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Improving Compliance with Healthcare Associated Infection (HAI) Practice Guidelines to Reduce the Acquisition of HAIs

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A Capstone Scholarly Project Presented By:

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Abstract

Healthcare Associated Infections (HAIs) have been estimated to be in the millions, directly associated with 99,000 deaths and costing nearly $28 to $33 billion in excess health care costs each year (AHRQ, 2011; Scott, 2009). The literature indicates that healthcare workers are aware and understand that their patients are susceptible to HAIs and that they themselves can affect patient outcomes. However, despite this awareness and the existence of evidence based HAI guidelines there are clear gaps between what is recommended and practiced, greatly impacting the acquisition of HAIs. The objective of this capstone project was to assess for gaps between HAI recommendations and practices in the acute care setting, provide interventions to address these gaps, and thereby impact HAI acquisition rates and patient outcomes.

keywords: : infection control practices; perceptions; compliance; culture of safety; patient safety; nursing; knowledge, beliefs and attitudes; nosocomial infections

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Background

As health care associated infections (HAI) have become a common complication in the health care setting and a leading cause of death in the United States, organizations committed to improving the safety and quality of patient care, e.g. Joint Commission (JC), the Agency for Healthcare Research and Quality (AHRQ), Healthcare Infection Control Practices Advisory Committee of the Centers for Disease Control and Prevention (CDC) and many others have recognized the importance of effective HAI prevention and placed the reduction of such infections on their patient safety agendas (AHRQ, 2011). In addition, as the prevention of HAIs and Multi-Drug Resistant Organism (MDRO) have become a major patient safety initiative, scrutiny by national and state consumer groups and heightened media and public attention have raised the stakes to all new levels as many organizations, whether by state regulation or voluntary, have subscribed to HAI transparency.

Gaps in Practice

The Institute of Medicine's (IOM) report, "To Err is Human", published in 2000 identified that there were clear gaps between what is practice and recommended. Many regulatory agencies asserted their authority by urging organizations to cultivate a culture of safety as the expected work environment for healthcare, as these inconsistencies in "what is recommend" and "what is practice" could greatly impact patient outcomes (AHRQ, 2011). These inconsistencies were also seen in compliance with HAI prevention measures, yielding agencies like JC and CDC to stress the importance of prevention by requiring that organizations incorporate HAI staff education at all levels as an essential element of their HAI preventive efforts.

Despite these increased efforts and the existence of evidence based guidelines like the 2007 CDC Guideline for Isolation Precautions; Society of Healthcare Epidemiology of America's (SHEA) 2008 Compendium of Strategies to Prevent Healthcare-Associated Infections in Acute Care Hospitals, and recommendations from expert panels, there continues to be a gap between "what is recommended" and "what is practiced" regarding HAI prevention. The reality is that the acquisition of these HAIs can significantly impact outcomes by impairing the patient's quality of life or worse, patient mortality.

Problem Statement

In the past twenty years, the overall incidence of HAIs has increased by 36% (Stone, 2009). In 2002, the number of HAIs was estimated to be in the millions and was directly associated with 99,000 deaths in United States each year, making HAIs the fourth leading cause of death among the U.S. patient population (AHRQ, 2011). Beyond this unacceptable human toll there is also an enormous financial burden being placed on our nation's healthcare systems due to the staggering numbers and dollars (See Table 1) associated with these infections (Stone, 2009). It has been estimated that HAIs costs range from $28 to $45 billion in excess health care costs each year imposing a significant economic consequence on an already strained U.S. financial system (AHRQ, 2011; Scott, 2009). However, despite costs, the morbidity, and mortality associated with HAIs, compliance with HAI prevention measures remain suboptimal, at best.

Table 1

Burden of Healthcare Associated Infections

Infection Type	Annual Infection (n)	Mean hospital cost per infection (U.S. dollars).	Mean deaths per year
Central Line Associated Bloodstream Infection (CLABSI)	248,678	36,441	30,655

Surgical Site Infection (SSI)	290,485	25,546	13,088
Ventilator Associated Pneumonia (VAP)	250,205	9,966	35,967
Catheter Associated Urinary Tract Infection (CAUTI)	561,677	1006	8205

Note. Cost of HAIs. Adapted from "Economic burden of healthcare-associated infections: An American perspective," by P. Stone, 2009, *Pharmacoeconomics Outcomes*, 9, p.418.

Review of Literature

The literature review for this project consisted of articles that examine the relationship between infection control, infection prevention, adherence to evidence based guidelines, and healthcare worker's knowledge, beliefs and attitudes regarding the prevention of HAIs. The literature and guideline search was performed utilizing the CDC, Cochrane, Cumulative Index of Nursing and Allied Health Literature, Medline, National Guideline Clearinghouse, and PubMed of the National Library of Medicine databases. The Medical Subject Headings (MeSH) terms used for the literature search were: infection control practices; perceptions; compliance; culture of safety; patient safety; nursing; knowledge, beliefs and attitudes; nosocomial infections. Article inclusion criteria included full-text articles, English language, clinical guidelines, systematic reviews, meta-analysis, and articles published between the years of 1997-2012.

The search resulted in sixty-four articles related to the above mentioned criteria. Of the sixty-four articles, nine were found to be relevant and selected for this literature review (See Appendix I for detailed matrix). In addition to the selected peer reviewed articles, infection prevention guidelines, best practices and websites put forth by CDC, SHEA, Infectious Disease Society of America, Joint Commission and AHRQ were reviewed.

The objective of evidence-based practice is to assist healthcare providers in differentiating between and utilizing research findings for the best answer to questions regarding appropriate interventions and treatments in the clinical practice setting. There are various

grading schemes available; however, most are based on Levels of Evidence and Grades of Recommendations which provide a summary of the literature's intervention effectiveness (AHRQ, 2012; GRADE, 2012; Johns Hopkins, n.d.; U.S. Preventive Services Task Force, 2003; Wright, n.d.). Any of the articles that were determined at Level IV through V were omitted, as they may provide insufficient or conflicting evidence regarding a recommendation (Johns Hopkins, n.d.). As this review was conducted to establish that the best answer regarding how gaps in infection prevention practice impact the acquisitions of HAIs, only articles rated at Level III / B and higher were determined to meet the review of literature criteria (Johns Hopkins, n.d.). The importance of utilizing articles that are ranked at higher levels of evidence/grade is that it provides evidence for or against an intervention, thereby reinforcing clinical decision making and practice (AHRQ, 2012; GRADE, 2012; Johns Hopkins, n.d.; U.S. Preventive Task Force, 2003; Wright, n.d.).

The consistent findings demonstrated from these articles, guidelines, best practices and websites suggested that the non-compliance with HAI practice guidelines negatively impacts the acquisition of infections. Although, organizations continue to struggle in holding individuals accountable for their lack of compliance with recommended guidelines, poor compliance with infection control practices not only places the patient's health at risk for developing a number of HAIs, it also jeopardizes their trust in the healthcare system (Angelillo, Mazziotta, & Nicotera, 1999; Helder, Brug, Looman, Van Goudoever, & Kornelisse, 2010; Kennedy, Elward and Fraser, 2004; Sinkowitz-Cochran, et al., 2012; SHEA, 2008; SHEA, 2010; Watkins, et al., 2006; Won, et al., 2004). It is clearly apparent that effective evidence based infection control measures can ensure the reduction and prevention of HAIs and promote patient safety. It is unlikely that one single HAI intervention will achieve or sustain adherence to the compliance issues; nonetheless,

establishing adherence to preventative measure should be a key institutional performance goal, as the literature suggests that proper implementation and consistent adherence of infection control measures can and is an effective intervention to controlling the development of HAIs and the emergence of MDROs (Angelillo et al., 1999; Apisarnthanarak et al., 2012; Kennedy et al., 2004; O'Boyle, Henly, & Larson, 2001; Tartari & Mamo, 2011; Watkins, et al., 2006; Won, et al., 2004).

Theoretical Framework

This project incorporated the Theory of Planned Behavior (TPB) model as this framework theorizes that the cause of a behavior is intention and that behavioral intention is influenced by specific key variables. This theory was proposed by Icek Ajzen in 1985 (see Appendix II) and states that human behavior is guided by key considerations: behavioral beliefs (beliefs strength and outcome evaluations), normative beliefs (strength and motivation to comply), and control beliefs (strength and perceived power) (Ajzen, 1991). The theory has become an influential model explaining human behavior and has allowed for the successful development of healthcare interventions (Ajzen, 1991). The TPB model suggests that as a general rule, the more favorable the attitude, subjective norm and perceived control of the behavior the more likely the individual will demonstrate the desired behavior. Utilizing this framework allowed for the identification of accessible beliefs and the development of an intervention design that will positively influence the adherence to HAI practice guidelines and thereby reduce the organization's healthcare associated infection acquisition rates.

Methodology

The objective of this improvement project was to assess for gaps between HAI recommendations and practices, provide interventions to address these gaps, and thereby impact

HAI acquisition rates and patient outcomes. The project utilized the TPB model to identify behavior adherence to HAI practice guidelines in the acute care setting (See Table 2). Participating **s**taff members were accessed through the use of a survey modified from the 2004 Columbia University: Attitudes Regarding Practice Questionnaire for current knowledge, attitudes and beliefs relating to HAI prevention strategies and adherence to HAI practice guidelines (see Appendix III). The Attitudes Regarding Practice Guidelines Questionnaire was developed by Dr. Elaine Larson, Columbia University. The tool was originally adapted from previous work by Cabana et al. (1999) that examined barriers to adherence to practice guidelines (Larson, 2004). The information gathered from the pre Knowledge, Beliefs and Attitudes survey provided the information for the construction of the TPB questionnaire. To make the project accessible to all staff members and elicit the maximum level of participation, the pre and post Knowledge, Beliefs, and Attitudes survey and the TPB questionnaire were available online through the use of Survey Monkey, an online survey and questionnaire development service.

The TPB questionnaire results then drove the focus of the project's intervention. The intervention consisted of staff training sessions, dissemination of an isolation handout, and a PowerPoint presentation delivered by the project manager, DNP (c) student, who will hereby be referred to as project manager.

Table 2

Methods

Phase	Steps	Activity
Project Preparation	**1** **2**	Obtain unit HAI rates/establish HAI goals Development: • Data Collection Tools • Complete/Finalize K, B, & A Survey
TPB Phase 1	**3** **4**	K, B, & A Pre-Survey Administered TPB Questionnaire Development
TPB Phase 2	**5**	TPB Questionnaire Administered

	6	Education Development (based on TPB Questionnaire results)
	7	Staff Training Session Administered
TPB Phase 3	**8**	HAI Surveillance/Data Collection (1 month)
	9	K, B, & A Post-Survey Re-Administered
	10	Data Analysis

Following the project intervention, HAI surveillance was conducted for four weeks and rates compared to the organization's internal benchmarks and the National Healthcare Safety Network (NHSN) (2012) benchmark data (if available) prior to the beginning of the project. The monitoring of staff compliance with transmission based isolation practices was conducted solely by the project manager.

Timeline

The project timeline (see Appendix IV for detailed timeline) consisted of a three month period with three distinct phases. Phase I of the project was conducted to identify accessible beliefs through the administration of a survey addressing common knowledge, attitudes and beliefs relating to the implementation and compliance of HAI practice guidelines. The survey results then provide necessary information needed to construct the TPB questionnaire. Phase II of the project began with the administration of the TPB questionnaire. The information gathered from the TPB questionnaire was then used to construct and design the training intervention. The project manager delivered multiple training sessions onsite, as well as provided an online access option for those unable to attend. The third phase of the project was the administration of the post Knowledge, Belief and Attitudes survey, surveillance of HAI acquisition and monitoring staff compliance to HAI prevention recommendation guidelines within the participating units.

Community

The city of Tampa is part of Hillsborough County located in western, central Florida. Each year, the United States Census Bureau publishes estimates of the population for each state and county, as well as the nation as a whole. Per the 2010 U.S. Census Bureau Report, the region's demographics are comparable to national averages in both age and sex; however, census data demonstrates lower than national averages for mean household income ($43,117 vs. $51,914), indicating that Tampa families may be at a socioeconomic disadvantage than their national counterparts (U.S. Census Bureau, 2010). The region also has higher than national averages for two minority groups, Hispanics (23.0% vs. 16.3%) and Blacks (26.2% vs. 12.6%) residents, making the region a diverse patient population (U.S. Census Bureau, 2010). Refer to Appendix V for demographic data from the 2010 U.S. Census Report for the city of Tampa, the state of Florida, and national averages.

The direct patient care staff employed at facility consisted of RNs (both baccalaureate and associate prepared), LPNs, CNAs and Techs (nursing students with completed clinical experience). Although, the intensive care unit prefers baccalaureate registered nurses to provide direct patient care to their critical patient populations, the medical surgical suites utilizes both RNs and LPNs to provide direct patient care.

Setting

Patients admitted to the acute care setting are particularly vulnerable to HAIs due to the severity of illnesses, the high number of invasive procedures, devices, and the increased contact with healthcare providers; therefore, the population of interest for this project were adult patients (male and female patients greater than 21years of age) admitted to the intensive care unit and medical surgical unit of a local acute care facility. The facility is a 120 bed hospital located in the Tampa Bay area. The facility houses a nine-suite surgery unit that offers advanced

technologies in gynecologic surgery, vascular surgery and joint replacement procedures. The hope was that in addition to impacting the HAI acquisition, the facility's smaller size would provide a receptive environment to introduce a cultural change that encompassed infection prevention in its patient safety initiatives.

Sample

The improvement project included a convenience sample (*n=30*) of the nursing (RN/LPN) and support staff (CNA)/Techs) assigned to the facility's medical surgical and the intensive care unit. As the population of interest was determined to be approximately sixty or less and participation strictly voluntary, a sample size of 30 was established and approved by the Infection Control Department and the project manager. The improvement project was made available to all staff members willing to participate. To be eligible, staff members (as listed previously) where employed by the organization, on site at a minimum one day per week, and provided direct patient care.

Protection of Human Subjects

This improvement project was exempt from the requirement of an Institutional Review Board review, as the project did not collect any personal identifiers and all outcome data was described in aggregate. The only record link of participants to the project were the surveys assessing common HAI knowledge, attitudes and beliefs and the TPB questionnaire form completed by the staff participants. A letter of agreement to conduct this project was signed by the organization's Chief Nurse Executive (CNO) was obtained and is available at Appendix VI.

Budget

The project budget consisted of project development and delivery by the project manager. Computer access, internet access, and printing services were made available by the project site.

The project manager provided participants with online access to project assessment tools (i.e. surveys and questionnaire) through Survey Monkey, all fees associated with the use of this service were incurred by the project manager. Project staff participation (infection control personnel, nursing, and support staff) were made accessible by the project site at no cost to the project. A detailed budget breakdown for this improvement project is available (see Appendix VII).

Stakeholders

In the acute care setting, the key stakeholders encompass the organizations complete hierarchy, from board members to the front line staff and most importantly anyone affected by the organizations decisions, specifically the patient. The project's success was dependent upon gaining all stakeholders' support, as a culture change in any organization requires support from each and every level of the organization so that barriers that contributing to the failure of following HAI recommended guidelines are removed. The project manager met with the CNO, infection preventionist, nurse managers, team leads and unit staff prior to implementation and throughout the project.

Cost Benefit of Prevention

Approximately 1 in 10 hospitalized patients will acquire an infection after admission, resulting in substantial economic cost (CDC, 2004). The prevention and cost associated with HAIs are a growing concern for many organizations. Scott (2009) estimates that the attributable cost associated with HAIs has become an astronomical burden too many organization's operational budgets. Therefore, gaining support for this project requires successfully articulating that HAIs can impact the organizations bottom line (see Table 3) with potential savings ranging from 5.7 to 31.5 billion, depended on the effectiveness of the infection control prevention efforts.

Table 3

Range of estimated 2007 direct medical cost of all HAIs adjusted by the preventable proportion of infections

	Range of Estimates (billions $)	**20% of infections preventable (billions $)**	**50% of infections preventable (billions $)**	**70% of infections preventable (billions $)**
Consumer Price Index- Urban	28.4 -33.8	5.7-6.8	14.2-16.9	19.9-23.7
Consumer Price Index-Hospital Inpatient Services	35.7-45.0	7.1-9.0	17.9-22.5	25.0-31.5

Note. Direct Cost of HAIs and Infections Preventable. Adapted from "The direct medical costs of health-associated infection in U.S. hospitals and the benefits of prevention," by D. Scott, 2009. CDC: Division of Healthcare Quality Promotion.

Barriers

Historically, compliance with HAI prevention strategies has remained suboptimal. Gaining support was essential, as the success of any quality improvement projects is based on the buy in from those involved in the performance improvement. Another barrier to this improvement project was its three month timeframe. To demonstrate a significant decline in HAI acquisitions a longer monitoring period would have been preferred; however, due to the project's short timeframe, HAI acquisition surveillance and monitoring of staff adherence to transmission based isolation practices were conducted for four weeks, post intervention. This timeframe allowed the project manager to meet the required project submission deadlines.

Method of Evaluation

The outcome measurement was (you did the project) compliance with HAI prevention guidelines and the reduction of the organization's current HAI acquisition rates, per the organization's established surveillance program (e.g., MDROs, Ventilator Acquired Pneumonias

(VAP), Primary Blood Stream Infections (PBSI), and Catheter Associated Urinary Tract Infections (CAUTI)). HAIs will be based on CDC/NHSN definitions (see Appendix VIII). Per CDC/NHSN, HAI rates were calculated as follows:

- # of infections/device days x 1000 for PBSI and CAUTIs
- # of infections/ventilator days x 1000 for VAPs
- # of infections/patient days x 1000 for MDROs.

The CDC provides, analyzes, and publishes HAI surveillance data that estimates and characterizes the national burden of HAIs; data collected in NHSN is used for improving patient safety at the local and national level. The project site's infection preventionist conducted active surveillance to identify hospital associated infections, as previously mentioned per their established infection control and prevention plan and provide that HAI data to the program manager. The HAI rates were compared to the NHSN data for national comparison. The surveillance data was also compared to baseline HAI rates obtained prior to the project start so that appropriate goals were established for subsequent monitoring periods.

The TPB model suggests the more favorable the attitude, subjective norm and perceived control of the behavior the more likely the staff will demonstrate the compliance with HAI prevention measures. The improvement project was also evaluated to determine if changes in HAI practice and attitudes relating to HAI prevention was achieved following the TPB phase II intervention. This was conducted through the following: staff perceptions relating to HAI prevention were re-assessed through the re-administration of the KBA survey to determine if a positive change to the perception HAI prevention was achieved; and weekly monitoring of staff compliance with transmission based precautions were also conducted.

Project Implementation

Phase I

As previously stated, the improvement project was made available to all staff members from both the medical surgical and intensive care unit of a 120 bed hospital located in the Tampa Bay area. To be eligible, staff members were employed by the organization, on site at a minimum one day per week and provide direct patient care. Participation was voluntary. Table 4 demonstrates participation by unit and Table 5 demonstrates participation by staff position.

Table 4

Participation by Unit

Unit	Response Percent	Response Count
ICU	16.7%	5
Medical Surgical	83.3%	25

Table 5

Participation by Position

Position	Response Percent	Response Count
RN	66.7%	20
LPN	6.7%	2
CNA/Tech	23.3%	7
Other	3.3%	1

To encourage and elicit participation (a sample size goal of 30 participants) the project manager met with the organization's CNO, infection preventionist, nursing manager and conducted rounds on the unit prior to beginning Phase I of the project.

Assessing Knowledge, Belief and Attitudes. The Pre-Knowledge, Belief and Attitudes survey consisted of fifteen questions. The questions were made available through paper copy or accessible online through the use of Survey Monkey. Participants were asked to grade each question on a scale of 0-5, 0 meaning strongly disagree to 5 meaning strongly agree (see Table 6).

Table 6

Grading Pre & Post Knowledge, Beliefs and Attitudes Survey

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
0	1	2	3	4	5

Average Scores $\geq$ 4.00 were determined to be positively associated, e.g. participant demonstrated appropriate awareness, familiarity, and agreement with the prevention practice, guidelines and/recommendation (Cabana et al, 1999) Those < 4.00 were determined to have a negative association, e.g. lack of familiarity, awareness, or agreement with prevention guidelines and/recommendations. Items within the surveys that had negative endpoints were re-coded by the project manager, so that high scores consistently reflected a favorable association.

The results of this Pre-KBA survey demonstrated that overall knowledge of HAIs and preventive strategies were not deficient, however five elements scored below 4.00 and suggested that external barriers could be influencing staff compliance with HAI prevention guidelines and recommendations. The elements were as follows: I am aware and able to locate my organization's HAI policies, 3.63; I don't have time to comply with HAI guidelines, 3.96; In my organization there is sufficient leadership support and resources to implement and comply with HAI practice guidelines, 3.77; HAI practice guidelines are cumbersome and inconvenient, 3.46; and I have the necessary supplies and equipment to follow HAI practice guidelines, 3.87.

Table 7

Pre-Knowledge, Beliefs and Attitudes Survey Results

Domain		Rate
Knowledge	**Questions: 1, 2 ,4**	**Average**
	I am familiar with HAI guidelines and its recommendations for the prevention of HAIs?	4.03
	My organization has HAI policies addressing Hand Hygiene, Transmission-based Precautions, and Cleaning and disinfecting?	4.60
	I am aware and able to locate my organization's HAI policies?	3.63
Belief	**Questions: 3, 5, 11, 12, 13, 14, 15**	

	My organization's HAI policies are based on recommended HAI guidelines?	4.40
	I don't have time to comply with HAI guidelines?	3.96
	In my organization there is sufficient leadership support and resources to implement and comply with HAI practice guidelines?	3.77
	HAI practice guidelines are cumbersome and inconvenient?	3.46
	In this organization, HAI practice guidelines are important?	4.60
	I am not really expected to comply with HAI practice guidelines?	4.90
	I have the necessary supplies and equipment to follow HAI practice guidelines?	3.87
Attitude	**Questions: 6, 7, 8, 9, 10**	
	HAI practice guidelines are practical to use in this setting?	4.27
	Following HAI guidelines recommendations will likely decrease our unit's HAI rates?	4.33
	HAI Practice Guidelines help standardized patient care?	4.23
	Patient's benefit from the use of HAI practice guidelines?	4.60
	The HAI guideline recommendations are relevant to my patient population?	5.60

Phase II

Theory of Planned Behavior Questionnaire. The results of the Pre-KBA survey provided the data needed to assist the project manager in the construction of the TPB questionnaire (see Appendix IX). The TPB questionnaire was then administered to staff members who volunteered to participate in the improvement project. As a general rule the more favorable the attitude, subjective norm, and perceived control, the stronger the individual's intention in performing the desired behavior (Ajzen, 1991.).

Items scoring $\geq$ 5.00 were determined to be viewed as favorable or positively associated with that behavior and intention to perform the behavior. Those assessment questions that scored < 5.00 were determined to be the less favorable, suggesting a decrease in the intention to carry out a behavior and thereby possibly necessitated a need for an intervention. (see Table 8.).

Table 8

Grading of TPB Questionnaire

less favorable						more favorable
1	2	3	4	5	6	7

Table 9 demonstrates the results of the TPB Questionnaire. Again, items within the questionnaire that had negative endpoints were re-coded by the project manager, so that high scores consistently reflected a positive association. Three assessment questions scored below a score of 5.00, indicating a less favorable response. Of the three assessment questions, one assessed normative beliefs and subjective norms; Most of my colleagues comply with infection prevention strategies put forth by our organization, with a score of 4.14. The other two questions assessed control beliefs and perceived behavioral control; My past compliance with infection preventions strategies has been deficient, score of 4.42; and In general, the use of infection preventive strategies are realistic in our unit, score of 4.57. All other assessment questions scored above a score of 5.00, demonstrating a favorable response and thereby likelihood that the individual would carry out the desired behavior, given the individual had a sufficient degree of actual control over the behavior.

Table 9

Results of TPB Questionnaire

Behavioral beliefs & Attitude	**Questions: 1, 2 , 3, 12**	**Rating Average**
	My consistent use of hand hygiene prevents infections?	7.00
	My use of personal protective equipment (PPE) will reduce the transmission of infections?	7.00
	My consistent use of infection prevention strategies positively impact patient outcomes?	7.00
	I have the necessary knowledge to prevent infections?	6.14
Normative Belief & Subjective Norms	**Questions: 4, 5, 6, 7, 8**	
	My leadership expects that use hand hygiene and personal protection equipment with every isolated patient?	7.00

	When it comes to reducing infection risk, I want to comply with infection prevention strategies put forth by our organization?	7.00
	Most of my colleagues comply with infection prevention strategies put forth by our organization?	4.14
	Patients expect that I perform hand hygiene prior to each encounter?	5.71
	When it comes to infection prevention, I want to be a positive role model for my colleagues?	6.92
Control Beliefs & Perceived Behavioral Control	**Questions: 9, 10, 11, 13, 14**	
	Having the necessary supplies enables me to comply with infection prevention strategies?	5.71
	Workloads impede my ability to comply with infection prevention strategies?	6.78
	In general, the use of infection preventive strategies are realistic in our unit?	4.57
	My past compliance with infection preventions strategies has been deficient?	4.42
	I expect that I will comply with infection prevention strategies as directed?	6.57

Training Intervention. The results of the TPB questionnaire drove the focus of the training intervention. These results demonstrated that the participants were aware and understood that HAI preventive measures are an effective method of preventing HAI; however, suggested a need for staff communication, empowerment and support from leadership would be essential to enhance staff adherence to HAI preventive strategies.

The project manager coordinated and scheduled multiple one hour sessions, as originally proposed. Flyers were posted, leadership notified, and staff were informed about the upcoming training when the project manager was onsite. Training session times were coordinated to reach as many staff members as possible. The training sessions consisted of a power point presentation that included an interactive simulation developed by the Department of Health and Human Services (DHHS): Partnering for Heal (see Appendix X). This interactive simulation included a

HAI case scenario (6 minute video) and then allowed the participants to role play as healthcare professionals, i.e. unit director, infection preventionist, medical student, nurse, and as a family member of the patient. Due to time constraints, the participants in each training session were allowed to select only one character for role play, but encouraged to complete the training on their own. Each role simulation provided the participants with opportunity to make a change to the patient care decisions made during the video, thereby possibly positively impacting the case scenario. This interactive simulation offered multiple perspectives regarding HAI prevention and demonstrated how lapses in medical judgment, communication, teamwork and attention to infection control practices can negatively impact patient outcomes and placed emphasis on organizational and individual accountability.

The project manager also presented instruction on basic HAI preventive strategies, antibiotic stewardship, how to locate the organization's infection control and prevention policies on the intranet and provided a handout that outlined appropriate transmission based isolation precaution to support compliance with preventive measures (See Appendix XI). The training session also provided the opportunity for discussion where staff discussed their perceptions of compliance barriers, which was then shared with the infection control department.

Following the training sessions, participants were then asked to complete and return the Post-Knowledge, Belief, and Attitudes survey. As per the request by the unit manager, an online training option was made available for those unable to attend the onsite training. Staff members were sent an email message that included a link to participate in the video simulation training, a PowerPoint presentation, isolation handout, and a link to complete the Post-KBA survey through Survey Monkey. The feedback relating to the information presented, training simulation, and the isolation precaution handout were positive.

Phase III

To assist in determining the overall success of the improvement project; a Post- KBA survey was administered, daily HAI surveillance was conducted per the organization's established Infection Control Plan, and weekly monitoring of staff compliance with HAI measures was performed by the project manager for four weeks post intervention.

Project Findings

HAI Surveillance and Acquisition Results

HAI surveillance was conducted by the organization's Infection Control Department and provided to the project manager for analysis. HAI rates for 2012 and prior to project intervention were requested as baseline data for analysis by the project manager. Table 10 demonstrates the HAI acquisition prior to, during and post intervention and provides the established 2013 internal and NHSN benchmarking goals. Benchmarking is used to measure performance using a specific indicator (e.g., rate of HAI MRSA) resulting in a metric of performance that is then compared to other similar organizations or internal trended data. Overall, the organization has remained below their established internal benchmark; however, the 2012 device related infections types when compared to the NHSN 50th percentile were above benchmark goals, calling for improvement.

Table 10

Results of Hospital Associated Infection Rates

Infection Type	Unit	2012 Data	Jan-Feb 2013	Post Intervention	Internal Benchmark	NHSN Benchmark
MRSA	Med Surg	0.0	0.0	0.0	0.7	Not available
	ICU	0.0	0.0	0.0		
VRE	Med Surg	0.0	0.0	0.0	0.4	Not available
	ICU	0.0	0.0	0.0		
C-diff	Med Surg	0.0	1.5	0.0	1.0	Not available
	ICU	0.0	3.9	0.0		

ESBL	Med Surg	0.0	0.0	0.0	0.6	Not available
	ICU	0.0	0.0	0.0		
MDRO *Acinetobacter*	Med Surg	0.0	0.0	0.0	0.2	Not available
	ICU	0.0	0.0	0.0		
CLBSI	Med Surg	1.2	0.0	0.0	10.2	0.0
	ICU	2.9	0.0	0.0		0.0
CAUTI	Med Surg	1.3	0.0	0.0	10.5	4.9
	ICU	3.9	0.0	0.0		2.1
VAP	ICU	1.9	0.0	0.0	15.7	0.7
	only		0.0	0.0		

Although, this project did not specifically target device related HAIs, one could assume that through the projects efforts to enhance the consistent use of HAI preventive practices, all infections would have been positively influenced. As this organization had an already low infection rate across the board, it was difficult to determine if the project's intervention impacted the reduction of HAI rates or if it was due to the heightened awareness.

Also, in the project's original proposal, it was suggested that MDRO hospital associated colonization rates be collected, but not included in final outcome data. However, following discussions with infection preventionist regarding the importance of gathering this data with their already low infection rates, it was agreed that the incorporation of Methicillin-resistant *Staphylococcus aureus* (*MRSA*) and Vancomycin-resistant *Enterococcus* (VRE) colonization would be included in their 2013 infection control plan, as well as included in this project's final outcome data (see Table 11). The surveillance of hospital associated colonization rates provides the organization with an overview of the overall healthcare associated acquisition burden and true rate of in-house transmission, as colonization of the patient precedes infection.

Table 11

MRSA and VRE Colonization Acquisition

Infection Type	**Unit**	**2012 Data**	**Jan-Feb 2013**	**Post Intervention**	**Internal Benchmark**	**NHSN Benchmark**
MRSA	Med Surg	Not	0.0	0.0	Not available	Not
	ICU	available	0.0	0.0		available

VRE	Med Surg ICU	Not available	2.2 0.0	0.0 0.0	Not available	Not available

Transmission Based Isolation Monitoring

As discussed previously, monitoring of transmission based isolation precautions (see Appendix XII) was conducted by the project manager for four weeks post intervention. Total compliance with transmission based isolation precautions was determined if the appropriate transmission based isolation precautions were ordered and implemented (e.g. droplet precautions for Pertussis positive patient) and staff demonstrated appropriate use of personnel protective equipment (PPE) while providing patient care (e.g. surgical mask). Per discussion with the Infection Control Department, a goal of 90% compliance was established for each element.

Table 12 depicts the compliance percentage demonstrated by unit staff members, following the monitoring period for compliance with transmission based isolation precautions. Observed compliance with appropriate PPE use was demonstrated at 85%. Compliance with isolation precautions implemented was lower at 80%, i.e. patients were isolated, however the order placed or sign communicating the isolation type was incorrect. For instance, the patient was admitted and had a history of VRE, requiring screening for current status of colonization. The patient was then placed on contact isolation, however per the organization's infection control policy the patient's should have been place on special contact, which indicated the use of gowns and gloves upon entering the isolation room, instead of when in contact with the patient and patient linen.

Table 12

Total Compliance with Transmission Based Isolation Precautions

Activity	Post Intervention
Isolation Precautions Implemented	80%

Appropriate PPE used	85%
Total Compliance	83%

Overall, the units scored 83% for total compliance with transmission based isolation precautions, 7 % below the established goal of 90 %. Compliance with appropriate PPE usage was greater than isolation implementation indicating although the communication of the correct isolation type was deficient; participants were taking the necessary PPE precautions. When this was discussed, it was suggested that this could be due to the recent implementation of the EMR and mobile devices that staff can wheel into patient's rooms while providing care. This provides the nursing staff with the opportunity to have patient's chart at the bedside, where they can verify laboratory results and review histories. It was articulated that not all staff members have access to these mobile devices when conducting their duties (for example environmental services or dietary) and consequently correct signage is still an essential communication tool needed to prevent the transmission of pathogens.

During a compliance check, a nurse was observed in a patient's room not following HAI precautions. The patient was accurately identified as a VRE patient on the chart and the appropriate signage had been placed on the door. At the time, this patient was the only isolated patient on the unit. A barrier identified in the Pre KBA survey was that time impeded compliance with HAI preventive strategies, which lead to the inclusion of workload as a question on the TPB questionnaire. Per the TPB questionnaire, participants scored workload at 6.78, indicating a favorable response; however, during a training session, one nurse expressed that time and nursing workload was her biggest obstacle to complying with HAI measures. This was then supported by other nurses on the unit, prompting the issue to be discussed with the infection control department. The nurse stated that shift assignments consisted of rooms bundled together

for convenience, "so the nurse doesn't have to run around the whole unit". When isolated patients are admitted to the unit they are placed at one end of the hall (specifically in the medical surgical unit). This means that a nurse could have as many as three to four isolated patients when assigned to that area of the hall, making it difficult to comply with HAI preventive strategies. Interestingly, in this instance the non-compliant nurse observed during this compliance check was the same nurse that originally expressed that this issue was the biggest barrier to complying with HAI preventive measures. As there was only one patient on isolation that day this observation coupled with the TPB score possibly questioned the validity that a significant barrier influencing non-compliance with HAI preventive measures was due to the nurse's workload assignment.

Post-Knowledge, Belief, and Attitudes Survey Results

The participants were asked to complete the Post KBA survey following the completion of the training intervention. At this point, some resistance was experienced as participants stated they "had already filled out this survey". Still, the importance of completing the post survey was discussed and it was reiterated that the project outcome data relied on honest feedback regarding how their perceptions had or had not changed from pre-intervention.

Table 13 demonstrates the results of both the pre and post survey. Of the fifteen elements, thirteen had an increased positive association. Increases ranged from Knowledge +0.32 to +0.87; Belief +0.20 to +0.81; and Attitudes +0.23 to +0.52. Only two elements demonstrated a decrease from pre survey results: The first question; Following HAI guidelines recommendations will likely decrease our unit's HAI rates?; 4.33 to 4.08, a decrease of 0.25 however overall score remained above a 4.00, indicating appropriate staff awareness, familiarity, and agreement with the prevention practice, guidelines and/recommendation; and second: I am

not really expected to comply with HAI practice guidelines?; 4.90 decreased to 3.42, a difference of 1.48. This drop could have been due to the question's delivery, a negative endpoint could have been misinterpreted by the participant. Also participation levels dropped significantly (a 52% decrease) from the beginning of the project, as this project already had a small sample size, any unfavorable responses could have skewed the outcome data. Nevertheless, the reduction of both these elements warrants further investigation, as it can possibly demonstrate a lack of awareness and personal accountability that may negatively impact patient outcomes. Furthermore, the results of the Pre-and Post-KBA surveys supported the notion that high levels of knowledge and belief do not necessarily lead to optimal infection control practices, which was also demonstrated through the results of the isolation monitoring conducted during the post intervention period.

Table 13

Post-Knowledge, Belief and Attitudes

Domain		**Rating Average**		
Knowledge	Questions: 1, 2 ,4	Pre	Post	*diff*
	I am familiar with HAI guidelines and its recommendations for the prevention of HAIs?	4.03	4.58	+0.55
	My organization has HAI policies addressing Hand Hygiene, Transmission-based Precautions, and Cleaning and disinfecting?	4.60	4.92	+0.32
	I am aware and able to locate my organization's HAI policies?	3.63	4.50	+0.87
Belief	Questions: 3, 5, 11, 12, 13, 14, 15			
	My organization's HAI policies are based on recommended HAI guidelines?	4.40	4.83	+0.43
	I don't have time to comply with HAI guidelines?	3.96	4.16	+0.20
	In my organization there is sufficient leadership support and resources to implement and comply with HAI practice guidelines?	3.77	4.58	+0.81
	HAI practice guidelines are cumbersome and inconvenient?	3.46	3.83	+0.37
	In this organization, HAI practice guidelines are important?	4.60	4.92	+0.32
	I am not really expected to comply with HAI	4.90	3.42	-1.48

	practice guidelines?			
	I have the necessary supplies and equipment to follow HAI practice guidelines?	3.87	4.67	+0.80
Attitude	Questions: 6, 7, 8, 9, 10			
	HAI practice guidelines are practical to use in this setting?	4.27	4.50	+0.23
	Following HAI guidelines recommendations will likely decrease our unit's HAI rates?	4.33	4.08	-0.25
	HAI Practice Guidelines help standardized patient care?	4.23	4.75	+0.52
	Patient's benefit from the use of HAI practice guidelines?	4.60	5.00	+0.40
	The HAI guideline recommendations are relevant to my patient population?	5.60	5.92	+0.32

Discussion

As discussed throughout this paper, the success of any quality improvement project is based on the buy in from those involved in the performance improvement. When the project was proposed to the organization in the fall of 2012, the organization's e leadership was very receptive and looking forward to the project implementation. However when Phase I began it was evident that gaining support from all levels, (e.g. front staff, unit leadership and administration) could become a setback. Although, the importance of gaining support from all levels was continually expressed, resistance to the project was experienced throughout most of the project's implementation, an unfortunate obstacle that became difficult to overcome. For instance, communication was a significant barrier encountered, e.g. phone calls and email correspondence made by the project manager, did not receive a responses or if a response were received the promised to follow up was not carried out.

Perhaps the solution to achieving any common goal is for senior staff and leadership to lead by example is by establishing a culture that expects individual accountability, which can then positively influence outcomes, as often individuals will mirror the actions of their leaders.

SHEA states that the key element to minimizing disparities between "what is recommended" and "what is practiced" requires a diligent effort in promoting a culture of safety that also encompasses a culture of prevention and individual accountability as this structure helps assimilate a safety conscious mentality that can thereby minimize risks by avoiding errors in judgment and practice (2008). Consequently, if individuals are expected to carry out HAI preventive measures, not only must barriers (e.g. time, workload) be removed, but it is essential that the support and resources to comply with these strategies are also in place.

Despite the difficulties encountered with this improvement project, overall it could be assumed that the project was successful, as the goal was to reduce the overall incidence of HAI acquisition which was demonstrated by both a zero infection rate for all infection types and a zero rate of colonization during the post intervention period.

Future Recommendations

Recommendations to sustain current efforts and momentum as the organization moves forward could include the following:

- Provide necessary leadership and resources for staff to comply with HAI preventive strategies, expect individual accountability.
- Continue with surveillance of hospital associated colonization rates, as it provides the organization's with true burden rate of hospital associated acquisition.
- Continue encouraging culture that places prevention as a key element in patient safety initiatives.
- Provide updated feedback, if possible monthly, to healthcare workers and administrators on the organization’s trends in MDRO infections, including

information on changes in prevalence or incidence of infections. Display unit successes and challenges

- Standardize reporting of barriers, so they can be addressed appropriately and in a timely fashion.
- Incentives for staff and unit culture change, e.g. stimulate healthy competition between units, establish and encourage participation in HAI process improvement teams, provide clinical ladder programs.

Limitations

There are some limitations that dictate caution in the interpretation of the results of this outcome data. First, the project consisted of a small sample population (less than 100) limiting data accuracy. Second, project participation in the TPB questionnaire and the Post-KBA survey decreased to almost 52% from project start levels. Third, HAI acquisition rates was conducted for only four weeks, for accurate data trending of HAI acquisition rates, a six month monitoring period post project intervention would be preferred. And finally, the monitoring for transmission based isolation precaution compliance may require a longer intervention and monitoring period to identify actual changes in behavior.

Plans for Dissemination

All aggregated project outcome data was distributed to the organization's Infection Control Department. The improvement project will also be presented at the organization's Infection Control and Prevention Committee on May 16th, 2013. In addition to the results of the improvement project, recommendations for post project sustainment will be communicated to sustain behavioral change and support the organization's continued effort in establishing a culture of safety and prevention.

In addition, a request has been made to present this improvement project to the Association for Professionals in Infection Control and Epidemiology, Tampa Bay Chapter. If approved the project is expected to be presented in June.

Conclusion

The goal of the improvement project was to assist the organization to understand why staff members choose to follow or not follow guidelines relating to HAI prevention. Although it has been traditionally suggested that knowledge is often the primary motivator in the process of change, the results of this improvement project highlighted that knowledge and belief related to HAIs is not the deficit as almost all participants expressed that their patients were susceptible to HAI acquisition and they could impact patient outcomes. It would be advantageous to continue to address factors that may be affecting the adoption and consistent use of evidence based guidelines, as well as establishing a cultural approach that encourages collaboration and focuses on both organizational and individual accountability. Clearly, if there is a conscious disregard of a risk or knowingly and/or intending to violate a duty during the course of performing a task, which also yields no response from leadership, the behavior can lead to detrimental consequences impacting the delivery of care and possibly harming our patients (Marx, 2001).

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Appendix I: Review of Literature Matrix

Citation	Sample & Location	Design	Outcomes	Strength(s) & Weakness (es)	Evidence Level/ Class
Angelillo, I. F., Mazziotta, A., and Nicotera, G., (1999)	N=216 Nurses 16 Acute care hospitals	Qualitative-Survey	**Objective**: The study objective was to determine the disinfection and sterilization practices and to evaluate the knowledge, attitudes and behaviors of the nursing staff concerning infection control. **Results:** The authors concluded there was a positive association between knowledge of infection control procedures and compliance with barrier techniques.	The data supported the need for finding and implementing interventions related to the prevention of hospital infection activities.	III/B
Apisarnthanarak, A., Greene, T., Kennedy, E., Khawcharoenporn, T., Krein, S., and Saint, S. (2012)	N=204 Acute care hospital	Qualitative-Survey	**Objective.** To evaluate hospital characteristics and practices used by hospitals to prevent catheter-associated urinary tract infection (CAUTI), central line–associated bloodstream infection (CLABSI), and ventilator-associated pneumonia (VAP). **Results:** Although While reported adherence to hand hygiene was high, many of the prevention practices for CAUTI, CLABSI, and VAP were used infrequently.	The study evaluated practice that 3 most common types of HAIs . The authors also noted that policies and interventions emphasizing specific infection prevention practices, and that establishing a strong institutional safety culture, and participating in collaboratives to prevent HAI may be beneficial. There were no identified conflict of interest noted.	III/B
Helder, Brug, Looman, Goudoever, and Kornelisse. (2010)	27 Bed IID Level NICU Acute Care Hospital Netherlands	Qualitative-Observational	**Objective:** The study objective was to evaluate the effectiveness of hand hygiene education program on the incidence of nosocomial blood stream infections. **Result:** The study authors concluded that their results were consistent with established relevant evidence that hand hygiene compliance among healthcare professionals positively impacts nosocomial blood stream infections in neonatal.	This study conducted for four years and had a large sample size. The study findings also supported current literature that compliance with hand hygiene reduces the risk of acquiring nosocomial infections. However, this study utilized the Stoll and Hanson definition of PBSI instead of CDC/NHSN. Limitations of the study included over emphasizing education with little attention to environmental changes as well as the study being influenced by the Hawthorne effect. Also the study did not control for confounders that may have affect hand hygiene compliance, e.g. hcw/patient ratio and workload. However these limitations were disclosed by the authors.	III/B
Kennedy, Elward and Fraser (2004)	N=215 HCW 53 bed NICU/Acute Care Hospital	Qualitative-Self administered Survey	**Objective:** The study objective was to assess the knowledge, beliefs and practice of NICU healthcare workers regarding Central Venous Catheter care. **Result:** The authors	The study had some limitation, one being that the survey was self reported, which could have lead to the over reporting of social desirable activates or downplaying negative ones. Also participation was	III/B

			concluded that there was a clear disconnect that existed between central venous catheter knowledge and actual beliefs and practice.	voluntary, having a selection bias as the participants may already have been interested in infection control and been more likely to respond.	
O'Boyle, Henly, & Larson (2001)	N=120 RNs Acute care Hospital	Qualitative-Longitudinal-observational	**Objective:** The study aimed at evaluating adherence to hand hygiene recommendation and describing any relationship motivational factors affecting practice compliance by the nursing staff. **Results:** The study concluded that intensity of activity rather than internal motivation factors influence adherence to hand hygiene compliance, highlighting the importance of safe staff to patient ratios.	This study utilized the Theory of Planned Behavior, which is a framework has demonstrated success in understanding health related behaviors.	III/B
Sinkowitz-Cochran, R., Burkitt, K., Cuerdon, T., Harrison, C., Gao, S., Obrosky, D., et al (2012)	N=2,314 surveys Veteran's Affair Hospitals	Qualitative-Cross sectional	**Objective:** To evaluate how knowledge, attitudes, and practices of health care personnel are associated with the overall success of infection control programs. **Results:** Three organizational culture factors—Staff Engagement, Overwhelmed/Stress-Chaos, and Hospital Leadership—were found to be significantly associated with individual health care personnel knowledge, attitudes, and self-reported practices regarding MRSA prevention.	This study biggest strength was the large sample size of 2314 surveys (43% completed by nurses, 9% by physicians, and 48% by other health care personnel) across 16 VA Hospitals.	III/B
Tartari & Mamo (2011)	N=155 Patients undergoing open heart surgery Msida, Malta	Cross sectional	**Objective:** The aims of this study was to explore the application and compliance of surgical site infection (SSI) control measure in a cardiothoracic operating theatre of a acute care community hospital and to identify SSI frequency. **Result:** The study identified poor compliance with infection control practices by non-scrubbed personnel involved in cardiac surgery and observed a high surgical site infection rate. Superficial 16.4% and Deep SSI rates were 16.4% and 4.3% respectively.	The study had a sufficient sample size, final sample was 140 of 155. (91.5% follow up response rate). Study participants were randomized and results were clearly presented. The authors also clearly presented study limitations, i.e. identifying SSIs by telephone could potentially introduce a misclassification bias, where SSI rates may be over or underestimated.	III/B
Watkins, Wynaden, Landsborough, McGowan, Spead, Hendersons, et al., (2006)	16 RNs and MDs Acute Care Hospital Western Australia	Qualitative - Survey	**Objective:** The objective of this study was to explore health care professional perceptions of infection control practices and the management of infectious disease.	This study had a major flaw, an insufficient sample size, which makes it difficult to make a definitive conclusion. There were no identified conflict of interest noted.	III/B

			Result: The findings indicated that both individual and organization factors determine the clinician's level of compliance with recommended infection control practices. The authors also noted that identification of factors that influence health professionals' level of compliance can be used to develop strategies to support long-term compliance.		
Won, Chou, Hsieh, et al., (2004)	III NICU (nurses, physicians and other NICU staff) Acute Care/Teaching Hospital	Open trial	**Objective:** To evaluate the effects of a hand hygiene program on compliance with hand hygiene and the rate of nosocomial infections in a neonatal intensive care unit. **Results:** The rate of nosocomial infections decreased from 15.13 to 10.69 per 1,000 patient-days (P = .003) with improved hand washing compliance.	The study concluded that study participants were aware and believed that hand washing by healthcare workers were an effective method of reducing infections acquisition among their patient populations, supporting HAI prevention guidelines.	III/B

Appendix II: Theory of Planned Behavior Model

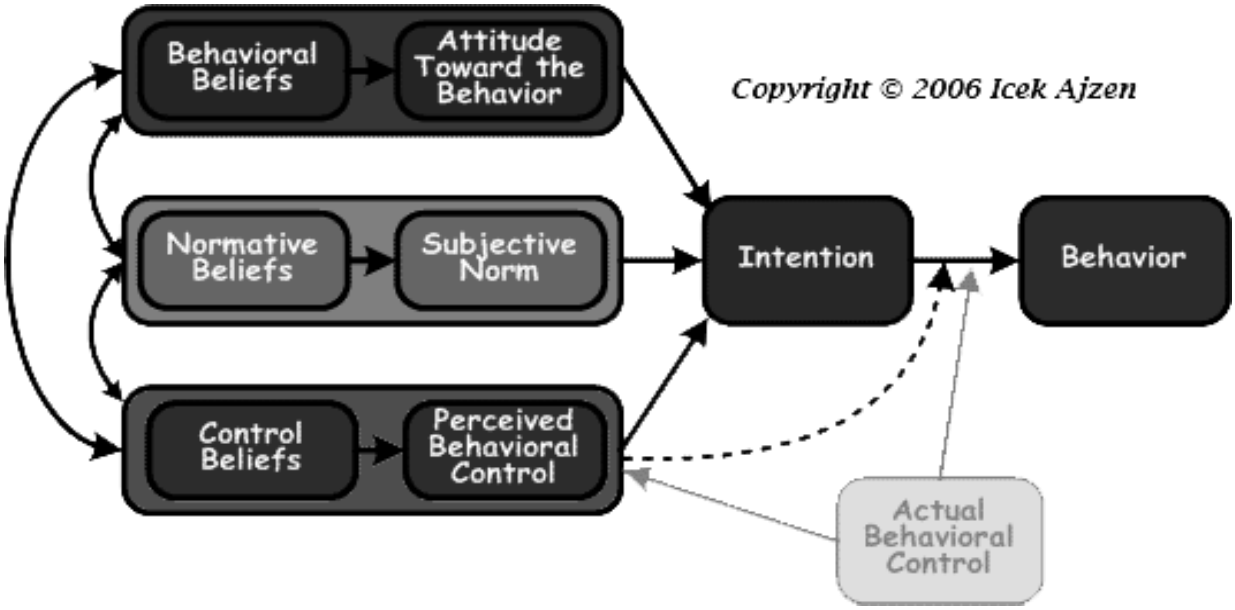

Figure 1. Theory of Planned Behavior Model. Reprinted from "Behavioral interventions based on the theory of planned behavior: Brief description of the theory of planned behavior," by I., Ajzen, n.d.

Appendix III: HAI Prevention: Attitudes Survey

Survey #_____

Unit (circle one): ICU Med/Surgical

Position (circle one): RN LPN CNA/TECH Other

Scoring:

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
0	1	2	3	4	5

Questions	Score
1. I am familiar with HAI guidelines and its recommendations for the prevention of HAIs?	
2. My organization has HAI policies addressing Hand Hygiene, Transmission-based Precautions, and Cleaning and disinfecting?	
3. My organization's HAI policies are based on recommended HAI guidelines?	
4. I am aware and able to locate my organization's HAI policies?	
5. I don't have time to comply with HAI guidelines?	
6. HAI practice guidelines are practical to use in this setting?	
7. Following HAI guidelines recommendations will likely decrease our unit's HAI rates?	
8. HAI Practice Guidelines help standardized patient care?	
9. Patient's benefit from the use of HAI practice guidelines?	
10. The HAI guideline recommendations are relevant to my patient population?	
11. In my organization there is sufficient leadership support and resources to implement and comply with HAI practice guidelines?	
12. HAI practice guidelines are cumbersome and inconvenient?	
13. In this organization, HAI practice guidelines are important?	
14. I am not really expected to comply with HAI practice guidelines?	
15. I have the necessary supplies and equipment to follow HAI practice guidelines?	

Note. Attitudes Regarding Practice Guidelines Questionnaire. Adapted from "A tool to assess barriers to adherence to hand hygiene guidelines," by E. Larson, 2004, *American Journal of Infection Control*, 32, 48-51. Adapted with permission

Appendix IV: Timeline

Timeline/Task(s)		Start	Completion
Project Preparation	Obtain unit HAI rates/baseline data Development: • Data Collection Tools • Complete/Finalize K, B, & A Survey	1-2013	1-2013
TPB Phase 1	K, B, & A Survey Administered TPB Questionnaire Development	1-2013	1-2013
TPB Phase 2	TPB Questionnaire Administered Education Development (based on TPB Questionnaire results) Staff Training Session Administered	2-2013 2-25-2013	2-2013 3-8-2013
TPB Phase 3	K, B, & A Survey Re-Administered HAI Surveillance/Data Collection Data Analysis Project Evaluation and Results	2-25-2013 3-9-2013 4-2013 4-2013	3-8-2013 4-7-2013 4-2013 4-2013
Complete Capstone Project	Capstone Project Writing/Submission Capstone Project Approval Presented to Professional Audience	4-2013 4-2013 5-16-2013	4-2013 5-2013 5-16-2013

Appendix V: U.S. Census Bureau Data – Tampa, State of Florida and National Averages

2010	Tampa	Florida	National
Population	335,709	18,801,301	308,745,538
Sex			
Female	51.1%	51.1%	50.8%
Male	48.9%	48.9%	49.2%
Race (not all races represented)			
White	62.9%	75.0%	72.4%
Black	26.2%	16.0%	12.6%
American Indian/Alaska Native	0.4%	0.4%	0.9%
Asian	3.4%	2.4%	4.8%
Native Hawaiian/Other Pacific Islander	0.1%	0.1%	0.2%
Hispanic/Latino	23.1%	22.5%	16.3%
Age			
< 18 years	22.6%	21.3%	24.0%
18-64 years	66.4%	61.4%	63.0%
> 65 years	11.0%	17.3%	13.0%
Mean household Income	$43,117	$47,661	$51,914

Note. U.S. Census Bureau Data for Tampa, State of Florida and National Averages. Adapted from the United States Census Bureau Report, 2010.

Appendix VI: Letter of Agreement

UNIVERSITY OF MASSACHUSETTS AMHERST
Skinner Hall
651 North Pleasant Street
Amherst, MA 01003-9304

School of Nursing

413-687-2626

Spring 2013

To Whom It May Concern:

I am the Director of the DNP Program at the University of Massachusetts, Amherst, School of Nursing. I am writing this letter on behalf of Nelia Bruce, RN, your student preceptee. Your student is in the final year of the DNP program, is a DNP Candidate, and is planning to complete the final requirement for the Degree, a Capstone Scholarly Project, in your facility. Your student will be designing, implementing, and evaluating the effect of translating a programmatic intervention into your practice or setting. As these projects are considered performance improvement or program evaluation projects and not research studies, the University does not require Institutional Review Board permission for this student to actualize the project as outlined by the student. I am using this letter as a "Key Stakeholder" commitment letter for the student to use in the Capstone Scholarly Project Proposal. A Graduate faculty member of the School of Nursing will, also, be working directly with your student as Chair of the Capstone Scholarly Project.

Thank you in advance for allowing this student to actualize the Capstone Project in your facility. If you have any questions, please call me at 413-687-2624 or email jdemart@nursing.umass.edu.

Key Stakeholder Signature: [signature] **Date:** 1/11/13

Student Signature: Nelia Bruce **Date: 1/9/2013**

Sincerely,

Jean E. DeMartinis

Jean E. DeMartinis, PhD, FNP-BC
Associate Professor
Director DNP Program

Appendix VII: Project Budget

Project Budget		Cost
Project Development	DNP Student • Development of Data Collection Tool • TPB Questionnaire Development • Education Development • Printing (e.g. questionnaires, survey, project flyers) • Miscellaneous Materials/Snacks • Survey Monkey.com Monthly Fee	 $0/hr x 3hrs = $0 $0/hr x 10hrs = $0 $0/hr x 30hrs = $0 $0.00 $40.00 $25.00
TPB Questionnaire	10 minute survey: (staff numbers/hourly rates estimated) • 30 RN/LPN • 5 CNA/Techs	**Provided by site (no cost to project)** $5 x 30 = $150 $2 x 5 = $10
Training Session	1hr Staff Training Sessions: (staff numbers/hourly rates estimated) • 30 RN/LPN • 5CNA/Techs • Education Delivery (student) • Printing (copies of slide sets)	**Provided by site (no cost to project)** RN: $30 x1 hr session = $900 $12 x1 hr session = $60 $0/hr x 5hrs = $0 $0.00
HAI Surveillance & Monitoring	Infection Control Personnel	**Provided by site (no cost to project)** $30.00 at 3 hr/per day = $11,700
Total		**$65.00**

Appendix VIII: CDC/NHSN HAI Definitions

TYPE	INFECTION DEFINITION		RATE
MDRO	Infections signs and symptoms were not present at time of admission, pathogen is isolated > 48hrs following admission or ≤ 48 hrs post patient discharge. Colonization, which means the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms is not an infection		# of infection/patient days x 1000
PBSI	PBSI criteria 1 and 2 may be used for patients of any age, including patients ≤1 year of age. PBSI must meet at least 1 of the following criteria: 1. Patient has a recognized pathogen cultured from 1 or more blood cultures and organism cultured from blood is not related to an infection at another site. 2. Patient has at least 1 of the following signs or symptoms: fever (≥38C), chills, or hypotension **and** signs/symptoms **and** positive laboratory results are not related to an infection at another site and common skin contaminant is cultured from 2 or more blood cultures drawn on separate occasions.		# of infection/device days x 1000
CAUTI	A symptomatic urinary tract infection must meet at least 1 of the following criteria: 1. Patient has at least 1 of the following signs or symptoms with no other recognized cause: fever (.>38C), urgency, frequency, dysuria, or suprapubic tenderness and patient has a positive urine culture, that is, $\geq 10^5$ microorganisms per cc of urine with no more than 2 species of microorganisms. 2. Patient has at least 2 of the following signs or symptoms with no other recognized cause: fever (.388C), urgency, frequency, dysuria, or suprapubic tenderness and at least 1 of the following: • positive dipstick for leukocyte esterase and/ or nitrate • pyuria (urine specimen with $10 white blood cell [WBC]/mm^3 or $3 WBC/high-power field of unspun urine) • organisms seen on Gram's stain of unspun urine • at least 2 urine cultures with repeated isolation of the same uropathogen (gram negative bacteria or Staphylococcus saprophyticus) with $\$10^2$ colonies/mL in non-voided specimens • $\leq 10^5$ colonies/mL of a single uropathogen (gram-negative bacteria or S saprophyticus) in a patient being treated with an effective antimicrobial agent for a urinary tract infection • physician diagnosis of a urinary tract infection • physician institutes appropriate therapy for a urinary tract infection.		# of infection/device days x 1000
VAP	Two or more serial chest radiographs with at least 1 of the following: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants #1 year old NOTE: In patients without underlying pulmonary or cardiac disease definitive chest	At least 1 of the following: • Fever (.>38C or 100.4F) with no other recognized cause • Leukopenia (< 4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no	# of infection/vent days x 1000

	radiograph is acceptable.	other recognized cause And at least 2 of the following: • New onset of purulent sputum or change in character of sputum or increased respiratory secretions or increased suctioning requirements • New onset or worsening cough, or dyspnea or tachypnea • Rales or bronchial breath sounds • Worsening gas exchange, O2 desaturations and increased oxygen requirements, or increased ventilator demand	

Note. NHSN Definitions. Adapted from "CDC/NHSN surveillance definition of healthcare-associated infection and criteria for specific types of infections in the acute care setting," by National Healthcare Safety Network, 2012.

Appendix IX: Theory of Planned Behavior Questionnaire

Questionnaire #_____

Unit (circle one): ICU Med/Surgical

Position (circle one): RN LPN CNA/TECH Other

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1. My consistent use of hand hygiene prevents infections?
   unlikely:__1:__2__:__3__:__4__:__5__:__6__:__7__:likely

2. My use of personal protective equipment (PPE) will reduce the transmission of infections?
   unlikely:__1:__2__:__3__:__4__:__5__:__6__:__7__:likely

3. My consistent use of infection prevention strategies
   will not:__1:__2__:__3__:__4__:__5__:__6__:__7__: will
   positively impact patient outcomes?

4. My leadership expects that
   I should not:_1:__2__:__3__:__4__:__5__:__6__:__7__: I should
   use hand hygiene and personal protection equipment with every isolated patient?

5. When it comes to reducing infection risk, I want to comply with infection prevention strategies put forth by our organization?
   disagree :__1:__2__:__3__:__4__:__5__:__6__:__7__: agree

6. Most of my colleagues comply with infection prevention strategies put forth by our organization.
   false :__1:__2__:__3__:__4__:__5__:__6__:__7__: true

7. When it comes to infection prevention, I want to be a positive role model for my colleagues?
   not at all:__1:__2__:__3__:__4__:__5__:__6__:__7__:very much

8. Patients expect that I perform hand hygiene prior to each encounter?
   false :__1:__2__:__3__:__4__:__5__:__6__:__7__: true

9. Having the necessary supplies enables me to comply with infection prevention strategies.
   disagree :__1:__2__:__3__:__4__:__5__:__6__:__7__:agree

BACK ⟶

10. Workloads impede my ability to comply with infection prevention strategies?
    disagree :__1:__2__:__3__:__4__:__5__:__6__:__7__:agree

11. In general, the use of infection preventive strategies are realistic in our unit?
    false :__1:__2__:__3__:__4__:__5__:__6__:__7__:true

12. I have the necessary knowledge to prevent infections?
    false :__1:__2__:__3__:__4__:__5__:__6__:__7__:true

13. My past compliance with infection preventions strategies has been deficient?
    false:__1:__2__:__3__:__4__:__5__:__6__:__7__:true

14. I expect that I will comply with infection prevention strategies as directed.
    unlikely:__1:__2__:__3__:__4__:__5__:__6__:__7__:likely

Thank you for your participation!

Appendix X: Project Intervention – Virtual Immersive Learning Simulation

U.S. Department of Health and Human Services. (n.d.). Virtual Immersive Learning Simulation (VEILS) Partnering to heal: Teaming up against healthcare-associated infections. Retrieved from http://www.hhs.gov/ash/initiatives/hai/training/partneringtoheal.html

Appendix XI: Project Intervention – Transmission-Based Isolation Handout

Precautions	Airborne	Special Airborne	Droplet	Special Contact	Contact	High Risk	CJD Precautions
When	• r/o Tuberculosis • order Sputum smear and culture for AFB • History positive PPD (TB skin test) and pneumonia • History positive HIV and pneumonia	• Chicken Pox • Shingles • Measles (Rubeola)	• R/O meningitis • Pertussis • Neisseria menigitidis • Mumps • German Measles (Rubella) • Influenza • Hemophilus influenzae (infants & children)	• VRE • Other Resistant Organisms As determined by Infectious Disease physician	• MRSA • Clostridium difficile • Influenza • Scabies, Lice • Rotavirus (children & diapered or incontinent patients) • RSV (Respiratory Syncytial Virus, infants, children & immunocompromised adults) • Parainfluenza (infants & children) •	• Absolute Neutrophil Count less than 1000	• R/O CJD • CSF 14-3-3 protein is ordered • NOTIFY INFECTION CONTROL immediately by phone
How	• Private Room • Negative Air Room • Door Closed • N95 Mask • Patient may leave room only for medically necessary tests, pat must wear surgical mask	• Private room • Negative Air Room if Chicken Pox or disseminated Varicella Zoster (Shingles) • Door Closed • Hand hygiene on entering room • Do NOT ENTER if you have NOT had the disease or have not had the vaccines. • Gloves • Gown if in contact with patient or linen	• Private Room • Hand hygiene on entering room • Standard surgical mask • May cohort patients with SAME disease • Patient to wear mask when leaving room • Clean ALL reusable equipment on leaving room with Cavicide	• Private Room • Hand hygiene on entering room • Gloves • Gowns • Clean ALL reusable equipment on leaving room with Cavicide • MDR Acinetobacter - Bleach Clean	• Private Room • Hand hygiene on entering room • Gloves • Gowns-if in contact with patient or linen • May cohort with Infection Control approval • Clean ALL reusable equipment on leaving room with Cavicide • C.difficile –use bleach and hand hygiene with soap and water only	• Private Room • Hand hygiene on entering room • No children without permission of MD • Limit visitors to immediate family or significant other • No fresh foods except whole food that can be washed & peeled before eating • Enter ONLY if you are FREE of ANY infection	• Private Room • Gloves, gowns, mask with eye protection for procedures (LP) • Bag all linen and tie bag prior to removing from room • All biohazardous waste in large sharps container • Hand hygiene before entering room, donning gloves, after removing gloves, after patient care after touching body fluids, before caring for another patient • Environmental Services to clean room with 1:10 bleach
							

Appendix XII: Isolation Compliance Audit - Data Collection Tool

Unit (circle one): ICU Med/Surgical

RM #	TYPE OF ISOLATION IMPLEMENTED (√ box(s) that apply)					Isolation Compliant	SIGN: Identified precautions required : (√ box(s) that apply)					Compliance with precautions	STAFF RN&LPN=R CNA/Tech=C Other =O (Circle one)	Comments
	A	C	D	SP	No iso		Gown	Gloves	Mask	N95	HH			
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
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						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	
						Y / N						Y / N	R C O	

Patients on Isolation_____ **Total Patients_____**

Total Compliance_____

Note: Transmission Based Isolation Tool. Adapted from "Isolation Audit Tool" by K. Davis, n.d.