevens, R., Edwards, J., Horan, T., Gaynes, R., Pollock, D., Cardo, D. (2007). Estimating health care –associated infections and deaths in U.S. hospitals, 2002. *Public Health Reports*, 122, 160-166
- Koch, A., Eriksen, H., Elstrom, P., Aavtislund, P., Harthug, S. (2008) Severe consequences of healthcare-associated infections among residents of nursing home: A cohort study. *Journal of Hospital Infection*, 71, 269-274.
- Lam,B., Lee, J., Lau, Y., (2004). Hand hygiene practices in a neonatal intensive care unit: A multimodal intervention and impact on nosocomial infection. *Pediatrics*, 113, e565-e571.
- Lee, J., Boyd, R., Stuart, P. (2007). Randomized controlled trial of an instructional DVD for clinical skills teaching. *Emergency Medicine Australia*, 19, 241-245.
- Lerner, N., Resnick, B., Galik, E., Russ, K. (2010). Advanced Nursing assistant education program. *The Journal of continuing Education*, 41 (8), 356-362.

- Lin, C., Yang, C., Lu, M., Kao, C. (2008). Effectiveness of a nosocomial infection control training in improving knowledge in patient –hired attendant and outsourced workers in Taiwan. *Journal of Nursing Research*, 16 (3), 187-194.
- Longest, B. (2006) *Health policy making in the United States* (4th ed.). Chicago: Health Administration Press.
- Lucet, J., Rigaud, M., Mentre, F., Kassis, N., Deblangy, C., Andreumont, A., Bouvet, E. (2002). Hand contamination before and after different hand hygiene techniques a randomized clinical trial. *Journal of Hospital Infection*, 50, 276-280.
- Makris, A. Morgan, L., Gaber, D., Richter, A., Rubino, J. (2000). Effect of a comprehensive infection control program on the incidence of infections in long-term care facilities. *American Journal of Infection Control*, 28 (1), 3-7.
- Maskerine, C., Loeb, M. (2006). Improving adherence to hand hygiene among health care workers. *The Journal of Continuing Education in the Health Professions*, 26 (3), 244-251.
- Mathai, E., Allegranzi, B., Kilpatrick, C., Pittet, D. (2010). Prevention and control of health care-associated infections through improved hand hygiene. *Indian Journal of Microbiology*, 28 (2), 100-106.
- McGuckin, M., Waterman, R., Govednik, J. (2009). Hand-hygiene compliance rates in the United States- A one year multicenter collaboration using product/volume usage measurement and feedback. *American Journal of Medical Quarterly*, 24 (3), 205-213.
- Menne, H., Ejaz, F., Noelker, L., Jones, J. (2007). Direct care workers' recommendations for training and continuing education. *Gerontology and Geriatrics Educations*, 28 (2), 91-108.

- Mullen, B., Wong, C. (2009). Hygienic food handling behaviors. An application of the Theory of Planned Behavior. *Appetite*, 52, 757-761.
- Mylotte, J., Keagle, J. (2005) Benchmarks for antibiotic use and cost in long-term care. *Journal of the American Geriatrics Society*. 53, 1117-1122.
- Nicolle, L. (2001). Preventing infections in non-hospital settings: Long term care. *Emerging Infectious Diseases*, 7 (2), 205-207.
- Nakhikian, E., Wilner, M., Hurd, D. (2002). Nursing assistant training and education: Recommendations for change. *Nursing Homes: Long Term Care Management*, 51 (8) 44, 46-47.
- Noelker, L. (2001). The backbone of the long term care workforce. *Generations*, 25 (1), 85-91.
- O'Boyle, C., Henly, S., Larson, E. (2001). Understanding adherence to hand hygiene recommendations: The Theory of Planned Behavior. *American journal of Infection control*. 29 (6), 352-360.
- Oughton, M., Loo, V., Dendukuri, N., Fenn, S., Libman, M. (2009). Hand hygiene with soap and water is superior to alcohol rub with and antiseptic wipes for removal of clostridium difficile. *Infection Control and hospital Epidemiology*, 30, (10), 939-944.
- Pennington, K., Scott, J., Magilvy, K. (2003). The role of certified nursing assistants in nursing homes. *JONA*, 33(11), 578-584.
- Pett, M. (1997). Nonparametric Statistics for health Care research: Statistics for Small Samples and Unusual Distributions. New York, NY: Sage Publications.
- Pfefferle, S., Weinberg, D. (2008). Certified nurse assistants making meaning of direct care. *Qualitative Health Research*, 18 (7), 952-961

- Pittet, D., Donald, L. (2005). Clean care is safer care: the first global challenge of the WHO world alliance for patient's safety. *American Journal of Infection Control*, 26, 476-479.
- Pittet, D., Hugonnet, S., Harbarth, S., Mourouga, P., Sauvan, V., Touveneau, S., Perneger, T. (2000). Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Lancet*, 356, 1307-12.
- Poulter, D., McKenna, F. (2010). Evaluating the effectiveness of a road safety education intervention for pre-drivers: An application of the Theory of Planned Behavior. *British Journal of Educational Psychology*, 80, 163-181.
- Pyrek, K. (2002) Breaking the chain of infection. *Infection Control today*. Retrieved from *Qualitative Health Research*, 18 (7), 952-961 www.infectioncontroltoday.com
- Rao, G., Jeannes, A., Russell, H., Wilson, D., Atere-Roberts, E., Sullivan, D., Donaldson, N. (2009). Effectiveness of short-term, enhanced, infection control support in improving compliance with infection control guidelines and practice in nursing homes: a cluster randomized trial. *Epidemiology and Infection*, 137, 1465-1471.
- Reynolds, C., Quan, V., Kim, D., Peterson, E., Dunn, J., Whealon, M, Haung, S. (2011). Methicillin-Resistant Staphylococcus Aureus (MRSA) carriage in 10 nursing homes in Orange County, California. *Infection Control and Hospital Epidemiology*, 32 (1), 90-93.
- Rosenthal, V., Guzman, S., Safdar, N. (2005). Reduction in nosocomial infection with improved hand hygiene in intensive care units of a tertiary care hospital in Argentina. *American Journal of Infection Control*, 33, 392-397.
- Scott, R. (2009). The direct medical costs of health-care associated infections in U.S. hospitals and the benefits for prevention. A CDC Report. Retrieved from http://www.cdc.gov/ncidod/dhqp/pdf/scott_costpaper.pdf

- Siegel, J., Rhinehart, E., Jackson, M., Chiarello, L., and the Healthcare Infection Control Practices Advisory Committee. (2007). Guidelines for Isolation Precautions: Preventing Transmission of Infections Agents in Healthcare Settings. Retrieved from <http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html>
- Sengupta, M., Harris-Kojentin, L., Ejaz, F. (2010). A national overview of the training received by certified nursing assistants working in U.S. nursing homes. *Gerontology and Geriatrics Education*, 31, 201-219.
- Smith, P., Bennett, G., Bradley, S., Drinka, P., Lautenbach, E., Marx, J., Mody, I., Nicolle, L., Stevenson, K. (2008). SHEA/APIC guideline: Infection prevention and control in the long-term care facility. *American Journal of Infection Control*, 26, 504-535.
- Smith, P., Rusnak, P. (1997). APIC guidelines for infection prevention and control in the long term care facility. *American journal of Infection Control*, 25, 488-512.
- Spaulding, L. (2006). The changing role of infection-control programs in long-term care management. *Nursing Homes*,
- Strausbaugh, L., Joseph, C. (2000). The burden of infection in long-term care. *Infection Control and Hospital Epidemiology*, 21, 674-679.
- Squillace, M., Remsburg, R., Harris-Kofetin, L., Bercovitz, A., Rosenhoff, E., Han, B. (2009). The national nursing assistant survey: Improving the evidence base for policy initiatives to strengthen the certified nursing assistant workforce. *The Gerontologist*, 49 (2), 185-197.
- Takahashi, I., Turale, S. (2010). Evaluation of individual and facility factors that promote hand washing in aged-care facilities in Japan. *Nursing and Health Sciences*. 12, 127-134.

- The Joint Commission. (2009). Measuring Hand Hygiene Adherence: Overcoming the Challenges. Retrieved from [http://www.ascquality.org/Library/Measuring%20Hand%20Hygiene%20Adherence_Overcoming%20the%20Challenges%20\(TJC\).pdf](http://www.ascquality.org/Library/Measuring%20Hand%20Hygiene%20Adherence_Overcoming%20the%20Challenges%20(TJC).pdf)
- Thomas, M., Burke, K. (1998) A nursing assistant training program in a long term care setting. *Gerontology and geriatrics Education*, 19 (1), 23-35.
- Trunell, E., White, G. (2005). Using behavior change theories to enhance hand hygiene behavior. *Education for Health*, 18 (1), 80-84.
- Umscheid, C., Mitchell, M., Doshi, J., Agarwal, R., Williams, K., Brennan, P. (2011). Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. *Infection Control and Hospital Epidemiology*. 32 (2). 101-114.
- U.S. Department of Health and Human Services. (2002) Nurses Aide training report. Retrieved from <http://oig.hhs.gov/oei/reports/oei-05-01-00030.pdf>
- Wald, H., Krammer, A. (2007). Nonpayment for harms resulting from medical care: catheter-associated urinary tract infection. *Journal of the American Medical Association*, 298 (23), 2782-2784.
- Weitzel, T., Robinson, S., Henderson, L., Anderson, K. (2005). Helping hands: CNAs in elder care. *Nursing Management*, 36 (4), 41-46.
- Wenzel, R., Edmond, M. (2010). Infection control: the case for horizontal rather than vertical interventional programs. *International Journal of Infectious Disease*, 14 (S4) s3-s5.
- Whitby, M., McLaws, M. (2007). Methodological difficulties in hand hygiene research. *Journal of Hospital Infection*, 67, 194-195.

WHO Guidelines on hand Hygiene in Health Care (World Health Organization, Geneva) (2009).

Retrieved from http://whqlibdoc.who.int/publications/2009/9789247597906_eng.pdf

Won, S., Chou, H., Hsieh, W., Chen, C., Huang, S., Tsou, K., Tsao, P. (2004). Hand washing program for the prevention of nosocomial infections in a neonatal intensive care unit.

Infection Control and Hospital epidemiology, 25, 742-746.

Zoutman, D., Ford, B., Gauthier, J. (2009). A cross Canada survey of infection prevention and control in long-term care facilities. *American Journal of Infection Control*, 37 (5), 358-363.