IMPROVING HAND HYGIENE COMPLIANCE FOR THE
REDUCTION OF NOSOCOMIAL INFECTIONS:
RECOMMENDATIONS FOR BEHAVIOUR CHANGE IN A
HEALTH CARE SETTING

by

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ABSTRACT

Nosocomial infection rates are highly dependent on hand hygiene compliance within health care facilities. This paper examines the literature concerning elements of effective hand hygiene interventions and relevant behaviour change theory, in addition to current practice surrounding hand hygiene interventions in leading institutions, in order to inform and propose recommendations for the improvement and success of the University Health Network's current hand hygiene initiative. The results of these literature reviews support the use of the Theory of Planned Behaviour for promoting successful behaviour change in the context of hand hygiene compliance in health care settings. Further, the findings here suggest that the employment of an intervention that is tailored to the specific barriers and facilitators of a given setting, that evokes support from multiple levels within the institution, and one that is multifaceted, will be more likely to achieve sustained improvement in hand hygiene compliance and reduced nosocomial infection rates.
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INTRODUCTION

Current infection control practices are largely derived from the work of Ignaz Semmelweis, who demonstrated the importance of hand hygiene in the 1840's by showing how clean hands can reduce transmission of infection in hospitals (Weinstein and Stroger, 2001). Since then, numerous studies have repeatedly shown the connection between proper hand hygiene (i.e. adherence to given hand hygiene guidelines) and lower rates of infection transmission in health care settings (Burke, 2003)(Pittet et al, 2000).

Despite a widespread understanding of the importance of hand hygiene and other necessary infection control practices in health care settings, nosocomial infections remain a significant threat to patient safety in Canadian hospitals (Government of Ontario, 2007). It is estimated that over 8,000 Canadians die annually from nosocomial infections caused by microorganisms such as Methicillin Resistant Staphylococcus aureus (MRSA), Vancomycin Resistant Enterococci (VRE) and Clostridium difficile (C. Diff) (Ibid). In addition to increasing unexpected mortality, nosocomial infections complicate a significant number of patient care deliveries, and contribute to the use of limited resources within health institutions (Pittet, 2005).

Several studies have found that hand hygiene is essential to reducing hospital-acquired infections, and thus, to reducing morbidity and mortality as a
result of these infections (Burke, 2003) (Pittet et al., 2000). 'Hand hygiene' is defined as actions involving either proper hand washing, the use of antiseptic hand wash, antiseptic hand rub, or undergoing surgical hand antisepsis (Boyce and Pittet, 2002). Further, hand hygiene in this context comprises the act of hand washing with soap and water, or the use of an alcohol based hand rub in routine patient care contexts (as opposed to antisepsis before surgery).

Recently emerging public health concerns such as SARS and avian influenza have contributed to the resurgence of hand hygiene in hospitals as an issue of concern in the public sphere (Nicolle, 2007). Although nosocomial transmission of infection by definition occurs within clinical settings, the issue of hand hygiene compliance is a public health concern for several reasons: first, these infections are communicable diseases which can spread to the family members and friends that visit patients within the hospital (in addition to transmission between patients in hospitals); second, these infections also occur outside these institutions within the community at large; and third, nosocomial transmission is a public health concern because many of these infections are caused by drug-resistant bacteria that can be difficult to treat, even in healthy individuals. Thus, despite their occurrence in clinical settings, this issue requires a public health perspective when implementing an effective intervention.

Although hospital infection control departments and patient safety advocates have been trying to educate staff and improve hand hygiene among health care providers for the past 150 years, hand hygiene compliance remains shamefully low (Weinstein and Stroger, 2004). Thus, in order to improve
adherence to hand hygiene procedures, novel methods of integrating hand hygiene, so that it becomes a habitual act for all care providers, needs to become a priority for hospital management. Reaching this goal will necessitate individual behaviour change for many health care providers, as well as a significant degree of change in the discourse surrounding hand hygiene, as it will need to become viewed by both the public and health care providers as an integral part of providing primary care, and not merely as an asset to it.
BACKGROUND

The University Health Network (UHN) (which consists of three hospitals in Toronto and their associated medical facilities and foundations), has been tracking and reporting its nosocomial infection rates of MRSA, VRE and C. Diff for the past five years. Despite stringent hospital protocols for staff at the UHN surrounding hand hygiene practice, nosocomial infections remain a critical patient safety concern within the hospitals (University Health Network, 2008). From April to June of 2008, the nosocomial infection rates of C. Diff, VRE and MRSA within the UHN hospitals were approximately 7.6, 3.5 and 4.0 per 10,000 patient days respectively (Ibid) (see Appendices 1, 2, and 3).

Given the aforementioned understanding that nosocomial infections can be significantly reduced with proper hand hygiene practices in health care settings, the UHN's Infection Prevention and Control unit (IPAC) is currently undergoing a campaign to assess and improve hand hygiene compliance among staff in the UHN hospitals. The hand hygiene program that IPAC is implementing was designed by the Ontario Ministry of Health and Long-Term Care, and is called Just Clean Your Hands. The goal through the implementation of this program is to improve the hand hygiene compliance of health care providers at the UHN, and ultimately to reduce nosocomial infection rates within their facilities. Thus far in their campaign, the UHN has implemented several initiatives
such as: making environmental adjustments (ensuring point-of-care access to alcohol-based hand rub) in all three hospitals, putting up posters promoting hand hygiene, and initiating an auditing process with feedback to staff and managers on audited units. Although IPAC at the UHN is adhering to the guidelines proposed in the Just Clean Your Hands program, the results of the baseline hand hygiene audit (conducted by myself and two other auditors over a four month period) have shown hand hygiene compliance to be unacceptably low within the UHN hospitals (see Appendices 4 and 5)(Infection Prevention and Control at the University Health Network, 2008). It should be noted that the results of this audit are presented here as background information intended to help explain the need for a novel approach to behaviour change within the UHN context, and not as part of this report itself. As this paper will discuss, the current approach being taken for this intervention at the UHN is not likely to achieve a sustained improvement in hand hygiene compliance.

A recent assessment of our current primary care system acknowledges the existing and forthcoming challenge of achieving health care worker behaviour modification (Pittet, 2005). Consistently, studies investigating quality improvement have found that change can be a difficult process in health care settings (Grol et al, 2007). Through my experiences at the UHN during my practicum, as well as through discussions with the IPAC team, it has become evident that being able to achieve behaviour change (both at the individual and organizational levels) in order to improve hand hygiene compliance is a considerable challenge at the UHN.
METHODS

Through exploring current strategies being undertaken by other leading institutions to improve hand hygiene compliance, as well as through the discussion of evidence-based ways to effectively institute behaviour change in health care settings, this paper intends to explore these theories and ideas in order to make relevant recommendations for the University Health Network to successfully improve and sustain hand hygiene compliance.

The methodological approach to this paper involved compiling information from two separate literature reviews. One literature review focused on a grey literature search and information gathered from key informants concerning what other institutions are doing to improve hand hygiene, both within B.C. and around the world. Key informants in B.C. were identified through the help of an SFU Health Sciences faculty member who gave me the contact of Joanne Archer, who is an Educator/Consultant with the Provincial Infection Control Network (PICNet). I received the contact information of several infection control practitioners and managers at various health authorities and institutions in the Province from Joanne, a number of whom provided me with information that contributed to this paper. The second literature review was based on an academic journal search using a variety of online databases (such as JSTOR, EBSCO, Science Direct, PubMed and Wiley InterScience), with the purpose of
gaining information pertaining to the use of behaviour change theories for implementing new guidelines in health care. The majority of the literature review for this paper was conducted from September 10th to the end of October 2008, however several articles discussed here were retrieved in March 2008. Further, key search terms such as ‘hand hygiene’ and ‘behaviour change theory’ were used in order to find relevant articles. The intention of this approach was to explore the literature in order to find a relevant theory in addition to effective intervention approaches that have been found to be helpful in this context. The rationale behind performing the aforementioned literature searches is that the current obstacles being faced at the UHN in the implementation of their hand hygiene campaign are not unique to their institution, and thus, methods of implementation schemes that have worked elsewhere may be useful to the UHN.
IMPROVING HAND HYGIENE IN LEADING INSTITUTIONS

Similar to the Ontario Government-led *Just Clean Your Hands* initiative that is being implemented at the University Health Network, several other campaigns to improve hand hygiene in health care settings are underway both within Canada, as well as in other countries around the globe. At the international level, the World Health Organization (WHO) has implemented a campaign urging all countries to undergo their own hand hygiene initiatives, following their guidelines (World Health Organization, 2008). The WHO's campaign, called *Clean Care is Safer Care*, is focused on promoting patient safety within health systems around the globe through aiming to improve five key elements of care, one of which is hand hygiene compliance (Ibid). Through the hand hygiene element of this campaign, the WHO aims to strengthen the commitment within countries to implement national strategies that promote hand hygiene (Ibid).

A report produced by the WHO outlining in detail their recommended hand hygiene guidelines supports the idea that theory can be of significant use in the context of human behaviour change, and particularly in the context of health education (World Health Organization, 2006). Additionally, the WHO report suggests that countries looking to implement a hand hygiene campaign are more likely to be successful if they include the following elements in their campaign: education, motivation (by role modelling), reinforcement of proper hand hygiene
behaviour, cues to initiate action, as well as structural and philosophical system change (Ibid). Although several of these elements are being used in current hand hygiene campaigns around the globe, this type of multifaceted approach to hand hygiene intervention is relatively new, and is growing in popularity among various institutions.

One example of a nation that has taken on the WHO's patient safety challenge is Scotland, which launched a National Hand Hygiene Campaign in 2007 (Health Protection Scotland, 2008). The main elements of this initiative include an advertising campaign targeted towards the public, enlisting the use of television advertisements and various types of print media to promote the key messages of the campaign, as well as a campaign tailored specifically to raise awareness about hand hygiene among health care workers in the country (Ibid). An evaluation to determine the effectiveness of Scotland's campaign thus far has found that 71% of those asked who were aware of the campaign reported that they feel they are more likely to wash their hands more frequently as a result of seeing the advertisements (Ibid). Further, this evaluation suggested that their key messages were communicated clearly through the advertisement campaign, in that 92% of those who had seen the advertisements claimed hand-washing is very important, as opposed to only 68% of those who had not seen the campaign (Ibid). Although these results may support the use of advertising in this type of campaign, it should be noted here that despite these statistics, it is unclear whether or not this campaign has actually resulted in improved hand hygiene compliance, and whether or not any improvement will be sustained over time.
A similar campaign has been ongoing in the United Kingdom (UK) since 2005. One aspect of this campaign focuses on improving hand hygiene and reducing nosocomial infections within hospitals. Unlike the campaign in Scotland, the UK initiative has taken a multimodal approach, aiming to educate, prompt and enable health care workers to perform effective hand hygiene when appropriate (National Patient Safety Agency, 2007). The UK campaign, called Cleanyourhands, involves encouraging healthcare facilities to promote hand hygiene within their own institutions (Ibid). The National Patient Safety Agency of the UK provides materials for facilities to use, such as campaign posters, staff champion posters (these feature facility staff members who support hand hygiene and the campaign), educational materials prepared for patients, point of care prompts, and various other tools and materials such as template press releases to help facilities publicize the campaign (Ibid). Thus, the approach that the UK is taking towards improving hand hygiene is multifaceted, with a focus on raising awareness and supplying visual prompts and cues throughout healthcare facilities, with the hope that these will encourage improved hand hygiene compliance.

The aforementioned UK campaign is ongoing, however an independent evaluation of the campaign is already underway, and has been initiated by the Patient Safety Research Portfolio (Ibid). The latest results from this evaluation suggest that the campaign has been effective thus far, in that numerous improvements have been observed such as a significant increase in soap and hand-rub use from 2006 to 2007 (Ibid). Hand-rub has been made available at
point-of-care in approximately 90% of their facilities, and the proportion of facilities undergoing the audit and feedback process has reached 65%, whereas the proportion doing very little auditing is down to 10% (Ibid). It should be noted that because of the broad scope of this campaign, its success is being measured based on facility uptake of the campaign, as opposed to measuring actual hand hygiene compliance.

To date, the only hand hygiene campaign that has reported a sustained improvement in hand hygiene compliance and an associated decrease in nosocomial infections, is the campaign launched at the University of Geneva Hospitals in Switzerland (Pittet, 2005). This campaign, called Hopisafe, undertook a multifaceted approach, including key activities such as: repeated monitoring of hand hygiene compliance with feedback, administering communication and education tools, providing reminders (cues) in the work environment, active participation and feedback with staff both at the individual and organizational levels, and acquiring the support of senior management and institutional leaders (Ibid).

Further, there are three main pillars of this campaign that have been integral to its success. First, the campaign leaders recognized the need to rally support from senior hospital management to ensure that the institution was fully committed financially and politically. Second, an interdisciplinary hand hygiene team was assembled in order to communicate the campaigns messages effectively to every level of staff (doctors, nurses and hospital service departments), and third, the campaign leaders set out to determine the extent of
the problem prior to initiating the campaign, so that the approach could be tailored and appropriate, and so that improvement or change could be recognized (University of Geneva Hospitals, 2008).

Hopisafe has demonstrated success at both improving hand hygiene compliance among the target facilities, as well as at decreasing nosocomial infection rates (Ibid). Specifically, from 1994 to 1997, the Hopisafe campaign yielded an 18.6% increase in observed hand hygiene compliance, increasing from 47.6% to 66.2% (Ibid). Further, a substantial decrease in nosocomial infection rates was observed during the period of 1994 to 1998, during which rates dropped from approximately 18 cases per 100 admissions in 1994, to 10 cases per 100 admissions in 1998 (Ibid). Looking specifically at MRSA rates within the University of Geneva Hospitals, infection rates also declined during the same period, going from 0.6 new cases per 100 admissions in 1994, to less than 0.3 cases per 100 admissions in 1998 (Ibid). Thus, through its multifaceted and tailored approach to implementing best practices in hand hygiene, the Hopisafe campaign at the University of Geneva Hospitals has succeeded thus far in improving hand hygiene compliance and substantially decreasing nosocomial infection rates.

In a more local context, several health authorities in British Columbia have recently begun to tackle hand hygiene campaigns within their jurisdictions. For example, the Children's and Women's Health Centre of B.C., located in Vancouver, has undertaken a hand hygiene campaign that includes raising awareness through educational posters, auditing of compliance (with report cards
for feedback to the units audited), and promoting hand hygiene through the use of staff ‘champions’ (Hunt, 2008). Additionally, the Children's and Women’s Health Centre of B.C. campaign involves looking at the consumption of hand hygiene products as a measure for hand hygiene compliance, increasing the number of alcohol-based hand rub within their facilities, and employing a tailored perspective to guide their campaign through the use of staff perception surveys and focus groups with doctors (Ibid). It should be mentioned here, that although this campaign is measuring hand hygiene compliance through the consumption of hand hygiene products, this is not widely considered to be an accurate measurement of compliance to hand hygiene guidelines because it does not provide information as to whether or not staff are cleaning their hands at the necessary opportunities (for example, before doing an aseptic procedure).

Although several of the aforementioned activities in the Children's and Women's Health Centre of B.C. campaign are common across most hand hygiene campaigns, a unique aspect of this particular campaign is that it solicited the help of an advertising agency called TBWA in order to improve the social marketing element of the campaign (Ibid). Despite being unique to hand hygiene campaigns within healthcare facilities, this concept of utilizing advertising techniques for social marketing and behaviour change is not entirely foreign to the arena of improving hand hygiene compliance. For example, Dr. Val Curtis (who is now the director of the Hygiene Centre at the London School of Hygiene and Tropical Medicine), when faced with the challenge of trying to increase hand hygiene and the use of soap in Ghanaian culture, decided to approach three of
North America’s top consumer-goods companies to find out how they change consumer habits (Duhigg, 2008). Dr. Curtis, along with the advertising companies she recruited, created the Global Public-Private Partnership for Hand Washing with Soap (Ibid). This initiative aimed to double the hand-washing rate in Ghana, a country in which the majority of homes have soap, but roughly 4% of adults wash with soap after using the washroom (Ibid). Through research exploring the ideas and constructs surrounding soap and soap use in Ghanaian culture, Dr. Curtis and her colleagues found that a key barrier to soap use for many Ghanaians was that they did not consider using the washroom to be a ‘gross’ activity that warranted the use of soap (Ibid). Based on this finding, their campaign focused on posters and advertisements promoting the message that going to the washroom is indeed a ‘gross’ activity that requires the use of hand washing with soap to follow it. Their approach was in fact successful. By 2007, a survey reported a 13% increase in the use of soap after using the toilet among Ghanaians, compared to before the campaign began (Ibid). Further, they found that after the campaign, soap use prior to eating had increased by 41% (Ibid).

The success of this campaign is an example of the effectiveness of identifying barriers to hand hygiene that are specific to a culture or context, and then tailoring the intervention to address these specific barriers.

The variation in the aforementioned campaigns (as well as the likely variation in their final results) raises several pertinent questions, such as: what makes a hand hygiene campaign successful, and how is long-term behaviour change best achieved in this context? Many authors on this subject argue that
the use of behaviour change theories are helpful, or even essential, in designing
and implementing effective hand hygiene initiatives in health care settings.
BEHAVIOUR CHANGE IN HEALTH CARE SETTINGS

In any arena, human behaviour change is rarely achieved and sustained without significant effort. In health care facilities, behaviour change can be even more difficult to achieve due to the often high-paced environment and multitasking that health care providers often undertake in order to provide excellent care. Despite the fact that cleaning one's hands is a relatively simple procedure (and an increasingly faster procedure as a result of alcohol-based hand rubs), health care provider behaviour surrounding hand hygiene is surprisingly complex, and remains difficult to understand, explain or change (O'Boyle et al, 2001).

As a result of the seemingly universal and surprising inability to be able to get health care providers to routinely wash their hands, numerous studies have explored perceived barriers to following hand hygiene guidelines. For example, one study found that being 'too busy' was a common reason given by health care providers not to perform hand hygiene, in spite of the recognition of prevention of patient infections as the most important impetus to perform hand hygiene (Ibid). Other perceived barriers to hand hygiene compliance have been found to be a lack of sinks in the environment, the patient's condition (i.e. the need for care is more urgent than hand washing), complaints that hand hygiene products cause irritated and dry skin, and an inadequate knowledge of hand hygiene guidelines (Lankford et al, 2003). Other noted potential barriers to hand hygiene in health
care settings include disagreement with or skepticism regarding the hand hygiene guidelines, belief that the use of gloves negates the need for performing hand hygiene, the feeling that frequent hand hygiene may interfere with patient relations, forgetfulness, lack of peer or supervisor role models and an absence of an institutional priority for hand hygiene (Pittet, 2002).

In order to tackle the significant challenge of improving the hand hygiene practices of health care providers, many experts on the subject suggest employing the use of behaviour change theories. The main argument behind this suggestion is that the use of behaviour change theory when implementing guidelines provides an organized method for conceptualizing and identifying facilitators and barriers to behaviour change in a given setting (Ceccato et al, 2007). It has been suggested that behaviour change theory should not just be considered when planning a new initiative, but it should be used throughout the entire clinical practice guideline process, including development of the campaign, implementation and evaluation (Ibid). Further, using behaviour change theory for guideline implementation can help to make outcomes more predictable, and can increase the effectiveness and efficiency of intervention strategies (Ibid).

Evidence-based guidelines are often not implemented effectively, resulting in a failure of achieve optimal health outcomes (Michie et al, 2005). This provides further support for the use of behaviour change theories in this context. Part of the reason why guideline implementation often yields inadequate results may be due to a lack of a theoretical understanding of the processes involved in human behaviour change, and although there is no 'magic bullet' solution to changing...
health care provider behaviour, it is consistently suggested that the use of theory with a focus on acknowledging specific contextual barriers should be taken into account (Ibid).

Although there are several behaviour change theories available, one particular theory that is suggested by numerous authors for use in health care settings is the Theory of Planned Behaviour (TPB). The TPB postulates that the cause of a given planned behaviour (in this case, performing hand hygiene) is the intention to perform that behaviour (O'Boyle et al, 2001). Further, this theory supposes that one’s intention can be predicted by three intermediate variables: attitude (feelings about the behaviour), subjective norms (a person’s perception of the social pressures surrounding the behaviour), and perceived behavioural control (a person’s perception of the ease or difficulty of performing a given behaviour) (Ibid). Thus, the TPB suggests that behaviours can be predicted by the strengths of individuals’ beliefs about outcomes of the behaviour, normative beliefs, and their beliefs about obstacles to performing the behaviour (see Appendix 6) (Ibid). Therefore, this theory is essentially a series of hypotheses linking beliefs with determinants, determinants with intention, and finally, intention with behaviour (Kretzer and Larson, 1998).

The Theory of Planned Behaviour has been used to explain significant associations between beliefs, attitudes, social influences and perceived abilities to perform a given behaviour (Ceccato et al, 2007). The TPB makes the assumption that human behaviour is primarily rational and is derived from systematic decision-making that is driven by motivational factors (Ibid). Thus, the
The main point of contention when using this theory is to identify these motivational factors, so that the behaviour can be predicted, altered and explained (Ibid). In addition, this theory acknowledges that several other variables are involved in shaping behaviours in health care settings such as policies, time availability, patient requests and environmental factors (Ibid).

The TPB is an appropriate choice for use in the context of improving hand hygiene compliance considering the majority of the literature surrounding hand hygiene compliance and behaviour change theory advocates that the TPB is likely to be helpful in promoting sustained health care worker behaviour change (Pittet, 2005)(Grol and Grimshaw, 2003)(Pittet, 2002). Further, this theory seems to be the most relevant concerning the barriers to change and current challenges at the UHN for improving hand hygiene compliance, as I understand them. It is also an appealing choice because this theory does not place all of the responsibility for behaviour change on individual care providers, as it also holds the institution itself responsible for working towards creating behaviour change within its facilities.

Other common behaviour change theories, such as the Health Belief Model and Social Cognitive Theory, do not encompass all of the elements presented in the TPB, and thus they fail to acknowledge many of the factors presented in the literature as having an effect on health care provider behaviour in the context of hand hygiene. For example, the Health Belief Model is primarily concerned with an individual's perceptions and attitudes surrounding a given behaviour, and does not address the impact of social influences on behaviour
change (Kretzer and Larson, 1998). Contrary to the Health Belief Model, Social Cognitive Theory posits that individuals primarily learn through watching others, and thus that behaviour is influenced by what is observed (Ibid). Therefore, although Social Cognitive Theory agrees with one aspect of the TPB (concerning the influence of social norms), it is not sufficient for addressing all of the factors influencing health care provider behaviour in the context of hand hygiene.

The findings of several studies suggest that the Theory of Planned Behaviour is indeed an appropriate behaviour change theory for use in the health care context. A study by Lankford et al exploring the effect of medical staff role models and the number of sinks available on hand hygiene compliance, found that health care workers in a room with a senior staff member who did not wash their hands were significantly less likely to wash their own hands (Lankford et al, 2003). These results suggest that health care worker hand hygiene compliance can be influenced by the behaviour of other health care workers, which coincides with the TPB in that it recognizes the ability of social contexts to influence behaviour. This same study found that increasing the number of available sinks did not significantly increase hand hygiene compliance, further promoting predictions that could be made by the TPB that behaviour is more influenced by attitudes and social norms, rather than by what is available in the immediate environment. These findings are critical, in that numerous interventions (such as the one currently being implemented at the UHN) have focused on improving access to hand hygiene resources in order to improve compliance (i.e. ensuring point of care alcohol-based hand rub). Other scholars have noted that attitudes
and subjective norms have significantly predicted intention for a given behaviour (Kretzer and Larson, 1998). For example, intention was found to be significantly associated with behaviour in a study of seatbelt use (Ibid).

Given that the Theory of Planned Behaviour is likely to be helpful in changing the behaviour of health care workers, the question then becomes, what would the TPB recommend in the context of improving hand hygiene? Many studies have addressed this question, and several have concluded that interventions to improve the hand hygiene of health care providers have been found to be more successful when the TPB is used to help identify specific barriers and facilitators to hand hygiene, when the intervention is targeted towards addressing those barriers, and when the intervention is multifaceted (including acting at various social levels) (Pittet, 2005)(Grol and Grimshaw, 2003)(Pittet, 2002).

A number of authors concerned with improving hand hygiene compliance in health care settings have suggested that tailoring the intervention to the target setting is critical to its success (Grol and Grimshaw, 2003). Specifically, it has been noted that hand hygiene campaigns are more successful when barriers are identified within a given setting, and then addressed through an intervention that is specific to that setting (Ibid). Thus, it is suggested that a given campaign to promote behaviour change should be based on evidence for the behaviour itself, as well as on the identified barriers and facilitators to change (Ibid). An example of a campaign that has had success through identifying barriers and targeting
them directly, was the aforementioned campaign led by Dr. Val Curtis to improve hand hygiene practices in Ghana. Recall that this initiative found thatGhanaians tended to wash their hands with soap after an activity they perceived to be “gross”, and thus, the campaign used advertisements sending the message that using the toilet is a “gross” activity, and as a result they were successful in beginning to shift the Ghanaian cultural norms surrounding soap use (Duhigg, 2008).

Since barriers to change can be identified at the individual, team, or organizational levels, it is therefore important to understand these different levels and to tailor intervention strategies to them (Grol and Grimshaw, 2003). This concept of initiating change at several levels is supported by numerous studies that suggest multifaceted campaigns tend to be more successful at improving hand hygiene compliance compared with campaigns that use only one element (such as education), or target only one level (such as nursing staff)(Grol and Grimshaw, 2003)(Grimshaw et al, 2001). For example, a review of 22 studies assessing interventions to improve hand hygiene found that educational interventions seemed to only have a short-term effect on hand washing, the use of reminders (posters, signs) were found to have a small but sustained effect, implementing the use of new soap or hand-rub had a small or unclear effect and multifaceted campaigns that included education, written materials and feedback and reminders, had a pronounced and sustained effect on hand hygiene practices as well as on nosocomial infection rates (Ibid). Considering this finding that campaigns which are primarily educational tend not to yield a sustained
improvement in hand hygiene, it should be noted that perhaps the aforementioned hand hygiene campaign in Scotland could have benefited from this knowledge when planning its intervention, which as previously mentioned, is primarily based on promoting awareness and educating through the use of advertising (Health Protection Scotland, 2008).

In addition to effective campaigns being multifaceted and specific, it is also important (as suggested by the TPB) to consider social influences and their relation to behaviour. It has been noted that health care workers can be both influenced by and influential on their social environments (Pittet, 2005). Behaviour in this context is often influenced by peer group pressure (Ibid). To support this point, a paper (previously mentioned) by Lankford et al noted that several studies suggest that role models, group behaviour, and the level of managerial support in a given institution have an influence on reported levels of hand hygiene compliance (Lankford et al, 2003). In agreement with the TPB, a paper written by Michie et al suggests that perhaps low hand hygiene compliance is observed because at the motivational level, it may be that group norms within hospital settings tend to prioritize throughput in patient care (i.e. getting tasks done) rather than hand hygiene (Michie et al, 2005). Further, this paper suggests that poor compliance may also be the result of beliefs about consequences, meaning that some health care providers may have the belief that performing hand hygiene has little to do with rates of nosocomial infections (Ibid). Additionally, this same paper suggests that poor compliance may also be related to a problem with action initiation (meaning that staff may forget to wash their
hands), and thus, providing local cues such as reminder posters in key places may be helpful in improving hand hygiene compliance (Ibid). Thus, the aforementioned studies suggest that emphasis on environmental changes or education (which are currently being implemented in several campaigns), are less likely to be effective at improving and sustaining hand hygiene compliance than campaigns that involve a multifaceted approach, that target context specific barriers to hand hygiene, and that acknowledge the significant social influence that health care providers can have on their peers.
RECOMMENDATIONS FOR IMPROVED HAND HYGIENE COMPLIANCE AT THE UNIVERSITY HEALTH NETWORK

Through the application of relevant literature in conjunction with the experiences of other health care institutions, it is clear that the use of the Theory of Planned Behaviour has the potential to be very helpful in creating successful interventions to improve hand hygiene compliance in health care settings. Based on this finding, it is recommended that the University Health Network utilize the concepts present in the TPB when considering further aspects of their hand hygiene campaign. Specifically, incorporating the TPB at the UHN should involve creating a tailored intervention that is specific to the staff, culture and facilities at each of the three UHN hospital sites, cultivating support from all levels of staff, and maintaining and expanding the current campaign's multifaceted quality.

The UHN's current hand hygiene campaign has several gaps considering what is recommended for sustained improvement of hand hygiene compliance through the TPB and the literature surrounding health care provider behaviour change. First, because the UHN is implementing the Just Clean Your Hands campaign as outlined by the Ontario Ministry of Health and Long-Term Care, and because this campaign has been created as a template for use in all Ontario hospitals, it is not tailored to the UHN context. This campaign was introduced without performing a needs assessment, and so specific information about what might be the existing barriers to successful behaviour change at the UHN have
not been accounted for. As a result, the current campaign is not facility or institution specific, and thus has a reduced-likelihood of achieving sustained success. Second, IPAC is the primary department in charge of running this campaign at the UHN, and it has focused thus far on obtaining support from other sectors through harnessing the support of institutional leaders. Thus, the current hand hygiene campaign at the UHN is taking a top-down approach, and has not included front-line staff in the process of designing and implementing the campaign. This has the potential to be problematic in that staff may feel they are being told what to do, and may be unlikely to support the campaign if they are not involved in the decision-making process. From my experience working within the UHN hospitals, front-line staff (such as nurses and physicians) prefer to be consulted on all issues, and thus, excluding front-line staff from the campaign’s development may result in decreased uptake within the institution. Finally, the UHN’s hand hygiene campaign is not currently based on behaviour change theory, and as a result it does not sufficiently address several key factors implicated in health care provider behaviour change, such as attitudes and social norms.

As previously mentioned in this paper, the Theory of Planned Behaviour supposes that behaviours are performed when the intention to perform them is present, and that an individual’s intention can be mediated by their attitude about the behaviour, the social pressures or norms surrounding the behaviour, and their perception of the ease or difficulty involved in performing the behaviour.
In relation to this last point mentioned about the ease or difficulty in performing a behaviour, the UHN has gone to great lengths in order to ensure that hand hygiene can be performed by staff in a quick and easy manner, via the installation of point-of-care alcohol-based hand rub in all of its facilities. Although the UHN has addressed this aspect of the TPB, the first two elements should be re-visited (perhaps also staff at the UHN need further education concerning the efficacy of alcohol-based hand rub in reducing transmission of nosocomial infections). Specifically, in my experience working with the current hand hygiene campaign at the UHN, it is apparent that the general attitudes and social norms surrounding hand washing guideline compliance have ample room for improvement in the three hospital sites. It should be noted that this is not to say that all health care providers at the UHN have a negative attitude towards hand washing (in fact, many staff members are quite enthusiastic about the intervention), but merely to point out that there is a lot of work to be done in this area among the staff at the UHN if nosocomial infection rates are to be decreased. Further, the TPB is also an appropriate choice for this setting, as it tends to promote a focus on behaviour change as a group (culture change), and thus does not put all of the responsibility for change onto individuals. Therefore, given the aforementioned evidence and support for the use of the TPB in this context, and the understanding that the TPB focuses on elements of behaviour change that align with general barriers to change at the UHN, it is recommended that the TPB be employed in further developments of the UHN hand hygiene campaign.
Creating an intervention that is specifically tailored to the UHN is also a necessity. Because the UHN is comprised of three different hospital sites, it has the additional challenge of promoting behaviour change in three facilities which each have their own internal cultures, and for the most part, separate groups of staff that work within them. Therefore, in order to implement the TBP at the UHN, barriers and facilitators to hand hygiene compliance will need to be identified at each of the three sites. Once these barriers and facilitators are identified, they should then be used to inform areas and approaches for intervention. Further, it should be mentioned that in order to identify these barriers and facilitators, the UHN would likely benefit from approaches such as perception surveys (in order to gain an understanding of the attitudes and perceptions of staff), focus groups, as well as continued work by the human factors group that is currently investigating various barriers related to hand hygiene and other elements of best practices at the UHN (perhaps with an increased focus on social and perceived barriers, rather than environmental barriers).

In conjunction with a tailored approach, the UHN's hand hygiene campaign should also evoke multi-level support from staff at all three sites. Currently, the UHN is in the process of forming a hand hygiene committee comprised of institutional leaders in order to gain and maintain support from management and to further ensure that the hand hygiene initiative moves forward. Although this is a necessary component of the intervention, advocating for the support of staff at all levels is just as important in the context of promoting
behaviour change. Thus, the UHN should work towards involving staff on the front lines of care as well, which for example, could be approached through the use of identifying staff hand hygiene 'champions'. The idea of champions is used in many hand hygiene campaigns, and is one element suggested for use in the Just Clean Your Hands campaign led by the Ontario Government. The UHN has begun to use this concept on several hospital units, however this could be much more widespread. For example, one area at the UHN in which staff champions may help to initiate behaviour change is in the radiation unit at Princess Margaret Hospital. This unit stands out because while auditing there this past summer, it became apparent in numerous cases that individuals who would not regularly perform hand hygiene tended to clean their hands when working with staff peers who cleaned their hands (for example when entering or exiting a radiation room). This idea is also supported through the related aforementioned finding that health care workers have been observed to be less likely to wash their hands when in the presence of a superior who did not wash their own hands (Lankford et al, 2003). Therefore, if staff champions are identified, this would not only help to empower staff who are already excellent at hand hygiene compliance, but it would help to shift the social norm within the hospitals towards performing proper hand hygiene when appropriate. Activities such as holding focus groups and conducting perception surveys (as previously mentioned) may also help to gain support from multiple levels simply through involving all levels of staff in the process of the campaign design and implementation.
Continuing and expanding the current multifaceted approach to the hand hygiene campaign at the UHN is important for the promotion of behaviour change in this context. As previously discussed, numerous studies have found that multifaceted campaigns are more effective at creating sustained behaviour change in health care settings (Grol and Grimshaw, 2003)(Grimshaw et al., 2001). Thus, the UHN is likely to benefit from continuing to implement various aspects of the Just Clean Your Hands campaign, while keeping these actions tailored to identified barriers. Further, the UHN’s campaign is also likely to benefit from installing small posters as local cues in places where hand hygiene should be performed (such as at inpatient doorways), as a reminder to those who may simply forget to wash their hands (because even though some staff may have the intention to perform hand hygiene, they may forget to do so). This has already been done by several units under the initiative of staff members on the floors, however this should be something that is done throughout all three sites consistently.

Another activity that can be used to augment campaign implementation that may be beneficial at the UHN is having the Infection Control Practitioners (ICPs) take a more active role in promoting the hand hygiene campaign among the physicians and nurses on their respective hospital units that they are responsible for. In addition to identifying unit-specific hand hygiene “champions” (as previously suggested), this might involve the ICPs engaging in frequent discussions concerning hand hygiene with the staff on their units, and obtaining regular feedback from them regarding any suggestions or concerns they have
about the campaign or hand hygiene in general. Involving the ICPs in the hand hygiene campaign in this fashion is likely to be beneficial because these individuals have existing relationships with the staff on their given units, and they are therefore appropriate individuals to be communicating the importance of hand hygiene to front-line staff.

Finally, there may be aspects of the current behaviour change challenge at the UHN that cannot be explained or amended solely through the use of the TPB. One particular example is that certain health care providers may simply be unaware of when they should be performing hand hygiene. There are many opportunities to perform hand hygiene when providing direct patient care, and it is possible that part of the existing problem is that health care workers are not always aware of what these opportunities are. Because not being aware of the need to perform hand hygiene has little to do with the intention to perform hand hygiene, this barrier to change lies outside of the TPB. This suggests that an element of education (such as via the ICPs or holding frequent information sessions) within the UHN campaign may be useful if it aims to ensure that health care providers are aware of when hand hygiene should be performed.

Another potential limitation of the TPB in the context of improving hand hygiene is that it does not account for persons who may forget to follow through with the behaviour, or who may re-contaminate their hands prior to making contact with a patient after they have already washed their hands. Although these potential barriers to hand hygiene lie outside of predictions that could be
made using the TPB, they can be easily addressed through education
surrounding proper hand hygiene protocol, as well as through the installation of
simple environmental cues so that staff are reminded to wash their hands when
appropriate.
CONCLUSION

Through the exploration of current strategies being undertaken by leading health care institutions in order to improve hand hygiene compliance, as well as through the discussion of evidence-based ways to promote behaviour change in health care settings, it has become clear that the University Health Network’s current hand hygiene initiative stands to benefit substantially through the implementation of behaviour change theory, in addition to various intervention elements as outlined in this paper.

Despite the existence of ample studies and papers citing the success of theory-based, tailored, multifaceted interventions for hand hygiene improvement, numerous campaigns are currently underway at leading institutions around the world that fail to address these elements of successful interventions, and are thus at risk of being unsuccessful at achieving and sustaining significant improvement. Fortunately, the existence and ready availability of this knowledge base, in conjunction with the current wave of hand hygiene initiatives being undertaken (both globally and within Canada), suggests that the will and means to pursue improvement in hand hygiene and the reduction of nosocomial infections are apparent. Thus, it is hopeful that continued momentum surrounding this issue in the public health arena will direct interventions towards employing evidence-based approaches. More specifically, I would like to conclude this
paper by acknowledging that the unyielding dedication of the Infection Prevention and Control department and of all staff members at the UHN to ensuring that their facilities provide the best-available patient-centred care, has formed a positive and inspiring foundation upon which an effective and successful hand hygiene intervention can be built in the months and years to come.
APPENDICES

Appendix 1.
Nosocomial and community C.Diff rates at the UHN, April 2005-June 2008

Nosocomial and community C. difficile rate, UHN, April 2005 - June 2008

(University Health Network, 2008)
Appendix 2.
Nosocomial and community VRE rates at the UHN, from April 2005-June 2008

Nosocomial and Community VRE rate, UHN, April 2005 - June 2008

Rate per 10,000 pt days

(University Health Network, 2008)
Appendix 3.
Nosocomial and community MRSA rates at the UHN, from April 2005-June 2008

Nosocomial and community MRSA rate, UHN, April 2005 - June 2008

(University Health Network, 2008)
Appendix 4.
Baseline hand hygiene audit results by unit at the UHN, from May 2008-August 2008

UHN Hand Hygiene Compliance by Unit

(Infection Prevention and Control at the University Health Network, 2008)
Appendix 5.
Percent hand hygiene compliance by hospital site at the UHN, from May 2008-August 2008

Overall Compliance by Hospital

<table>
<thead>
<tr>
<th>Hospital Site</th>
<th>Percent Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto Western</td>
<td>45</td>
</tr>
<tr>
<td>Princess Margaret</td>
<td>50</td>
</tr>
<tr>
<td>Toronto General</td>
<td>58</td>
</tr>
</tbody>
</table>

(Infection Prevention and Control at the University Health Network, 2008)
Appendix 6.
Schematic of the Theory of Planned Behaviour

(Ceccato et al., 2007)
REFERENCE LIST


