Infection control: behavioural issues for healthcare workers

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Abstract

Purpose – The purpose of this research is to explore healthcare workers' infection control practices from a behavioural viewpoint. Major behavioural theories are explored. Findings from a study which drew heavily from the PRECEDE theoretical framework are presented. The main purpose of this quasi-experimental study was to observe health care workers' behavioural compliance with hand hygiene guidelines during patient care in an Intensive Care Unit in Ireland before (pre test) and after (post test) implementation of a multifaceted hand hygiene program. Health care workers' attitudes, beliefs and knowledge in relation to compliance with hand-washing guidelines were also investigated.

Design/methodology/approach – Data were collected through non-participant observation and survey methods. A convenience sample of nurses, doctors, physiotherapists and care assistants ($n = 73$ observational subjects, $n = 62$ questionnaire respondents) was used.

Findings – Data ($n = 314$ observations, 62 questionnaires) were analysed descriptively and cross-tabulated using Chi Square (Pearson's) and Mann Whitney statistical tests. Results revealed that a significant shift (32 per cent) occurred in health care workers' compliance with hand washing guidelines (pre-test 51 per cent/post-test 83 per cent, $p < 0.001$) following the interventional hand hygiene program. Similarly, significant changes were also found in relation to health care workers' attitudes, beliefs and knowledge ($p < 0.05$).

Originality/value – Findings from this paper are also of value to future researchers investigating any form of behavioural change. Recommendations from this study are that future research which aims to investigate behaviour should be underpinned by an appropriate theoretical framework. Only multifaceted interventions are justified.

Keywords Behaviour, Hygiene, Nurses

Paper type Research paper

Introduction

There are official guidelines that cover the hand washing/hand hygiene practices of healthcare workers, such as the widely accepted ones developed by the Center for Disease Control (CDC, Atlanta). These guidelines are evidence based and it is important to realize that rates of hospital acquired infections may be reduced by up to one-third if healthcare workers comply with such guidelines (Pittet, 2000; Larson, 1988; Haley *et al.*, 1985). However, compliance rarely exceeds 50 per cent (Creedon, 2005; Bischoff *et al.*, 2000; Maury *et al.*, 2000; Moongtui *et al.*, 2000; Pittet, 2000; Pittet *et al.*, 1999; Larson *et al.*, 1992; Graham, 1990).

The purpose of this paper is to examine some of the evidence surrounding healthcare workers compliance with hand washing guidelines. Behavioural theories are discussed prior to investigating results from a study which drew heavily on behavioural aspects of PRECEDE theoretic model. Conclusions are drawn.

Compliance

Compliance is the degree to which a person adheres to advice (Haynes, 1979) and may be defined as "the act of complying, yielding, or acting in accord" (Reid, 1996, p. 26). According to Kelman (1967) compliance or obedience occurs when another person or

group influences an individual. Raven and Haley (1982) conducted a survey of nurses' ($n = 7,100$) reported compliance to hypothetical situations involving infection control practices. In relation to allowing an infectious patient out of isolation 39 per cent stated that they would allow this happen if instructed and 22 per cent said that they would proceed to catheterize a patient with a contaminated catheter. With regard to permitting a child to keep a pet turtle in his hospital room, 24 per cent said that they would agree to this. Reasons given were that a doctor, who was apparently viewed as having more knowledge or authority, had requested or expected this action and therefore they had complied or obeyed with the request.

In reality, compliance appears to be more than simply obeying or yielding as suggested by Reid (1996) or Kelman (1967). Its definition is closer to that described by Rungapadiachy (1999) in that it is a behaviour exhibited as a response to a direct request or wish of an influencing source. However, the rate at which this behaviour occurs appears to be dependant on the legitimacy or credibility of the request, influencing source or information.

Non-compliance

Non-compliance, therefore, is defined as lack of a behaviour exhibited as a response to a direct request. Healthcare workers non-compliance with hand washing guidelines has been well documented. Various reasons have been cited: insufficient time (Voss and Widmer, 1997, Gould and Ream, 1994, Larson and Killien, 1982), inaccessible hand washing supplies (Harris *et al.*, 2000) and skin irritation (Larson and Kretzer, 1995; Zimakoff *et al.*, 1992).

Many attempts have been made to improve compliance such as provision of an educational program (Gould and Chamberlain, 1997; Dubbert *et al.*, 1990; Conly *et al.*, 1989) a motivational program (Simmons *et al.*, 1990), automated sinks (Larson *et al.*, 1997) and patient educational programs (McGuckin *et al.*, 1999). However, having found compliance shifts of 12 per cent or less, researchers have concluded that healthcare workers hand washing rates are difficult to shift, despite best efforts. The absence of a behavioural theory underpinning most of these interventional studies is important. Therefore, a review of some behavioural theories is justified prior to examining results from a study which drew heavily from a theoretical model – PRECEDE (Predisposing Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation). This model was originally constructed by Green *et al.* (1980) and is based on the proposition that because health risks are determined by multiple factors, efforts to effect behavioural, environmental or social change must be multi-faceted.

Behavioural theories

Most compliance studies have been guided by one of the major theoretical orientations:

- (1) Biomedical model.
- (2) Operant behaviour and social learning.
- (3) Communications approach.
- (4) Theory of reasoned action.
- (5) Theory of planned behaviour.

Each of these theoretical orientations view compliance from a different perspective and gives more or less attention to the following processes: disease perspective, risk perception, and intention.

Biomedical model

The biomedical model has become the “folk model” of illness in Western society (Fabrega, 1975). Western society views disease as resulting from biochemical malfunctions caused by the invasion of foreign agents (i.e. pathogens), genetic factors or the natural breakdown of the body’s parts or processes. These malfunctions generate symptoms, which are labeled as diseases and “diagnosed” by medical experts. These professionals then offer advice, prescribe treatments and apply their various skills to eliminate the underlying conditions that cause the symptoms. In this setting, the patient is likely to be viewed as the recipient and performer of instructions that are to be accepted and obeyed – with or without the patients understanding of the treatment.

Nishimura *et al.* (1999) investigated healthcare workers/visitors compliance with a specific hand washing guideline. The biomedical model was not overtly used as a theoretical framework, but its application is straightforward. The “experts” (authors of the study) devised a guideline that all persons entering the ICU should wash their hands. This guideline was posted up on the entrance door to the unit, no rationale for the guideline was given and all persons were expected to comply. Prior to the study there had not been a practice of hand washing before entering the ICU. During the period while the notice was on the door ICU personnel complied with the guideline to hand wash at a rate of 71 per cent, non-ICU personnel at a rate of 74 per cent and visitors 94 per cent (total $n = 1,030$). When the notice was removed, hand washing prior to entering the unit was again extinct. The results revealed that behaviour changed on a short term basis due to provision of “expert” advice. In essence Nishimura *et al.* (1999) expected “obedience” without attention to psychological processes that underpin behaviour such as behaviour reinforcement. Whilst behaviour did change, it was not sustained and appeared linked to instruction only. This perspective is quite different from the use of Operant and social learning behavioural models to study compliance.

Operant and social learning models

Operant and social learning behavioural models evolved from learning theories developed by psychologists such as Pavlov, Skinner, Hull and Tolmen and came into vogue as compliance research shifted its focus from the characteristics of the complier/non-complier to the behaviours needed for compliance (Dworetsky, 1993). These models pay attention to the stimuli or cues that elicit behaviour, the rewards that reinforce behaviour, the gradual shaping or patterning of behaviour and its automation after sufficient repetition.

Despite an extensive literature review, no study was found in which direct reinforcement was used to alter healthcare workers behaviour in a ward setting. However, in a systematic review of 11 studies, Giuffrida and Torgerson (1997) found that reinforcement by using financial incentives increased patients’ compliance with healthcare treatments. Financial incentives included provision of cash, vouchers, lottery tickets or gifts in relation to attempts made to decrease non-compliance with medication taking, adherence to medical advice or keeping medical appointments. Only randomized trials with quantitative data were included. As well as randomization, each study had to include a “free” treatment (control) group. Results revealed that all studies reviewed (11 out of a possible 491) were conducted in the USA. In all but one of the studies, financial incentives were found to be more effective than other methods at decreasing non-compliance. In that study the intervention comprised of telling parents of behaviourally disturbed children that if three successive appointments were missed their child would be assigned to the bottom of the waiting list. This had a more desired effect

than provision of gift vouchers. This type of reinforcement differs from paying attention to how information is communicated to a target audience.

Communications approach

In the communications approach, compliance is seen to depend upon six major steps: generation of the message, reception of the message, message comprehension, acceptance or belief in the substance of the message and compliant action (Leventhal and Cameron, 1995). While compliance depends on acceptance of the information itself, Seto *et al.* (1991) concluded that the person delivering the message must generate a favorable attitude towards the recommended actions in order to achieve compliance. Myers and Robertson (1972) identified people who exert social influence over others as Opinion Leaders (OLs). The concept of OLs drawing on communications approach theory was used in relation to investigating nurses' compliance with urinary catheter care guidelines by Seto *et al.* (1991) in a quasi-experimental study in Hong Kong. Study subjects were selected from six wards and divided randomly into two groups: A and B. Opinion Leaders were identified by sociometric method (which is to use members within the social group (nurses) to identify them) from group A only. Results revealed that the percentage of incorrect patient care practices in the two groups before the intervention (educational program and demonstration) was comparable (A: 62 per cent, B: 69 per cent) and decreased (A: 42 per cent, B: 62 per cent) after the intervention. Other studies investigating the importance of role-modeling also found positive results (Muto *et al.*, 2000; Brown *et al.*, 2003). Alternatively, studies which investigated compliance from an individual's perspective may have drawn from the Theory of Reasoned Action or Planned Behaviour.

Theory of reasoned action

This Theory of Reasoned Action suggests that an individual who believes a behaviour (e.g. compliance) leads to a positive outcome holds a favorable attitude, and thus there is likely to be an intention (willingness to try) to perform the behaviour (e.g. compliance) (Ajzen and Fishbein, 1980). Drawing on this theory, Seto *et al.* (1991) conducted a study to examine nurses' compliance with a policy on needle recapping. A convenience sample of nurses was divided into three groups – A, B and C and surveyed to determine their needle recapping practices. Subsequently the groups were divided into those who were intent to discontinue with recapping (agreeables) and those without the intent (non-agreeables) i.e. group norms. The policy, to stop needle recapping, was introduced to group A (control) through the use of a memo from nursing management, to group B by posters and pamphlets (passive method) and to group C by posters, pamphlets and in-service lecture (passive and active methods). Changes in relation to their intention to discontinue needle recapping i.e. the "agreeables" was most marked in group B (passive methods) with 85 per cent change ($p = 0.05$) which was superior to group A (control) at 30 per cent ($p = 0.05$) and no significant change was shown in group C (active method) – $p = 0.67$. In contrast, in the "non-agreeables" group, there was no significant ($p = 0.58$) change in behaviours in group A or B, while in group C a change of 83 per cent had occurred. Results of this study suggests that if a new policy is to be introduced to health care workers that it may be worthwhile to survey attitudes and group norms first.

Theory of planned behaviour

The Theory of Planned Behaviour is concerned with understanding factors (such as attitudes, social norm, and behavioural control) that define an individual's behavioural intention. In a longitudinal, observational study in 2001, O'Boyle, Henley and Larson used it as a theoretic underpinning to test nurses' ($n = 120$) intentions towards specific infection control measures, such as hand hygiene guidelines. Observational and self-report data was collected. Analysis revealed low correlation ($r = 0.21$) between self-reported and observed compliance with hand washing recommendation. The predictor that appeared to affect hand hygiene most was intensity of activity, rather than Theory of Planned Behaviour variables.

Healthcare workers compliance with hand washing guidelines remains a problem as observational studies rarely report compliance rates exceeding 50 per cent (Creedon, 2005; Afif *et al.*, 2002; Bischoff *et al.*, 2000; Maury *et al.*, 2000; Moongtui *et al.*, 2000; Pittet, 2000; Pittet *et al.*, 1999; Larson *et al.*, 1992). From a review of behavioural theories presented in this paper, it appears that attempts to increase compliance while drawing on different theoretical perspectives have had sub-optimal results: Biomedical Model (Nishimura *et al.*, 1999), Operant and Social learning (Giuffrida and Torgerson, 1997), Communications Approach (Seto *et al.*, 1991), Theory of Reasoned Action (Seto *et al.*, 1991), Theory of Planned Behaviour (O'Boyle *et al.*, 2001). Therefore, what may be needed is an integration of major theoretical perspectives and in particular a more comprehensive model which focuses more on integration of cognitive (knowledge of characteristics of the disease, knowledge of guidelines), emotional (attitude of and support for the health care professional) and behaviour-enabling aspects of the compliance situation. Such integration might guide the investigator to consider the relationship between the patient, control of a health problem and control of emotional reactions to the problem rather than focusing on any single factor in isolation (Leventhal *et al.*, 1983, Baumann and Leventhal, 1985). Applied to investigating health care workers compliance with hand washing guidelines, such integration might guide the investigator to consider the relationship between health care workers, control of hospital acquired infection and control of attitudes and beliefs leading to compliance, thus making it a multifaceted approach rather than an approach focusing on any single factor. The PRECEDE health education theoretic model may represent such an approach.

The PRECEDE health education theoretic model

The PRECEDE health education theoretic model was developed in the 1970s to enhance the quality of health education interventions, by offering health professionals a systematic planning process (Glanz *et al.*, 1997). The model has been used with some success in health education programs to bring about change in behaviours – compliance with guidelines – such as in the wearing of car seat belts (Erikson and Grielen, 1983), cessation of smoking (Bennett, 1982), examining health education practices by physicians (Green *et al.*, 1980), planning infection control programs (Goldrick and Larson, 1992) and promoting health care workers compliance with hand washing guidelines (Creedon, 2005, Larson *et al.*, 1997), protecting Health Care Workers from SARS (Moore *et al.*, 2005) and others. The strength of the model is that it takes into account the multifaceted nature of behaviour change.

Drawing on this theoretical foundation and a careful review of relevant literature, the primary aim of this study was to investigate healthcare workers compliance with hand hygiene guidelines in a quasi-experimental study during patient care in an intensive care unit in Ireland before (pre test) and after (post test) implementation of a

multifaceted hand hygiene program. A secondary aim was to investigate healthcare workers' attitudes, beliefs, and knowledge (behavioural predisposition) in relation to compliance with hand washing guidelines.

In accordance with the nature of the study design (Quasi-experimental), a pre-test, post-test and interventional study phase was used. During the pre-test phase healthcare workers compliance with hand hygiene guidelines was observed. The instrument used was originally devised by Elaine Larson (Larson *et al.*, 1997) and was modified for use in this study. It was based on guidelines issued by CDC (beginning/resuming care, between contact with patients, before invasive procedures, after touching inanimate objects likely to be contaminated, before and after touching wounds, after direct contact with body substances, and after taking care of an infected patient or one who is likely to be contaminated). Healthcare workers attitudes, beliefs and knowledge in relation to compliance with hand hygiene guidelines were also surveyed. The questionnaire used was originally devised by O' Boyle *et al.* (2001) and further modified for use in this study. Healthcare workers completed it prior to and after the interventional program.

The pre-test phase was conducted over a four week period and was followed by a seven week interventional program. The interventional program relied heavily on the PRECEDE model and aimed to predispose, reinforce and enable hand hygiene behaviour. Healthcare workers were predisposed to hand hygiene through a poster campaign and distribution of information leaflets developed exclusively for use in this study. Their behaviour was reinforced by informing them of results from observations conducted during the pre-test. Finally, their behaviour was enabled by providing them with an alcohol hand rub at each patient's bed-side. The post-test phase was conducted over a four week period and along similar lines to the pre-test. Particular consideration was given during both pre and post test phases to reducing the limitation created by the "Hawthorne effect" while conducting observations. In order to limit the impact of healthcare workers altering their behaviour because of being observed, the researcher was present in the Unit for a number of weeks prior to collecting any data. This meant that healthcare workers were familiar with her presence when data collection commenced and therefore the impact was plausibly reduced. Ethical considerations meant that healthcare workers were fully informed of the purpose of the study. A convenience sample of nurses, doctors, physiotherapists, and care assistants involved in direct patient care in an ICU of a large teaching hospital was used.

Data ($n = 314$ observations, 62 questionnaires) were analyzed descriptively and cross-tabulated using Chi Square (Pearson's) and Mann Whitney statistical tests. Results revealed that a significant shift (32 per cent) occurred in health care worker's compliance with hand washing guidelines (pre-test 51 per cent/post-test 83 per cent, $p < 0.001$) following the interventional hand hygiene program. This positive compliance shift of 32 per cent compared favorably to compliance shifts in other interventional/observational studies, e.g. 1 per cent (Gould and Chamberlain, 1997), 3 per cent (Larson *et al.*, 1997), 7 per cent (Simmons *et al.*, 1990), 13 per cent Graham (1990), 11 per cent (Dubbett *et al.*, 1990), 16 per cent (Pittet, 2000), 20 per cent (Bischoff *et al.*, 2000). Clearly, factors other than individual knowledge and positive attitude must have been at work to give such an improvement in compliance (51 per cent – 83 per cent, $p < 0.001$).

Significant changes were also found in relation to health care worker's beliefs and knowledge ($p < 0.05$). Attitudes had been positive prior to the interventional program and did not change significantly afterwards ($p = 0.0905$). However, healthcare workers beliefs in relation to skin condition changed significantly ($p < 0.001$) following the interventional program. Prior to the intervention, Healthcare workers stated that the

condition of their skin was poor (in terms of redness, itching, and dryness). The only factor that could have contributed to the reported improvement was the alcohol hand rub (which contained emollients) as patient numbers, staff numbers and infection rates remained constant throughout the study period. Knowledge of hand hygiene guidelines was high prior to the intervention with 79-91 per cent of healthcare workers correctly identifying when hand washing should occur. However, this significantly increased to all (100 per cent, $p < 0.05$) correctly identifying when hand washing should occur post-intervention.

Due to the multifaceted nature of the intervention, it was not possible to speculate how individual strands (posters, feedback of results, alcohol hand rub, and educational hand out) may have contributed to the overall compliance shift that occurred in this study. However, provision of knowledge (Gould and Chamberlain, 1997) and feedback of results (Simmons *et al.*, 1990) separately have had minimal effects on hand washing practices. Provision of an alcohol hand rub on its own has increased hand hygiene rates (Graham, 1990; Bischoff *et al.*, 2000; Maury *et al.*, 2000) but the greatest increase of 20 per cent which was found by Graham (1990) was 12 per cent less than that found in this study. This deduction supports the theory that in order to bring about behavioural change, attention must be paid to all factors that predispose, reinforce and enable behaviour and not to any single factor (Green *et al.*, 1980).

Conclusion

In conclusion, healthcare workers compliance with hand hygiene guidelines is sub-optimal. Many efforts have been made to address this problem but with poor success rates. Unifaceted interventions designed in the absence of behavioural theories appear to have the lowest success rates. Multifaceted interventions, based on behavioural theories, have more chance of success than single approaches or promotional programs focusing on one or two elements (Gopal Rao *et al.*, 2002; Pittet, 2000; Larson *et al.*, 2001). Choice of theory on which to base an intervention appears to be crucial to the success of a hand hygiene program. The Biomedical Model focuses strongly on disease perspective and personal characteristics as indicators of compliance or non-compliance. Operant and social learning models focus on motivation to comply with heavy emphasis on reinforcement. The communications approach is concerned with motivation to comply and disease perspective in that emphasis is on delivery, content and structure of the message. The Theory of Reasoned Action and Theory of Planned Behaviour are concerned mainly with attitude and intention. However, these theories have been in existence for at least the last 50 years and have been guiding studies of compliance over that time. The problem of non-compliance with hand washing guidelines remains. Therefore, what may be needed is a more comprehensive theory or model which integrates the major theoretical perspectives. The PRECEDE theoretic model may represent such an approach.

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