

The Effect of Social Influence on Nurses' Hand Hygiene Behaviors

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This work is dedicated to my Savior the Lord Jesus Christ and my husband, Bob.

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## LIST OF ABBREVIATIONS

ACA- Affordable Care Act  
CAUTI- Catheter-associated urinary tract infection  
CDC- Centers for Disease Control and Prevention  
CLASBI- Central-line associated bloodstream infection  
CMS- Centers for Medicare and Medicaid Services  
DRG-Diagnosis-related group  
HAI-Healthcare associated infection  
HH-Hand hygiene  
ICU-Intensive care unit  
IQR-Interquartile range  
MRSA- Methicillin-resistant *Staphylococcus aureus*  
PBC- Perceived behavioral control  
RN- Registered Nurse  
SD- Standard deviation  
SSI-Surgical site infection  
TPB- Theory of Planned Behavior  
VAP-Ventilator-associated pneumonia  
WHO- World Health Organization

# CHAPTER I

## INTRODUCTION

“...the very first requirement of a hospital is that it should do the sick no harm.”<sup>3</sup>

*Florence Nightingale*

Using a theory-driven approach, this study describes the effects of social influence on nurses' hand hygiene (HH) behaviors. Despite multiple decades of HH campaigns and initiatives nurses' HH rates remain unacceptable (< 60%). It is generally acknowledged that social influence/pressure can affect one's behavior.<sup>4</sup> A review of the literature indicates there are a limited number of nursing studies describing the phenomenon of social influence on nurses' HH behaviors.

### **Background and Significance**

Approximately one in twenty hospitalized patients will acquire a healthcare-associated infection (HAI) while receiving medical or surgical care.<sup>5,6</sup> These infections are associated with prolonged hospital stays, increased hospital costs, and increased mortality rates.<sup>7-10</sup> The overall annual direct medical cost for HAIs range from \$28.4 to \$33.8 billion.<sup>11</sup> Seventy-five percent of these infections result from device-related clinical interventions, such as central-line associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), ventilator-associated pneumonia (VAP), or a surgical site infection (SSI).<sup>12</sup> In 2008, the Centers for Medicare and Medicaid Services (CMS) began withholding reimbursement for patients readmitted with selected HAIs, including CAUTIs, CLABSIs, and SSIs.<sup>13,14</sup>

According to Kaiser Health news and the CMS, the U.S. spent 17.2% of its Gross Domestic Product (2012) on healthcare, and, by 2021, it is predicted that the national health spending will account for nearly 20% of the U.S. economy.<sup>15,16</sup> To reduce the growth of healthcare spending, the Affordable Care Act (ACA), section 3008, mandated that in 2015 acute

care institutions incurred financial penalties for not meeting the national benchmark on hospital-acquired conditions; in 2012, CMS added HAIs to the list of hospital-acquired conditions.<sup>17</sup>

The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) report HH as the primary strategy to prevent HAIs.<sup>18-20</sup> Hand hygiene is fundamental to the prevention, reduction, and control of the transmission of pathogens, especially antibiotic resistant organisms.<sup>21-24</sup>

Research suggests HH leads to lower HAIs. In a 4-year study conducted by Pittet et al. (2000) HH adherence increased significantly following a hospital-wide HH campaign.<sup>25</sup> Concomitantly, as HH adherence increased there was a decrease in HAI rates, specifically the annual incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia.<sup>25</sup> Most recently, in a 4-year study conducted by Talbot et al., (2013) HH adherence increased significantly following a hospital-wide HH accountability campaign.<sup>26</sup> Results indicated, as HH adherence increased there was a decrease in device-related (CAUTIs, CLABSIs, and VAP) standardized infection ratios.<sup>26</sup> Research suggests that most HAIs are related to cross-contamination from inappropriate patient care practices.<sup>27</sup> Despite the overwhelming evidence that contaminated healthcare workers' hands transmit pathogens and proper HH prevents the transmission of these pathogens, overall, healthcare workers' HH adherence rates remain < 50%.<sup>18,20,23,28</sup>

### **Nurses' Hand Hygiene Behavior**

The Bureau of Labor Statistics (2012) estimates that nationwide there are 2.7 million Registered Nurses (nearly 61% work in acute care setting), thus representing the single largest provider of inpatient care.<sup>29,30</sup> Nurses are essential to the delivery of high quality healthcare. Hand hygiene research suggests that nurses are more likely to wash their hands than other

healthcare workers; however, despite tremendous effort, nurses' HH adherence rates are suboptimal at < 60%.<sup>31,32</sup>

**Strategies to promote nurses' hand hygiene behavior.** Multiple strategies have been implemented to increase nurses' HH adherence rates. Hand hygiene strategies have included: education,<sup>33,34</sup> observation and feedback,<sup>35</sup> HH reminders in the workplace,<sup>25</sup> and rewards and punishments.<sup>36,37</sup> Educational interventions target nurses' cognition; however, educational training has shown limited effects when used as the sole HH intervention.<sup>14,38</sup> Behavioral interventions such as observation and feedback, HH reminders, and rewards and punishments are based on the premise that nurses' behaviors can be conditioned and moderated by external stimuli.<sup>39</sup> Hysong, Best, and Pugh showed that facilities with high recorded adherence to clinical guidelines provided feedback that was timely, individualized, and non-punitive as compared to low-performing facilities which used punitive feedback interventions.<sup>40</sup> Most recently, in the in-patient rehabilitative care setting a patient empowerment strategy entitled "Partners in your Care" encouraged patients to ask healthcare workers, "Did you wash your hands?"<sup>41</sup> However, in the acute care setting, patient empowerment is contingent on an acutely ill patient reminding providers to perform HH without fear of negative impact, this is not a realistic strategy for the critical care setting.<sup>41</sup> Collectively, these strategies have all shown modest gains, but they have shown limited sustained effects.<sup>25,27,42</sup> These strategies address the cognitive, self-regulatory (forethought, self-reflectiveness, and self-determinism), and environmental domains of HH behavior; however, there are limited studies addressing the social domain of nurses' HH behavior.

**Social influence as a hand hygiene strategy.** Healthcare delivery is a social process that requires social moderators. Social influence is described as the effect that one's intentional or unintentional actions, words, or presence has on another's behaviors, thoughts, or feelings.<sup>43</sup> To obtain an accurate understanding of one's social situation, individuals often look to social norms.<sup>44</sup> Social influence research suggests that individuals may subordinate their own thoughts and attitudes to conform to a desired individual's identity, thus supporting the influence of a normative referent (role model) on one's behavior.<sup>45,46</sup> There is a lack of research regarding the effects of social influence on nurses' HH adherence rates; therefore, social influence is a promising strategy to consider for increasing nurses' HH adherence rates.<sup>47</sup>

### **Study Purpose**

Furthermore, in the acute care setting there are many variables that may influence a nurse's decision to perform or not perform HH. Nurse labor as well as institutional and unit priorities may shape organizational climate and influence individual HH behavior. Accordingly, the **purpose of this study** is to increase our knowledge of the effects of social influence on nurses' HH adherence rates while examining some contextual nurse labor and climate variables to help explain the apparent gap between nurses' HH intention and actual HH behavior. This study is needed to explore an underdeveloped area of nurses' HH research, inform our current understanding of the possible antecedents to nurses' HH behavior, and contribute to future implementation strategies targeting nurses' HH behaviors.

The population of interest for this dissertation is Registered Nurses (RNs) working in the critical care setting. The critical care setting was chosen based on increased (a) patient susceptibility to HAIs; (b) patient acuity; and (c) opportunity for patient contact.<sup>6,48,49</sup>

## **Theoretical Framework**

The study of human behavior has led to many explanations surrounding what motivates, controls, and contributes to one's behavior. The Theory of Planned Behavior (TPB) is a social cognitive theory used to explain and predict human social behavior.<sup>50</sup> The TPB (Ajzen, 1985) proposes that one's intention to perform a behavior is determined by (a) personal attitude; (b) subjective norms; and (c) perceived behavioral control (PBC).<sup>1</sup> One's behavioral intention is then a direct determinant of actual behavior performance.

The TPB has been used extensively to explain and predict selected individual behaviors, such as healthy eating,<sup>51</sup> exercise adherence,<sup>52</sup> healthcare worker glove use,<sup>53</sup> food hygiene,<sup>54</sup> and healthcare worker blood pressure monitoring.<sup>55</sup> The TPB has shown predictive validity explaining 40-49% of the variance in behavioral intention and 26-36% of the variance in behavior.<sup>56</sup> Across 154 applications, 39% of the variance in intention was explained by attitude, subjective norm, and perceived control.<sup>57</sup> The TPB is a parsimonious theory that was chosen for its strong utility in the health domain and its well-established ability to explain, describe, and predict individual choice-related behaviors.<sup>4</sup>

### **Theory of Planned Behavior**

The TPB extends Fishbein and Ajzen's Theory of Reasoned Action (1967) to include the concept of perceived behavioral control (PBC) which addresses those behaviors that are not under one's complete control.<sup>58</sup> Ajzen (1985) included PBC as an antecedent to behavioral intention and a possible moderator of actual behavior.<sup>1</sup> The key constructs of the TPB can be applied directly to theorizing the effects of nurses' HH attitudes, subjective norms, and perceived control on their intention to perform HH, and the direct effect of HH intentions on nurses' actual HH behaviors (Figure 1.1).

**Personal attitude.** Personal attitude, one's hypothetical disposition or tendency towards a behavior, is the degree to which an individual forms a favorable or unfavorable evaluation of a behavior.<sup>59</sup> Nurses' attitudes towards HH develop from their beliefs about HH outcomes (reduced incidence of HAI, reduced cross-contamination, etc.) and the subjective value they place on these outcomes (i.e., it is important to reduce HAIs). The strength of nurses' HH outcome beliefs affects their attitude in direct proportion to their subjective value of this outcome.

**Subjective norm.** A subjective norm is one's perception of the social norm or pressure from important others to perform or not perform a behavior in a given social system.<sup>4,60</sup> Social norms are the given set of acceptable or admissible standards that serve as a guide to social behaviors.<sup>4,61</sup> Nurses' perceptions of their unit HH norms are captured in the TPB's subjective norm construct. Nurses' perceived HH subjective norm as well as their motivation to comply with this identified HH referent is reflective of their HH subjective norm.

**Perceived behavioral control.** As described by Ajzen and Madden (1986), PBC is one's belief as to how easy or difficult it is to perform a behavior based one's perception of the presence or absence of essential resources and opportunities.<sup>58</sup> To the extent that nurses are honest with their perceived difficulty or ease to perform HH, PBC may serve as a proxy for actual control and contribute to the prediction of HH performance.<sup>62</sup> The dashed arrow (Figure 1) between PBC and HH behavior serves as a direct link to HH only when the nurse perceives actual control over factors that could interfere with HH performance.<sup>58</sup> Nurses' PBC is their perception that an identified HH barrier or facilitator is present coupled with the perceived extent to which this barrier or facilitate affects HH performance.<sup>4</sup>

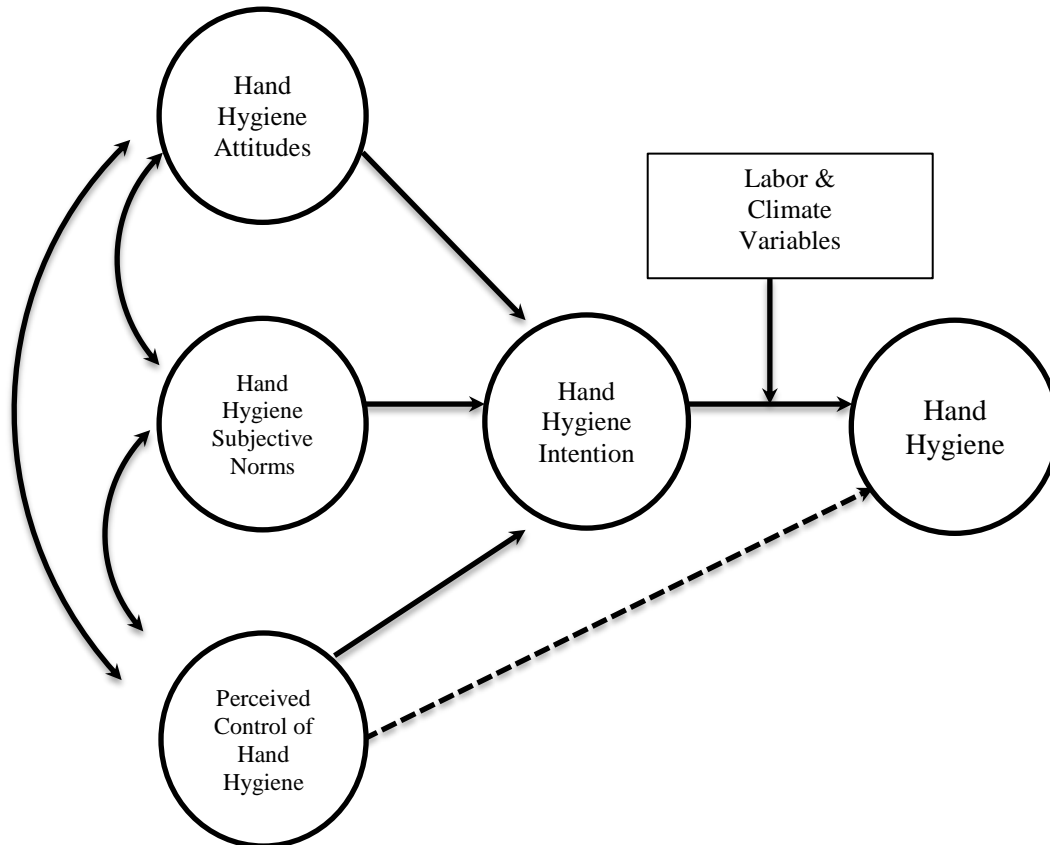


**Behavioral intention.** Behavioral intention captures one's motivation and readiness to perform a behavior; the stronger the perceived probability of performing a behavior the more likely this behavior will be performed.<sup>4</sup> Behavioral intention implies that nurses make a conscious and deliberate decision to perform or not perform HH.

**Behavior.** The behavior for this study is HH. Hand hygiene is defined as the act of hand cleansing using (a) soap and water or (b) antimicrobial foam for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms.<sup>47,48</sup>

**Nurse variables.** This study will examine selected nurse labor and climate variables as a possible explanation for any potential gap between nurses' HH intention and behavior (Figure 1). The following control variables were examined: (a) Labor: workload, assignment variability, with labor risk adjustments; and (b) Climate: perceived leadership priority on quality nursing care and perceived nurse autonomy and decision-making. These control variables were selected based on the investigator's critical care clinical experience, the perceived effects of workload and leadership emphasis on patient safety, and relevant nursing literature.<sup>63-67</sup>

**Figure 1. Theory of Planned Behavior Adapted for Hand Hygiene<sup>2</sup>**



### **Related Literature**

Ignaz Semmelweis conducted the first documented HH study with physicians at the Lying-in Women's Hospital in Vienna. This study supported the claim that cleansing heavily contaminated hands using a chlorinated lime solution before patient care reduced the nosocomial transmission of contagious diseases (as compared to cleansing with soap and water).<sup>68,69</sup> This

historical study supports the linkage between contaminated healthcare workers' hands as a reservoir for bacterial transmission between patients.

Throughout the patient care shift, nurses' hands become exponentially more colonized with bacteria and pathogens: bacterial contamination increases linearly over time.<sup>24</sup> Reportedly, as many as ten of thousands of nurse hand exposures occur per day, thus owing to the spread of microorganism throughout a healthcare facility in several hours.<sup>47,70,71</sup> Although the efficacy of HH is well documented, nurse adherence remains suboptimal.<sup>32,47</sup> Explanations for nurses' suboptimal HH adherence rates include forgetfulness, HH agents causing skin irritation, glove-use is sufficient, intense workload, lack of time due to patient care duties, inconvenient sink and soap dispenser locations, and scarcity of HH supplies.<sup>47,69,71</sup> Additionally, risk factors for low HH adherence are based on (a) location: ICUs; (b) rank: physicians; and (c) patient acuity: high intensity care areas.<sup>47,72</sup> Unfortunately, research suggests when patient acuity is greatest, HH adherence rates are lowest.<sup>60</sup>

### **Hand Hygiene Strategies**

There have been multiple national and worldwide strategies targeting HH adherence. The Joint Commission added a National Patient Safety Goal (2004) aimed at HH adherence; the CDC launched a state-level toolkit used to guide senior policy makers on various ways to use legal and policy interventions to launch a HAI prevention program (2011); and, the WHO launched their "Clean Care is Safer Care" (2008) and Multimodal HH Improvement Strategy (2009).<sup>5,47,48</sup> Despite these initiatives to facilitate, promote, and regulate HH adherence rates remain relatively modest.

Hand hygiene practices vary considerably among healthcare workers thus suggesting social influence (interpersonal) may affect HH rates. There are limited studies on the effects of

social influence on nurses' HH rates.<sup>47,73</sup> Individual and peer group effects may play a vital role on nurses' HH behavior.<sup>47,74</sup> The peer group effect is reflected in a study by Whitby, McLaws, and Ross who showed that nurses were more likely to perform HH when referent administrators and physicians practiced HH.<sup>33</sup> Additionally, Schneider et al. conducted a prospective observational study using HH role models in the clinical setting.<sup>73</sup> Results from this study indicate a 34% increase in observed HH rates; thus indicating a HH rate 1.5 times greater than at baseline.<sup>73</sup> Few studies have utilized the TPB as a framework to guide their HH research.<sup>60,75</sup>

#### **Healthcare workers hand hygiene studies using the Theory of Planned Behavior.**

Using the TPB and the Health Belief Model, Jenner, Watson, Miller, Jones, and Scott (2002) conducted a cross-sectional survey of various healthcare workers and found that attitude, PBC, and behavioral intention were strong predictors of self-reported HH behavior.<sup>42</sup> Pittet et al. (2004) conducted a cross-sectional study of physician's attitude and perceptions regarding HH using the TPB; physician attitude, behavioral norm, and HH intention were significantly associated with observed HH adherence.<sup>76</sup> Sax, Uçkay, Richet, Allegranzi, and Pittet (2007) conducted a cross-sectional study suggesting healthcare workers' attitude, subjective norms, and control beliefs ranked high (32%, 89%, 77%, respectively) as determinants of self-reported HH adherence.<sup>77</sup> Few studies have used the TPB to explain nurses' HH behaviors.

**Nursing hand hygiene studies using the Theory of Planned Behavior.** Using the TPB, O'Boyle, Henly, and Larson (2001) conducted a longitudinal observational study with RNs looking at the motivational factors and unit activity variables associated with self-reported and observed HH behaviors.<sup>60</sup> In this study, the TPB factors predicted self-reported HH; however, the critical care unit intense activity predicted actual HH behaviors.<sup>60</sup> In addition to utilizing the variables from the TPB, Whitby et al. (2006) used focus groups to further explain determinants

of inherent and elective HH.<sup>75</sup> Results suggest nurses' beliefs about the benefits of HH and peer pressure from senior officers were strong predictors of HH intent.<sup>75</sup> Most recently, White et al. (2015) using the TPB framework and WHO 5-moments, conducted a study to examine the determinants of Australian ward nurses' HH behaviors.<sup>78</sup> Findings from this study suggest subjective norm, group norm, and subjective knowledge as significant predictors of HH behaviors.<sup>78</sup> This review indicates that only one study (O'Boyle et al. 2001) has used the TPB to examine critical care nurses' self-reported and observed HH behaviors.<sup>60</sup>

Using the TPB as a framework, this study is the first to examine the effects of critical care nurses' attitudes, subjective norms, and perceived control as antecedents to HH intention while exploring the effects of contextual nurse labor and climate variables on self-reported and observed HH adherence rates.

### **Study Aims**

The **specific aims** of this study are to (1) describe nurses' unit normative referents for nursing practice and HH; (2) determine associations of nurses' HH attitudes, subjective norms, and perceived control with HH intention; (3) determine the contribution of nurses' HH attitudes, subjective norms, and perceived control with HH intention; (4) explain the relationship between nurses' HH intention and self-reported and observed HH; and (5) determine the extent to which labor and climate variables explain the variation between nurse's HH intention and performance.

### **Dissertation Chapters**

Subsequent chapters of this dissertation are manuscripts compiled to describe (a) the qualitative process used to construct the Patient Safety Opinion Survey (Chapter II); (b) the results of the analysis of aim one (Chapter II); (c) the methods, analysis, and results of aim two

three, and four (Chapter III). The final chapter, chapter IV, is dedicated to outlining my research trajectory based on this dissertation's findings.

## CHAPTER II

### CRITICAL CARE NURSES' SALIENT HAND HYGIENE BEHAVIORAL ATTITUDES, NORMATIVE REFERENTS AND CONTROL BELIEFS

This chapter details a qualitative descriptive study designed to collect data from critical care nurses' about their salient HH behavioral attitude, normative referents, and control beliefs. The results from this study contributed to the body of relevant literature and informed a larger survey designed to measure nurses' perception of the TPB constructs: attitude, subjective norms, and perceived behavioral control towards HH intention and HH behavior.

#### **Background and Significance**

Healthcare-associated infections acquired while receiving medical or surgical care are the most common hospital care complication (>700,000 annually) and result in 99,000 deaths each year with estimated annual direct hospital costs up to \$45 billion.<sup>6,11</sup> These infections are associated with prolonged hospital stays, increased hospital costs, increased mortality rates, and the need for further clinical interventions and therapies.<sup>5,11</sup>

Research suggests that most HAIs are related to cross-contamination from inappropriate patient care practices.<sup>18</sup> The World Health Organization and the Centers for Disease Control and Prevention report HH as the primary strategy to prevent HAIs.<sup>18,19</sup> Despite the overwhelming evidence that contaminated healthcare workers' hands transmit pathogens and proper HH prevents the transmission of these pathogens, overall HH adherence rates, among healthcare workers, remains less than 50%.<sup>18,19</sup>

Due to their large group size and abundant opportunity for patient contact, nurses are frequently targets of HH interventions.<sup>25</sup> Hand hygiene research suggests that nurses are more

likely to wash their hands than other healthcare workers<sup>18</sup>; however, the challenge of channeling the benefits of HH into sustained HH behaviors persists. Despite tremendous efforts, nurses' HH adherence rates range between 34%-57%.<sup>32</sup>

Healthcare-associated infections affect approximately 30% of patients in the adult Intensive care unit (ICU) with nurses providing 92% of the direct patient care in the ICU.<sup>49,79</sup> For this study, the population of interest is the RN providing bedside patient care in the ICU.

Multiple strategies have been implemented to increase nurses' HH rates. Strategies have targeted (a) nurses' awareness (HH prompts and signage); (b) environmental accessibility (sink, soap, and soap dispenser manipulation); (c) sense of regulation/competition (feedback from peer performance scores); (d) learning (HH training); and (e) motivation (patient empowerment).<sup>80-82</sup> These strategies address the cognitive, self-regulatory, and environmental domains of HH behavior; however, these strategies fail to address the social domain of nurses' HH behavior.

Healthcare delivery is a social process that requires social moderators to facilitate adherence with HH recommendations.<sup>27</sup> Social influence research suggests that individuals may subordinate their own thoughts, feelings, and attitudes to conform to a desired individual's identity.<sup>45</sup> There is insufficient research regarding the effects of social influence on nurses' HH adherence rates; study of effects, if any, may suggest ways to increase nurses' HH rates.<sup>18</sup>

### **Study Purpose**

The aim of this two-phase project is to describe the effects of social influence on critical care nurses' HH adherence. Using the TPB as a guiding framework, this phase-one qualitative descriptive study sought to identify and describe nurses' salient HH behavioral attitudes, normative referents, and control beliefs using the Nurses' Salient Belief Instrument.



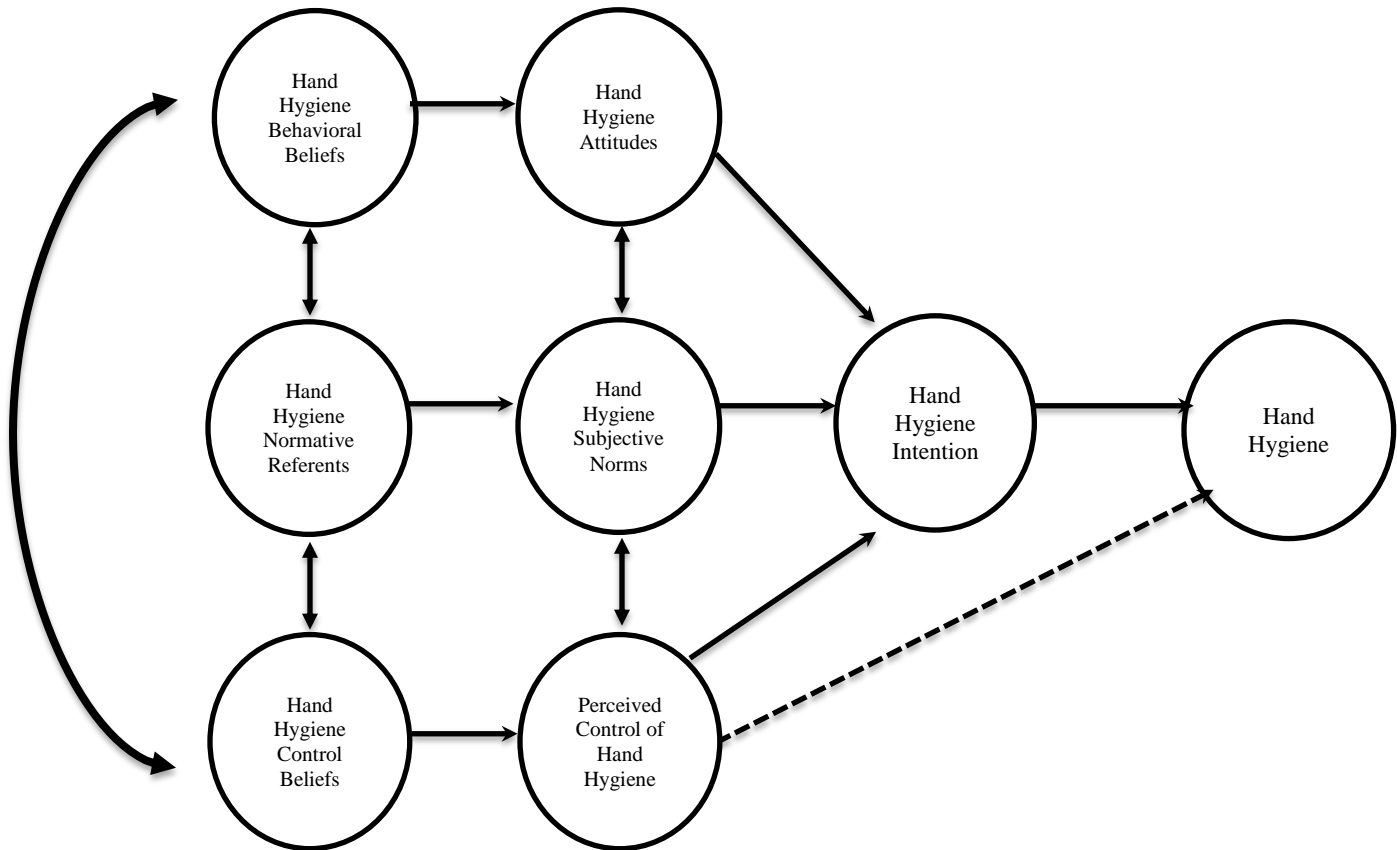
## Theoretical Framework

Since the groundbreaking work conducted by La Piere with Chinese-Americans, researchers have explored the enigmatic gap between one's intention to perform an overt behavior and the actual demonstration of the behavior.<sup>83</sup> The most widely accepted theory used to describe, explain, and predict overt choice behavior is the TPB.

The TPB is a social cognitive theory that posits an individual's expectations and values about performing a particular behavior contribute to their behavioral, normative, and control beliefs.<sup>2</sup> Respectively, these beliefs contribute to one's (a) **attitude**: one's hypothetical disposition towards a behavior; (b) **subjective norms**: one's perception of social pressure to perform or not perform a behavior; and (c) **perceived behavioral control**: the unrestrained ability to perform or not perform a behavior with regards to internal or external factors.<sup>1,2</sup> Finally, behavioral intention, how motivated an individual is to perform a behavior, is a direct determinant of actual behavior performance.<sup>1</sup>

Nurses' attitudes about HH are their latent dispositions towards HH (favorable or unfavorable). Subjective norm is the social pressure nurses' perceive from important others-normative referents-who desire or expect HH adherence. Nurses' perceived HH control is their unconstrained opportunity to perform or not perform HH. The TPB clearly depicts the three beliefs that contribute to the TPB constructs (attitude, subjective norm, and perceived behavioral control) that, in turn, may influence the central determinant of intention on actual behavior performance (Figure 2-1). The dashed arrow between perceived control and HH (Figure 2-1) serves as a direct link to HH only when perceived control serves as a proxy for actual control over barriers to HH performance.<sup>2</sup>

**Figure 2-1 Theory of Planned Behavior with Salient Hand Hygiene Beliefs<sup>1</sup>**



The TPB has a strong presence in the health literature because it parsimoniously addresses the intrapersonal (attitude, control beliefs, and intention) and interpersonal (subjective norms) dimensions associated with human behavior.<sup>56</sup> In a meta-analysis by Armitage and Conner the average correlation of theory constructs (attitude, subjective norm, and perceived control) with intention was  $R = 0.63$ , thus explaining 39% of the variance in intention.<sup>84</sup> Most recently, with health behaviors, the TPB has shown predictive validity explaining 44.3 % of the variance in behavioral intention and 19.3% of the variance in behavior.<sup>56</sup>

To determine the beliefs that serve as a basis for theory constructs, Ajzen and Fishbein suggest conducting an elicitation study using an open-ended question format.<sup>85,86</sup> An elicitation study establishes the cognitive foundation (thoughts and feelings) of a population's salient beliefs about performing a specific behavior of interest.<sup>85,87</sup> This elicitation study identified nurses' HH behavioral attitudes, normative referents, and control beliefs, a goal that must be achieved to operationalize the application of TPB to HH behaviors of critical care nurses.

### **Related Literature**

Although some studies have used the TPB as a guiding framework for nurses' HH research, few have elicited nurses' qualitative HH beliefs before constructing a survey. In lieu of eliciting nurses' qualitative HH behavioral attitudes, normative referent, and control beliefs, studies have relied on beliefs identified through non-empirically derived literature reviews.<sup>42,77,88</sup>

Some studies have elicited nurses' beliefs by conducting focus groups and accessing literature recommendations. Guided by the TPB, Whitby, McLaws, and Ross (2006) used focus group discussions along with content from the literature to design a questionnaire used to explain the determinants of nurses' HH.<sup>75</sup> Additionally, O'Boyle, Henly, and Duckett (2001) used both approaches to construct the Handwashing Assessment Instrument: a tool used to assess nurses' HH behaviors.<sup>89</sup> Most recently, White et al., (2015) using the framework of the TPB, conducted a thematic content analysis from qualitative focus group HH data obtained from Australian nurses.<sup>90</sup>

Using the TPB as a guiding framework, this is the first elicitation study designed to gather critical care nurses' salient HH beliefs individually in an open, free-response format. This open-ended, free response question format was chosen to capture nurses' unencumbered salient beliefs about the HH outcomes, positive and negative HH unit referents, and barriers and

facilitators to performing HH; due to social and group pressure, these immediate salient beliefs may not be obtained in a focus group setting.<sup>86</sup>

## **Methods**

### **Setting and Sample**

This study was conducted in the critical care unit setting at 2 acute-care institutions located in the southeastern United States: (a) an academic medical center (> 750 adult beds); and (b) a regional medical center (< 250 adult beds). Five critical care units were included in this study: 2 Cardiovascular ICUs (1 unit at each institution), 1 ICU, 1 Medical ICU, and 1 Surgical ICU. The critical care settings were chosen based on comparable patient acuity, nurse:patient ratios, and location of HH equipment.

A homogenous purposive sampling strategy was used. Registered nurse inclusion criteria were: (1) role involving direct bedside care; (2) employment  $\geq$  20 hours/week; (3) hospital tenure  $\geq$  12 months; and (4) respective ICU employment  $\geq$  6 months. Exclusion criteria included work status as contract, travel, or float pool RN. The investigators determined a sample size of 25-30 nurses (5-7 from each unit) based on literature recommendation and adequate population representation.<sup>86</sup> Of twenty-nine nurses who volunteered to participate, 25 nurses met the inclusion criteria and worked in the following unit types: ICU (n=5), Cardiovascular ICUs (n=5, n=7), Medical ICU (n=5), and Surgical ICU (n=3). All 25 nurses completed the instrument with the sample consisting of 18 female and 7 male participants (72% female; 28% male).

### **Instrument**

The primary investigator (PI) developed the Nurse's Salient Belief Instrument-based on recommendations from Icek Ajzen.<sup>86</sup> This self-report instrument contained 7 open-ended, free-response questions designed to elicit nurses' salient responses about HH behavioral attitudes-

benefits and disadvantages; normative referents-positive and negative; and control belief-barriers and facilitators. To establish reliability, each question was reviewed by a qualitative research expert for descriptive wording, clarity, and clearly defined terms.<sup>91</sup> The PI enhanced validity by taking measures to minimize social desirability bias by ensuring anonymity and confidentiality for each study participant.

The instrument's cover-page addressed the study's purpose and procedure, strategies to assure anonymity and confidentiality, potential use of data, procedure for study withdrawal or concerns, and consent, which were verbally reviewed for understanding. The instrument contained paired questions that addressed each of the HH salient beliefs; additionally, one question was included to elicit nurses' overall HH belief. The first paired questions addressed nurses' salient HH behavioral attitude beliefs: "When performing direct patient care, what are some of the benefits (#1), disadvantages (#2) of performing HH?" The entire instrument may be viewed in Appendix A. Three blank lines followed each question thus allowing the participants opportunities to record multiple salient beliefs.

### **Data Collection**

After obtaining Institutional Review Board approval from each institution and each nursing director's and unit manger's consent, the PI scheduled four face-to-face recruitment presentations. One unit manger requested a staff-wide recruitment email in lieu of a face-to-face recruitment presentation. During monthly unit staff meetings throughout September and October 2015 (average meeting attendance 15-20 RNs), the PI explained participant eligibility along with the study's purpose, procedure, and consent process. Informed consent was supplied with each instrument; however, to ensure anonymity, the IRBs granted a waiver of documentation of consent. To ensure data security and confidentiality, the PI remained on the unit to collect each

completed instrument; the instruments were completed in approximately 15-20 minutes. Per one unit manager's request, the PI sent out a unit-wide recruitment email soliciting participation and instrument completion. Study data were collected and managed using REDCap electronic data capture tools hosted by Vanderbilt University.<sup>92</sup>

To reduce any threat of coercion or undue influence, the PI asked the nurse manager to leave the unit staff meeting during the recruitment presentation. Participant anonymity was essential to ensure written responses that were transparent and unencumbered, especially because nurse participants were asked to list positive and negative unit HH normative referents. Field notes were taken at the end of each nurse's instrument completion; collectively, notes consisted of nurses' questions, comments, and time to instrument completion. While new data were being collected, the PI and the expert qualitative researcher conducted data analysis separately and simultaneously. Both investigators identified data saturation independently, when repetition of reported data occurred and no new information emerged.<sup>93</sup> Completed instruments will be kept in the PI's locked file cabinet for three years after which time they will be shredded.

### **Data Analysis**

A deductive, theory-driven thematic analysis, as described by Braun and Clarke, was used to analyze the Nurses' Salient Belief Instrument data.<sup>94</sup> This method involves identifying, analyzing, and reporting repeating patterns of meaning using a recursive movement across the data.<sup>94</sup>

### **Thematic Analysis**

Initially, using a cross-case approach, the investigators, independently, familiarized themselves with the data while repeatedly reading nurses' written responses from 25 completed nurse instruments; informal note-taking and clustering of like data occurred throughout this

initial step. After reviewing the data the investigators worked systematically through the entire data set to organize the data into meaningful units. Responses to the Nurses' Salient Belief Instrument items served as an organizing guide throughout the analytic process. During analysis, each question's open-ended response was given equal attention while being grouped and identified with a code to describe the grouped response information (Table 2-1). The responses and codes were then re-read and discussed to ensure clarity and consistency and resolve any discrepancies in the coding procedure. The codes were further analyzed and re-named based on similar descriptors or repeated patterned responses that captured the essence of each group of codes. The codes were then combined, integrated, and renamed to create thirteen categories. This "renaming" to capture the essence of the nurses' responses ultimately became the four major themes.

Topic	Data	Coded for
Hand Hygiene Belief	"Increases length of procedure that patients may find uncomfortable."	Time
	"I have bodily fluids on my gloves, arm, etc... Need to wash my hands"	Protective
	"Sometimes the water is too hot"	Equipment
	"Preventing spread of bacteria"	Protective
	"Demonstrating to the patient and family that we are careful to prevent infection."	Protective
	"Foam in, Foam out"	Process

To facilitate theme development, the PI created a thematic map to visualize the interconnectedness between and among grouped codes and identified repeated patterns in the data; this process led to the development of categories and then to four major themes (Figure 2-2).<sup>94</sup> The investigators conducted the iterative process of salient theme development using a method called “abstracting up” (Author, personal communication, October 2015) which takes the themes and once again redefines, collapses or combines them to bring further clarity and understanding. After “abstracting up”, two themes, location and supplies, were combined and four key themes were identified. Finally, the investigators defined and further refined the four themes to ensure that the “essence” of each theme was captured.<sup>94</sup> The investigators conducted an exhaustive analysis in that 85% of the data was assigned to one of the four themes.

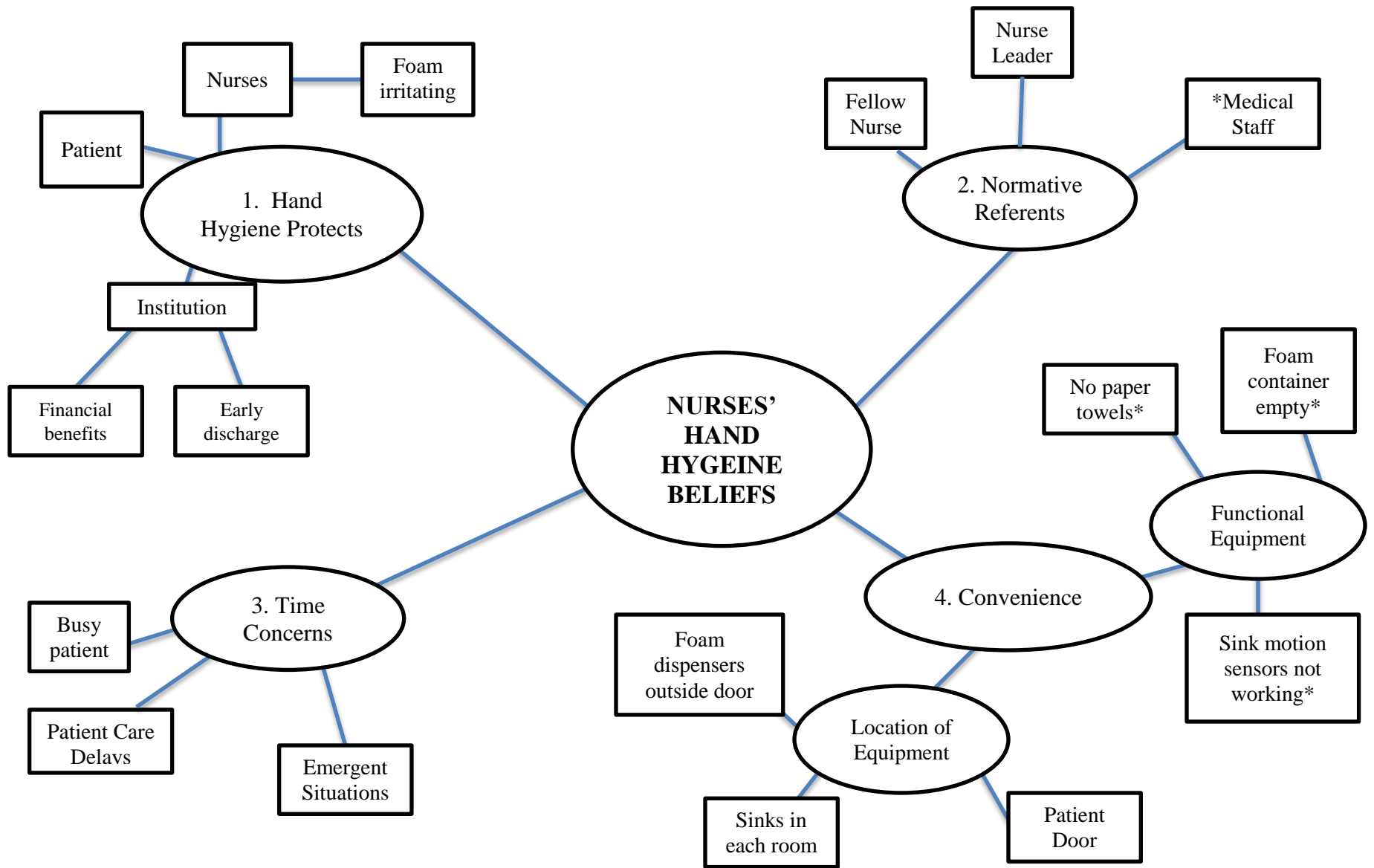
The investigators took measures to ensure this study met the criteria for rigor in qualitative studies: credibility, transferability, dependability, and confirmability.<sup>95</sup> To establish data credibility, this study’s qualitative descriptive design and thematic analysis process were chosen to align with the study’s research focus and theoretical framework. During data collection, strategies to allow instrument completion without time constraints were employed. Credibility was strengthened throughout the data collection period and analysis through introspection and mutual collaboration as the investigators reviewed and discussed the data while remaining open to new findings. Transferability was established by including two distinct institutions of varying size, mission, and geographical setting. Additionally, participants’ HH belief responses were corroborated with previous literature findings.<sup>27,42,89,90</sup> To enhance dependability, the investigators met for periodic debriefings throughout the data collection period and periodic code checks during data analysis. The primary investigator kept salient notes of the entire data collection period and each debriefing session; additionally, an audit trail was created



documenting each phase of the research process.<sup>95</sup> To ensure confirmability, the investigators anticipated potential instances for bias and strategized to mitigate these threats. For example, clear documentation of the analytical process was recorded to give the reader a full understanding of our data analysis.

**Figure 2-2 Thematic Map with Four Themes**

\* denotes negative nurse response



## Results

### Responses to Nurse's Salient Belief Instrument

All of the 25 nurse participants completed their Nurses' Salient Belief Instrument. The data were complete for each participant. Nurses' salient HH attitudinal beliefs were analyzed based on nurses' subjective responses to three open-ended belief questions focused on identified benefits, disadvantage, and general belief (s) about HH. Nurses responded the major advantage of performing HH was patient, nurse, and institutional protection against bacterial and pathogen transmission and cross-contamination. Nurses' overall HH belief responses included the logistical mechanics of the HH process and overall protection from bacterial transmission.

Two open-ended questions elicited unit HH normative referents. Nurses were asked to identify unit exemplars of HH (positive referent) and those who were least likely to perform HH (negative referent). Nurses identified their unit nurse peer group and nurse leaders as positive HH referents. Those who were least likely to perform HH included various ranks of medical staff and other members of the healthcare team.

Nurses' perceived control to perform HH was captured using 2 open-ended questions created to identify facilitators and barriers to performing HH on their unit. Cited facilitators to unit HH included adequately stocked HH supplies that are conveniently located near the patient's door. The primary barrier to HH performance was associated with time. Time-related barriers were identified during emergent patient situations and busy patient assignments.

### Themes

Four major themes were identified based on the critical care nurses' written responses to the Nurses' Salient Belief Instrument. These themes were (1) "*Hand hygiene is protective*"; (2) *Nurses look to nurses*; (3) *Time-related concerns*; and (4) "*Convenience is essential*," has two

subthemes that target the logistics of HH execution: “Functional Equipment” and “Strategically Located Equipment.” Although there was some overlap in the data, these four key themes are unique yet interrelated because they capture the full and inclusive understanding of the nurse’s view of their beliefs.

**Theme 1: Hand hygiene is a protective behavior.** All nurse participants answering this instrument recorded protection against infection and the transmission of bacteria and other pathogens as a benefit to performing HH. *“Hand hygiene protects the patient from potentially harmful bacteria/infection.”* Nurses also believe HH protects them from infection. *“I perform hand hygiene to avoid direct contact with the patient body fluids or wounds (‘ick’ factors)”*. On a broader level, nurses believe performing hand hygiene is beneficial to their healthcare institution. *“My performing hand hygiene benefits the hospital financially by decreasing risk of hospital acquired infections.”*

Second to nurses’ belief that HH is protective was their response regarding the process of performing HH. When asked what comes to mind when thinking about HH, thirteen nurses discussed the mechanical logistics of HH performance: soap and water or foaming. *“At least 30 seconds of scrubbing followed by completely drying hands.”* *“Foam in and foam out of a room.”* Two particularly interesting responses came from nurses who wrote, when thinking about HH, *“it is being watched to make sure I am doing it”* and *“I know we have undercover staff members surveying for hand hygiene, and if I am not compliant, my units will have a lower score for the month.”*

Although all nurses responded that HH was protective to the patients, themselves, or the institution, the second and third level responses addressed some of their concerns about harming themselves with frequent HH. Ten nurses responded that HH irritated their skin and at times

produced cracks in their hands. Hand hygiene can cause *“decreased skin integrity on my hands”* or *“causes my hands to get dry and hurt.”* One serendipitous concern targeted the possible long-term effects of HH foam: *“I hope I don't get cancer from the foam in/out chemicals used at hospitals.”*

**Theme 2: Nurses look to nurses for hand hygiene norms.** Twenty-three nurses responded that they looked to “nurses” as the individual or group who would most likely perform HH on their critical care unit. Those nurses further distinguished between 2 nurse-ranks: nurse leaders and fellow nurses (n=12, n=11, respectively). Nurses responded, *“I look to nurses in leadership roles...charge nurse.”* *“I look to other nurses on the floor.”* and *“Other nurses who I know are strict rule followers.”* Additional findings suggest an institutional difference in nurses’ initial responses to positive HH referents. At the smaller regional medical center, three out of twelve nurses identified fellow nurses as their HH referent on their unit, whereas, at the large teaching medical center, ten out of thirteen nurses identified their fellow nurses as their unit HH referent.

Nurses also identified those who were least likely to perform HH. Fifteen nurses responded that the medical staff was least likely to perform HH on their unit. Distinctive ranks of medical staff were identified: *“Physicians”*, *“Residents”*, *“First-year Interns”*, as well as *“Doctors performing procedures such as stat line placement for an emergent situation”* were least likely to perform HH on their unit. Nurses also identified various individual healthcare workers as those who were least likely to perform HH. These healthcare workers included, *“Case management,” “Radiology,” “Respiratory Therapist,”* and *“Dietary.”*

**Theme 3: Hand hygiene causes time-related concerns.** The most widely reported concern nurses had related to HH performance was associated with time. Twenty-three nurses responded performing HH, as directed, could be “*tasky at times*” and “*increase time to completion of tasks.*” Additionally, nurses responded these time-related concerns could delay nursing care, thus directly impacting the patient. Hand hygiene, “*increases length of a procedure that patients may find uncomfortable.*” and “*at times, takes time away from direct care.*”

Nursing in the critical care setting can be intense, focused, and at times emergent. Ten nurses responded that during emergent situations HH was especially difficult to perform. During these inherently demanding emergent situations, “*it is necessary to run into the patient’s room immediately*” and “*sometimes you can’t put things on hold to wash hands.*”

**Theme 4: Convenience is essential to hand hygiene performance.** Twenty nurses identified fully supplied, functioning equipment strategically placed at opportune locations as essential requirements for consistent, HH performance. Without functioning equipment, HH performance can be cumbersome, time-consuming, perfunctory, and ineffective. Poorly located equipment can delay HH, and, at times, make it impossible to perform.

**Subtheme 4.1: Functioning equipment.** Nurses responded that fully supplied operational HH equipment facilitated their HH performance. Nurses responded, “*sometimes it takes housekeeping a whole shift to bring towels, soap, etc ...to the room*” and “*making sure empty foam containers are replaced*” would facilitate HH performance.

**Subtheme 4.2: Strategically located equipment.** Conveniently located HH equipment is essential to the timely performance and frequency needed to perform HH in the critical care setting. Thirteen nurses responded the “*convenient location of sanitizer*” facilitated HH

performance, while “*poorly located soap/sink*” made HH performance difficult. One nurse accurately described the ideal location of HH equipment as “*located at the entry/exit of the room.*”

## **Discussion**

### **Nursing Practice Implications**

Based on this study’s findings, critical care nurse participants look to unit nurse leaders and fellow nurses as models to perform HH and believe HH is a protective behavior that requires time and functional equipment positioned in strategic locations. These salient beliefs, grounded in the TPB, provide valuable insight into the cognitive and social beliefs of these critical care nurses. Discussion of these findings will be organized in alignment with TPB constructs and include theory contributions, nursing implications, and future research recommendations.

Nurse participants believe HH is a protective behavior that, at times, delays patient care. In an earlier study by O’Boyle et al. (2001) critical care nurses reported a sense of obligation to perform HH and patient protection as their main HH salient beliefs.<sup>89</sup> Although it has been fifteen years since this study, the belief that HH is protective has not changed; however, our qualitative data targets HH protection to include not only the patient population, but the nurse and institution as well. Possible rationale for this inclusion can be explained by the heightened awareness of the incidence of HAI in the critical care setting and the undue institutional cost and burden of these infections. The overall nurse belief that HH protects the patient and nurse from infection is undisputed; however, why are HH adherence rates still less than optimal? These results suggest, as posited by the TPB, HH attitudinal beliefs are not the sole moderator of nurses’ HH performance. Therefore, further investigation is warranted into the level of importance nurses place on patient and nurse protection from infection in relation to the strength

and value they place on identified HH barriers, such as time-related concerns and hand irritation from repeated soap or foam use.

Normative referents, positive or negative, provide the framework for nurses' subjective norms and play a large part in a nurse's socialization into an organizational milieu, unit climate, collegial relationships, and professional development.<sup>1</sup> Our findings suggest, to the extent that nurses value referent's opinion, nurses may perceive social pressure to perform HH from unit nurse leaders and fellow nurses. These findings are supported by data from O'Boyle et al. (2001) who reported nurses identified their nurse manager as the HH unit referent, and White et al. (2015) who identified both nurse colleagues and supervisors (professors) as HH referents.<sup>89,90</sup> Our data suggest nurses look to nurses for HH performance. Therefore, research is needed to evaluate the relationship between unit nurse leaders' HH adherence rates and overall unit HH adherence. Additionally, our participants reported unit medical staff and other healthcare-related workers as least likely to perform HH. These undisputed findings are supported by numerous studies.<sup>18,25,96</sup> The literature further suggests, in the clinical setting, junior medical staff abandoned their HH training when senior staff members failed to perform HH.<sup>96,97</sup> Further research is needed to assess the effects of social influence on HH behaviors. Additionally future consideration should be given to develop a nurse empowerment strategy to hold medical staff and other healthcare workers accountable for their suboptimal HH performance.

Perceived control, an indirect measure of perceived behavioral control, is one's belief as to how easy or difficult it is to perform a behavior. Most overt choice behaviors, such as HH, plot somewhere on the control-continuum between absolute lack of control and complete control.<sup>1</sup> It is clear from our data that our participants' HH control beliefs plot between lack of control, due to poorly supplied or malfunctioning equipment (soap, foam dispensers, paper



towels) and control, due to strategically located equipment. In a study conducted in 18 hospital wards, after 16 months of use, only 77% of wall-mounted foam dispensers were found to be functional.<sup>98</sup> Jang et al. (2010) reported unreliable access to HH foam a commonly reported barrier to healthcare workers' HH performance.<sup>99</sup> Hand hygiene requires readily accessible supplies; the lack of these supplies suggests HH performance is not completely under nurses' control. Therefore, it is incumbent on the institution to select high quality, readily accessible HH equipment that is strategically located near the patient's door or at the patient's bed. Frequent monitoring of equipment functionality and fully supplied HH supplies should be an ongoing responsibility of the environmental staff.

### **Limitations**

The findings from our study should be considered in light of its limitations. First, because of faculty: student associations formed with the primary investigator during students' prelicensure nursing education, the primary investigator was familiar with some of the most recent nurse hires on the critical care units at one institution. This familiarity may have influenced recruitment and responses, indirectly. Second, performing HH is a socially desirable nursing task due to the scientific support and the Nurses' Code of Ethics. Although Instruments were completed individually, nurses may have felt pressure to over-report their salient HH beliefs. Third, although we used a purposive sampling strategy, participation was limited to those nurses who attended the monthly staff meetings, thus limiting the sample.

Although the investigators took many measures to meet the criteria for qualitative rigor, there were some limitations in this process. Credibility could have been enhanced using triangulation of data sources and member checking. Member checking was not conducted due to (a) nurses immediately returned to their work with patients upon instrument completion; and (b)

there was no identifying information collected from the nurse participants. Transferability of this study's findings is limited because we conducted our study at one institution that was a large academic research medical center and a smaller rural regional medical center. Future studies should include multiple sites using institutions of similar size and institution purpose.

### **Conclusion**

Healthcare associated infections are prevalent in the critical care environment. Hand hygiene is the leading measure to prevent the transmission of bacteria. Suboptimal HH adherence rates continue to be a conundrum in the acute care setting. Our data validate previous HH behavioral outcome and control beliefs: Hand Hygiene is Protective; Convenience is Important; and there are Time-related Concerns. Nurses (fellow nurses and nurse leaders) were overwhelmingly identified as those who are looked to and most likely to perform HH on their unit. Our hope is that the aforementioned data will contribute to the present literature addressing critical care nurses' salient HH beliefs, paying particular attention to further explore the effects of social influence on nurses' HH adherence.

CHAPTER III  
THE EFFECTS OF SOCIAL INFLUENCE ON CRITICAL CARE NURSES' HAND  
HYGIENE BEHAVIORS

This chapter details a quantitative descriptive study designed to collect data from critical care nurses' measuring perceptions of their HH attitudes, subjective norm, perceived control and intention on observed and self-reported HH behaviors. A shorter version of this manuscript, that was compliant with journal word-count, was submitted for publication.

**Background**

The United States Department of Health and Human Services has identified the reduction of HAIs as an Agency Priority Goal. These infections are the most common hospital care complications (> 700,000 infections annually) with 99,000 deaths each year and estimated direct annual hospital costs up to \$45 billion.<sup>11,100</sup>

Hand hygiene is widely recognized as the primary strategy to prevent HAIs.<sup>18</sup> With over 1.3 million RNs working in the acute care setting, nurses have the greatest opportunity for patient contact.<sup>49</sup> Nurses provide 92% of the patient care in ICUs making it an important target for improvement and a priority setting for HH research.<sup>49</sup> Although nurses are more likely to wash their hands than other healthcare workers and numerous HH strategies have been employed, their HH rates range between 34%-57%.<sup>31,32</sup>

Nurses' self-reported explanations for suboptimal HH include malfunctioning equipment, time conflicts, and lack of knowledge.<sup>18,42</sup> Interventions addressing these concerns have focused on education, feedback, equipment management, and individual influence strategies.<sup>18,32,101</sup> Healthcare delivery, however, is a social process and as such social influence interventions may

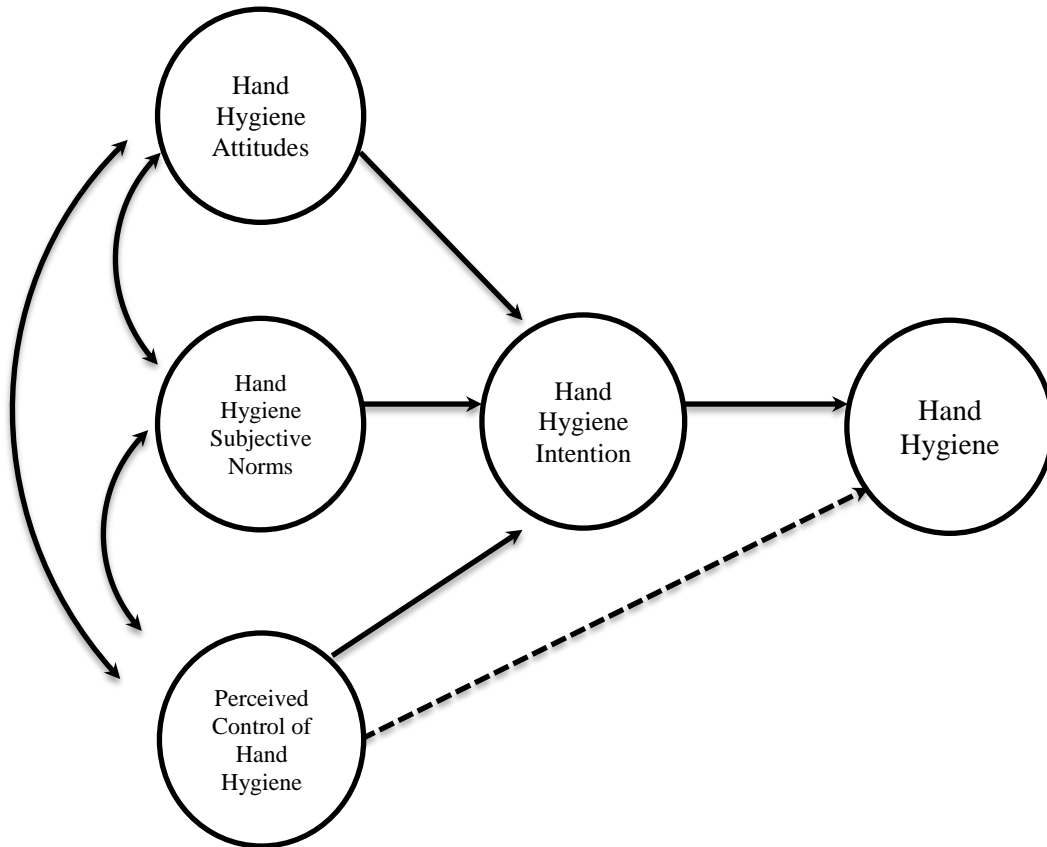
be a promising strategy to increase nurses' HH adherence, if there is a relationship with behavior. In this study we draw upon the TPB to determine the contributions of nurses' HH attitudes, subjective norms, and PBC to HH intention and nurses' HH intention on their HH performance.

## **Theoretical Framework**

### **Theory of Planned Behavior**

Behavioral studies have led to multiple explanations of what motivates, controls, and contributes to one's behavior. The TPB is a belief-based social cognitive theory that suggests the overall intention to perform a behavior is determined by (a) **personal attitude**: the overall latent disposition or tendency towards a behavior (favorable or unfavorable); (b) **subjective norms**: perceived social pressure from referent others who desire or expect behavior adherence or non-adherence; and (c) **perceived behavioral control (PBC)**: perceived power or control to perform a behavior as reflected by facilitating factors or obstacles.<sup>1,2,4</sup> Behavioral intention captures one's likelihood and perceived probability to perform a behavior.<sup>4</sup> The relationship among these four constructs can be directly applied to theorizing the effects of nurses' HH attitudes, subjective norms, and perceived control on intention, and the direct determinant of HH intention on actual HH behavior (Figure 1). The dashed arrow (Figure 1) between PBC and HH behavior serves as a direct link to HH only when PBC serves as a proxy for actual control over barriers to HH performance.<sup>2</sup>

**Figure 3-1**  
**Theory of Planned Behavior Adapted for Nurses' Hand Hygiene<sup>2</sup>**



Few empirical studies have addressed both the intrapersonal (attitude, beliefs, motivation) and interpersonal (subjective norms, social influence) domains of HH behavior.<sup>18</sup> O'Boyle, Henly, and Larson (2001) found that TPB variables predicted nurses' self-reported HH, but not observed HH.<sup>60</sup> Results from Huis et al. (2013) supported the value of enhanced team strategies to increase ward-nurses' HH rates.<sup>101</sup> White et al. (2015) found that TPB variables were associated with ward-nurses' self-reported HH; observed HH was not measured.<sup>78</sup> Based on this review, there is one study (O'Boyle, 2001) that has examined the intrapersonal and interpersonal

determinants of nurses' observed and self-reported HH behaviors.<sup>60</sup> However, as reported by the CDC, in 2005-2006 the landscape of infection control shifted and public awareness was heightened after the publication of two formative studies suggesting CLASBIs are preventable.<sup>102</sup> Because of the increased infection control emphasis, nurses may have formed new HH beliefs in the 15 years since O'Boyle's study. As suggested by Ajzen and Fishbein (1980) some behavior beliefs persist over time while other beliefs may be forgotten and replaced with new beliefs.<sup>85</sup> Therefore, this present study is needed to assess associations, if any, between currently practicing nurses' HH attitude, subjective norm, and perceived control and their observed and self-reported HH performance.

### **Study Aims**

Using a theory-driven approach, the purpose of this two-phase project was to describe the effects of social influence on nurses' HH behaviors. Phase one was an elicitation study to determine nurses' salient HH beliefs (currently under review). Phase-two, reported here, aims were to (a) determine the contributions of nurses' HH attitudes, subjective norms, and perceived control on HH intention; and (b) explain the relationship between nurses' HH intention and their HH performance.

### **Methods**

This cross-sectional descriptive study was conducted at two southeastern U.S. medical centers. Institutional Review Board approval with a waiver of documentation of consent was granted. There were no financial incentives associated with participation.

### **Setting and Sample**

Setting included: (a) academic research medical center (>750 adult beds) and (b) a regional medical center (<250 adult beds). The units included: 1 Medical ICU, 1 Surgical ICU,

and 1 Cardiovascular ICU located at the research medical center and 1 Cardiovascular ICU and 1 ICU located at the regional medical center. These institutions were chosen because of their variation in mission, setting, and size. The ICU setting was chosen based on the (a) increased patient susceptibility to HAIs;<sup>6</sup> (b) 100% RN staff; (c) comparable 2-patient/1-nurse ratio; and (d) similar location of aerosol foam (outside of patient's room and inside near patient's sink).

This study used a convenience non-probability sampling strategy to include 100 nurses (20 nurses each of the five ICUs). Inclusion criteria were (a) direct bedside care providers; (b) working  $\geq$  20 hours/week; (c) practicing at the institution  $\geq$  12 months and on unit for  $\geq$  6 months. Nurses were excluded if they were caring for a patient in isolation or had a work status of "travel," "float pool," or "new graduate."

A sample of 100 nurses (20 nurses/unit) was recruited from the five ICUs. This sample size was based on the desire to achieve at least 80% statistical power to detect a regression coefficient (beta) accounting for a minimum of 10% shared variance with HH behavior. A sample of 100 achieved 90% statistical power (alpha = 0.05) to detect a coefficient that size or larger. Given the low possibility of missing responses to some survey items and desire for sufficient sample for multivariate analyses a sample of 100 seemed justified.

## **Instruments**

**Patient Safety Opinion Survey.** The Patient Safety Opinion Survey was developed based on results from a prior elicitation study (under review). Qualitative data of the nurses' salient HH beliefs served as a framework for constructing a 46-item instrument consisting of (a) 23 salient belief TPB items; (b) 10 climate items; and (c) 13 demographic items. The Flesch Kincaid readability indices were 63, at a 7.6th grade level. A health service researcher, a qualitative researcher, and two senior ICU nurse managers reviewed the survey-draft for face

validity, clinical accuracy, readability, and survey completion time (7-9 minutes). The entire instrument may be viewed in Appendix B.

## **Variables and Measures**

**Theory of Planned Behavior Constructs.** Unless otherwise noted, subjects used a 7-point bipolar adjective scale (1-7). To reduce the potential for positive response bias, random survey items were reverse scored and recoded these items during analysis to indicate a higher score reflected a more positive response.

**Attitude.** Attitude was measured by nurses' ratings that HH (a) protects the patient against infection; (b) protects the nurse against transmission of bacteria; and (c) delays patient care because of time constraints. These 1-7 scores were multiplied by their corresponding valuation of each attitude (1-7). The three products were summed (possible score 3-147) to produce the HH attitude score. Higher scores indicated a more favorable HH attitude than lower scores.

**Subjective Norm.** Subjective norms were measured by ratings of HH referents: (a) fellow nurses, (b) nurse leaders, and (c) medical staff. These 1-7 scores were multiplied by the nurse's rating (1-7) motivation to comply with each referent. The three products were summed (possible score 3-147) to produce the subjective norm score. Higher scores indicated greater social pressure to perform HH than lower scores.

**Perceived Behavioral Control.** Perceived HH control was measured by ratings that (a) conveniently located, well-supplied HH equipment was available and facilitated HH; and (b) emergent patient situations were a barrier to HH. These 1-7 scores were multiplied by the rating (1-7) of the ability/power of each to influence HH performance. The two products were summed



(possible score 2-98) to produce the perceived control score. Higher scores indicated a greater degree of perceived HH control than lower scores.

**Behavioral Intention.** Intention was measured by nurses' rating three items: "I am likely to perform HH before and after patient care." "I want to perform HH before and after patient care." "I intend to perform HH before and after patient care." These three 1-7 scores were averaged (possible score 1-7) to arrive at a measure of nurses' intention to perform HH; higher scores indicated a greater intent to perform HH than lower scores.

**Behavior: Hand Hygiene.** Hand hygiene is defined as the act of hand cleansing using (a) soap and water or (b) antimicrobial foam for the purpose of physically or mechanically removing dirt, organic material, and/or microorganisms.<sup>18</sup> As described by the World Health Organization (WHO), HH was specified as opportunities occurring before and after touching a patient.<sup>18</sup> Hand hygiene adherence was measured two ways: self-report and observation. To enhance reliability of HH observations, the PI completed the WHO Training Film: Clean Care is Safer Care.<sup>103</sup>

**Observed Hand Hygiene.** The PI used the iScrub 1.5 application, downloaded onto a handheld device, as the primary HH collection tool. iScrub is a free application designed to collect, store, organize, and export HH data.<sup>104</sup> Using a touchscreen interface, the PI customized iScrub 1.5 to record (a) Location: ICU, SICU, MICU, or CVICU; (b) Subject #: Nurse 1, 2, 3, 4, etc; and (c) HH behavior: "no, wash, or rub". A screen shot of the iScrub interface may be viewed in Appendix C. The HH unit of analysis was defined as the number of HH actions per 11 separate nurse-patient encounters. Adherence rates were calculated based on the division of HH actions by the number of HH opportunities (before and after patient care) multiplied by 100 to yield a composite HH adherence rate.<sup>18</sup>

*Self-Reported Hand Hygiene.* A one-question item, administered after HH observations were completed, asked the nurse to rate HH performance to the nearest 10% (range of 0-100%); higher percentages indicated greater self-reported HH than lower scores.

## **Procedure**

The study was conducted from December 2015 through March 2016. After obtaining unit nurse manager's consent, the PI attended each unit's monthly staff meeting to present the study's purpose, procedure, eligibility, and consent process (average attendance: 10-15 nurses). The PI remained on the unit to begin face-to-face nurse recruitment and data collection. Of the 107 nurses approached for recruitment, 106 consented to participate. During the HH observation period, six of these nurses were excluded because of patient situations (isolation, surgery, or death) or nurse reassignment; one nurse declined participation (n=100).

Subjects were given a study number (1-100), which linked HH observation data in iScrub to a corresponding numbered Patient Safety Opinion Survey. Using the iScrub application, the PI recorded participant's HH opportunity and actions during 11 nurse-patient encounters. Based on nurse-patient encounters and unit activity, HH observations took between 2-7 hours/nurse. To reduce recall bias and the temporal distance between observed and self-reported HH,<sup>4,18</sup> the PI administered the survey immediately following each nurse's observation period. The PI remained on the unit until the survey was completed.

The PI conducted 2,448 nurse HH observations (total observation time approximately 180 hours). During observations, the PI made no judgments regarding the indications for glove-use versus HH or the quality of HH performance. Additionally, the PI observed each nurse-patient encounter only as it related to HH.

All survey data were double-entered into REDCap, an electronic data capture tool hosted by Vanderbilt University.<sup>92</sup> The double-entered datasets were compared using SAS Proc Compare. Any discrepancies were checked against the paper survey and corrected prior to use in the analyses.

### **Statistical Analysis**

All data were analyzed using IBM SPSS version 24. Frequency distributions were used to summarize nominal variables. Means and standard deviation summarized normally distributed continuous variables; median and interquartile range (IQR) skewed continuous and ordinal data. One-sample Chi-Square tests compared the sample demographic characteristics to those reported by the American Association of Critical Care Nurses (AACN). Wilcoxon Signed-Ranks test were used to compare the two sources of HH behavior. Pearson correlations and multiple linear regressions were used to assess the associations of the attitude, subjective norms, and perceived control scores with the observed and self-reported HH behavior values. Skewed distributions were transformed to normal prior to using those procedures. The negatively skewed attitude and HH self-reported values were inverted and square-root transformed prior to use of those procedures. All other assumptions of linear regressions (e.g. evaluation of residual skewness, heteroscedasticity) were met. An alpha level of 0.05 ( $p < 0.05$ ) was used for determining statistical significance.

## **Results**

### **Participant Characteristics**

Current study subject characteristics, as well as those reported by the American Association of Critical Care Nurses (AACN) are summarized in Table 1. The study sample was a median age of 29 years (IQR=26, 39), with median RN experience of 5 years (IQR=3,10). Most

(82%) held a Bachelor's degree and were Caucasian and female (95%, 78%, respectively). They worked primarily during the day shift with a full-time work status. As shown in Table 1, the sample was statistically significantly more male, younger, formally educated, and Caucasian than the national AACN membership sample ( $P < 0.001$ , Table 1).

**Table 3-1. Demographics of nurse participants (n=100) and AACN membership**

<b>Nurse Descriptors</b>	<b>Study Values</b>	<b>AACN Values</b>	<b>p-value</b>
	<b>n, %</b>	<b>%</b>	
Gender (female)	78 (78)	86	< 0.001
Age (n=97)			
0-29	51 (53%)	17	< 0.001
30-39	25 (26%)	26	
40-49	8 (8%)	22	
50-59	12 (12%)	24	
60+	1 (1%)	11	
Education			
Diploma	0	3	< 0.001
Associate	11 (11)	19	
Bachelors	82 (82)	58	
Masters	7	19	
Doctorate	0	1	
Primary Shift			
Days (0700-1900)	84 (84)	-	
Nights (1900-0700)	16 (16)	-	
Race			
Caucasian	95 (95)	75	< 0.001
Asian	1 (1)	12	
Black	4 (4)	5	
Other	0	8	
Ethnicity (n=96)			
Non-Hispanic	95 (99)	96	0.139
Hispanic or Latino	1 (1)	4	
	<b>Median (IQR)</b>		
Age (years) (n=97)	29 (26, 39)		
Years Experience as RN	5 (3, 10)		
Employment Tenure (years)			
Hospital	4 (2, 7)		
Specific ICU	3 (2, 6)		
	<b>Mean (SD)</b>		
Hours/week, mean (SD)	36 (4.6)		
Patients cared for during observation	2 (0.447)		

## **Personal Attitudes, Subjective Norms, and Perceived Control**

Survey scores are summarized in Table 2. The overall HH attitude median score was 63 (IQR=57, 70). Nurses' individual HH attitudes varied that HH protects (the patient median was 49, IQR=49,49; and themselves median was 49, IQR=42,49) from the risk of infection to their denial that HH was time consuming and could delay patient care (median=8, IQR=4-15). IQR=49,49; and themselves median was 49, IQR=42,49) from the risk of infection to their. Nurses tended to deny that HH was time consuming and could delay patient care (median=8, IQR=4-15). Nurses perceived moderately positive social pressure to perform HH (median=99, IQR=72, 119) with unit nurse leaders being the strongest subjective norm (median 42, IQR=35, 49). Perceived control to perform HH median was 48 (IQR=34,61). There were no statistically significant correlations among the attitude, subjective norms, and perceived control scores ( $r < 0.15$ ,  $p > 0.20$ ).

**Intention.** When asked how likely they were to perform HH, 86% of nurses responded with an average score of greater than 6 on a 7-point scale anchored with 1=extremely unlikely, 7=extremely likely (Table 2).

### **Hand Hygiene Behavior: Observed and Reported**

The observed HH performance was a median 55% (IQR=33-78%). During those same opportunities nurses self-reported they performed HH a median 90% of the time (IQR= 80-100%,  $p < 0.001$ ). Nevertheless, the correlation of these two HH performance scores was statistically significant ( $r = 0.48$ ,  $p < 0.001$ )

**Table 3-2. Descriptive summaries of TBP Scores and Hand Hygiene (n=100)**

<b>Survey TPB Construct Scores</b>	<b>Median (IQR)</b>	<b>Min, max</b>
<b>Attitude</b> (n=98) (range 3-147)	63 (57, 70)	15, 98
Protects patient	49 (49, 49)	7, 49
Protects nurse	49 (42, 49)	6, 49
Delays care	8 (4, 15)	1, 42
<b>Subjective Norm</b> (n=98) (range 3-147)	99 (72, 119)	12, 147
Peers	28 (7, 42)	3, 49
Nurse leaders	42 (35, 49)	4, 49
Medical staff	25(14, 35)	1, 49
<b>Perceived Control</b> (n=99) (range 2-98)	48 (34, 61)	8, 98
Inconvenient Location/Supplies	30(18, 42)	1, 49
Emergent patient situations	15 (9, 30)	1, 49
<b>Intention</b> (range: 1-7)	7 (6.3, 7)	4.3, 7
<b>Hand Hygiene</b>		
<b>Observed</b> (%)	55 (33, 77)	0, 96
<b>Self-reported</b> (%)	90 (80, 100)	5, 100

For consistency median and IQR are reported for all distributions.

Observed HH was normally distributed with mean=55.3% (SD=26.3)

TPB items are bolded

### **Associations of Attitudes, Subjective Norms, Perceived Control with Hand Hygiene Behavior**

Statistically significant ( $p < 0.05$ ) positive associations of subjective norms and perceived control scores with both observed and self-reported HH behavior were observed for both sets of analyses. No statistically significant associations with behavior were observed for the attitude scores.

The multiple correlations of nurses' attitude, subjective norm, and perceived control scores with their observed and self-reported HH adherence rates were both statistically significant ( $P < 0.001$ ) and accounted for similar overall percentage of variability in nurses' behavior (17% observed, 18% self-reported,  $P < 0.001$ ). In terms of the adjusted associations of each of the scores, findings from the multivariate analyses were largely consistent with those observed from the univariate correlations. Nurses' subjective norm and perceived control scores

remained statistically significantly associated with both observed and self-reported HH behavior, while their attitude scores were not. Within either analysis, no statistically significant associations of nurses' attitudes scores with HH behavior were observed ( $\beta = -0.10$  (observed),  $\beta = 0.03$  (self-report),  $p > 0.05$ ). Subjective norm scores demonstrated slightly stronger associations with observed HH behavior than did perceived control scores (Norms:  $\beta = 0.32$ , 10% shared variance,  $p = 0.001$ ; Control:  $\beta = 0.20$ , 4% shared variance,  $p = 0.036$ ). The opposite pattern was observed for the self-reported HH behavior values (Norms:  $\beta = 0.21$ , 4% shared variance,  $p = 0.028$ ; Control:  $\beta = 0.35$ , 12% shared variance,  $p < 0.001$ ) (see Table 3).

**Table 3-3. Summaries of the attitude, subjective norm, and perceived control scores with observed and self-reported hand hygiene behavior (N=97).**

Characteristic	r	p-value		beta	p-value
<b>Observed<sup>a</sup></b>					
<b>Attitude</b>	-0.12	0.259		-0.10	0.278
<b>Subjective Norm</b>	0.34	0.001		0.32	0.001
<b>Perceived Control</b>	0.24	0.017		0.20	0.036
<b>Self-Reported<sup>b</sup></b>					
<b>Attitude</b>	0.01	0.961		0.03	0.773
<b>Subjective Norm</b>	0.25	0.012		0.21	0.028
<b>Perceived Control</b>	0.37	<0.001		0.35	<0.001

Note: Attitude and self-reported HH values were square-root transformed to normal distribution.

a Multiple R = 0.42,  $p < 0.001$ ;  $R^2 = 0.17$  (Adjusted  $R^2 = 0.15$ )

b Multiple R = 0.43,  $p < 0.001$ ;  $R^2 = 0.18$  (Adjusted  $R^2 = 0.16$ )

## Discussion

The purpose of this study was to examine the influence of a theoretically grounded set of intrapersonal and interpersonal variables on nurses' HH behavior. Our results indicate nurses'

HH subjective norms and PBC scores are significant contributors to their HH performance, with subjective norms being strongest with observed HH and PBC strongest with self-reported HH.

Given the limited variation in nurses' HH intention scores this construct was not helpful in explaining or predicting HH. This finding was contrary to O' Boyle et al.'s (2001) study which suggested critical care nurses' HH intention was a predictor of self-reported HH, but not observed HH.<sup>60</sup> Our unexpected finding may be a function of the social desirability of reporting one's intention to engage in appropriate HH in the ICU combined with heightened awareness of patient morbidity, mortality and institutional cost associated with HAIs in the years since the O'Boyle study. However, it also suggests that nurses intend to engage in HH and are motivated to do so, but other factors interfere with doing so. In light of our finding, nurses' HH attitude, subjective norm, and PBC scores had to be analyzed as direct determinants of nurses' observed and self-reported HH. Similarly, yet unexpectedly, we found that nurses' HH attitude scores had limited variation and were not a significant contributor to their observed or self-reported HH.

Nurses' subjective norms scores were significant contributors to their self-reported and observed HH suggesting that interventions to increase HH subjective norm scores may increase HH. Consequently, future HH work should focus on exploring social strategies paying particular attention to the nurse leader because nurses identified them as the most important referent. Initially, further investigation should include a multi-site study designed to examine associations, if any, between unit nurse leaders' HH and respective nurses' HH performance. Furthermore, nurses' subjective norms scores explained more of the shared variance in observed HH than self-reported HH (10%-observed HH; 4%-self-report HH). This finding suggests nurses' actual HH performance may be more influenced by perceived social pressure than self-reported HH.



Nurses' PBC was a significant contributor to their self-reported and observed HH. Of particular interest was the conflict nurses perceive regarding the prioritization of performing HH while attending to emergent patient situations. Focus group discussions should be considered to explore the conflict nurses perceive regarding the time required to perform HH when faced with emergent patient situations.

Contrary to the TPB model and O'Boyle's study, there were no inter-correlations among the three TPB constructs-HH attitude, subjective norm, and PBC. Possible explanations may be the modal set of nurses' salient HH beliefs that were used to construct the Patient Safety Opinion Survey. Our nurses believe HH is a protective behavior (attitude) that requires time and functional equipment positioned in strategic locations (PBC) while looking to unit nurse leaders as HH models (subjective norm). In our study, these three factors were separate and unique determinants of nurses' HH behavior.

### **Implications for Nurse Executives**

As previously identified by O'Boyle et al. and of concern for nurse executives and infection control directors is the moderate association between nurses' observed and self-reported HH rates, if this study can be replicated.<sup>60</sup> Healthcare workers overestimate their HH performance.<sup>48</sup> If actual HH performance statistics are desired, self-report is thus inaccurate. If relative change needs to be estimated, administrators might use this approach. Additionally, due to the moderate association between HH self-report and observation, attention should be given to consistency and uniformity in HH methods when attempting to compare HH results from various studies.

## **Implications for Nurse Researchers**

One opportunity lies in development of interventions centered on unit nurse leaders because of their high referent scores. Reconsideration should be given to the previously used HH educational training and surveillance strategies with future efforts targeting the social influence of nurse leaders modeling quality standards of nursing practice.

## **Limitations**

First, although the PI was as unobtrusive as possible, several nurses became aware their HH performance was being observed; therefore, nurses' actual HH rates may be lower than recorded. One nurse commented, "When I see you, I foam because I know what you are doing." Second, at times it was difficult to view HH at the room sink. Although most nurses used aerosol foam, some incidents of sink HH may have been missed. Third, this study was a cross-sectional 2-site design thus limiting generalizability of study findings. Last, the convenience sample limited participation primarily to only one shift, the day shift.

## **Conclusion**

Hand hygiene is the primary effective strategy to prevent HAIs. Despite decades of HH strategies, nurses' HH rates remain suboptimal although their HH attitudes and intention are highly favorable. We found an association between nurses' HH subjective norms and PBC with their self-reported and observed HH performance. Nurses' predominantly identified nurse leaders as their HH normative referents. This study has implication for nurse administrators regarding the methods used for HH data collection and for nurse researchers regarding studies of associations between social influence and HH behaviors.

## CHAPTER IV

### IMPLICATIONS FOR FUTURE RESEARCH

The goal of this study was to describe the effects of social influence on nurses' HH behaviors. Specific study aims were to (1) describe nurses' unit normative referents for nursing practice and HH; (2) determine associations of nurses' HH attitudes, subjective norms, and perceived control with HH intention; (3) determine the contribution of nurses' HH attitudes, subjective norms, and perceived control with HH intention; (4) explain the relationship between nurses' HH intention and self-reported and observed HH; and (5) determine the extent to which labor and climate variables explain the variation between nurse's HH intention and performance.

Throughout this two-phase research project careful attention was given to align the study aims with TPB recommendations.<sup>86,105</sup> To align Aim 1 with TPB recommendations, initially, hand hygiene (outcome behavior) was clearly defined and a specific population of interest was identified (critical care RNs). An elicitation study was conducted using the Nurses' Salient Belief Instrument (phase one). A thematic analysis of survey data yielded a modal set of nurses' salient HH beliefs used to describe nurses' normative referents and TPB constructs. Elicitation study findings suggest nurse participants look to their unit nurse leaders and fellow nurses as HH referents (Aim 1). The salient belief data were used to create the Patient Safety Opinion Survey.

To align study aim 2, 3, and 4 with TPB recommendations a second quantitative descriptive study was designed to measure nurses' HH perceptions using the Patient Safety Opinion Survey (phase-two). Phase-two findings indicated nurses' HH intention scores had limited variation; therefore, nurses' intention scores were not a reliable outcome variable for nurses' attitudes, subjective norms, and perceived control scores nor was it helpful in explaining or predicting HH. After consulting with my dissertation committee members it was decided that

Aim 2, 3 and 4 would be modified and nurses' HH attitudes, subjective norms, and perceived control scores would be analyzed as direct determinants of nurses' self-reported and observed HH. Results indicated nurses' subjective norm and perceived control scores were positively associated and contributed to nurses' self-reported and observed HH adherence rates (Aim 2, 3, and 4). The limited variability in nurses' HH intention scores precluded analysis of nurse labor or climate variables as possible explanation of the gap between nurses' HH intention and HH behavior (Aim 5). It was determined by the dissertation committee that no further analyze was needed. The findings from this study suggest many areas of research that will be explained in this chapter.

Social research is primarily conducted to design interventions that change behavior.<sup>106</sup> However, as reported in a systematic review by Hardeman et al., the TPB has been used primarily to measure and predict process and outcome variables and less commonly used to develop interventions.<sup>107</sup> The TPB recommends two subsequent steps in 5-step sequence (steps 1-3 have been conducted in this research project) leading up to an intervention development (a) identify the TPB beliefs that discriminate between nurses who performed HH and nurses who did not perform HH; and (b) develop an intervention designed to target key determinants of HH using the TPB measures to evaluate the intervention.<sup>4,108</sup>

## **Research Trajectory**

### **Short-term Research Goals**

In this study, nurses' subjective norm and perceived HH control scores positively contributed to nurses' observed and self-reported HH adherence. Initially, further analysis is needed to identify those subjective norm and perceived control beliefs that discriminate between nurses who performed HH and nurses who did not perform HH.<sup>4,108</sup>

Second, nurses responded that functional HH equipment facilitated their HH performance, but emergent patient situations were a barrier to HH performance. Qualitative work is needed to explore nurses' perceptions regarding any conflict or tension they may experience when confronted with prioritizing between performing HH while dealing with emergent patient situations. Because nurses' perceived HH control contributed to their HH performance, this qualitative knowledge is important to help nurse educators and infection control departments gain a full understanding regarding the obstacles/conflicts nurses confront on their unit. For example, on one ICU where I conducted this study during emergent situations it was standard practice to page/contact the unit nurse educator to respond to the situation. As the nurse educator entered the patient's room he/she would put on gloves and grab a handful of gloves to distribute to everyone in the patient's room. This practice was consistently followed during my observations on one ICU. This approach, through nurse leader modeling, may mediate some of the conflicts nurses experience when prioritizing between HH performance and patient emergencies.

Finally, it has been 15 years since O'Boyle (2001) resulted a low correlation between critical care nurses' observed, and self-reported HH rates ( $r=21, p<0.05$ ).<sup>60</sup> Our findings, although slightly increased, indicated only a moderate correlation between these two HH methods ( $r=0.48, p<0.001$ ). Public awareness regarding the low-moderate correlation between these two HH methods must be heightened. To raise awareness among nurse executives, infection control nurses, quality assurance departments a systematic review of this phenomenon is needed.

## **Long-term Research Goals**

Future work to replicate the findings from this two-phase research project using multiple sites located in various geographic regions is merited. Our findings suggest nurses look to nurse leaders as HH referents. Based on our findings, further analysis of associations, if any, between nurse leader's HH performance and respective unit nurses' HH adherence rates is needed.

Research of these associations will be conducted at the unit-level; therefore, future work will include multiple institutions using multiple units to reach an adequate sample size and power.

The long-range goal of this line of research is to develop a social influence intervention that targets nurse's HH adherence rates. Based on the findings from the multi-site study, a longitudinal role modeling/social influence intervention study may be developed. At present, the literature indicates only two intervention studies using social influence to increase nurses' HH performance. Schneider et al. (2009) conducted a prospective observational study in the pediatric ICU setting comparing HH rates of junior medical staff at baseline and then after a supervisor HH role model intervention.<sup>73</sup> Results from this study showed an increase from baseline HH at 22% to 56% after the role model intervention ( $p < 0.001$ ).<sup>73</sup> Results from Huis et al. (2013) supported the value of enhanced team leadership and modeling strategies to increase ward-nurses' HH rates

## **Conclusion**

The effect of social influence on nurses' behaviors is an underdeveloped domain in nursing science. Additionally, there continues to be an enigmatic gap between nurses' favorable HH attitudes and intentions and their actual HH adherence rates. Nursing implications of this foundational work include the effects of nurse leaders social influence/pressure to increase ICU

nurses' HH adherence rates. In conclusion, this preliminary work is fundamental to our understanding of nurses' HH behaviors that directly influence patient care outcomes.

## Appendix A

### **Table 1. Nurses' Salient Belief Instrument**

1. When performing direct patient care, what are some of the benefits of performing hand hygiene during patient care activities?
  2. What are some of the disadvantages to performing hand hygiene during patient care activities?
  3. In the clinical setting, what comes to mind when you think about performing hand hygiene?
  4. Sometimes we are not sure of what to do and we look to others for example. Please list the important individuals or groups ( no names please) who you look to and would most likely perform hand hygiene as indicated during patient care activities.
  5. Please list the important individuals or groups (no names please) who are least likely to perform hand hygiene as indicated during patient care activities.
  6. List any factors that would make it easier or enable you to perform hand hygiene on your unit.
  7. List any factors that would make it difficult or prevent you from performing hand hygiene on your unit.
-



## Appendix B

### Patient Safety Opinion Survey

This survey is designed to gather information about your opinions on performing hand hygiene in your critical care unit. After reading each statement, please **circle** the number that matches your **immediate** judgment rating your opinion as one of seven numbers. There are no right or wrong answers to these questions.

For the purpose of this study, hand hygiene is defined as any action of **hand cleansing** performed before, during, or after contact with your patient or patient surroundings (World Health Organization, 2009). Hand hygiene may be performed using (a) **soap and water** or (b) **antimicrobial foam**.

All responses to this survey are anonymous (no identification) and confidential. There is no need to include your name on this survey. Your nurse manager has **nothing** to do with this survey or this research study. Your answers will in no way impact your job on your unit.

Please answer all questions referencing your **current** critical care unit and hospital.

This survey is the second part of my research study focused on nursing activities in the critical care unit. Your participation is completely voluntary, and you may withdraw by not completing this survey at any time without any consequences. If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this survey with someone other than the investigator, please contact Human Research Protection Program, 1313 21st Ave., South, Suite 504, Nashville, TN 37232-4315; Phone: 615-322-2918 or 1-866-224-8273.

By answering the survey questions, you are voluntarily agreeing to participate in this research and have your responses included in the results.

Collective unidentified unit results will be made available to each unit upon completion of this study.

*Thank you very much for your participation in this study.*

Hospital: \_\_\_\_\_

Critical Care Unit: \_\_\_\_\_

**Hand Hygiene Opinion Survey**

**Section I**

Most questions in this survey use a 7-point rating scale. In this section, please **circle** the number that best describes your hand hygiene opinion. For example, in question #1 if you completely disagree with the opinion described this statement circle: 1-‘extremely disagree’, and if you have a favorable opinion of the statement circle: 7-‘extremely agree’.

1. I can decrease the risk of transmission of infections to my patient/s by performing hand hygiene.

extremely disagree:  1 : 2 : 3 : 4 : 5 : 6 : 7 : extremely agree

2. I am likely to perform hand hygiene before and after patient care activities.

extremely unlikely :  1 : 2 : 3 : 4 : 5 : 6 : 7 : extremely likely

3. Performing hand hygiene is a time consuming activity, which at times may delay patient care.

extremely disagree:  1 : 2 : 3 : 4 : 5 : 6 : 7 : extremely agree

4. The fellow nurses on my unit think it is important to perform hand hygiene.

extremely disagree:  1 : 2 : 3 : 4 : 5 : 6 : 7 : extremely agree

5. During emergent patient situations it is inconvenient to perform hand hygiene.

extremely disagree:  1 : 2 : 3 : 4 : 5 : 6 : 7 : extremely agree

6. I perform hand hygiene before and after patient care activities

: 0% : 10% : 20% : 30% : 40% : 50% : 60% : 70% : 80% : 90% : 100% :

of the time.

7. Delaying patient care to perform hand hygiene is

undesirable :  1 : 2 : 3 : 4 : 5 : 6 : 7 : desirable

8. Decreasing the risk of transmission of infection to my family and me is

desirable :  1 : 2 : 3 : 4 : 5 : 6 : 7  : not desirable

9. The unit medical team (physician, residents, interns) performs hand hygiene before and after patient care.

extremely agree :  1 : 2 : 3 : 4 : 5 : 6 : 7  : extremely disagree

10. When it comes to hand hygiene, I want to do what the other nurses on my unit think I should do.

important to me :  1 : 2 : 3 : 4 : 5 : 6 : 7  : not important to me.

11. The hand hygiene equipment on my unit is inconveniently located or sometimes not stocked with the necessary supplies (working foam dispensers, paper towels)

extremely agree :  1 : 2 : 3 : 4 : 5 : 6 : 7  : extremely disagree

12. Decreasing the risk of transmission of infection to my patient/s is

important to me :  1 : 2 : 3 : 4 : 5 : 6 : 7  : not important to me

13. I want to perform hand hygiene before and after patient care activities

extremely agree :  1 : 2 : 3 : 4 : 5 : 6 : 7  : extremely disagree

14. During emergent patient situations, I am

extremely likely:  1 : 2 : 3 : 4 : 5 : 6 : 7  : extremely unlikely to perform hand hygiene.

15. The nurse leaders on my unit (clinical coordinator, managers) think it is important to perform hand hygiene.

extremely agree:  1 : 2 : 3 : 4 : 5 : 6 : 7  : extremely disagree

16. When the hand hygiene equipment is inconveniently located or not stocked with the necessary supplies, I am

unlikely : 1 : 2 : 3 : 4 : 5 : 6 : 7 : likely to perform hand hygiene

17. When it comes to hand hygiene, I want to do what the unit nurse leaders (clinical coordinator, charge nurse) think is important to do.

not important to me: 1 : 2 : 3 : 4 : 5 : 6 : 7 : important to me.

18. I intend to perform hand hygiene before and after patient care activities.

extremely disagree: 1 : 2 : 3 : 4 : 5 : 6 : 7 :extremely agree

19. When it comes to hand hygiene, I want to do what the unit medical team thinks I should do

not important to me: 1 : 2 : 3 : 4 : 5 : 6 : 7 : important to me.

20. Performing hand hygiene protects my family and me from getting infections.

extremely disagree: 1 : 2 : 3 : 4 : 5 : 6 : 7 :extremely agree

21. Hand hygiene is an important job requirement that is performed using soap and water or hand foam.

extremely disagree: 1 : 2 : 3 : 4 : 5 : 6 : 7 :extremely agree

22. At times we all look to others as examples to follow. On your unit, who, if anyone (title only, no names please), do you look to as a model of quality nursing practice?

a). \_\_\_\_\_

23. On your unit, who, if anyone (title only, no name please), do you look to as a model of hand hygiene performance?

a). \_\_\_\_\_

## Hand Hygiene Survey

### Section II

This next section asks question about your perceptions of your critical care unit. Using the 7-point scale provided, indicate how well the statements match your thought about your unit. Please **circle** the number that best describes your response.

	To A Very Great Extent						
	To A Great Extent						
	To A Considerable Extent						
	To A Moderate Extent						
	To A Limited Extent						
	To A Very Limited Extent						
	Not At All						
<b>24. On my unit...</b>							
a. I have significant autonomy in deciding how I do my job.	1	2	3	4	5	6	7
b. I can decide on how I go about doing my work.	1	2	3	4	5	6	7
c. I have considerable independence and freedom as to how I do my work.	1	2	3	4	5	6	7
<b>25. On my unit...</b>							
a. to get my job done, I must <b>ignore</b> some safety aspects.	1	2	3	4	5	6	7
b. whenever work pressure builds up, the pressure is to get the job done as fast as possible even if it means compromising on safety.	1	2	3	4	5	6	7
c. poor staffing undermines safety recommendations.	1	2	3	4	5	6	7
d. safety rules and procedures are ignored.	1	2	3	4	5	6	7
e. safety rules and procedures are nothing more than a cover-up for lawsuits.	1	2	3	4	5	6	7
f. ignoring safety rules is acceptable.	1	2	3	4	5	6	7
g. it doesn't matter how my work is done, as long as there are no safety violations.	1	2	3	4	5	6	7

**Hand Hygiene Survey**

**Section III**

**Descriptive Information**

1. Please indicate your highest degree of nursing education:

- Associate' degree       Bachelor' degree  
 Master's degree       Diploma

2. Number of years experience as an RN: \_\_\_\_\_

3. Number of years working at this institution: \_\_\_\_\_

4. Number years working on this unit: \_\_\_\_\_

5. Employment status:

- Employee of hospital       Agency Nurse  
 Float pool       Travel Nurse

6. On which shift do you primarily work (please select one)?

- \_\_\_\_\_ 12 Hour Day (e.g., 7am – 7pm)  
\_\_\_\_\_ 12 Hour Night (e.g., 7pm – 7am)  
\_\_\_\_\_ Rotate (No primary shift)

7. Hours worked per week: \_\_\_\_\_

8. How many patients did you care for during your study observation period? \_\_\_\_\_

9. How many patient admissions, discharges, or transfers did you process while you were being observed? admissions\_\_\_\_\_, discharges\_\_\_\_\_, or transfers\_\_\_\_\_

10. Age: \_\_\_\_\_

11. Gender:    Male    Female

12. Which of the following would you say best represents your race?      American Indian

White/Caucasian    Black/African American    Asian      Pacific Islander

13. Are you Hispanic or Latino?    Yes      No

Appendix C

Screenshot of iScrub Interface



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