HAND HYGIENE COMPLIANCE AMONG HEALTHCARE PERSONNEL IN KASEMRAD RATTANATHIBETH HOSPITAL

PORNLUCK HARNPHANICH

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……..…...…….....
Miss Pornluck Harnphanich
Candidate

.....	.....
Asst. Prof. Prattana Punnakitikashem, Ph.D. Advisor	Asst. Prof. Astrid Kainzbauer, Ph.D. Chairperson
.....	.....
Duangporn Arbhasil, Ph.D. Dean College of Management Mahidol University	Asst. Prof. Pornkasem Kantamara, Ed.D Committee member

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Pornluck Harnphanich

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PORNLUCK HARNPHANICH 5649030

M.M. (HEALTHCARE AND WELLNESS MANAGEMENT)

THEMATIC PAPER ADVISORY COMMITTEE: ASST. PROF. PRATTANA PUNNAKITIKASHEM, Ph.D., ASST. PROF. ASTRID KAINZBAUER, Ph.D., ASST. PROF. PORNKASEM KANTAMARA, Ed.D.

ABSTRACT

Background: The main purpose of this independent study is to identify the factors associated with hand hygiene compliance among healthcare personnel including physicians, nurses and nurse assistants during routine clinical tasks in Inpatient Department and Critical areas including Emergency room and Hemodialysis unit at Kasemrad Rattanathibeth hospital to improve the compliance with best hand hygiene practices and create the area of clean care work place.

Method: We monitored the overall compliance with hand hygiene during routine patient care. Self-reported questionnaires were based on the Theoretical Domains Framework by Dyson et al., 2012 were done. Then observation and interview "real time" (immediately after observation) was done among 210 healthcare personnel from May to June, 2016. Factors were analyzed and data between professional category (doctors, nurses and nurse assistants) were compared.

Result: These were "believe about capacities and optimism", "social influences", "behavioral regulation" and "knowledge" as the 4 behavioral domains commonly linked to hand hygiene compliance. An explanation between professional category compliance identified that nurses and nurse assistants have higher concern on "environmental context", "belief about capacities and optimism", "social influences" than doctor. Doctors have stronger "believe about consequences than other medical workers".

Conclusions: This study found valuable components in hand hygiene improvement strategies. Addressing only influencing factors such as believe about capacities and optimism, social influences, behavioral regulation and knowledge are not enough to change hand hygiene behavior. Addressing combinations of different influencing factors showed better results. This work is an essential step towards a new paradigm for safety culture in Kasemrad Rattanathibeth Hospital.

KEY WORDS: Hand hygiene, healthcare associated infections, guideline, patient safety, World Health Organization, healthcare personnel, the theoretical domain framework

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CHAPTER I
INTRODUCTION

One of the major common adverse events in hospital is healthcare associated infections (HCAIs) or nosocomial infection. HCAIs refers to an infection, which was not present or incubating at the time of admission, transmitted to a patient during his/ her stay in hospital or other health care setting. Moreover, an occupational infection among staff is also part of HCAI (World Health Organization, 2016). HCAI poses massive financial cost on patients, their families, and healthcare systems. While Hospital-acquired infections (HAIs) results in complications, prolong hospital stay, increase financial burden, and threaten one's life, HAI also increases the opportunity for microorganisms to develop resistance to antimicrobial drugs (Huis, Achteberg, Bruin, Schoonhoven, & Hulscher, 2012; Pittet et al., 2000). It has been estimated that there are 2 millions HAIs impacting world's population annually accounting for 10% of hospitalized patients (Hass & Larson, 2008). Moreover, many findings from existing studies indicate that burden of HCAIs are several times higher in low- and middle-income countries when compared to high-income countries (Allegranzi et al., 2010).

The increasing incidence of multi-drug resistant organisms and emerging infections such as Ebola virus emphasizes the need for the control of infection diseases transmission. In health care setting, healthcare workers' hands are the most common transmission vectors for the spread of healthcare associated pathogens from patient to patient (World Health Organization, 2016). Hand hygiene is defined as encompasses hand washing, hand antisepsis and action taken to maintain healthy hands and fingernails. Hand washing is the process of using soap and water to remove soil and transient microorganisms from the hands. Hand antisepsis includes either hand washing with antiseptic soap, or rubbing the hands with alcohol-based hand rub, to destroy resident and transient pathogens on the hands. Hand hygiene is the simplest, most effective method for preventing the spread of pathogens and reducing HCAI incidence. Research has shown that up to 50% HAIs could be prevented with improvements in hand hygiene

compliance (Pittet et al., 2000; World Health Organization, 2006). Thus, hand hygiene is recommended as a routine best practice for all staff-patient interactions. The "5 Moments for Hand Hygiene" is the tool to achieve most effective hand hygiene recommended to all healthcare workers to clean their hands for five indications as follows (World Health Organization, 2009):

- Before patient contact
- Before an aseptic procedures
- After body fluid exposure risk
- After patient contact
- After contact with patient surrounding

The first indication addressed that staff should clean their hands before touching a patient to protect the patient against harmful germs carried on their hands. The second indication stated that staff should clean their hands immediately before performing a clean or aseptic procedure to protect patient against harmful pathogens, including the patient's own, from entering his/her body. Third, the procedure is suggested immediately after an exposure risk to body fluid and after glove removal to protect the staff, themselves, and the health-care environment from harmful patient microorganisms. The fourth indication recommended staff to clean their hands after touching a patient and his/her immediate surrounding when leaving the patient's side for the same reason as the previous indication. Lastly, the five Moments for Hand Hygiene is indicated after staff touches any object or furniture in the patient's immediate surroundings, when leaving, even if the patient has not been touched to prevent transmission of pathogen to staff and to other hospital facilities (World Health Organization, 2009).

Today, several evidence-based interventions and guidelines have been developed in order to improve hand hygiene compliance (Boyce & Pittet, 2002). While most healthcare organization have invested massive resources on staff education to enhance HCAIs through hand hygiene, the compliance of hand hygiene in many hospital remains in suboptimal levels and improvement is difficult to achieve (Boscart, Fernie, Lee, & Jaglal, 2012). Barriers to hand hygiene are highly complex and includes multifactorial elements at both organizational and individual levels. A common barriers discovered at organizational level are incompetent hand hygiene facilities and workplace atmosphere

that do not promote the importance of hand hygiene (Boscart, Fernie, Lee, & Jaglal, 2012). At individual level, the major barriers are habits developed early in life and lack of knowledge combined with misconception about hand hygiene (Boscart, Fernie, Lee, & Jaglal, 2012).

1.1 Significance of study

HAIs present a significant threat to health of patients and staff and is currently affecting health care setting worldwide. The original article where Multistate Point-Prevalence Survey of Health Care-Associated Infections in 2014 was conducted in 183 hospitals with 11,282 patients showed the estimation that on any given day approximately 1 of every 25 inpatients in United State acute care hospital has at least one healthcare associated infection. Moreover, there were an estimated 722,000 HCAIs in U.S. acute care hospital in 2011. Furthermore, >50% of all HCAIs occurred outside the intensive care unit (ICU) (Magill et al., 2014). The overall prevalence of HCAIs in developed countries various between 5.1% and 11.6%, where as, hospital-wide prevalence of HCAIs rate in developing countries vary from 5% to 19%, markedly higher than those in developed countries. The prevalence of HCAI in Thailand is 7.3% (World Health Organization, 2016).

According to current evidence, the impact of HCAIs include prolonged hospital stay, increased resistance of microorganisms to antimicrobials, long-term disability, significant additional financial cost for healthcare system, higher costs for patients, and their family, and unnecessary deaths (Boscart et al., 2012; Pittet et al., 2000). In Europe, HCAIs cause 16 million additional days of hospital stay and 37,0000 deaths, and contribute to an additional 110,000 annually. Moreover, the disease burden also reflected in massive annual financial loses estimated at approximately €7 billion of direct costs (World Health Organization, 2016). In developing countries, increased length of stay associated with HCAI range between 6 and 23 days in non-critically ill patients. Among hospital-born babies in developing countries especially in South East Asia and Sub-Sharan Africa (75%), HCAI are responsible for 4% to 56% of all causes of death in the neonatal period (World Health Organization, 2016).

Even though, there are numerous evidence-based guidelines for hand-hygiene, compliance level is still under expectation and improvement remains challenging. Multi studies have been documented hand hygiene compliance rate with mean observed rate of 40% (Gould, Chudleigh, Moralejo, & Drey, 2007; Hass & Larson, 2008)(CDC 2002). The continually suboptimal compliance of hand-hygiene among healthcare workers may be due to failure to understand factors that influence staff's hand hygiene behavior and subsequent lack of incorporation of these finding into intervention designs and the delivery of the intervention.

Refer to one of the infectious control report of Kasemrad Rattanathibeth hospital is hand hygiene compliance. According to last meeting of an annual hospital meeting in January 2016, the report was shown that hand hygiene compliance rate was still at a low-level around 48% in average, similar to WHO that was less than 50%, with the average of hand hygiene compliance is 38.7% (WHO 2009). Varies of adherences between different wards, working conditions, and professional categories is observed. Impacts of unawareness of low compliance rates of hand hygiene in the hospital include surgical site infection, bloodstream infection, urinary tract infection, respiratory infections, and gastrointestinal infections, resulting in extensive prolonged hospital stay, customer dissatisfaction, and significant costs to the hospital. Even though our hand hygiene reported in January 2016 is higher than average, Kasemrad Rattanathibeth hospital should still strive for a better hand hygiene compliance. This is because WHO standard of 38.7% was an average number calculated from hand hygiene practice from countries all over the world including both developed countries, developing countries, and underdeveloped countries. From the current problems of HCAIs encountering at Kasemrad Rattanathibeth and other hospital worldwide, it is important to study how to improve hand hygiene compliance by understanding and assessing influencing factors in order to derive new effective intervention and create pathogen-free hospital environment.

1.2 Problem statement

The contaminated hands of Kasemrad Rattanathibeth personnel are one of the known vectors in the transmission of potentially pathogenic microorganisms to admitted patients. The need for careful hand hygiene among Kasemrad Rattanathibeth

health care personnel is clear, and the vulnerability of patient is evident. However, the reason why some of the personnel fail to consistently comply with hand hygiene guidelines is still unclear. There is a need for management team to find out the influencing factors affecting quality of hand hygiene to improve their team.

The theory of Planned behavior (TPB) (Ajzen, 1985), which purposed the explanation of how cognitive variables including attitude, subjective norms, intentions, and perceived behavioral control can predict hand hygiene practices, offers an assuring approach to study hand hygiene behavior among Kasemrad Rattanathibeth health care personnel's. However, previous results of studies based on this theory showed some conflict (see literature review), and none were conducted with Thai healthcare personnel in private hospital.

1.3 Objectives of Study

1. To study the factors that influence hand hygiene compliance in healthcare personnel
2. To study the level of compliance to perform hand hygiene among doctors, nurses and nurse assistants
3. To provide the possible recommendations and tools to improve current hand hygiene compliance

1.4 Scope of Study

This study is designed to understand influencing factors of hand hygiene compliance in healthcare personnel at Kasemrad Rattanathibeth hospital including physicians, nurses, and nurse assistants who work in Inpatient Department and Critical areas.

1.5 Key word

Hand-hygiene, performance, healthcare associated infections, guideline, patient safety, World Health Organization, healthcare personnel, the theoretical domain framework, behavior intention

CHAPTER II
LITERATURE REVIEW

This chapter provides an insight of the impact and prevalence of healthcare associated infection (HAI), followed by the role of hand hygiene in preventing HAI. A review on the barriers to compliance to hand hygiene and interventions that are recommended to improve compliance hand hygiene are also included in this chapter. A review of research on hand hygiene based on theory of behavioral theory as theoretical framework is provided

2.1 The Burden of Healthcare Associated Infections

Healthcare associated infection (HAI) is the most common life-threatening complication encountered in many healthcare settings. The impacts of HAI include prolonged hospital stay, increased resistance of microorganisms to antimicrobials, long-term disability, additional financial burden on both health systems and patients and their family, and unnecessary deaths (Boscart et al., 2012; Pittet et al., 2000). Overall estimation shows that more than 1.4 million patient worldwide in developing and developed countries are affected by HAI (World Health Organization, 2011). World Health Organization (2011) also estimated the prevalence of HAI in developing countries and developed countries to be between 5% to 19% and 3.5 to 12% of hospitalized patients, respectively.

There are approximately 8,000 deaths resulted from 200,000 HAI incidences recorded in Canada and the rates appear to be increasing (Public Health Agency of Canada, 2013). It has been reported that there are more deaths associated with healthcare associated infections than diabetes (6,923 deaths in 2009), Alzheimer's disease (6,281 deaths in 2009), or pneumonia and influenza (5,826 deaths in 2009) encountered in Canada (Saher, 2013). According to data provided by the Hospital in Europe Link for Infection Control through Surveillance (HELICS), approximately 5 million HCAIs are estimated to occur

in acute care hospitals in Europe every year, accounting for around 25 million extra days of hospital stay and a corresponding economic burden of €13–24 billion (World Health Organization, 2011). The original article where Multistate Point-Prevalence Survey of Health care-associated infections in 2004 was conducted in 183 hospitals with 11,282 patients shows the estimation that on any given day approximately 1 of every 25 inpatients in United State acute care hospitals has at least one healthcare associated infection (Magill et al., 2014). There were an estimated of 722,000 HCAIs in United State acute care hospital in 2011 and 75,000 hospital patients with HCAIs died during their hospitalizations. The burden of HCI is dramatically increased in high-risk patients such as those admitted to intensive care units (ICUs). In ICUs around 30% of patients develop at least one HAI (World Health Organization, 2011).

Concerning endemic HCAI, many studies conducted in developing countries. report higher rates than in developed countries (Azzam & Dramaiz, 2001; Danchaivijtr, Tangtrakool, & Chokloikaew, 1995; Valinteline, Jurkuvenas, & Jepsen, 1996) However, it is important to note that most of these studies concern single hospitals; hence, it may not be able to represent the problem across the whole countries. For example, in one-day prevalence survey recently carried in single hospitals in Albania (Faria et al., 2007), Morocco (Jroundi et al., 2007), Tunisia (Kallel et al., 2005), and the United Republic of Tanzania (Gosling, Mbatia, Savage, Mulligan, & Reyburn, 2003), HCAI prevalence rates were 19.1%, 17.8%, 17/9%, and 14.8%, respectively. Patients with HAI remain in hospital on average three times longer than uninfected patients (World Health Organization, 2006). As a result, increased wait times for new admissions and increased financial cost are evidenced. Moreover, patient with HAI are usually treated with antimicrobial drugs, thus, increasing the risk of resistance developed by microorganisms (Boscart et al., 2012).

Microorganisms commonly associated with HAI can develop resistance to increasing usage of antimicrobial drugs. For example, The rate of HAI caused by methicillin-resistance *Staphylocuccus aureus* (MRSA) increased more than 1,000% in Canadian hospitals recorded between 1995 and 2009, (Public Health Agency of Canada, 2013). In addition to becoming more resistant to antibiotics, some microorganisms are becoming increasingly virulent. For instance, between 2007 and 2011 death associated with *Clostridium difficile* infections almost tripled (Public Health Agency of Canada,

2013). From example provided, it is now widely recognize that antimicrobial drugs alone cannot be depended to control HAI, it has been contended that up to 70% of HAI can be prevented through hand hygiene (Sax, Allegranzi, Uckay, Larson, & Pittet, 2007).

2.2 The Roles of Hand Hygiene in Preventing Healthcare Associated Infections

Professionals in healthcare setting are continuously exposed to sequence of patients, environmental surfaces with bidirectional exchange of microorganism (Sax et al., 2007). Pathogenic contamination of hands can occur both from exposure to patient's body fluid or waste, with or without glove, from contact with patients' dry and intact skin, and from contact with environmental surfaces such as gowns, linens, furniture, and equipment (Pittet et al., 2006). Factors influencing the survival rate and reproductive rate of microorganisms are type of microorganism and contamination level. For instance, MRSA and VRE strains of *Staphylococcus aureus* can survive longer than 150 minutes and 60 minutes, respectively (Kampf & Kramer, 2004). In addition, a study conducted on the survival capability of *Enterococcus faecalis* and *E. faecium* indicated that both of the pathogen survived for at least 60 minutes on gloved and ungloved fingertips (Noskin, Stosor, Cooper, & Peterson, 1995). Similar to VRE strains of *Staphylococcus aureus*, a study on *Shigella dysenteriae* type 1 showed its survival capacity on hands for up to 60 minutes (Islam et al., 1997). Moreover, many microorganisms can persist on dry surfaces for months resulting in continuous risk of transmission (Kramer, Schwebke, & Kampf, 2006). Without good hand hygiene, healthcare personnel can spread pathogens from patient to patient, patient to environmental surfaces, and vice versa (Pittet et al., 2006). The disperse of pathogens can occurs throughout a healthcare environment in hours (Sax et al., 2007). Hence, it is vital to maintain adequate hand hygiene in order to minimize the transmission of pathogenic microorganisms. Routine hand hygiene may be conducted either with alcohol-based hand rubs, or using soap and running water.

Alcohol-based hand rubs kill microorganisms when applied correctly, on the other hand, hand hygiene with soap and running water, get rid of the pathogens. The advantages of alcohol-based hand rubs is that it provide rapid antibacterial effects and affects on broad-spectrum (Girou, Loyeau, Legrand, Oppein, & Brun-Buisson, 2002;

Zaragoza, Salles, Gomez, Bayas, & Trilla, 1999). In addition to previous advantage, another pros of alcohol-based hand rubs are that they take less time than hand washing with soap, and solution dispensers can be installed at the near proximity to the workstation providing more convenience. Moreover, less skin irritation and dryness of hand is observed in association with alcohol-based rubs when compared to hand washing (Trampuz & Widmer, 2004). While hand washing is indicated when hands are visibly contaminated or when caring for patients with known or suspected norovirus or *Clostridium difficile* infections. However, alcohol-based hand solutions are now recommended as the primary method of hand hygiene for all indications in today patient care due to ease of application, tolerability, accessibility, and its efficacy (World Health Organization, 2009).

2.3 Hand Hygiene Compliance

Though, regional, national and international health agencies agree that hand hygiene is one of the most effective mechanism to interrupt pathogenic transmissions (Alberta Health Services, 2010; Center for Disease Control and Prevention, 2006; Community and Hospital Infection Control Association, 2008; World Health Organization, 2011), low compliance rate among healthcare personnel has been documented extensively (Erasmus et al., 2010). According to WHO (2011), healthcare professionals' adherence to hand hygiene practice ranges from 5% to 89%, with an average of 38.7%. Similar to WHO report on overall average rate of hand hygiene adherence in 2011, a systematic review by Erasmus et al. (2010) also suggested an overall median compliance rate of 40%. In addition, unadjusted compliance rates were lower in ICU (30%-40%) than other settings (50-60%). Moreover, lower compliance rate is observed among physicians (32%) when compared to nurses (49%).

Appendix 1 shows that the compliance rates lower than 20% before patient contact were found in 29%, 49%, 67%, and 67% of studies among nurses, other healthcare workers, and healthcare workers of unknown profession, respectively. While compliance rate lower than 20% after patient contact were not documented for nurses, 13%, 14%, and 18% of studies on healthcare workers, healthcare worker of unknown profession, and physicians poses a lower than 20% compliance rate after patient contact, respectively. Among physicians, it was found that there were large differences in compliance both

before and after patient contact. The tendency of lower compliance rates is observed before contact with median of 13% and higher compliance toward after patient contact with median of 43% (Erasmus et al., 2010). While there are differences in adherence level between nurses, physicians, and other healthcare workers, it has also been found that hand hygiene compliance may also vary among different physician specialties (Pittet et al., 2004).

2.4 Barriers to Hand Hygiene Compliance

There are many factors that may influence hand hygiene adherence. According to appendix 2, known barrier to compliance with hand hygiene include inaccessible hand hygiene supplies, skin irritation due to washing solution, forgetfulness, wearing of gloves, limited knowledge of guidelines, time constraints, understaffing and high workload, and misconceptions about hand hygiene.

2.5 Strategies to Improve Hand Hygiene

Since there are many factors contributing to the poor compliance rate of hand hygiene practices multiple strategies is needed in order to improve hand hygiene adherence. Strategies recommended by WHO includes, system change, training and education, evaluation and feedback, and safety climate.

2.5.1 System change

WHO (2006) stated that hand hygiene compliance is possible only if there is enough infrastructures and a reliable and permanent supply of hand hygiene products e.g. soap, alcohol-based antiseptics. When healthcare professional faces time constraint they are less likely to leave patient bedside to find sink, thus, increasing the risk of pathogenic transmission. It has been proven that alcohol-based hand rubs are more efficient than hand washing with soap and running water. Comparing to hand washing with soap which can take up to two minutes, alcohol-based hand antiseptics required only less than 30 seconds without having to leave patient out of sight (Trampuz & Widmer, 2004). In addition, emollients have been added to alcohol-based hand rubs, hence, the

solutions are less likely to cause damage to user skin (Boyce, Kelliher, & Vallande, 2000). Owing to the advantages of alcohol-based hand rubs, WHO recommended it as a first line product for hand hygiene.

In Canada, healthcare facilities are required to ensure the availability of alcohol-based hand rubs at the point of care, nursing and computer stations, patient room entrance, and areas where medications are being prepared (Alberta Health Services, 2010). Even though, alcohol-based solution are highly recommended and proven to be very efficient, many healthcare workforces still continue to wash their hand instead of using provided alcohol-based hand rub (Naikoba & Hayward, 2001). WHO (2011), stated that reluctance to use alcohol-based hand solution is due to lack of knowledge about the product's advantages. Reminder posters can be posted around healthcare facilities to encourage and reinforce healthcare professionals to compliance with hand hygiene. In addition posters can also act as resources about hand hygiene for both patients and staff.

2.5.2 Training and Education

Education is believed to be a foundation for improvement of hand hygiene practices. WHO (2006), emphasizes that education is vital for successful hand hygiene practice and that education must be provided on regular basis because one-time education normally result in short-term change. Furthermore, WHO (2016) added that teaching should not include only educational content, but also training strategies for practicing, promoting, and assessing knowledge and performance. Refresher sessions should be available for enrolment regularly to strengthen and sustain awareness and to keep knowledge up to date. Topics that are essential for training suggested by WHO (2006) are rational for hand hygiene, indications and technique for hand hygiene, and methods to maintain hand skin integrity.

The risks of transmission of pathogen and the consequences of healthcare associated infection including morbidity, mortality, and costs should be stress in the rational for hand hygiene during the training. Healthcare professionals need knowledge about the relationship between activities that they perform on daily basis and method of transmission. Moreover, correct indications for hand hygiene should be addressed to the workforce to appropriately interrupt the chain of transmission (World Health Organization, 2006).

Majority of healthcare workers are lack of clear understanding on hand hygiene indications required during service delivery, especially those tasks when potential contamination is not readily apparent e.g. contact with surfaces in patient environment (Cole, 2007). It has been proposed that nurses self-developed their hierarchy of risk to assess when hand hygiene should be performed and act accordingly. However, assessments can be biased in busy, or unstable practice situations (Whitby, McLaws, & Ross, 2006). Research done at the University of Geneva Hospital allowed researcher to develop "Five moments for hand hygiene", which is a framework that can be applied easily to all health care settings in order to improve understanding of hand hygiene indication (Sax et al., 2007).

2.5.3 Evaluation and feedback

In addition to education, WHO (2006) also recommended post-training evaluation to verify the competency of healthcare workers on hand hygiene. It is recommended to evaluate not only through direct observation on hand hygiene compliance, but also on their knowledge and perception on healthcare associated infection and hand hygiene. Many international accreditations require hospitals to implement regular observation of hand hygiene and feedback on staff performance.

2.5.4 Safety Climate

According to WHO (2006), Safety climate is define as "an environmental and the perceptions that facilitate awareness-raising about patient safety issues while guaranteeing consideration of hand hygiene improvement as a high priority at al levels". On the other hand, Singer and Vogues (2013) defined safety climate as "the shared values, attitudes and patterns of behavior". They proposed that interventions are often unsuccessful because they fail to address the fundamental problem which is a weak organizational safety culture (Singer & Vogus, 2013). In addition, Singer and Vogues (2013) identify three interrelated and recursive processes of enabling, enacting, and elaborating. Enabling refers to leaders' action, practices, and policies that focus on safety. Leaders can be a role model by performing appropriate behavior and enhance consistency on creating a safety climate. Enacting means frontline actions that enhance patient safety. Lastly, elaborating means learning practices.

2.6 Behavioral theory

From the statement of problem, this research aims to focus on factors that impact hand hygiene compliances in healthcare personnel in order to improve hand hygiene adherence. The behavioral has been extensively used to identify influencing factors of hand hygiene compliance (Huis et al., 2013; Jenner, Watson, Miller, & Scott, 2002; O'Boyle, Henly, & Larson, 2001; Sax et al., 2007; Whitby et al., 2006). Most of research applied one of the following behavioral theories:

1. The theoretical domains framework (TDF)
2. Theory of reasoned action (TRA)
3. Theory of planned behavior (TPB)

2.6.1 The theoretical domain framework (TDF)

The TDF has been designed as a framework to help apply theoretic approaches to interventions aimed at behavioral changes (Cane, O'Connor, & Michie, 2012; Duncan et al., 2012). Expert consensus process was the method used to develop TDF. The process includes factor analysis and validation to determine psychological and organizational theory associated to healthcare provider clinical behavior change (Francis, O'Connor, & Curran, 2012). TDF comprises of 14 domains that allows assessment and explanation of behavioral problems and associated barriers. The 14 domains are knowledge, skills, social/professional role and identity, beliefs about capabilities, optimism, belief about consequences reinforcement, intentions, goals, memory, attention and decision processes, environmental context and resources, social influences, emotion, and behavioral regulation.

Table 2.1 The 14 domains of Theoretical Domains Framework (TDF) and theirs contents

	TDF domain definition	Constructs
1	**Knowledge** (An awareness of the existence of something)	Knowledge (including knowledge of condition /scientific rationale), Procedural knowledge, Knowledge of task environment
2	**Skill** (An ability or proficiency acquired through practice)	Skills, Skills development, Competence, Ability, Interpersonal skills, Practice, Skill assessment

Table 2.1 The 14 domains of Theoretical Domains Framework (TDF) and theirs contents (cont.)

	TDF domain definition	Constructs
3	**Social/Professional Role and Identity** (A coherent set of behaviors and displayed personal qualities of an individual in a social or work setting)	Professional identity, Social identity, Identity, Professional boundaries, Professional confidence, Group identity, Leadership, Organizational commitment
4	**Beliefs about capabilities** (Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use)	Self-confidence, Perceived competence, Self-efficacy, Perceived behavioral control, Beliefs, Self-esteem, Empowerment, Professional confidence
5	**Optimism** (The confidence that things will happen for the best or that desired goals will be attained)	Optimism, Pessimism, Unrealistic optimism, Identity
6	**Belief about consequences** (Acceptance of the truth, reality, or validity about outcomes of a behavior in a given situation)	Beliefs, Outcome expectancies, Characteristics of outcome expectancies, Anticipated regret, Consequents
7	**Reinforcement** (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus)	Rewards (proximal / distal, valued / not valued, probable / improbable), Incentives, Punishment, Consequents, Reinforcement, Contingencies, Sanctions
8	**Intentions** (A conscious decision to perform a behavior or a resolve to act in a certain way)	Stability of intentions, Stages of change model, Trans theoretical model and stages of change
9	**Goals** (Mental representations of outcomes or end states that an individual wants to achieve)	Goals (distal / proximal), Goal priority, Goal / target setting, Goals (autonomous / controlled), Action planning, Implementation intention
10	**Memory, Attention and Decision processes** (The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives)	Memory, Attention, Attention control, Decision making, Cognitive overload / tiredness

Table 2.1 The 14 domains of Theoretical Domains Framework (TDF) and theirs contents (cont.)

	TDF domain definition	Constructs
11	**Environmental context and resources** (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behavior)	Environmental stressors, Resources / material resources, Organizational culture /climate, Salient events / critical incidents, Person x environment interaction, Barriers and facilitators
12	**Social influences** (Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors)	Social pressure, Social norms, Group conformity, Social comparisons, Group norms, Social support, Power, Intergroup conflict, Alienation, Group identity, Modelling
13	**Emotion** (A complex reaction pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event)	Fear, Anxiety, Affect, Stress, Depression, Positive / negative affect, Burn-out
14	**Behavioral regulation** (Anything aimed at managing or changing objectively observed or measured actions)	Self-monitoring, Breaking habit, Action planning

Note: Information from Cane et al.

2.6.2 Theory of reasoned action

The TRA suggests that one's behavior is a function of their intent to perform that behavior. It is the intention and attitude that contribute individual to perform behavior. TRA is developed to predict and explain volitional behaviors (Pessoa-Silva et al., 2005). Behavioral intent is a function of two determinants which are subjective norms and attitude. Attitude can be defined as assessed benefits and drawbacks of the actions and outcomes which influences feeling or affective regard for a behavior (O'Boyle et al., 2001). If the outcomes seem desirable, a positive attitude toward behavior may be observed, in contrast, if the outcomes deem undesirable, a positive attitude toward the behavior may result (Ajzen, 1985). Subjective norms refers to one's perception of social pressure that influence individual to perform or not perform a behavior (O'Boyle et al., 2001).

Subjective norms are determined by overall evaluation of others' expectations or normative beliefs (O'Boyle et al., 2001). Individuals may experience social pressure that forces them to perform a given behavior. Similarly, individuals may avoid performing a given behavior objected by the majority of the social group (Ajzen, 1985).

The TRA suggests that compliance with hand hygiene recommendations is a function of the healthcare professionals' intent to perform hand hygiene. Hence, it can be implied that healthcare personnel's' intent to perform hand hygiene is a function of attitudes and subjective norms toward hand hygiene. Hence, if healthcare workers have a belief that the outcome of hand hygiene is desirable, e.g. minimize incidence of healthcare associated infection (Erasmus et al., 2010), a positive attitude toward hand hygiene may be observed (O'Boyle et al., 2001). Moreover, subjective norms represent healthcare personnel's belief about the social pressure that others exert to perform and not perform hand hygiene. For instance, if the workers believe that their colleagues, or family member expect good hand hygiene the workers are more likely to comply to hand hygiene guideline(O'Boyle et al., 2001).

2.6.3 Theory of planned behavior

According to Ajzen (1988), the TPB (figure 1) is an extension of the TRA developed to explain motivational factors that influence individuals' behavior intentions more than only attitude and subjective norms. In addition to TRA, TPB include more variables including perceived behavioral control and suggest how difficult people are willing to perform the behavior. The TPB was developed with the idea that behavior is not always under one's volitional control because people may have strong intent, a positive attitude, and motivational to comply with social pressures, however, other external factors disrupted them from conducing that behavior (Ajzen, 1985). Perceived behavioral control is determined by one's belief about the resources or obstacles associated with performance of a behavior i.e. the ease or difficulty of a particular task (O'Boyle et al., 2001). To put it differently, the TPB accounts for both perceived control and the actual control over a given behavior.

In term of hand hygiene, perceived behavioral control refers to healthcare practitioners' perceptions about the external factors that limited their ability to conduct good hand hygiene practice. With the TPB, failure to compliance to hand hygiene guideline

may occur as a result of other external factors that the employees have little control of, for example the number of sinks, time constraints, heavy workload, or patient condition (Lankford et al., 2003).

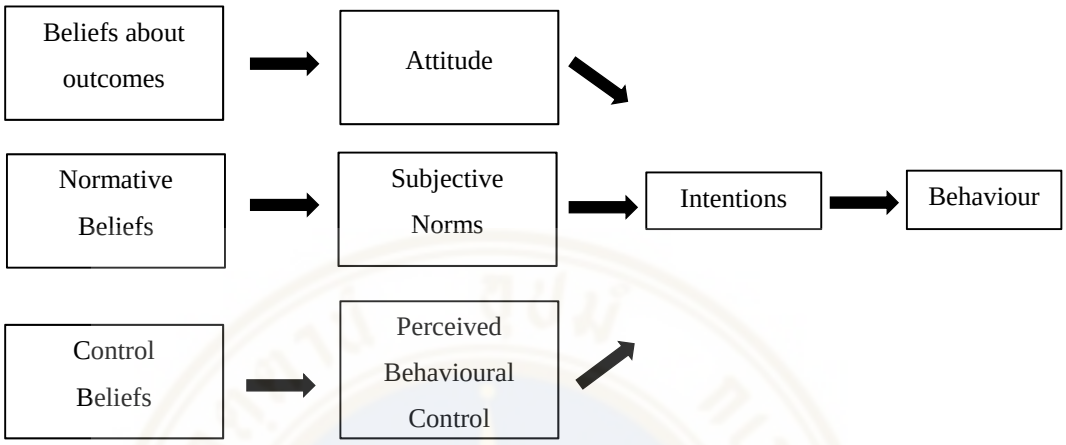

Figure 2.1 Theory of planned behavioral model

The TDF was selected in this research because it was used in many papers and can be used to identify all factors that can affect hand hygiene compliance in Kasemrad Rattanathibeth hospital. A journal named a systematic review of hand hygiene improvement strategies: a behavioral approach used a theoretical framework to predict the factors of hand hygiene in healthcare personnel (Huis et al., 2012). This journal complied the behavioral component with staff's hand hygiene by using experimental research from January 2000 to November 2009. The most frequent factors that affect hand hygiene compliances are knowledge, awareness, action control and facilitation of behavior. The minority of paper reviewed show additional factors including social influence, attitude, self-efficacy and intention (Huis et al., 2012). In the article titled application of a theoretical framework for behavior change to hospital workers' real-time explanations for noncompliance with hand hygiene guidelines, the significant dominants are memory/ attention/decision making and knowledge (Fuller et al., 2014). Another research named Development of a theory-based instrument to identify barriers and layers to best hand hygiene practice among healthcare practitioners reported that the influencing factors for noncompliance are motivation, strong beliefs about capabilities, social influence, participants' sense of professional identity and memory. A research, using psychological theory to inform methods to optimize the implementation of a hand hygiene intervention

also used the theoretical domains framework to understand processes to change staff behavior in order to achieve to good compliance (Boscart et al., 2012). In conclusion, there were a total of nine domains that has an effect on nurse's hand hygiene behaviors including are knowledge and skills, consequences, believe about capacities, incentive and goal, social influences, attention and self-monitoring. The factor that significant in all researches are memory/attention and decision processes follow by knowledge, believe in capacities and social influences. Summary of the finding can be found in table 2.2

Table 2.2 Summary of literature reviewed based on 14 domains of theoretical domain framework

Factors	**Paper1** A systematic review of hand hygiene improvement strategies: a behavioural approach (Huis et al., 2012)	**Paper2** Application of a theoretical framework for behaviour change to hospital workers' real-time explanations for noncompliance with hand hygiene guidelines (Fuller et al., 2014)	**Paper3** Development of a theory-based instrument to identify barriers and layers to best hand hygiene practice among healthcare practitioners (Dyson, Layton, Cath, & Cheater, 2013)	**Paper4** Using psychological theory to inform methods to optimize the implementation of a hand hygiene intervention (Boscart et al., 2012)
1. Knowledge	✓	✓		✓
2. Skills	✓			✓
3. Social/professional role and identity			✓	
4. Believe about capacities [self-efficacy]	✓		✓	✓
5. Optimism				
6. Believe about consequences [anticipated outcomes/attitude]	✓			✓
7. Reinforcement			✓	✓
8. Intentions	✓			
9. Goal				✓
10. Memory, attention and decision processes	✓	✓	✓	✓

Table 2.2 Summary of literature reviewed based on 14 domains of theoretical domain framework (cont.)

Factors	Paper1 A systematic review of hand hygiene improvement strategies: a behavioural approach (Huis et al., 2012)	Paper2 Application of a theoretical framework for behaviour change to hospital workers' real-time explanations for noncompliance with hand hygiene guidelines (Fuller et al., 2014)	Paper3 Development of a theory-based instrument to identify barriers and layers to best hand hygiene practice among healthcare practitioners (Dyson, Layton, Cath, & Cheater, 2013)	Paper4 Using psychological theory to inform methods to optimize the implementation of a hand hygiene intervention (Boscart et al., 2012)
11.Environmental context and resources				
12.Social influence	✓		✓	✓
13.Emotion				
14.Behavior regulation	✓			✓

2.7 Conceptual framework

In this research, the theoretical domains framework is used to identify the factors of noncompliance toward hand hygiene practice. Moreover, the framework is also used to better understand the behavior that can be improved in order to enhance quality of care in Kasemrad Rattanathibeth hospital.

The domains from theoretical domains framework were used to explain the behavior, barrier, and compliance of hand hygiene among staff in Kasemrad Rattanathibeth hospital. The domains were categories into internal and external factors as shown in figure 2. The definition of each variable is described in below.

2.7.1 Internal Factors

1. Knowledge and Skill: Knowledge can be defined as an awareness of existence of something. Knowledge according to TDF includes knowledge about condition/ scientific rationale, schemas, mindsets, illness representation, procedural knowledge and knowledge of task environment (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015). For this study, knowledge means awareness and role clarify of the rationale of hand hygiene and the correct hand washing technique (Huijg et al., 2014).

Skill is an ability or proficiency acquired through practice (Cane et al., 2012). Skills refer to skills development, competency, ability, interpersonal skills, practice, and skill assessment (Michie, Johnston, Abraham, et al, 2015). In healthcare setting, skill is the ability to perform correct hand hygiene during appropriate time following the guidelines (Huijg et al., 2014).

2. Social/professional role and identity (Self-Standard): Social/ professional role and identity means a coherent set of behaviours and displayed personal qualities of an individual in a social or work setting (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015). This term includes social identity, professional boundaries, professional confidence, group identity, leadership, social norm and organizational commitment. In healthcare setting, profession role is a responsibility to follow the hand hygiene guidelines (Huijg et al., 2014).

3. Beliefs about capabilities and Optimism: Beliefs about capabilities can be defined as acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use (Cane et al., 2012). The term covers self-confidence, perceived competence, self-efficacy, perceived behavioural control, self-esteem, empowerment, and professional confidence (Michie, Johnston, Abraham, et al, 2015). In this study, the term refers to perceived self-efficacy and control as potential barriers or facilitators to perform hand hygiene (Huijg et al., 2014).

Optimism means the confidence that things will happen for the best or that desired goals will be attained (Cane et al., 2012). In healthcare setting, optimism means the healthcare personnel need to expect more good things to happen than bad (Huijg et al., 2014).

4. Beliefs about consequences: Beliefs about consequences refer to acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation. Things

that constructed toward this term are outcome expectancies, anticipated regret, appraisal/ evaluation/review, consequents, attitudes, contingencies, reinforcement/ punishment/ consequences, incentives/ rewards, salient event/ sensitization/ critical incidents (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015). In healthcare setting, poor hand hygiene can result in bad consequences such as patient being infected or healthcare worker transmitting infectious disease around hospital environment (Huijg et al., 2014).

5. Memory/ Attention/ Decision process: Memory, attention and decision processes is the ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives. This factor include memory, attention, attention control, decision making, and cognitive overload/tiredness (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015).

6. Emotion: Emotion is a complex reaction pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event. Emotion includes fear, anxiety, affect, stress, depression, positive/negative affect, and burn-out (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015). Healthcare worker should work with positive emotion such as comfortable, relaxation and cheerful to make patient feel better (Huijg et al., 2014).

7. Behavioral regulation: Behavioural regulation is anything aimed at managing or changing objectively observed or measured action. This term includes self-monitoring, breaking habit and action planning (Cane et al., 2012) (Michie, Johnston, Abraham, et al, 2015). It means healthcare workers have a clear plan when perform hand hygiene following the guidelines (Huijg et al., 2014).

2.7.2 External Factors

1. Reinforcement/ Intention/ Goal: Reinforcement means increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus (Cane et al., 2012). Reinforcement includes reward, incentives, punishments, consequent, contingencies, and sanction (Michie, Johnston, Abraham, et al, 2015).

Intentions can be defined as a conscious decision to perform a behaviour or a resolve to act in a certain way (Cane et al., 2012). Healthcare worker should have a good intention toward the patients and toward other healthcare worker. They should

have an intention to wash their hand to protect both themselves, their colleagues and their patients (Huijg et al., 2014).

Goals are mental representations of outcomes or end states that an individual want to achieve (Michie, Johnston, Abraham, et al, 2015). An example of a goal that covers hand hygiene in healthcare setting is to prevent transmission of infectious disease from patient to patient (Huijg et al., 2014).

2. Social influences: Social influences refer to those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors (Cane et al., 2012). Social influences include social pressure, social norms, group conformity, social comparison, group norms, social support, power, intergroup conflict, alienation, group identity, and modeling (Michie, Johnston, Abraham, et al, 2015). In this study, whether other colleagues perform hand hygiene or not might influences the compliance of hand hygiene (Huijg et al., 2014).

3. Environmental context and resources: Environmental context and resources refers to any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behavior (Cane et al., 2012). The factors include environmental stressors, resources/ material resources, organizational culture/ climate, salient events/ critical incidents, person and environment interaction, and barriers and facilitators (Michie, Johnston, Abraham, et al, 2015). An example of a good hospital environment that would facilitate good hand hygiene compliance is having an antiseptic in front of every patient room (Huijg et al., 2014).

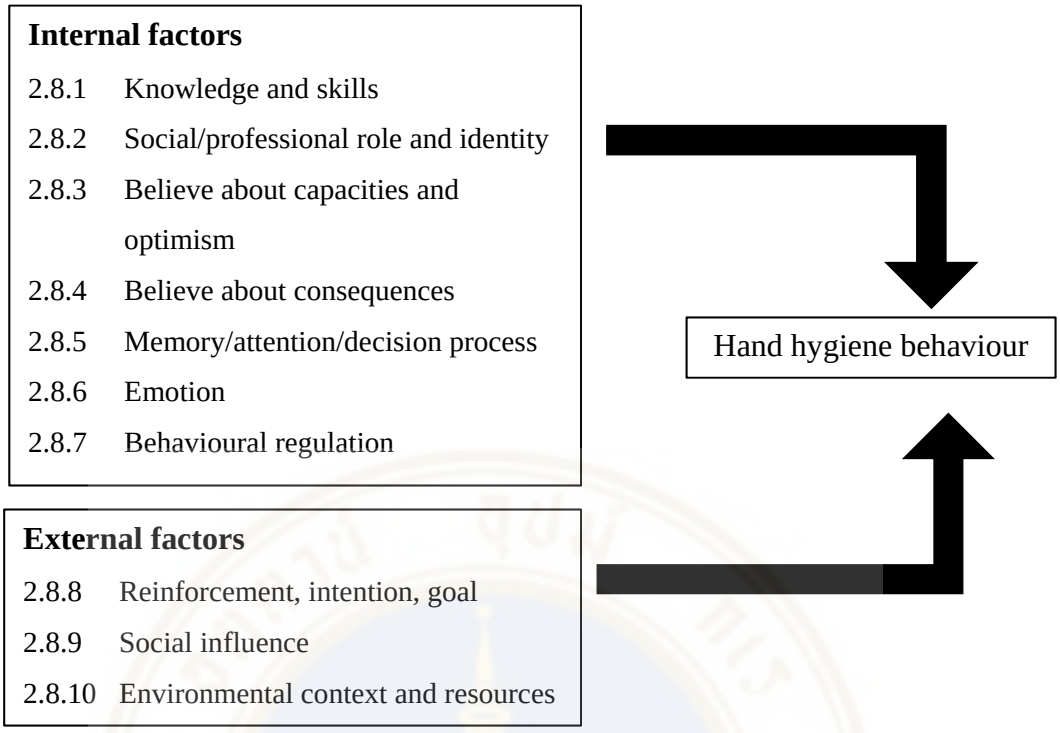

Figure 2.2 Conceptual Framework

2.8 Hypotheses

H1: Knowledge and skills have a positive relationship on hand hygiene behaviour

H2: Social/professional role and identity has a positive relationship on hand hygiene behaviour

H3: Believe about capacities [self-efficacy] and optimism has a positive relationship on hand hygiene behaviour

H4: Believe about consequences [anticipated outcomes/attitude] has a positive relationship on hand hygiene behaviour

H5: Memory, attention and decision processes have a positive relationship on hand hygiene behaviour

H6: Emotion has a positive relationship on hand hygiene behaviour

H7: Behavioural regulation has a positive relationship on hand hygiene behaviour

H8: Reinforcement, intentions and goals have a positive relationship on hand hygiene behaviour

H9: Social influences [norms] have a positive relationship on hand hygiene behaviour

H10: Environmental context and resources has a positive relationship on hand hygiene behaviour.

CHAPTER III
RESEARCH METHADOLOGY

This chapter focuses on the methodology and process of the research. It is comprised of six sections. The six sections discuss issues of research design, sample population, subjects of the study, data collection process, research instrument, and data analysis.

3.1 Research design

The study design is designed as an exploration study to identify and analyze enabling factors that affect hand hygiene compliance. Then, the observation and self-reporting by using opened-ended questions was used to collect data. The content validity was also tested. Participants completed their questionnaire as anonymous and all information was kept confidential. Descriptive statistics is used to analyze the data. Statistic values considered in this study include percentage, standard deviation, and mean. Moreover, Spearman's rank correlation coefficient, one-way ANOVA and post-hoc analysis was also used in this study. All statistical analysis was done via SPSS program.

3.2 Sample population

Kasemrad Rattanathibeth hospitalis a 400-bed tertiary care hospital, which located at Bang Yai district, Nonthaburi province, Thailand. It is one of private hospital chains in Bangkok Chain Hospital Public Company Limited (BCH). As of 2016, Kasemrad Rattanathibeth hospital has total 500 employees including healthcare personnel and non-patient care personnel that work separately between front-line and back office but middle managers and over need to coordinate between departments to care patients smoothly and effectively. However, as of 2016, the hospital has healthcare workforces of 210 people, consists of 62 doctors, 76 nurses, and 72 nurse assistants. These numbers do

not include management teams and back office workers. Hence, the study conducted among healthcare provider whom are in contact with inpatients, and critical areas. The number of population in this study is 210. Convenience sampling technique was applied for selecting sample for questionnaire distribution; where only the healthcare personnel present at the hospital during in May – June, 2016 were asked to participate in the study. In order to acquire appropriate sample size, the formula was using to calculate the sample since the size of population is exactly known. According to Taro Yamane equation (1967), the estimate sample size for confidence level of 95% of N = 210 should be at least n = 138 samples. A sample size was collected of 195 healthcare providers in Questionnaires section. For regarding to the observation, only 129 healthcare providers were available to participate in this process.

3.3 Subjective of the study

Quantitative and qualitative data was collected from each healthcare personal including doctors, nurses and nurse assistants via observation and self-report. Appropriate hand washing is indicated before patient contact, before aseptic procedures, after body fluid exposure risk, after patient contact and after contact with patient surroundings. Data were collection from each inpatient unit of Kasemrad Rattanathibeth hospital including intensive care unit, nursery, ward 3A, ward 3B, ward 4, ward 7, ward 8, operation room, labor room and two critical areas which are emergency room and hemodialysis room.

3.4 Data collection

The process of data collection was done during May – June 2016. The researcher uses three steps for collecting information of the research subject. A first step is self-reporting; hard copies of questionnaires were distributed to the target respondents in the morning by chief of each ward. After the participants completed their questionnaires, they put the questionnaires into a returning box which located at each ward. The researcher then collected all the questionnaires from the box in the evening. A second step is observational survey, an observer is monitoring respondent's behavior of hand hygiene from five indications, including before patient contact, before an aseptic procedure, after

body fluid exposure risk, after patient contact, and after contact with patient surroundings across three job positions, consists of doctor, nurse, and nurse assistance. An observer had only one person who is a back office staff who is not belonging to the observed departments and has no relationship with doctors, nurses and nurse assistances to avoid bias. The observer visited different wards randomly at random time within 2 weeks. The last step is real time interview, if the observer found any medical personals who do not perform hand hygiene, the observer asked the respondents about reason why they not follow protocol and recorded in paper. The observation was use to cross check with self-report questionnaires regarding hand hygiene practice.

Moreover, Kasemrad Rattanathibeth hospital has an Infectious Control committees (ICC), a multidisciplinary team from Infection Control. ICC is responsible for monitoring program policies implementation and recommend corrective actions for the prevention and control of infection. ICC also establish standards for patient care, educate all grades of staff regarding infectious control policy, practice and procedure, and provide availability of appropriate supplies. ICC reported an annual infection control plan and the results in annual hospital meeting. The researcher was not part of Infectious Control Committees, hence, the research participants were willing to give the truthful answer instead of stating untruthful fact to impress the ICC.

3.5 Instrument

The questionnaire selected for use in this study was modified from previous literatures that are Development of a theory-based instrument to identify barriers and layers to best hand hygiene practice among healthcare practitioners and WHO (2009). It had never been used with a Thai population and in Thai language.

The questionnaire used in the research consisted of three sections.

1. The first section is asking on personal information of respondent, which is including demographic characteristics, healthcare personnel position and experiences of work. There are six questions which employed multiple choice questions.

2. The second section is asking on respondent's opinion toward factors associated with hand hygiene compliance, which derived from previous literature, Dyson et al. (2013). There are 35 questions were asked in this section. Likert 7-points rating scales questions was applied for determining the respondent's opinion. A 7-point scale

ranging from “Strongly Agree” on number seven to “Strongly Disagree” on number one. Thus, in order to assess the reliability of measure base on the original research, the author derived the 7-point scale as same as Dyson et al. (2013).

3. The third section is hand hygiene behavior. Questionnaires were applied for determining the respondent’s opinion and their behavior toward hand hygiene, which adopted questions from WHO 2009’s guideline include the correct hand washing procedure, and when to perform hand washing. There are 6 questions were asked in this section. All of questions were applied in term of ordinal scale with five level measurements. The reason to assess with 5-points scale of ordinal measurement instead of 7-points based on frequency of hand washing. Other reason is to avoid the tendency of data in specific direction. A 5-point scale ranging from “More than 10 time” on number five to “Never” on number one.

The questionnaires were distributed by using paper-based survey in the self-reporting.

3.6 Questionnaire Validity and Reliability

1. Validity of this questionnaires were verified by obtaining quality assurance of academic 3 experts in related field which are Medical Director, Infectious Control Nurse and Quality director in Kasemrad Rattanathibeth hospital.

2. Reliability of the questionnaire was verified by conducting a pilot study with 30 questionnaires. In order to measure reliability of questionnaire, Cronbach’s alpha test was applied. The acceptance of reliability is expected alpha coefficients be higher than 0.70 (Nunnally, 1978).

3.7 Data analysis

After complete in gathering data from target participants, all of the primary data were coded and interpreted by using the Statistic Package for Social Science (SPSS), which is software package use for statistical analysis. Furthermore, the researcher also implements both descriptive and inferential statistics for analyzing data from survey and observation.

For descriptive statistic, it is a statistical technique that applies for transforming numerical data into useful form. The general use of descriptive statistic is for explain the characteristic of population. Transformed data is usually represented into form of table, chart, or figure. Using descriptive statistics can help researcher to measure the different of opinion and behavior among participants. So frequency, percent, mean, and standard deviation were chosen to describe the personal information and opinion of doctor and nurse from Kasemrad Rattanathibeth hospital towards hand hygiene compliances. In case of inferential analysis, the researcher selects correlation test for solving ten research hypotheses. It allows author to identify the relationship between internal and external variables with hand hygiene behavior. According to Zigmund et al., (2013), the strength of relationship can be explained by measuring correlation coefficient value or r-value. The r-value that nearest zero is explains no relationship between variables, while correlation of one refers to perfect correlation. Furthermore, relationship can be represented into two directions, positive (+) or negative relationship (-). Due to difference of measurement used in independent variables (7-points scale) and dependent variables (5-point scale), Spearman's rank correlation test was applied. This test is appropriate to measure the relationship of ordinal data, continuous data and discrete data (Lehman, 2005; Hinkle et al., 2003). In order to interpret the result, the measurement from table 3.1 was applied.

Table 3.1 Interpretation of correlation coefficient

Correlation coefficient (r)	Interpretation
-1	Perfect negative correlation
btween -0.76 and -0.99	Very strong negative correlation
btween -0.56 and -0.75	Strong negative correlation
between -0.26 and -0.55	Moderate negative correlation
between -0.01 and -0.25	Weak negative correlation
0	No correlation
between 0.01 and 0.25	Weak positive correlation
between 0.26 and 0.55	Moderate positive correlation
between 0.56 and 0.75	Strong negative correlation
between 0.76 and 0.99	Very strong negative correlation
1	Perfect positive correlation

Furthermore, one-way ANOVA and post-hoc analysis are selected for comparing the opinion and behavior of hand hygiene among doctor, nurse, and nurse assistance, as well as observe the behavior of hand hygiene from five indications, including before patient contact, before an aseptic procedure, after body fluid exposure risk, after patient contact, and after contact with patient surroundings across job position. Least significant different test (LSD) is choose for identify the different among categories.

CHAPTER IV
DATA ANALYSIS

This chapter aims to represent the analysis of quantitative and qualitative data obtained from questionnaires and observation. The data analysis can be divided into six sections. At the beginning, the reliability analysis has been tested with Cronbach's alphatest. Second section is applying descriptive analysis to summarize the result from close-ended questionnaire. Third section covers the use of inferential statistic to measure the relationship between ten factors and behavior with hand hygiene. The fourth section was applied both descriptive and inferential statistical analyses to compare hand hygiene behaviorparticipants from three groups, including doctor, registered nurse (RN), and nurse assistance (NA). The fifth section is result of observation, which also applied both descriptive and inferential statistical analyses to study difference among respondent's behavior of hand hygiene from five indications. The last section discusses the empirical finding and compares the result to past research. IBM Statistical Package for Social Sciences (SPSS) software version 21.0 was chosen as an analysis tool. The last section selects content analysis to identify the opinion of interviewees.

4.1 Reliability Analysis

Before distributing of the questionnaire, the author performed pilot test in order to identify quality of research instruments. As mentioned by Saunders et al. (2012), conducting pilot test can assist the researcher to know that participants will understand questionnaire clearly without misunderstanding, as well as it also helps to check the internal consistency of variables in questionnaire.

In this study, pilot testing was conducted during April, 2016 with a sample of 30 respondents. In order to measure reliability, Cronbach's alpha test was applied. The Cronbach's alpha statistic is commonly used to test internal consistency of Likert scale question. The threshold of alpha coefficient should not lower than 0.70 in order

to meet with the typical prerequisites of reliability of research instrument (Nunnally, 1978). The result represents in the table 4.1 indicates alpha coefficient varies from 0.736 to 0.889, which is higher than 0.70. Therefore, the questionnaire has high internal consistency and considered as reliable.

Table 4.1 Reliability statistics represented by Cronbach's alpha

n = 195	Cronbach's Alpha	No. of Items
Internal factor		
Knowledge and skills	0.882	3
Social/profession role and identity	0.742	3
Believe about capacities and optimism	0.736	4
Believe about consequences	0.790	4
Memory/attention/decision processes	0.749	3
Emotion	0.889	3
Behavioral regulation	0.785	4
External factor		
Reinforcement, intentions and goals	0.787	4
Social influences	0.834	4
Environmental context and resources	0.833	3
Overall score of influencing factors	0.843	35
Hand hygiene behavior	0.737	6

4.2 Descriptive Analysis

To summarize primary data and represents it in an appropriate way, descriptive analysis was suggested to use in summarizing personal data and level of opinion towards factors of hand hygiene. Frequency, percent, mean, and standard deviation were applied to summarize collecteddata from 195 participants, either doctors or nurses/ nurse assistants from KasemradRattanathibeth hospital.

Table 4.2 Summary of Respondents Information

	n = 195	Frequency	Percent
Gender	Male	41	21
	Female	154	79
Age	21-30 year old	85	43.6
	31-40 year old	80	41
	41-50 year old	23	11.8
	More than 50 year old	7	3.6
Education status	Lower than Bachelor's Degree	64	32.8
	Bachelor's Degree	108	55.4
	Master's Degree	18	9.2
	Higher than Master's Degree	5	2.6

From the table 4.2, the total number of respondent is 195 people, comprising of 154 females (79%) and 41 males (21%).Most respondents age between 21 and 30 years old (43.6%). Then, the next largest proportion is 80 respondents who aged between 31 and 40 years old(41%). Among the sample, there were 23 and 7 respondents whose ages were between 41 and 50 years old (11.8%) and more than 50 years old (3.6%), respectively. Furthermore, the largest proportion of respondents have completed their undergraduate degree, which accounted as 55.4% of the total sample. Respondents with lower than undergraduate degree qualification accounted for 32.8% of the total sample population. There were 9.2% or 18 respondents who have highest educational background as Master Degree. There was only 2.6% or 5 out of 195 participants who have qualification level is higher than Master degree.

Table 4.3 Summary of Career Background

	n = 195	Frequency	Percent
Working experience	Lower than a year	30	15.4
	1-3 years	81	41.5
	4-6 year	35	17.9
	More than 6 years	49	25.1
Profession	Doctor	60	30.8
	Nurse	66	33.8
	Nurse assistance	69	35.4

Table 4.3 Summary of Career Background (cont.)

	n = 195	Frequency	Percent
Working area	Medicine	14	7.2
	Surgery	11	5.6
	Obstetric -Gynecology	8	4.1
	Pediatric	8	4.1
	Orthopedics	6	3.1
	ENT	8	4.1
	Anesthesiology	7	3.6
	Emergency room	17	8.7
	Intensive Care Unit	7	3.6
	Nursery	11	5.6
	Ward 3A	7	3.6
	Ward 3B	14	7.2
	Ward 4	11	5.6
	Ward 7	17	8.7
	Ward 8	14	7.2
	OR	9	4.6
	Labour room	9	4.6
	Hemodialysis room	17	8.7

According to table 4.3, most participants in the study have working duration between one to three years which can be accounted for 41.5% of the total sample. Out of 195 participants, there were 49 respondents (25.1%) whose working durations were above six years. Furthermore, 17.9% of respondents have working experience between four to six years. Additionally, there were 84.6% of respondents who work with Kasemrad Ratthanatibeth Hospital more than one year.

The descriptive results show that there are similar proportions of different working positions between doctor, nurse and nurse assistance. Out of 195 respondents, 60 of them were doctors (30.8%). Nurses were accounted for 33.8% of the total sample while nurse assistances were accounted for 35.4%. Most of the participants are from ER, Ward 7, and Hemodialysis room, where each areas accounting for 8.7% of total participants.

Table 4.4 Average Score of Influencing Factors toward Hand Hygiene Compliance

n = 195	Mean	S.D.
Internal factor		
Knowledge and skills	5.74	.88
Social/ profession role and identity	6.26	.77
Believe about capacities and optimism	4.83	1.21
Believe about consequences	5.87	.86
Memory/ attention/ decision processes	4.20	1.16
Emotion	3.23	1.44
Behavioral regulation	4.21	1.12
External factor		
Reinforcement, intentions and goals	4.83	1.14
Social influences	4.31	1.22
Environmental context and resources	5.36	1.00

For table 4.4 – 4.6, the researcher applies mean and standard deviation to explain the dispersion of questions that measure with Likert 7-point scale. For the internal factors of compliance hand hygiene, there are seven factors, which include knowledge and skills, social/profession role and identity, believe about capacities and optimism, believe about consequences, memory/attention/decision processes, emotion, and behavioral regulation. Refers to the external factors of compliance hand hygiene, there are three factors include reinforcement, social influence, and environmental context and resources.

Regarding to table 4.4, the average mean score of all influential factors towards hand hygiene compliance varies from 3.23 to 6.26. It was found that respondent were mostly agreed with social/profession role and identity ($\bar{x}$ = 6.26), then followed by believe about consequences ($\bar{x}$ = 5.87), knowledge and skills ($\bar{x}$ = 5.74), environmental context and resources ($\bar{x}$ = 5.36), reinforcement, intentions and goals ($\bar{x}$ = 4.83), believe about capacities and optimism ($\bar{x}$ = 4.83), social influences ($\bar{x}$ = 4.31), behavioral regulation ($\bar{x}$ = 4.21), memory/attention/decision processes ($\bar{x}$ = 4.20), while emotion has lowest score among constructs ($\bar{x}$ = 3.23).

Table 4.5 Average mean and Standard Deviation of Internal Factors of Compliance Hand Hygiene

	n = 195	Mean	S.D
Knowledge and skills	Hand hygiene training is available to me	5.70	1.10
	There are adverts or newsletters about hand hygiene in my workplace	5.74	.94
	Hand hygiene guidelines are easily accessible	5.78	.91
Social/ profession role and identity	I engage in hand hygiene out of respect for my patients	6.21	.91
	Hand hygiene is a non-negotiable part of my role	6.32	.85
	Hand hygiene is part of my professional culture	6.25	.88
Believe about capacities and optimism	There are some practical barriers to hand hygiene because of my particular job/role	4.63	1.56
	I am reluctant to ask others to engage in hand hygiene	4.26	1.91
	The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary	4.51	1.77
	I am confident in my ability to carry out hand hygiene	5.93	1.05
Believe about consequences	If I do not engage in hand hygiene I may catch an infection	6.26	.99
	If I omitted hand hygiene I would blame myself for infections	6.06	1.14
	If I engage in hand hygiene it improves patient confidence	6.13	1.03
	If I miss out hand hygiene I will be subject to disciplinary action	5.02	1.68
Memory/ attention/ decision processes	I feel complacent about hand hygiene	6.00	1.43
	I cannot be bothered with hand hygiene	3.26	1.89
	I disagree with some parts of the hand hygiene guidelines	3.35	1.78
Emotion	Sometimes I miss out hand hygiene simply because I forget it	3.42	1.54
	Hand hygiene is not second nature for me	3.09	1.68
	I am more likely to forget hand hygiene if I am tired	3.19	1.62
Behavioral regulation	It is difficult for me to attend hand hygiene courses due to time pressure	3.69	1.61
	Some hospital policy targets make hand hygiene more difficult (such as high bed occupancy)	3.85	1.53
	My environment is cluttered	4.10	1.65
	My area of work has available sink and hand washing products	5.19	1.52

In term of knowledge and skills, the results show that the majority of the respondents agreed that hand hygiene guidelines are easily accessible ($\bar{x}$ = 5.78), as their workplace provides adverts or newsletters and also arrange training session on hand hygiene for their healthcare personals ($\bar{x}$ = 5.70).

In case of social/profession role and identity, it was found that most of the respondents agreed thathand hygiene is a non-negotiable part of their role ($\bar{x}$ = 6.32), but it is the part of their professional culture ($\bar{x}$ = 6.25). Furthermore, the participants agreed to engage in hand hygiene out of respect for their patients ($\bar{x}$ = 6.21).

Regarding to believe about capacities and optimism, it was found that the respondents were agreed to have confident in ability to carry out hand hygiene ($\bar{x}$ = 5.93). However, they were neither agreed nor disagreed with the rest of questions, such as barriers to hand hygiene because of their job/role ($\bar{x}$ = 4.63), requiring of frequency of hand hygiene ($\bar{x}$ = 4.51), or even asking others to perform in hand hygiene ($\bar{x}$ = 4.26).

For believe about consequences, participants were mostly agreed with catching an infection if they do not engage in hand hygiene ($\bar{x}$ = 6.26), followed improving confidence of patient if engage hand hygiene ($\bar{x}$ = 6.13), and self blaming for infection if not perform hand hygiene ($\bar{x}$ = 6.06). The lowest score of this construct is that the participant will be subjected to disciplinary actionifone misses out on hand hygiene ($\bar{x}$ = 5.02).

Regarding to memory/attention/decision processes, most of respondent agreed that they feel complacent about hand hygiene ($\bar{x}$ = 6.00). It was found that they agreed with some parts of the hand hygiene guidelines ($\bar{x}$ = 3.35), as well as bothered with hand hygiene ($\bar{x}$ = 3.26).

The results also show that respondents disagreed towards miss out hand hygiene simply because they forget it ($\bar{x}$ = 3.42) or tired ($\bar{x}$ = 3.19). Furthermore, the respondents also disagreedthathand hygiene is not a second nature ($\bar{x}$ = 3.09).

In term of regulation, it was foundthat most of the respondents agreed that their area of work has available sink and hand washing products ($\bar{x}$ = 5.19). However, the respondents disagreed that their environment is clustered ($\bar{x}$ = 4.10). Furthermore, the participants disagreed that some hospital policy targets make hand hygiene more difficult ($\bar{x}$ = 3.85), or attend hand hygiene courses due to time pressure ($\bar{x}$ = 3.69).

Table 4.6

Table 4.6 Average mean and Standard Deviation of External Factors of Compliance Hand Hygiene

	n = 195	Mean	S.D
Reinforcement, intentions and goals	When staff engage in hand hygiene they are praised	4.82	1.44
	I engage in hand hygiene because I do not want to let the team down	4.83	1.46
	Supervision from senior staff means that carrying out hand hygiene is easier for me	4.83	1.46
	My hand hygiene is encouraged by others	4.83	1.36
Social influences	I feel angry if hand hygiene is not carried out by others	4.02	1.46
	I feel frustrated when others omit hand hygiene	4.09	1.52
	I feel guilty if I omit hand hygiene	4.56	1.44
	I feel ashamed if I omit hand hygiene	4.57	1.44
Environmental context and resources	WHO targets have led to improvements in my hand hygiene	5.22	1.21
	Hospital targets relating to infection or hand hygiene has led to improvements in my hand hygiene	5.49	1.07
	Some strategies designed to improve hand hygiene influence my practice	5.36	1.16

In case of reinforcement, it was found that respondents agreed with their hand hygiene is encouraged by others ($\bar{x}$ = 4.83), as well as supervision from senior staff ($\bar{x}$ = 4.83). Furthermore, they were agreed to engage in hand hygiene because they did not want to let the team down ($\bar{x}$ = 4.83). Additionally, respondents agreed that staff will be praised if they engage in hand hygiene ($\bar{x}$ = 4.82)

However, the respondents were neither agreed nor disagreed toward feeling guilty or ashamed if they omit hand hygiene, with mean score of 4.57 and 4.56, respectively. Moreover, they disagreed to feel frustrated or angry when others omit hand hygiene with mean score of 4.09 and 4.02, respectively.

For the environmental context and resource, the results show that the respondents mostly agreed that hospital targets relating to infection or hand hygiene has led to improvements in their hand hygiene ($\bar{x}$ = 5.49), followed by hand hygiene strategies ($\bar{x}$ = 5.36), and influences from WHO ($\bar{x}$ = 5.22).

Table 4.7 Frequency of hand washing in one day

n = 195	Frequency	Percent
3 - 5 times	7	3.6
6 - 10 times	19	9.7
Over 10 times	169	86.7
Total	**195**	**100.0**

According to table 4.7, it was found that almost all of the respondents have washed their hand over ten times per day, which accounted for 86.7%.Out of 195 respondents, 19 of them performed hand washing between six and ten times per day (9.7%). Only 3.6% or seven respondents washed their hand less than five times per day.

Table 4.8 Hand washing behavior

n = 195	Frequency of behavior				
	Never	Rarely	Sometime	Often	Always
Frequency of hand washing before contact patient	4 2.1%	-	10 5.1%	61 31.3%	120 61.5%
Frequency of hand washing before doing aseptic procedures	-	-	5 2.6%	63 32.3%	127 65.1%
Frequency of hand washing after contact body fluid	-	-	-	52 26.7%	143 73.3%
Frequency of hand washing after contact patient	-	-	2 1%	64 32.8%	129 66.2%
Frequency of hand washing after contact with patient surroundings	-	-	11 5.6%	67 34.4%	117 60%

Regarding to table 4.8, the result shows that more than sixty percent of the participants always perform hand washing before they make any contact with their patient. It was found that 61.5% of the total respondents washed their hands before contacting the patient. Out of 195 respondents, 127 of them always wash their hands before doing aseptic procedures (65.1%). Among other activities, 73.3% or 143 respondents always wash their hands after contacted their patients' body fluid. Furthermore, 66.2% of overall

participants always wash their hand after contacted with their patient. The result also shows that 60% or 117 respondents performed hand washing after contact with patient surroundings. However, about 26.7% - 34.4% of respondents often wash their hand when they contact with their patients, while 1% - 5.6% sometime do so. Only four respondents or 2.1% never wash their hands before contacting their patient.

4.3 Hypothesis Testing

In order to test research hypotheses, the researcher chooses Spearman's rank correlation coefficient analysis to test the relationship between ten independent variables and behavior with hand hygiene. The acceptance level is set to 95% as the significant level or p-value lower than 0.05 for accepting research hypotheses. The results were displayed in table 4.9. Then, the interpretation of relationship and hypotheses will be solved as below.

Table 4.9 The analysis of relationship between hand hygiene behavior and indicators

	Behavior with hand hygiene		
	r-value	**p-value**	**Relationship**
Knowledge and skills	.146*	.042	Weak positive
Social/profession role and identity	-.020	.778	Weak negative
Believe about capacities and optimism	.262**	.000	Moderate positive
Believe about consequences	-.056	.439	Weak negative
Memory/attention/decision processes	-.009	.901	Weak negative
Emotion	.116	.106	Weak positive
Behavioral regulation	.169*	.018	Weak positive
Reinforcement, intentions and goals	-.093	.195	Weak negative
Social influences	.205**	.004	Weak positive
Environmental context and resources	.082	.254	Weak positive

*p-value < 0.05

**p-value < 0.01

H1: Knowledge and skills have a positive relationship on hand hygiene behavior

According to the table, the r-value of 0.146 represents the relationship between knowledge and skills and hand hygiene behavioras weak positive. The result shows knowledge and skills has relationship on hand hygiene behaviorat 0.05 significant level (p-value = 0.042, Sig. < 0.05). Hypothesis 1 was **supported.**

H2: Social/ professional role and identity has a positive relationship on hand hygiene behavior

The r-value of -0.020 represents the relationship between social/ professional role and identity and hand hygiene behavioras weak negative. The result shows social/ professional role and identity has no relationship on hand hygiene behavior at 0.05 significant level (p-value = 0.778, Sig. > 0.05). Hypothesis 2 was **rejected.**

H3: Believe about capacities [self-efficacy] and optimism has a positive relationship on hand hygiene behavior

From the table, the result shows that believe about capacities and optimism has a relationship on behavior with hand hygiene at 0.05 significant level (p-value = 0.000, Sig. <0.05). However, the r-value of 0.262 represents the relationship between believe about capacities and optimism and hand hygiene behavior as moderate positive. So the hypothesis 3 was **supported.**

H4: Believe about consequences [anticipated outcomes/attitude] has a positive relationship on hand hygiene behavior

The r-value of -0.056 represents the relationship between believe about consequences and hand hygiene behavior as weak negative. However, the result shows believe about consequences has no relationship on behavior with hand hygiene at 0.05 significant level (p-value = 0.439, Sig. > 0.05). Hypothesis 4 was **rejected.**

H5: Memory, attention and decision processes have a positive relationship on hand hygiene behavior

As seen in the table, the r-value of -0.009 represents the relationship between memory/ attention/decision processes and hand hygiene behavior as weak negative. The result shows that memory/ attention/decision processes has no relationship on behavior with hand hygiene at 0.05 significant level (p-value = 0.901, Sig. > 0.05). Hypothesis 5 was **rejected.**

H6: Emotion has a positive relationship on hand hygiene behavior

The r-value of 0.116 represents the relationship between emotion and behavior with hand hygiene as weak positive. However, the result shows that emotion has no relationship on behavior with hand hygiene at 0.05 significant level (p-value = 0.106, Sig. >0.05). So the hypothesis 6 was **rejected.**

H7: Behavioral regulation has a positive relationship on hand hygiene behavior

From the table, the result shows behavioral regulation has a relationship on hand hygiene behavior at 0.05 significant level (p-value = 0.018, Sig. <0.05). However, the r-value of 0.169 represents the relationship between behavioral regulation and hand hygiene behavior as weak positive. So the hypothesis 7 was **supported.**

H8: Reinforcement, intentions and goals have a positive relationship on hand hygiene behavior

As seen in the table, the r-value of -0.093 represents the relationship between reinforcement, intentions and goals and hand hygiene behavior as weak negative. The result shows reinforcement, intentions and goals has no relationship with and hygiene behavior at 0.05 significant level (p-value = 0.195, Sig. > 0.05). Hypothesis 8 was **rejected.**

H9: Social influences [norms] have a positive relationship on hand hygiene behavior

From the table, the result showsthatsocial influenceshave a relationship on hand hygiene behavior at 0.05 significant level (p-value = 0.004, Sig. < 0.05). Furthermore, the r-value of -0.205 represents the relationship between social influences and hand hygiene behaviors weak positive. It means hypothesis 9 was **supported.**

H10: Environmental context and resources has a positive relationship on hand hygiene behavior

As seen in the table, the r-value of 0.082 represents the relationship between environmental context and resources and hand hygiene behavior as weak positive. The result shows environmental context and resources has no relationship on hand hygiene behavior at 0.05 significant level (p-value = 0.254, Sig. > 0.05). Hypothesis 10 was **rejected.**

4.4 Comparison Analysis

In this section, the researcher compares the opinion towards factor affects the hand hygiene behavior with profession of respondents. One-way ANOVA was applied for distinguishing the level of agreement among doctor, nurse, and nurse assistance. The results are shown in the table 4.10. Furthermore, post-hoc technique like least significant different test or LSD was tested for identifying the different among group.

Table 4.10 One-way ANOVA test and post-hoc analysis (LSD) of compliance with hand hygiene in both internal and external factor

n = 195	Doctor		Nurse		Nurse Assistance		F	Sig.
	Mean	S.D	Mean	S.D	Mean	S.D		
Knowledge and skills	5.71	0.88	5.72	0.87	5.80	0.91	0.195	.823
Social/profession role and identity	6.15	0.65	6.31	0.80	6.29	0.84	0.831	.437
Believe about capacities and optimism	2.55[bc]	1.09	3.52[a]	1.06	3.36[a]	1.25	12.896	.000
Believe about consequences	6.10[c]	0.86	5.81	0.71	5.72[a]	0.95	3.427	.034
Memory/ attention/ decision processes	5.12	0.77	5.36[c]	1.23	4.92[b]	1.56	2.158	.118
Emotion	4.70	1.01	4.96	1.39	4.66	1.78	0.734	.481
Behavioral regulation	4.32	0.72	4.37	1.20	4.47	1.18	0.358	.699
Reinforcement, intentions and goals	4.98	0.97	4.66	1.28	4.85	1.12	1.212	.300
Social influences	4.02[b]	0.90	4.57[a]	1.07	4.32	1.52	3.309	.039
Environmental context and resources	5.05[c]	0.80	5.31[c]	1.03	5.66[ab]	1.05	6.438	.002

a has significant different with doctor at 0.05

b has significant different with nurse at 0.05

c has significant different with nurse assistance at 0.05

According to table 4.10, the result shows the mean score of respondent toward factors influence on compliance with hand hygiene in both internal and external factor and also result of one-way ANOVA. It was found that only four variables show significant different in mean score when compare with profession of respondents (Sig. < 0.05). Four factors include believe about capacities and optimism ($p = 0.000$), believe about consequences ($p = 0.034$), social influences ($p = 0.039$), and environmental context and resources ($p = 0.002$).

From the result of LSD analysis, for the compliance with hand hygiene in both internal and external factor, it was found that doctor has significantly lower score in believe about capacities and optimism than nurse and nurse assistance at 0.05 level. On the other hand, doctor also has significantly stronger believe about consequences than nurse assistance (Sig. < 0.05).

For nurse, they have the highest agreement towards social influences as shown by the significant different with doctor at 0.05 significant level. Also, nurse has significantly higher in memory/ attention/decision processes than nurse assistant at 0.05 level. Additionally, it was found that nurse assistance has significantly higher in agreement towards environmental context and resources rather than doctor and nurse at 0.05 level.

4.5 Result of Observation

For the observation, the researcher observed the behavior of hand hygiene from five indications, including before patient contact, before an aseptic procedure, after body fluid exposure risk, after patient contact, and after contact with patient surroundings. There are 129 participants from 11 working areas, consist of42 doctors, 43 nurses and 44 nurse assistants. The descriptive results explain in table 4.11 as below.

Table 4.11 Summary of hand hygiene behavior

		Profession			Total
		Nurse Assistance (n = 44)	Nurse (n = 43)	Doctor (n = 42)	
Before patient contact	No	25 56.8%	23 53.5%	19 45.2%	67 51.9%
	Yes	19 43.2%	20 46.5%	23 54.8%	62 48.1%
Before an aseptic procedures	No	5 11.4%	4 9.3%	5 11.9%	14 10.9%
	Yes	39 88.6%	39 90.7%	37 88.1%	115 89.1%

Table 11 Summary of hand hygiene behavior (cont.)

		Profession			Total
		Nurse Assistance (n = 44)	**Nurse (n = 43)**	**Doctor (n = 42)**	
After body fluid exposure risk	No	-	22 51.2%	0 0.0%	22 38.6%
	Yes	-	21 48.8%	14 100.0%	35 61.4%
After patient contact	No	3 6.8%	1 2.3%	3 7.1%	7 5.4%
	Yes	41 93.2%	42 97.7%	39 92.9%	122 94.6%
After contact with patient surroundings	No	14 31.8%	11 25.6%	7 16.7%	32 24.8%
	Yes	30 68.2%	32 74.4%	35 83.3%	97 75.2%

From the table 4.11, the result shows hand hygiene behavior that54.8% of doctor washed their hand before contact patient, followed by 46.5% of nurse, and 43.2% of nurse assistance. However, most of nurse 90.7%washed their hand before aseptic procedures, followed by nurse assistance (88.6%), and doctor (88.1%). Furthermore, all of the doctors washed their hand after contacting with patient's body fluid, while only 48.8% of the nurse do so. When contacting patient, almost all of the nurse (97.7%) perform hand washing, followed by nurse assistance (93.2%), and doctor (92.9%). Additionally, only 83.3% of the doctor washes their hand after contacting with patient surroundings, followed by nurse of 74.4% and nurse assistance of 68.2%.

Table 4.12 One-way ANOVA test and post-hoc analysis (LSD) of hand hygiene behavior

	Doctor (n = 42)		Nurse (n = 43)		Nurse Assistance (n = 44)		F	Sig.
	Mean	S.D	Mean	S.D	Mean	S.D		
Before patient contact	.55	.50	.47	.50	.43	.50	.600	.551
Before an aseptic procedures	.88	.33	.91	.29	.89	.32	.082	.922
After body fluid exposure risk	1.00[b]	.00	.49[a]	.51	-	-	14.152	.000
After patient contact	.93	.26	.98	.15	.93	.25	.598	.551
After contact with patient surroundings	.83	.38	.74	.44	.68	.47	1.329	.268
Overall five stages of hand hygiene behavior	.80	.29	.72	.25	.73	.30	1.172	.313

a has significant different with doctor at 0.05

b has significant different with nurse at 0.05

c has significant different with nurse assistance at 0.05

The observation data was characterized in form of dichotomous variable, which "1" is defined as perform hand hygiene, "0" is not perform hand hygiene. The average score represents the rate of hand hygiene compliance under five stages. From the table 4.12, the result shows mean score of respondent toward behavior of hand hygiene from five indications and also result of one-way ANOVA. It was found that only one activity shows significant different in mean score when compare with profession of respondents (Sig. < 0.05).With one-way ANOVA test, the result shows that there is a significance difference in hand hygiene behavior after body fluid exposure risk between doctor and nurse (p = 0.000, Sig. < 0.05). According to post-hoc analysis, the result shows that doctor performed hand washing after contactingbody fluid exposure risk is significantly higher than nurse.

4.6 Interviewing Results

Totally 129 respondents were observed. However, there are 67 respondents who do not perform hand hygiene were interviewed. One respondents may have had more one reasons. According to real-time interview Table 4.13, The result shows that

the main reason for not performing hand hygiene is the knowledge aspect, as respondents thought wearing gloves negated need for hand hygiene (59.38%) and 4 respondents were thought about taking a pulse/ a temperature/ blood pressure readings were being clean no need to clean hand. Four respondents stated with forgetfulness (12.5%), which accounted for one doctor and three nurse assistants. Furthermore, two nurse assistances mentioned hand hygiene is not affect the clinical outcome (6.25%). Additionally, three nurse assistants also claimed on the attention (9.38%), as high workload and understaffing. Result from the answers, most of doctors answered they forgot to wash their hand but on the other hand nurses and nurse assistances said they worn gloves and lack of time to wash their hand.

Table 4.13 Reason for not performing hand hygiene

Reason		Frequency	Percent
Knowledge	*"I already worn gloves"*(*N, NA*) • *"I only took a pulse/ a temperature/ blood pressure readings, it was not contaminated"*(*NA*) • *"I just only touch.."*(*N, NA*)	52 10	63 12
Memory	*"I forgot"* (*D, N*)	14	17
Attention	*"Very busy" "Lack of time"*(*N*) *"I don't always have time to wash my hands"***(*N*)**	5	6
Beliefs about consequences	*"Patient did not sick because of my unwashed hand"*(*NA*)	2	2

D = doctor, N = Nurse, NA = Nurse Assistance

4.7 Discussion

There are many indicators that significantly affected on hand hygiene behavior. But this research is studying the behavior, barrier, and compliance of hand hygiene among staff in Kasemrad Rattanathibeth hospital. The author derived the Theoretical Domain Framework (TDF) (Cane, O'Connor, &Michie, 2012; Duncan et al., 2012) and The

Barriers and Levers to Hand Hygiene Instrument (BALHHI) (Dyson et al., 2013) to measure the effectiveness of factors on behavioral change in hand hygiene in regard of two perspectives, external (Reinforcement & intention & goal, environmental context and resources, social influences) and internal factors (knowledge, skills, social/ professional role and identity, beliefs about capabilities, optimism, belief about consequences, memory, attention and decision processes, emotion, and behavioral regulation). Furthermore, the author also studies hand hygiene behavior and attitude toward compliance of hand hygiene behavior across doctor, nurse and nurse assistance through self-reporting, observation and interviewing.

The finding obtained from observation and comparative analysis indicated doctor, nurse, and nurse assistance has difference in attitude and behavior toward hand hygiene compliance. The results were supported to Lankford et al. (2003) and Cole (2007) that mentioned on difference of workers will have difference on their understanding on hand hygiene was required during medical service. The result shows nurse and nurse assistant has stronger attitude toward believe about capacities and optimism, social influence, and environment context and resource than doctor. It can be explained that nurses and nurse assistants are directly controlled by the nurse director and human resource department. As they were enforced by policies of their organization, they need to concern on external factors and other social influence. But doctor has stronger attitude in term of belief about consequence. This finding reflects that doctor possessed with knowledge and understand the consequence if they do not perform hand hygiene. The observation reveals majority of practitioner do not wash their hand before patient contact. A main cause is ineffective or insufficient education and hand hygiene is still not a safety culture in the hospital. The finding was partially consistent to Erasmus et al. (2010) that revealed healthcare workers have low compliance rate before rather than after contact with patient, while low compliance rate of physician was found. While many nurses do not wash their hand after contact body fluid exposure risk. The reason expressed by nurse and nurse assistant is wearing gloves instead of wash their hands were adequate.

Based on self-report questionnaires, it shown that only 2.1% of healthcare personnel did not wash their hand before contact patient. However, there is a contrast in result because in observation process found that more than 50% of the healthcare personnel did not perform hand washing in this process.

According to hypotheses results, it shows social/profession role and identity, believe about consequences, memory/attention/decision process, emotion, reinforcement, intention and goals, and environmental context and resource has no relationship with behavior of hand hygiene ($p > 0.05$), which are not supported to study of Huis et al. (2012), Fuller et al. (2014), Dyson et al. (2013), and Bostcart et al. (2012). However, the correlation coefficients indicate that believe about capacities and optimism is the strongest effect on hand hygiene behavior ($r = 0.262$), followed by social influences ($r = 0.205$), behavioral regulation ($r = 0.169$), and knowledge and skills ($r = 0.146$) at 0.05 significant level. The empirical finding indicates that medical staff and providers who have strong believe about capacities and optimism were realized the important of hand hygiene compliance in term of prevent patients from infection, which is supported by Huis et al. (2012) and Boscart et al. (2012). In term of social influence, the finding is linked to TPB model (Ajzen, 1988) that explains individual will perform behavior when affected from social pressure, as well as supported to study of Dyson et al. (2013) mentioned on the social influence is positively impacted on hand hygiene. Because practitioner feels be dissimilar to others who performed hand hygiene. This study found many practitioners will feel guilty or ashamed when they omit hand hygiene. In term of regulation, it shows positive relationship between hand hygiene behavior and behavioral regulation (Huis et al., 2012; Boscart et al., 2012). Practitioners will perform hand hygiene if their working area has available facilities for hand washing. Moreover, they will less perform hand hygiene if they faced time pressure or case of high bed occupancy, which is supported by TPB model (Ajzen, 1998) that explains obstacles are associated to performance of behavior. Also, O'Boyle et al (2001) also mentioned difficulty of particular task is affected on behavior. Furthermore, there are many research informed the factor mostly influenced on hand hygiene is knowledge (Huis et al., 2012; Boscart et al., 2012; Fuller et al., 2014). Moreover, the finding acquired from interviewing and observation also indicated that lacking of knowledge caused participants do not wash their hand, as they informed to observer that only wearing gloves were adequate or thinking about record vital sign touch patient were be clean.

The result of this research comparing with previous literatures had shown the influencing factors that nearly the same which are knowledge believe in capacities and social influences. Base on difference literatures reviewed by Huis et al. (2012),

those researchers addressed on knowledge, awareness, control variables (time pressure), and facilitation of behavior are the most influential factors on compliance of hand hygiene. Not only these factors are important on hand hygiene behavior, but also noticed on influence from social, self-attitude and intention as well. From the 207-observed data from study of Fuller et al. (2014) mentioned on memory and knowledge is commonly related to hand hygiene indicators, while environmental context such as heavy workload or lack of facilities decrease a tendency to perform hand hygiene behavior. This study also shows many attendances mostly forget to clean their hand due to distract of concentration to other tasks, e.g. urgent cases, which is similar to our case study of Kasemrad Rattanathibeth hospital that many observed nurses deny on wash their hand because they are too busy. According to Dyson et al. (2012), the main barrier for hand hygiene mostly addressed to lack of motivation and belief about capacities, as well as memory and other social influences. This study also explains that most of practitioner of hand hygiene has strong sense of professional identity. Thus, it is similar to our study which found most of doctor is always careful on activity that possibly direct or indirect contact with their patients, while nurse and nurse assistant perceived that is enough by basic prevention like wearing gloves.

CHAPTER V
CONCLUSION AND RECOMMENDATION

This last chapter aims to summarize overall conclusion and discusses how this research have been achieved. In this chapter, the contribution of main finding, suggestion and practical implementation to perform best hand hygiene practices was explained. Lastly, the forth section in this chapter provides limitation and useful suggestion to overcome the obstacle in the further study.

5.1 Conclusion

The study has been achieved to investigate hand hygiene compliance of Kasemrad Rattanathibeth personnel, a private hospital sector in Bangkok, Thailand. In order to identified factors of noncompliance with hand hygiene during routine patient care, the variables included professional category (doctors, nurses and nurse assistants), hospital wards in the hospital and in regard of five indicators of hand hygiene (World Health Organization, 2009). The study also explores the factors that influence hand hygiene compliance in healthcare personnel. Lastly, the study is to provide the possible recommendation and tools to improve current hand hygiene compliance. Furthermore, data collection was done through paper-based questionnaire distribution and observation, which contains 195 and 129 participants respectively. From total 195 respondents, there are similar proportions of different working positions among 60 doctors (30.8%), 66 nurses (33.8%) and 69 nurse assistants (35.4%). Majority of 195 respondents have working duration between one to three years. Furthermore, most of practitioners is female, who aged 21-30 years old and completed at least undergraduate degree. In case of observation, 129 participants who were being observed consists of 42 doctors (32.6%), 43 nurses (33.3%) and 44 nurse assistants (34.1%). IBM Statistical Package for Social Sciences (SPSS) software version 21.0 was selected for data analysis.

The first objective aims to study the relationship between influential factors and hand hygiene behavior. This research discovered the relationship between four influential factors and hand hygiene behavior. The finding represents believe about capacities and optimism is the strongest effect on hand hygiene behavior, followed by social influences, behavioral regulation, and knowledge. A framework for change should include parameters to be consider for hand hygiene promotion, together with the level at which each change must be applied: enhance individual and institutional self-efficacy, encourage hand hygiene as a safety culture and education.

Table 5.1 Summary of hypotheses testing

	r-value	**Relationship**	**Result**
H1: Knowledge and skills have a positive relationship on hand hygiene behavior	.146*	Weak positive	Supported
H2: Social/professional role and identity has a positive relationship on hand hygiene behavior	-0.020	Weak negative	Rejected
H3: Believe about capacities [self-efficacy] and optimism has a positive relationship on hand hygiene behavior	.262**	Moderate positive	Supported
H4: Believe about consequences [anticipated outcomes/attitude] has a positive relationship on hand hygiene behavior	-0.056	Weak negative	Rejected
H5: Memory, attention and decision processes have a positive relationship on hand hygiene behavior	-0.009	Weak negative	Rejected
H6: Emotion has a positive relationship on hand hygiene behavior	0.116	Weak positive	Rejected
H7: Behavioral regulation has a positive relationship on hand hygiene behavior	.169*	Weak positive	Supported
H8: Reinforcement, intentions and goals have a positive relationship on hand hygiene behavior	-0.093	Weak negative	Rejected
H9: Social influences [norms] have a positive relationship on hand hygiene behavior	.205**	Weak positive	Supported
H10: Environmental context and resources has a positive relationship on hand hygiene behavior	0.082	Weak positive	Rejected

The second objective aims to discover the level of compliance to perform hand hygiene among doctors, nurses, and nurse assistants. These were “believe about capacities and optimism”, “social influences”, “behavioral regulation” and “knowledge” as the 4 behavioral domains commonly related to hand hygiene compliance. An explanation between professional category compliance identified that nurses and nurse assistants have higher concern on “environmental context”, “belief about capacities and optimism”, “social influences” than doctor. Doctors have stronger “believe about consequences” than other medical workers. However, it shows those practitioners have no difference attitude toward knowledge and skill, profession identity, memory, emotion, regulation, and reinforcement. Majority of practitioners do not clean their hand before make contact with patients especially among doctors. The finding represents after body fluid exposure risk is the significant of hand hygiene behavior. Nurses not follow hand hygiene compliance after process of body fluid exposure risk more than doctors but nurse assistants do not allow practice in this procedure. According to the interviewing result, it shows practitioners were insufficient of knowledge in term of believing about unnecessary of hand hygiene compliance and think wearing gloves were enough. Since those practitioners have difference in perception and behavior bases on their memory, attention and beliefs about consequences, the assigning strategy and guideline for improving their hand hygiene should be suitable for their position.

5.2 Recommendation and Managerial Implementation

In this section, the recommendations on basis of empirical finding are explained in both theoretical and managerial aspects. In term of theoretical side, this study is successfully filled the linking indicators and hand hygiene behavior based on Theory of Planned Behaviour model (TPB) (Ajzen, 1988), Theoretical Domain Framework (TDF) (Cane, O'Connor, &Michie, 2012; Duncan et al., 2012) and The Barriers and Levers to Hand Hygiene. Instrument (BALHHI) (Dyson et al., 2013). It shows the factors such subjective norms, controls value such time pressure, and positive attitude toward hand hygiene is indicators to cause performer do their hand washing. The information gained from this research can explains the situation of hand hygiene compliance from healthcare workers and physicians in Kasemrad Rattanathibeth hospital, a private hospital,

Thailand. From the finding, this research contributes useful information to assign the effective tool and strategy that influence all healthcare workers to clean their hands.

Several factors that could potentially be associated with successful promotion of hand hygiene would require a system change. Enhancing individual and institutional self-efficacy, promoting an institutional safety climate, perceived social pressure and create safety culture, making an environment friendly and education that exceed the current perception of the infection control practitioner's role.

5.3 Strategies for Successful Promotion of Hand Hygiene In Hospitals

5.3.1 Education

Knowledge was found to be associated with hand hygiene compliance (Pittet, 2001). This study also gives additional evidence of the lack of knowledge acted as a barrier to current hand hygiene practices. Education and training about hand hygiene advantage will build the capacity of healthcare providers to improve hand hygiene compliance. Competency testing and educational sessions to update healthcare personnel's knowledge and skills will be useful. In addition, this study shown that doctors have higher scores in beliefs about consequences than nurses and nurse assistants. For doctor, medical director should do arrangement seminar to their doctors in order to improve knowledge and benefits of hand hygiene compliance. It should be clearly explained the significant threat to health of patients from infections of germs when medical practitioners do not perform hand washing. In order to create a sustainable hand hygiene practice change, it will be necessary to continuously follow as below

- General education on hand hygiene expectations including information on infection prevention, and stress the organization wide commitment to hand hygiene, highlighting strategies deployed to reinforce and remind compliance such as posters and visual cues
- Make this part as annual training provided to new and existing employees
- Provide education and training to the context of an employee's daily work and processes

- Reinforce education with just-in-time coaching and feedback to healthcare personnel by Infectious Control Team and senior staffs
- Provide training on glove use that incorporates hand cleansing and glove use within a specific work only
- Locate glove dispensers near hand-rub dispensers and sinks to facilitate the proper use of gloves

5.3.2 Enhancing individual and institutional self-efficacy

There was a positive significant association between believe about capacities and optimism and hand hygiene compliance. This result is supported by previous studies that have demonstrated an association between beliefs and practices. For example. Development of a theory-based instrument to identify barriers and layers to best hand hygiene practice among healthcare practitioners (Dyson, Layton, Cath, & Cheater, 2013) surveys that self-efficacy prompt hand hygiene behavior. Making their confidence in hand hygiene ability to cope with hospital associated infection problems among healthcare personnel will be the most effectiveness. The management team should

- Use of a role model. Demonstration of proper hand hygiene behavior in group, class or team
- Designed messages to strengthen empower beliefs about the way of performing correct hand hygiene
- Designed hand hygiene behavior to be an organizational goal to be achieved
- Encourage to do hand hygiene as frequently as needed

5.3.3 Encourage hand hygiene as a safety culture and use social influence

Base on the data, social influences is one of influencing factors affected hand hygiene compliance. Nurses and nurse assistant do describe social influences more than doctors such as the opinion or care practice of colleagues. They were focused on improving their performance and preferred to stay with other workers. In addition, Thai's culture respect for rank and age. The elder persons have a seniority and should follow through because they have more experiences to care patients. In order to support the compliance of hand hygiene in organization, it should support activities that can improve practitioners become proud when applied hand hygiene under the standard of WHO. The staffs who

successfully achieved all five moments for hand hygiene (World Health Organization, 2009) will be awarded by gift and listed by certificate. Furthermore, supporting hand hygiene activities should be promoted, for example, launching the campaign to promote on the use of gloves, combining the compliance of hand hygiene regulation and use facilities such alcohol gel to clean their hands. The management team should provide

- Make hand hygiene as a habit or Norm, for example, having a quote with their colleges such as “Did you was them/hands today?”
- Create a safety ward culture to improve hand hygiene compliance such as set up a challenge hand hygiene event between wards
- Ensure commitment of leadership to achieve hand hygiene compliance of 90+%
- Supervision from senior staffs to improves hand hygiene compliance
- Having hand hygiene champions to motivate healthcare providers
- Infectious Control Team need to influence hand hygiene performance
- Intrinsic and extrinsic reward should also apply to increase compliance rate
- Make this part as KPIs for rewards and punishment when perform hand hygiene

5.3.4 Making an environment friendly

Lastly, behavior regulation is effecting hand hygiene performance, the hospital should improve facilities in regard of hand hygiene to all wards to make hand hygiene easy and convenient. Time limitation is a major barrier of hand hygiene. Due to time pressure of staffs, facility such hand gel is convenience and easily to use. The management team should

- Provides enough sink for good hand hygiene
- Make available alcohol-based hand rub in wards
- Promote skincare for healthcare workers hands to avoid irritation
- Avoid overcrowding of patient or excessive workload
- Have a daily self-monitoring checklist for hand hygiene behavior

5.4 Limitation and Suggestion for Further Study

In the last part of the chapter, the author provides the limitation of the research which is also include problems that faced during research process. Furthermore, suggestion for improving overall study in the future is also discusses in this section. According to the methodology, this research applies both survey and observation technique to collect data. Beside survey, the use of observation can help the researcher to discover in-depth about hand washing in the organization. However, it is difficult to acquire data in similar size as survey technique. In this study found an information bias in self-report about hand hygiene behavior. Moreover, this study is cross-sectional research, which means data collection is completed in the specific time. It provides a snapshot of information that results and findings cannot be generalize to other settings.

Base on weakness of this research, the author focuses on accessing the generalization of finding. In order to achieve generalization, the further study will be emphasizing on conducting research to explore hand hygiene practice compliance by comparing the difference between Kasemrad Rattanathibeth Hospital and other hospitals in order to discover factors influence on hand hygiene behavior. Comparing the result from various populations can help the researcher to achieve generalization of findings. Moreover, future study can be done to follow up on the outcome of the recommendation made.

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APPENDICES

Appendix A: Baseline Compliance Rates before and after Patient Contact

	Nurses		Physicians		Other HCWs		HCW with unknown profession	
Observed compliance rate	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**
Before patient contact								
<20%	(Conly, Hill, Ross, Lertzman, & Louie, 1989) (Golan et al., 2006)	2/7 (29)	(Sproat & Inglis, 1994) (Conly et al., 1989) (Golan et al., 2006) (Jenner et al., 2006)	4/6 (67)	(Conly et al., 1989) (Golan et al., 2006)	2/5 (40)	(M. Arenas et al., 2005) (Bischoff, Reynolds, Sessler, Edmond, & Wenzel, 2000) (Lankford et al., 2003) (J. Arenas, Sanchez-Paya, Gonzales, Rivera, & Antolin, 1999)	4/6 (67)
20-30%	(Jenner et al., 2006)	1/7 (14)	(Aragon, Sole, & Brown, 2005)	1/6 (17)	(Aragon et al., 2005) (Jenner et al., 2006)	2/5 (40)	(Sproat & Inglis, 1994)	1/6 (17)
31-40%	-	-	(Raju & Kobler, 1991)	1/6 (17)	-	-	(MacDonald, Dinah, MacKenzie, & Wilson, 2004)	1/6 (17)
41-50%	(Aragon et al., 2005; Whitby & McLaws, 2004) (Whitby & McLaws, 2004)	2/7 (29)	-	-	(Raju & Kobler, 1991)	1/5 (20)	-	-
51-60%	(Raju & Kobler, 1991)	1/7 (14)	-	-	-	-	-	-
61-70%	(O'Boyle et al., 2001)	1/7 (14)	-	-	-	-	-	-
71-80%	-	-	-	-	-	-	-	-
>80%	-	-	-	-	-	-	-	-
After patient contact								
<20%	-	-	(Kaplan & McGuckin, 1986) (McArdle, Lee, Gibb, & Walsh, 2006)	2/12 (17)	(Feather, Stone, Boursicot, & Pratt, 2000)	1/8 (13)	(Bischoff et al., 2000)	1/7 (14)

	Nurses		Physicians		Other HCWs		HCW with unknown profession	
Observed compliance rate	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**	**References**	**Proportion (%) of samples**
20-30%	(McArdle et al., 2006)	1/11 (9)	(McArdle et al., 2006) (Sproat & Inglis, 1994)	2/12 (17)	(Kaplan & McGuckin, 1986) (Conly et al., 1989) (Golan et al., 2006)	3/8 (38)	-	-
31-40%	(Conly et al., 1989; McArdle et al., 2006) (Golan et al., 2006)	3/11 (27)	(Golan et al., 2006) (McArdle et al., 2006)	2/12 (17)	-	-	(Lankford et al., 2003; Sproat & Inglis, 1994) (J. Arenas et al., 1999) (M. Arenas et al., 2005)	4/7 (57)
41-50%	(McArdle et al., 2006) (Raboud et al., 2004)	2/11 (18)	(Harris et al., 2000) (McArdle et al., 2006)	2/12 (17)	-	-	(Perry & Gore, 1997)	1/7 (14)
51-60%	(Whitby & McLaws, 2004)	1/11 (9)	(Jenner et al., 2006) (Conly et al., 1989)	2/12 (17)	(Davenport, 1992)	1/8 (13)	-	-
61-70%	(Jenner et al., 2006; Kaplan & McGuckin, 1986) (Kaplan & McGuckin, 1986)	2/11 (18)	(Aragon et al., 2005)	1/12 (8)	(Aragon et al., 2005; Jenner et al., 2006) (Jenner et al., 2006)	2/8 (25)	-	-
71-80%	(Aragon et al., 2005)	1/11 (9)	(Aizman, Stein, & Stenson, 2003)	1/12 (8)	-	-	-	-
>80%	(O'Boyle et al., 2001)	1/11 (9)	-	-	(Alp, Haverkate, & Voss, 2006)	1/8 (13)	(MacDonald et al., 2004)	1/7 (14)

Notes: The numbers are calculated by dividing the sum of all performed hand hygiene events by the sum of all possible hand hygiene events.
HCW = Healthcare worker

Appendix B: Factors Influencing Adherence to Hand Hygiene Practices

	Factors for poor adherence	References
1.	Understaffing or overcrowding	(Pittet et al., 2000) (O'Boyle et al., 2001)
2.	Hand irritation due to hand washing agent	(Kretzer & Larson, 1998) (Pittet et al., 2000) (Patarakul, Tan-Khum, Kanha, Padungpean, & Jaichaiyapum, 2005)
3.	Inconvenient sinks location or shortage of sinks	(Pittet et al., 2000) (Kretzer & Larson, 1998)
4.	Lack of soap, hand washing agents, paper towel	(Pittet et al., 2000) (Suchitra & Lakshmi Devi, 2007)
5.	Insufficient time	(Pittet et al., 2000) (Bischoff et al., 2000) (Suchitra & Lakshmi Devi, 2007) (Dedrick et al., 2007)
6.	Wearing gloves	(Pittet et al., 2000)
7.	Lack of knowledge	(Suchitra & Lakshmi Devi, 2007) (Fuller et al., 2014)
8.	Lack of rewards or encouragement	(Suchitra & Lakshmi Devi, 2007)
9.	Lack of role model	(Pittet et al., 2000) (Suchitra & Lakshmi Devi, 2007)
10.	Forgetfulness	(Muto, Sistrom, & Farr, 2000) (Pittet et al., 2000) (Patarakul et al., 2005) (Suchitra & Lakshmi Devi, 2007) (Fuller et al., 2014)
11.	Social norms	(Fuller et al., 2014)
12.	Beliefs about consequences	(Fuller et al., 2014)

Appendix C: Questionnaire

แบบสอบถามเพื่อการวิจัย เรื่องปัจจัยที่มีผลต่อการล้างมือของบุคลากรทางการแพทย์

แบบสอบถามชุดนี้ เป็นส่วนหนึ่งของโครงการปริญญาโท สาขาวิชาการจัดการสุขภาพแบบองค์รวม (หลักสูตรนานาชาติ) มหาวิทยาลัยมหิดล โดยมีวัตถุประสงค์เพื่อศึกษาความคิดเห็นและพฤติกรรมด้านการล้างมือ ของบุคลากรทางการแพทย์

แบบสอบถามนี้มีทั้งหมด 3 ตอน ซึ่งแต่ละตอนได้ระบุคำแนะนำในการตอบไว้เรียบร้อยแล้ว ขอความกรุณาท่าน โปรดตอบคำถามตามความเป็นจริงมากที่สุด ทั้งนี้คำตอบและข้อมูลของท่านจะถูกเก็บรักษา และนำไปใช้ประโยชน์ในเชิงวิชาการ เพื่อการศึกษาวิจัยในครั้งนี้เท่านั้น

ตอนที่ 1 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

คำแนะนำ: กรุณาตอบแบบสอบถาม โดยเลือกตัวเลือก ที่ตรงกับคำตอบ และความคิดเห็นของท่านมากที่สุด

1. **เพศ**

   ☐ ชาย ☐ หญิง

2. **อายุ**

   ☐ 21-30 ปี ☐ 31-40 ปี ☐ 41-50 ปี ☐ มากกว่า 50 ปี

3. **การศึกษาๆ**

   ☐ ต่ำกว่าปริญญาตรี ☐ ปริญญาตรี

   ☐ ปริญญาโท ☐ สูงกว่าปริญญาโท

4. **อายุการทำงาน**

   ☐ น้อยกว่า 1 ปี ☐ 1-3 ปี ☐ 3-5 ปี ☐ มากกว่า 5 ปี

5. **ตำแหน่งงาน**

   ☐ แพทย์ ☐ พยาบาล ☐ ผู้ช่วยพยาบาล

6. **แผนกในการทำงาน**

   ☐ ห้องฉุกเฉิน ☐ แผนกผู้ป่วยวิกฤต ☐ แผนกเด็กแรกเกิด

   ☐ Ward 3A ☐ Ward 3B ☐ Ward 4

   ☐ Ward 7 ☐ Ward 8 ☐ ห้องผ่าตัด

   ☐ ห้องคลอด ☐ แผนกไตเทียม

ตอนที่ 2 แบบสอบถามความคิดเห็นและระดับการปฏิบัติที่เกี่ยวกับมาตรฐานการล้างมือ

คำแนะนำ: กรุณาตอบแบบสอบถาม โดยเลือกคำตอบ ตามลำดับความสำคัญ ที่ตรงกับความเห็นของท่าน

เห็นด้วยมากที่สุด ⟶ เห็นด้วยน้อยที่สุด

Attributes	7	6	5	4	3	2	1
ด้านความรู้และทักษะในการปฏิบัติ							
1. ฉันได้รับการอบรมเกี่ยวกับการล้างมือ							
2. มีประกาศหรือจดหมายข่าวเกี่ยวกับการล้างมือในที่ทำงาน							
3. มีแนวทาง/คำแนะนำเกี่ยวกับการล้างมือที่เข้าถึงได้ง่าย							
ด้านสังคม หน้าที่วิชาชีพและอัตลักษณ์							
4. ฉันให้ความสำคัญกับการล้างมือเพื่อผู้ป่วย							
5. การล้างมือเป็นสิ่งที่ละเลยไม่ได้เลยในหน้าที่ที่ฉันทำ							
6. การล้างมือเป็นส่วนหนึ่งของวัฒนธรรมทางอาชีพของฉัน							
ความเชื่อเกี่ยวกับความสามารถ							
7. การล้างมือของฉันถูกขัดขวางบ้าง โดยปัจจัยทางหน้าที่และ/หรือ การงานบางอย่างของฉัน							
8. ฉันไม่อยากเตือนให้ผู้อื่นปฏิบัติตามมาตรฐานเกี่ยวกับการล้างมือ							
9. ความบ่อยของการล้างมือตามข้อกำหนดนั้นมากเกินกว่าจะทำได้จริง							
10. ฉันมั่นใจว่าฉันรักษามาตรฐานการล้างมือได้ดี							
ความเชื่อเกี่ยวกับผลลัพธ์							
11. หากฉันละเลย/ไม่ล้างมือ ฉันอาจจะติดเชื้อได้							
12. หากฉันละเลย/ไม่ล้างมือ การติดเชื้อย่อมเป็นความผิดของฉัน							
13. หากฉันรักษามาตรฐานการล้างมือได้ดี ผู้ป่วยจะมีความเชื่อมั่นมากขึ้น							
14. หากฉันละเลย/ไม่ล้างมือ ฉันจะได้รับโทษทางวินั							
แรงจูงใจและเป้าหมาย							
15. ฉันรู้สึกพึงพอใจเมื่อฉันล้างมือ							

Attributes	7	6	5	4	3	2	1
16. ฉันไม่สนใจที่จะล้างมือ							
17. ฉันไม่เห็นด้วยกับมาตรฐานการล้างมือบางประการ							
การจดจำได้ ความใส่ใจ การตัดสินใจ							
18. บางครั้งฉันไม่ทำตามมาตรฐานการล้างมือเพราะฉันหลงลืม							
19. การล้างมือไม่ใช่ธรรมชาติของฉัน							
20. เวลาที่ฉันเหนื่อย ฉันมักจะหลงลืมเกี่ยวกับการล้างมือ							
สภาพแวดล้อมในที่ทำงานและอุปกรณ์ที่มี							
21. ฉันไม่มีเวลาเพียงพอที่จะเข้ารับการอบรมเกี่ยวกับการล้างมือ							
22. นโยบายบางประการ (เช่น การเพิ่มจำนวนเตียงผู้ป่วย) ทำให้การรักษามาตรฐานการล้างมือ ทำได้ยากขึ้น							
23. สภาพแวดล้อมที่ทำงานของฉันไม่เป็นระเบียบ							
24. ที่ทำงานของฉันมีอ่างล้างมือและน้ำยาฆ่าเชื้อเพียงพอ							
ผลกระทบจากสังคมรอบตัว							
25. พนักงานที่รักษามาตรฐานการล้างมือ จะได้รับการชมเชย							
26. ฉันรักษามาตรฐานการล้างมือ เพื่อทำตามความคาดหวังของทีม							
27. พนักงานที่อาวุโสกว่าช่วยให้ฉันรักษามาตรฐานการล้างมือ ได้ง่ายขึ้น							
28. เพื่อนร่วมงานมีส่วนช่วยในการรักษามาตรฐานการล้างมือของฉัน							
ปัจจัยด้านอารมณ์							
29. ฉันรู้สึกโกรธเมื่อคนอื่นละเลยการล้างมือ							
30. ฉันรู้สึกไม่พอใจเมื่อคนอื่นละเลยการล้างมือ							
31. ฉันรู้สึกผิดเมื่อละเลยการล้างมือ							
32. ฉันรู้สึกละอายเมื่อละเลยการล้างมือ							

Attributes	7	6	5	4	3	2	1
การควบคุม/ ปรับปรุงพฤติกรรม							
33. เป้าหมายขององค์กรอนามัยโลก (WHO) เป็นส่วนหนึ่งที่ทำให้ฉันพัฒนาตนเอง ในด้านการล้างมือ							
34. เป้าหมายของโรงพยาบาลที่เกี่ยวกับการติดเชื้อหรือการล้างมือ เป็นส่วนหนึ่งที่ทำให้ฉันพัฒนาตนเองในด้านการล้างมือ							
35. กลยุทธ์บางอย่างที่พัฒนามาเพื่อช่วยด้านมาตรฐานการล้างมือ เปลี่ยนวิธีการปฏิบัติของฉัน							

ตอนที่ 3 แบบสอบถามเกี่ยวกับพฤติกรรมการล้างมือของท่าน

คำแนะนำ: กรุณาตอบแบบสอบถาม โดยเลือกตัวเลือก ที่ตรงกับคำตอบ และความคิดเห็นของท่านมากที่สุด

1. ท่านล้างมือเฉลี่ยวันละกี่ครั้ง
   a) ไม่ล้างเลย
   b) 1–2 ครั้ง
   c) 3–5 ครั้ง
   d) 6–10 ครั้ง
   e) มากกว่า 10 ครั้ง
2. ท่านล้างมือก่อนสัมผัส/ดูแลผู้ป่วยบ่อยแค่ไหน
   a) ล้างมือสม่ำเสมอ
   b) ล้างมือบ่อยๆ
   c) ล้างมือบ้าง
   d) ไม่ค่อยได้ล้างมือ
   e) ไม่ล้างเลย
3. ท่านล้างมือก่อนทำหัตถการที่จำเป็นต้องปลอดเชื้อ (Aseptic procedure) บ่อยแค่ไหน
   a) ล้างมือสม่ำเสมอ
   b) ล้างมือบ่อยๆ
   c) ล้างมือบ้าง
   d) ไม่ค่อยได้ล้างมือ
   e) ไม่ล้างเลย

4. ท่านล้างมือหลังจากสัมผัสกับสารคัดหลั่งของผู้ป่วย (เช่น เลือด, น้ำลาย) บ่อยแค่ไหน
   a) ล้างมือสม่ำเสมอ
   b) ล้างมือบ่อยๆ
   c) ล้างมือบ้าง
   d) ไม่ค่อยได้ล้างมือ
   e) ไม่ล้างเลย
5. ท่านล้างมือหลังจากสัมผัสผู้ป่วยบ่อยแค่ไหน
   a) ล้างมือสม่ำเสมอ
   b) ล้างมือบ่อยๆ
   c) ล้างมือบ้าง
   d) ไม่ค่อยได้ล้างมือ
   e) ไม่ล้างเลย
6. ท่านล้างมือหลังสัมผัสสิ่งแวดล้อมรอบตัวผู้ป่วย (เช่น เตียง, โต๊ะ) บ่อยแค่ไหน
   a) ล้างมือสม่ำเสมอ
   b) ล้างมือบ่อยๆ
   c) ล้างมือบ้าง
   d) ไม่ค่อยได้ล้างมือ
   e) ไม่ล้างเลย

ขอขอบคุณท่านที่สละเวลาตอบแบบสอบถาม

Additional File 2: Final Instrument

Barriers and Levers to Hand Hygiene Instrument (BALHHI)

Information and Instructions

- This questionnaire has been developed because research tells us that hand hygiene will vary from hospital to hospital, between different wards and departments and also according to the role of different practitioners. We are trying to identify the factors that influence hand hygiene.
- The information you give will enable the identification of the improvement strategies that will be the most effective in supporting good hand hygiene.
- Simply consider each statement in the light of your own hand hygiene and circle the number that demonstrates to what extent you agree or disagree with the statements given.
- It is anticipated that this will take about 10 minutes.
- Your responses will be anonymous as you do not need to put your name on the questionnaire.

1. What is your job title? (e.g. staff nurse) .....
2. How long have you worked in health care? (In full years)
3. What area of the hospital do you work in? .....
   (e.g. elderly Care)
4. Are you male or female (please circle) M F
5. To what extent do you consider you usually comply with good practice guidelines for hand hygiene? (Times you clean your hands compared with opportunities to do so – 0 to 100%)
   _____ %
6. To what extent do you consider your colleagues in your department comply with good practice guidelines for hand hygiene?
   _____ %

Please consider your own hand hygiene. Then circle the number between 1 and 7 that best reflects your opinion at present.

	Strongly agree						Strongly disagree
7. I engage in hand hygiene out of respect for my patients	1	2	3	4	5	6	7
8. Government targets have led to improvements in my hand hygiene	1	2	3	4	5	6	7
9. Hand hygiene is a non-negotiable part of my role	1	2	3	4	5	6	7
10. It is difficult for me to attend hand hygiene courses due to time pressure	1	2	3	4	5	6	7
11. I feel complacent about hand hygiene	1	2	3	4	5	6	7
12. Sometimes I miss out hand hygiene simply because I forget it	1	2	3	4	5	6	7
13. Hand hygiene is not second nature for me	1	2	3	4	5	6	7
14. I feel angry if hand hygiene is not carried out by others	1	2	3	4	5	6	7
15. When staff engage in hand hygiene they are praised	1	2	3	4	5	6	7
16. I am more likely to forget hand hygiene if I am tired	1	2	3	4	5	6	7
17. Hand hygiene training is available to me	1	2	3	4	5	6	7
18. There are some practical barriers to hand hygiene because of my particular job/role	1	2	3	4	5	6	7
19. If I do not engage in hand hygiene I may catch an infection	1	2	3	4	5	6	7
20. I cannot be bothered with hand hygiene	1	2	3	4	5	6	7
21. Some government targets make hand hygiene more difficult (such as high bed occupancy)	1	2	3	4	5	6	7
22. If I omitted hand hygiene I would blame myself for infections	1	2	3	4	5	6	7
23. I engage in hand hygiene because I do not want to let the team down	1	2	3	4	5	6	7
24. There are adverts or newsletters about hand hygiene in my workplace	1	2	3	4	5	6	7
25. I am reluctant to ask others to engage in hand hygiene	1	2	3	4	5	6	7
26. The frequency of hand hygiene required makes it difficult for me to carry it out as often as necessary	1	2	3	4	5	6	7
27. I disagree with some parts of the hand hygiene guidelines	1	2	3	4	5	6	7

	Strongly agree						Strongly disagree
28. I am confident in my ability to carry out hand hygiene	1	2	3	4	5	6	7
29. Hospital targets relating to infection or hand hygiene has led to improvements in my hand hygiene	1	2	3	4	5	6	7
30. I feel frustrated when others omit hand hygiene	1	2	3	4	5	6	7
31. If I engage in hand hygiene it improves patient confidence	1	2	3	4	5	6	7
32. Hand hygiene guidelines are easily accessible	1	2	3	4	5	6	7
33. Hand hygiene is part of my professional culture	1	2	3	4	5	6	7
34. My environment is cluttered	1	2	3	4	5	6	7
35. I feel guilty if I omit hand hygiene	1	2	3	4	5	6	7
36. I feel ashamed if I omit hand hygiene	1	2	3	4	5	6	7
37. My area of work has poor staffing levels	1	2	3	4	5	6	7
38. Supervision from senior staff means that carrying out hand hygiene is easier for me	1	2	3	4	5	6	7
39. Some strategies designed to improve hand hygiene influence my practice	1	2	3	4	5	6	7
40. My hand hygiene is encouraged by others	1	2	3	4	5	6	7
41. If I miss out hand hygiene I will be subject to disciplinary action	1	2	3	4	5	6	7

42. In which of the following situations should hand hygiene be performed (circle as many letters as apply).

a. Before having direct contact with a patient

b. Before inserting an invasive device (e.g. catheter)

c. When moving from a contaminated body site to a clean body site during an episode of patient care

d. After having direct contact with a patient or with items in the immediate vicinity of the patient

e. After removing gloves

43. If your hands are not visibly soiled or visibly contaminated with blood or other material, which is most effective for reducing the number of disease causing bacteria? (circle one letter corresponding to the single best answer)

a. Washing hands with plain soap and water

b. Washing hands with an antimicrobial soap and water

c. Applying 1.5 to 3ml of alcohol-based hand rub to the hands and rubbing hands together until they feel dry

44. How are antibiotic-resistant bacteria most frequently spread from one patient to another in health care settings? (circle one letter corresponding to the single best answer)

a. Airborne spread resulting from patients coughing or sneezing
b. Patients coming in contact with contaminated equipment
c. From one patient to another via the contaminated hands of clinical staff
d. Poor environmental maintenance

45. Which of the following infections can be potentially transmitted from patients to clinical staff if appropriate glove use and hand hygiene are not performed? (Circle as many letters as apply)

a. Herpes simplex virus infection
b. Colonisation or infection with MRSA (methicillin-resistant Staphylococcus aureus)
c. RSV (Respiratory syncytial visus infection)
d. Hepititis B virus infection

46. Clostridium difficile (the cause of antibiotic-associated diarrhoea) is readily killed by alcohol based hand hygiene products. (Circle one letter corresponding to the single best answer)

a. True
b. False

Thank you for participating!
Please return this questionnaire to:

Questionnaire developed by Judith Dyson (j.dyson@hull.ac.uk), Francine Cheater, Cath Jackson and Rebecca Lawton
Questions 75 to 81 are adapted from: Institute for healthcare improvement, How to guide: A guide for improving practices among health care workers, 2009. http://www.shea-online.org/Assets/files/IHI_Hand_Hygiene.pdf

แบบสำรวจพฤติกรรมการล้างมือ

แผนก_____

คนที่	อาชีพ	ก่อนสัมผัสผู้ป่วย	ก่อนทำหัตถการปลอดเชื้อ	หลังจากสัมผัสกับสาร	คนที่	อาชีพ	ก่อนสัมผัสผู้ป่วย
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Appendix D: Certificate of Ethical Approval

โรงพยาบาลเกษมราษฎร์ รัตนาธิเบศร์
บริษัท โรงพยาบาลรัตนาธิเบศร์ จำกัด
RATTANATIBETH GENERAL HOSPITAL CO.,LTD.
60 หมู่ 6 ถ.ตลิ่งชัน-สุพรรณบุรี ต.เสาธงหิน อ.บางใหญ่ จ.นนทบุรี 11140 ☎ 0-2594-0020-65, 0-2921-1981 FAX : 0-2594-0067
60 Moo 6 Talingchan-Suphanburi Rd. Saothonghin Bang-Yai Nonthaburi THAILAND ☎ 0-2594-0020-65, 0-2921-1981 FAX : 0-2594-0067
www.kasemrad.co.th/rattanatibeth Facebook: kasemrad rattanatibeth

KR.RTB.0055/2016

Certificate of Ethical Approval

Title of Project: ***Hand Hygiene Compliance Among Healthcare Personnel in Kasemrad Rattanathibeth Hospital***

Duration of Project: ***2 months (May – June 2016)***

Principal Investigator (PI): ***Ms. Pornluck Harnphanich***

PI's Institutional Affiliation: ***Collage of Management, Mahidol University***

Approval includes: **1) Submission form**
2) Research proposal
3) Questionnaire
4) Informed and voluntary consent to participate in research
5) Participant information sheet
6) Observation and real-time interview sheet

Kasemrad Rattanathibeth Hospital Committees met on 3rd April, 2016 to review the above project. After reviewing the research proposal and other documents, the committees did not see any issues that may violate research ethics.

Signature
(Dr. Surapan Taweewikayakarn)
Hospital Director
Date 3rd April, 2016