An explorative descriptive study to examine whether Azjen's Theory of Planned Behaviour can be used to understand nurses' hand hygiene behaviour.

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This Thesis would not have been written without the unstinting encouragement of my husband John.

I would also like to thank my supervisor Professor Lorraine N Smith for her support and patience.

Thanks are also due to the nurses who agreed to participate in this study. Their co-operation was entirely voluntary and made the whole thing happen.

Finally I would like to dedicate this thesis to my daughters, Emily and Ruth

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I –
I took the one less travelled by,
And that has made all the difference.

From 'The Road Not Taken' by Robert Frost

ABSTRACT

Hand hygiene among health care professionals is persistently sub-optimal and the failure of a number of different strategies aimed at improving hand hygiene rates has led to commentators suggesting that Azjen's Theory of Planned Behaviour be employed. A descriptive and explorative study was carried out to examine whether Azjen's Theory of Planned Behaviour could be used to explain nurses' hand hygiene behaviour. Nurses (n=7) were recruited and data collected through observation of hand hygiene, self-report questionnaire, knowledge of hand hygiene quiz, audit of hand hygiene facilities and semi-structured interview. Field notes were also kept during the observation period. Although the sample size was small and generalisations could not be made it was found that nurses' hand hygiene behaviour could be examined using Azjen's Theory of Planned Behaviour. The study also found that nurses' hand hygiene rates were 39.5% of optimum. In addition, nurses were often unaware of correct hand hygiene, stating a hand hygiene procedure over sufficient for a task. This finding was reflected in observations of hand hygiene performance that was also frequently over sufficient for the related task.

GLOSSARY

Azjen's Theory. Azjen's Theory of Planned Behaviour.

DoH. Department of Health

Hand hygiene. Hand decontamination that occurs as a result of either soap and water, soap and water and alcoholic hand rub or alcoholic hand rub only.

Hand washing. Hand decontamination with soap and water only. Is also used in the data collection tools to denote hand hygiene

Health care workers. Members of the medical profession and professions allied to medicine.

HAI. Hospital acquired infection.

HBM. Health Belief Model

NMC. Nursing and Midwifery Council.

Nosocomial infection. Hospital acquired infection.

UKCC. United Kingdom Central Council

CHAPTER ONE
INTRODUCTION

My father, a Civil Engineer, gave me this quote;

'There is no glory in foundations for your sources of success or failure are buried deep in the earth. As such they are sometimes treated like stepchildren and like stepchildren, their acts of revenge for lack of attention can be very embarrassing' Karl von Terzaghi 1935.

And so it is with hand hygiene. A simple procedure, the foundation of care in the hospital, has been given far too little attention with embarrassing results.

This study shows that although hand hygiene is recognised as the foundation of good infection control, actual hand hygiene rates among health care professionals frequently fall below optimum levels and strategies employed to improve hand hygiene compliance often fail to bring about sustained improvements.

This thesis examines the proposition that nurses' hand hygiene behaviour can be explored using a model of behaviour, Azjen's Theory of Planned Behaviour. The background to this study lies in an Open University degree and reflects my interest in understanding what determines nurses' behaviour in certain situations.

In 1997 I completed a BSc (Hons) with the Open University. Among the topics studied were theories that attempted to explain human behaviour. This led to a proposal to examine whether a specific model of behavioural theory, Ajzen's Theory of Planned Behaviour, hear-after known as Azjen's Theory, could be used to examine nurses' infection control behaviour based on their intention to perform hand hygiene and actual hand hygiene behaviour.

Ajzen's Theory was chosen because although the association between hospital acquired infection and inadequate hand hygiene has long been recognised, compliance of health care workers with recommended procedures remains low. In addition studies have found that many strategies, particularly educational, aimed at raising the awareness of hospital staff in infection control matters, do not lead to sustained changes in behaviour when measured against hand decontamination rates and performance.

An examination of the current literature indicated that when this research commenced no previous study using Ajzen's Theory to examine hand hygiene had been undertaken. Therefore the overall aim of the study was to explore whether nurses' hand hygiene behaviour could be examined and understood using Ajzen's Theory. For this reason a multi-method cross sectional study, descriptive and explorative in nature, was designed.

This thesis begins with a literature review and description of the methods and data collection tools used. The presentation of the findings includes quantitative, descriptive data collected from; observation of hand hygiene; a self-report questionnaire; demographic data; a hand hygiene quiz and an audit of hand hygiene facilities, and qualitative data collected from field notes made at the time of the observation and a semi-structured interview. The discussion of the findings is with reference to the literature. There are reflections on the research process and the role of the researcher and the thesis concludes with a discussion of the implications for nursing research, practice and education.

CHAPTER TWO.

A REVIEW OF THE LITERATURE

2.1 Introduction

The overall purpose of this literature review was to explore hand hygiene behaviour and issues surrounding the non-compliance of health care workers in hand hygiene. The review begins with a brief overview of hospital infection control with particular reference to Great Britain. There is an examination of the evidence that hand hygiene controls the spread of infection and that hand hygiene rates among health care workers are less than optimum. This is linked to a consideration of the factors that influence hand hygiene behaviour and a discussion of strategies employed to improve hand hygiene rates. Alternative strategies for improving hand hygiene compliance, such as behavioural theories, are considered. Ajzen's Theory is described and an argument made that application of this theory would give a better understanding of health care workers' hand hygiene behaviour.

During this review the term 'hand washing' is used when researchers under review use it or to describe hand decontamination with soap and water only. The term 'hand hygiene' is also used by a number of researchers and describes hand decontamination that occurs as a result of both soap and water, or an alcohol based hand rub. The term 'health care workers' is used when referring to members of the medical profession and professions allied to medicine such as nurses and physiotherapists. Finally the term hospital acquired infection (HAI) is used to describe an infection that has been acquired by patients during a hospital stay. The term nosocomial infection is also used in some literature to describe HAI. However in this literature review it is not used.

2.2 Search parameters

This literature search commenced in 1998 and was updated on a continual basis. A first search of computerized databases, MEDLINE, CINAHL and PSYCINFO was for articles written in English from 1988 to 1998 and extended to include the Cochrane database and Nursing collection. Further searches were conducted in 2002 and 2003.

Key words and phrases used were hospital acquired infection, hand washing, hand hygiene, infection control, hand washing compliance, attitude to hand washing and hand washing behaviour. In addition and combined with the above, a search was conducted of researchers who had written on infection control, hand hygiene and hand hygiene compliance among health care workers. A number of journals were targeted including the American Journal of Infection Control, The Journal of Hospital Infection and Hospital Infection and Epidemiology. Government and official publications were also accessed through the relevant websites or directly from the organizations concerned. In addition access was gained to grey literature and a hand search conducted of the reference lists of papers and official documents for relevant literature.

The papers selected for this review fall into three broad groups; those that are a good example of a particular point of view or intervention; those that add to a particular debate and those regarded as important contributions to a particular debate and widely reviewed by other researchers.

2.3 An overview of hospital acquired infection

2.3.1 Introduction

In this overview of hospital acquired infection the focus is on the prevalence and cost of HAI with reference to infection control and hand hygiene policies in Great Britain.

In the literature search for this section of the review one paper was identified that dealt specifically with this subject, Selwyn (1991). The article by Selwyn (1991) is a transcript of a lecture given at the 2nd International Conference of the Hospital Infection Society in 1991 and reviews hospital infection over the past 2500 years. In addition the Department of Health and NHS Scotland websites were accessed and using the search words hospital acquired infection six papers identified.

2.3.2 The prevalence of hospital acquired infection

The study of hospital infection began, according to Selwyn (1991), in the 19th century although physicians such as Pringle had been observing and commenting on HAI since the middle of the 18th century. For instance, Sir James Simpson conducted a survey of mortality following amputation at the beginning of the 1830s and in 1858 Florence Nightingale published data on the incident of infection among soldiers in hospitals in the Crimea (Selwyn 1991).

However, no study was found that comprehensively surveyed the incidence of HAI in the United Kingdom until 1960 when the Public Health Laboratory Service surveyed and categorized the incidence of wound sepsis in England and Wales (Selwyn 1991). In 22 hospitals 3276 post-operative wounds were surveyed and the infection rate was found to be 9.4 percent (Public Health Laboratory Service 1960). This was calculated to give an

average of 7.3 days extra in hospital for every infected patient and represented in 1960 an extra 1 million extra in-patient days.

The first national survey of HAI in the United Kingdom and Republic of Ireland was carried out in 1980 and reported an overall prevalence rate of 9.2%. There were four major groups of HAIs identified: Urinary tract (30.3%), surgical wounds (18.9%), lower respiratory tract (16.8%) and skin infections (13.5%) (Meers, Ayliffe, Emmerson, Leigh, Mayton-White and Makintosh 1981). A second survey conducted in 1995, 15 years later, found the overall prevalence rate remained at nine per cent (Emmerson, Enstone, Griffin, Kelsey and Smyth 1996). Again the four major groups of infection were: Urinary tract (23.2%), surgical wound (10.7%), lower respiratory tract (22.9%) and skin infections (9.6%) These findings, according to the researchers, need to be viewed in the light of changing medical practices over the previous decade such as shorter hospital stays, an aging population and advances in surgery (Emmerson et al 1996).

However a National Audit Office report, *The Management and Control of Hospital Acquired Infection in Acute NHS Trusts in England,* (2000) estimated that HAI rates remained at nine per cent. The top five infection sites were blood, post-operative wounds, urinary tract, respiratory tract and skin. While the cost to the NHS in England and Wales could be as high as £1000 million each year, the cost to the patient in terms of morbidity and mortality is incalculable. In addition, the Hospital Infection Working Group of the Department of Health and Public Health Laboratory Service estimated that 30% of HAI could be avoided by improved infection control (National Audit Office 2000). However a subsequent report from the Public Accounts Committee (2000) suggested that a reduction of 15% in HAI rates was more achievable. This would amount to a saving of around £150 million in England alone as well as saving lives (Public Accounts Committee 2000).

2.3.3 The cost of hospital acquired infection

The reports from the National Audit Office (2000) and Public Accounts Committee (2000) suggest that HAI is costly both in terms of the mortality and morbidity of patients and the financial burden on the health service. In order to understand the most current estimates of the cost of HAI, this section of literature review examines the evidence from the most recently published reports on the cost of HAI in Great Britain, *The Socio-Economic Burden of Hospital Acquired Infection* (Public Health Laboratory Service 1999), also reported in the National Audit Office Report (2000).

The report from the Public Health Laboratory Service (1999), *The Socio-economic Burden of Hospital Acquired Hospital Infection,* aimed to assess the cost of HAI to the public sector, patients, patients' carers and society as a whole. To do this, the study recruited adult patients with a minimum stay of at least 30 hours from the general wards of a district general hospital over a 13 month period. The resources each patient used were recorded during their hospital stay. In addition patients who presented with pre-defined symptoms of infection, and a sample of patients who did not, were followed up with a questionnaire post discharge. This information was used to estimate the cost of resources used and analysed to determine the extent to which variations in costs could be attributed to HAI (Public Health Laboratory Service 1999).

The report from the Public Health Laboratory Service (1999) found that the incidence of in-patient HAI was 7.8% and post-discharge the incidence was 19.1%. Patients who presented with a HAI during their hospital admission were found to incur a cost 2.9 times greater that those for an uninfected patient. This amounted to an average increase of £3154 per patient with a HAI. In addition the costs incurred by the infected patient varied with the site of the infection. For instance, urinary tract infections cost an additional £1327 while patients with an infection of the blood stream cost an additional £5397.

After patients had been discharged the Public Health Laboratory Service (1999) found that patients who had an infection at or after discharge had more; contact with their general practitioner; out-patient appointments and visits from the district nurse. In addition patients who had an infection while an in-patient and post-discharge incurred personal financial costs 3.2 times greater and took longer to return to normal daily activities and paid employment than uninfected patients. Finally, patients who acquired an infection that presented either as an in-patient or post-discharge received more care from informal carers than the uninfected group.

As a result of this study in a single district general hospital the Public Health Laboratory Service (1999) estimated the economic burden of HAI occurring in adult patients across England. The cost of HAI to the NHS in England was estimated £983.36 million annually and included in-patient and post-discharge costs. The economic burden to patients was estimated at £4.74 million annually and the number of days taken to return to normal living activities was estimated to be 8.7 million. The report from the Public Health Laboratory Service (1999) concluded that a reduction of 10% in HAI would lead to an estimated saving of £93.06 million annually for the NHS in England and 364,056 bed days released for alternative use. However it should be noted that the data from this study was collected in 1995 and at the time the study was published already four years old. No up to date figures on the cost of HAI in Great Britain were found during this literature review.

2.3.4 National initiatives to control hospital acquired infection

The expensive and complex nature of hospital infections discussed in Section 2.3.3 has led the Governments in Great Britain and other organizations allied to health to issue a number of initiatives to monitor and control HAI. In a search of Government websites (Department of Health, England; NHS Scotland) in 2003 seven articles were revealed related to HAI published since 2001. One of them concerned variant Creutzfeldt Jakobs

disease and is not reviewed here. In addition papers were found that reported on initiatives to monitor and control HAI dating back to the 1940s.

A reference to an early initiative is found in Selwyn (1991). It is a recommendation from the British Medical Council in 1941 that officers should be appointed to supervise infection control (Selwyn 1991). In 1944 the British Medical Research Council recommended that every hospital should have an infection control committee comprising of doctors (medical and laboratory) nurses and administrators. This was followed by a recommendation from Gardner, Stamp, Bowgen and Moore (1962) that a specialist nurse should be appointed to oversee infection control and liaise between the laboratory and the wards. The first infection control nurse was appointed in 1959 (Selwyn 1991). This is still an important role and infection control nurses are responsible for surveillance, education and managing infection outbreaks (Gould and Brooker 2000).

By 1988 a report from the Department of Health and Social Security recommended that all hospitals providing an acute service should have an infection control committee with an infection control nurse to manage outbreaks (DHSS 1988). This was updated in 1995 to include guidance on routine surveillance (DoH 1995).

Clinical governance

The government in Britain in the 1980s and early 1990s introduced a number of quality initiatives into the NHS such as medical and clinical audit, clinical guidelines, evidence based medicine and total quality management (Crinson 1999). The advent of a new British government administration in 1997 emphasised efficiency and excellence. In T*he New NHS: Modern, Dependable* (DoH 1997), the concept of clinical governance was introduced. The idea was that NHS Trusts would now be made explicitly accountable for clinical performance. This was to be achieved through clinical audit, best practice guidelines and multi-disciplinary pathways of care becoming an established and essential feature of clinical practice (Crinson 1999).

One of the basic principles of clinical governance is that clinical, managerial and educational practice is based on best scientific evidence. This followed the Culyer Report published in 1994 (Research and Development Task Force 1994) which proposed that research and development should be an integral and separately funded part of the National Health Service in order to address the need for health care workers to deliver care based on the best available evidence. For this reason Hospital Trusts developed departments dedicated to research and development with the aim of gathering evidence for practice and disseminating it among the staff in a trust, implementing national guidelines and Government and European directives (Crinson 1999).

Initiatives following the introduction of clinical governance

That the best possible evidence should inform practice is particularly relevant to the field of infection control. Since the advent of clinical governance three major reports have been published in the United Kingdom that relate directly to hospital acquired infection, its surveillance and control. They are the; National Audit Office Report (2000); Public Accounts Committee Report (2000) and the *epic* project (2001).

The National Audit Office report (2000) was an analysis of how management and control of HAI should be addressed. The report began with an assessment of the impact of HAI both on mortality and morbidity among patients but also the financial cost to the NHS that was taken from the Public Health Laboratory Service Report (1999) (see Section 2.3.3). The report also noted that there was a lack of information on HAI and a mismatch between what was expected of infection control teams and what they could deliver given the resources available to them. The report recommended greater surveillance of HAI with feedback to clinicians and senior management within hospitals, a revision of the 1995 DoH guidelines on infection control (DoH 1995) and integration of infection control considerations into overall bed management (National Audit Office Report 2000).

Furthermore the National Audit Office Report (2000) also made other recommendations. These were that NHS Trusts needed to improve their strategic management of infection control. This included the Trust Chief Executives being on the Hospital Infection Control Committees and infection control teams having a separate budget and adequate clerical support. The report also highlighted the importance of effective surveillance so that rates and trends could be understood and compared across Trusts. In addition the report recommended that infection control training and education should be given to key clinical staff within a Trust and that infection control policies and procedures should be more widely available (National Audit Office 2000).

The National Audit Office Report (2000) also deals at length with the subject of hand hygiene. In the recommendations it stated that hand washing is regarded by many as one of the most effective preventative measures against hospital acquired infection. However while it acknowledged the difficulties involved in maintaining good hand hygiene practice over a long period, and endorsed the recommendations of the Hand Washing Liaison Group (see section 2.3.5), the National Audit Office Report (2000) did not have any suggestions as to how this could be achieved except to repeat hand washing campaigns and include senior staff in promoting and monitoring hand hygiene (The National Audit Office Report 2000).

The National Audit Office Report (2000) was followed in the same year by the report from the Public Accounts Committee of the House of Commons (England) (Public Accounts Committee - Forty-Second Report 2000) already cited. The report found that while the NHS Executive recognised the seriousness of HAI they did not have a grip on the extent of HAI and the costs involved and would probably need another three to four years to gather the information needed. The report also found that a 'root and branch' move towards prevention of HAI was needed and made recommendations on the surveillance of HAI and its prevention.

The National Audit Office Report (2000) and Report from the Public Accounts Committee (2000) were followed by the *epic* Project: *Developing National Evidence-based Guidelines for Preventing Healthcare Associated Infections* (Pratt, Pellowe, Loveday, Robinson and Smith 2001). The guidelines took three key areas; standard principles, preventing infections associated with short-term indwelling urethral catheters and preventing infections associated central venous catheters. The standard principles were recommendations for preventing HAI generally. Preventing infections associated with urethral catheter and central venous catheter was chosen because of the high frequency of HAI from these devices (Pratt et al 2001). Of particular interest within the section on the standard principles for preventing HAI are the recommendations on hand hygiene. These recommendations describe when hands should be decontaminated; how they should be decontaminated, including hand decontamination technique; and other factors to be taken into consideration such as jewellery to be worn and applying an emollient hand cream after hand decontamination (Pratt et al 2001).

The main issues raised by these three reports were these; that there was a lack of information on HAI; that additional resources should be given to Infection Control teams in order for them to operate more effectively; that there should be greater surveillance of HAI with feedback to clinicians and senior management within hospitals and the importance of hand hygiene in preventing HAI. (National Audit Office Report 2000; the Public Accounts Committee Report 2000; the *epic* project 2001).

2.3.5 The importance of hand hygiene in preventing hospital acquired infection

Although the reports discussed in Section 2.3.4 (National Audit Office Report 2000; the Public Accounts Committee Report 2000; the *epic* project 2001), focus on the importance of surveillance as part of an overall infection control strategy, the reports also specifically mention hand hygiene as an important factor in HAI (National Audit Office Report 2000; the Public Accounts Committee Report 2000; the *epic* project 2001).

In order to highlight the importance of hand hygiene and raise hand hygiene compliance among healthcare workers, a number of strategies have been put forward by Government bodies, organisations allied to healthcare and hospital trusts. For instance a Hand Washing Liaison Group was set up in March 1999 and issued an Action Plan on Hand Washing (Hand washing Liaison Group 1999). This consisted of: the Infection Control Nurses Association, Hospital Infection Society, Association of Medical Microbiologists, Department of Health, Royal College of Nurses and Public Health Laboratory Service. The group proposed that hand washing should have the same status as other health and safety issues so that individuals are accountable for their practices and Trusts liable in the event of litigation (Hand washing Liaison Group 1999).

The British Hospital Infection Society and the Infection Control Nurses Association have been involved in a number of initiatives. For instance, the Infection Control Nurses Association has been involved in the Hand Washing Liaison Group (1999) as already mentioned and developed tools to audit infection control practices (Millward, Barnett and Thomlinson 1993; Crawford 1994; Infection Control Nurses Association 1997).

In relation to the development of tools to audit infection control procedures, Trusts have, through the Infection Control teams, developed infection control policies. Within these documents are policies on hand hygiene. However the National Audit Office report (2000) found that eight per cent of hospital trusts in England did not have a policy on hand washing and only 50% of infection control teams included clinical audit in their annual infection control programme although most saw it as an important strategy in the fight to improve HAI rates (National Audit Office report 2000).

2.4 Evidence that hand hygiene controls the spread of infection

2.4.1 Introduction

The finding by the National Audit Office report that eight per cent of hospitals in England do not have a policy on hand washing is surprising as much has been written about hand hygiene and the control of infection since the importance of hand hygiene in controlling the spread of infection was first recognised by Ignaz Simmelweis, an obstretrician, 150 years ago (Selwyn 1991). However it is because of the discussion in academic journals, government publications and the popular press (Washington Post 1997) that it is important to establish a link between hospital infection and hand hygiene. It is the purpose therefore of this section of the literature review to examine the evidence for the assumption held that hands are vectors for infection and that inadequate hand hygiene is a contributing factor in HAI.

For the purpose of this section of the literature review, hand washing/hygiene and infection control were key words used in a search of Medline 1993-2003. When the key words were combined 238 references were displayed. There were only 18 references that, on inspection of the abstract, specifically linked hand hygiene and control of infection. Microbial evidence for the importance of hand hygiene proved harder to find. A search of Medline using the keywords hand washing/hygiene and bacteria/microbiology produced only 10 references. On closer inspection only three discussed the relationship between hand flora and hand hygiene. However evidence for the importance of hand hygiene in the spread of infection exists and was found in examination of reference lists going back to 1938.

For the purpose of this literature review the evidence accumulated is discussed in two broad groups; those that have studied the organisms cultured from the hands of health care workers and those that have demonstrated a link between hand washing and infection

rates within a group of patients. The papers reported here were chosen because they were good examples of the studies examined.

2.4.2 Microbial evidence

In any discussion on the importance of hand hygiene in preventing HAI it is important to establish that the hands of health care workers carry organisms pathogenic to vulnerable patients. As already mentioned, there are few recent studies that attempt to make a link between hands and hospital infections. The consensus, it would appear, is that the link is already well established. Certainly commentators such as Hugonnet and Pittet (2000) believe this to be the case; '*From our point of view, this issue is no longer a subject of debate'*. However, in a letter to the Journal of Hospital Infection, Rahman and Chattopadhyay (2000) argued that there was a lack of scientific evidence from controlled double blind trials demonstrating a relationship between hand washing and HAI. Therefore it is important when discussing hand hygiene and its role in the control of HAI, to clarify that the link between hand hygiene and HAI exists and to examine whether there could be any other routes by which infection is transmitted between patients.

The spread of infection through sources other than hands

The risk of transmitting infection through equipment that comes into direct contact with patients is well documented and hospitals have specific procedures for decontaminating equipment (Pratt et al 2001). However in order to establish the association between the hands of health care workers and the spread of pathogenic organisms between patients, the importance of other routes need to be considered, particularly the airborne route of transmission. A study conducted by Bauer Ofner, Just, Just and Daschener (1990) attempted to assess the relative importance of airborne and direct contact transmission of organisms in an intensive care unit. Hand washing and airborne cultures were compared with samples taken from patients in a medical intensive care unit over a seven-week period. The main sites from which pathogenic organisms were isolated from patients were

the tracheal secretions, urine, infusion sites, humidifiers and wounds. It was found that with the exception of one instance, the bacteria cultured from the air samples were not the same as those found on the patients. However there were a number of bacteria cultured from the hands of nursing and medical staff that were also found to be colonising patients. In one instance a pathogen isolated from a patient's urine was found five days later in the patient's tracheal secretions and on the hands of the nurse attending him. Although no attempt was made to evaluate the results statistically and it was difficult to see from the percentages given the relative importance of airborne and direct contact transmission, this study was able to demonstrate with descriptive statistics and case history how organisms spread through an intensive care unit on the hands of health care workers (Bauer et al 1990).

The link between organisms found on patients and those found on healthcare workers' hands

The link between the hands of health care workers and the organisms found on patients has been established with studies that have taken cultures from patients and staff at the same time and found that the organisms on the staffs' hands corresponded with those found on patients, particularly in vulnerable areas such as their tracheal secretions and the urine.

An example of a study that found a link between the organisms found on patients and those on the hand of healthcare workers was undertaken by Pittet, Dharan, Touveneau, Suavan and Perneger (1999). Pittet et al (1999) designed a study that investigated the degree of contamination that occurred at five-minute intervals into patient care. They found, unsurprisingly, that the longer patient care continued, the higher the bacterial count on the hands of the attending health care worker became. They also found that the type of contact that the health care worker had with the patient directly affected bacterial counts. Therefore, respiratory care that included handling endo-tracheal tubes, was associated with a rise in bacterial contamination of 21 colony-forming units (CFUs) per minute, while handling uncontaminated body fluids was associated with a rise of 16

CFUs per minute. However concurrent samples were not taken from the patients under going care so although the transmission of micro-organisms on the hands was strongly suggested it was not directly established. In addition 75% of the flora cultivated were normal skin flora, the pathogenic potential of which is usually considered to be low (Hugonnet and Pittet 2000). Finally the authors found that wearing gloves was the most effective way of reducing the growth of micro-organisms as glove wearers had a CFU growth rate of only three per minute (Pittet et al 1999).

The relationship between the organisms colonizing patients and those found on the hands of health care workers was more positively established in a study undertaken by Moolenaar, Crutcher, San Joaquin, Sewell, Hutwanger, and Carson (2000) to investigate an outbreak of *Pseudomonas aeruginosa* in a neonatal intensive care unit. They were able to produce evidence that linked the outbreak to two particular nurses through; culture of their hands that yielded an organism genetically identical to the organism responsible for the outbreak and case-control analysis that demonstrated a significant association between exposure to the nurses and *p aeruginosa* infection. The authors attributed the nurses' colonisation with *p aeruginosa* to their long fingernails although when the fingernails were cut, the infection did not entirely go away. The reason why these nurses were at particular risk of infecting their patients with *p aeruginoa* was not therefore established, neither was it established whether these nurses had high colonization of any other pathogenic bacteria. It would be easy to assume that these two nurses were particularly poor hand washers however that is speculation. (Moolenaar et al 2000).

The evidence suggests that organisms found on patients are also found on the hands of healthcare workers (Bauer et al 1990; Pittet et al 1999; Moolenaar et al 2000). However this does not prove that healthcare workers' hands are transmitting infection and distracts from the central theme of establishing that hand hygiene itself, is an effective way of reducing HAI.

2.4.3 The link between hand hygiene and infection rates

In order to establish that hand hygiene is an effective method of reducing HAI it is necessary to examine the evidence that the incidence of HAI is reduced when hand hygiene rates are improved.

The link between hand hygiene and rates of infection was demonstrated in a study by Black, Dykes, Anderson, Wells, Sinclair, Gary, Hatch and Gangarosa (1981). Black et al (1981) looked at the effect of a hand-washing program, involving children and staff, on incidents of diarrhoea among the children in two day care centres, and compared it with two control centres. The incidence of diarrhoea in the hand washing centres eventually reached half that of the control centres ($p = < 0.001$), in children between six and eighteen months. However, although there was a reduction in the incidence of diarrhoea among children between 18 and 36 months old in the hand washing centre, this was not statistically significant when compared to the incidence of diarrhoea among the children of 18 to 36 months old in the control centre (Black et al 1981). The reason for this was not discussed in the paper and the results were not adjusted for extraneous variables. Such a variable could have been the older childrens' ability to attend to their own toilet needs and the possibility therefore, that their hand washing was insufficient. However in the group of children (6-18 months old) who had their toilet needs dealt with by the staff members there was a significant difference in the incidence of diarrhoea between the hand washing centre and the control centre. The conclusion drawn was that hand hygiene is an important infection control measure (Black et al 1981).

In a subsequent literature review of 37 studies, Reybrouck (1983) discussed the normal microbial flora of the skin and the pathogenic organisms most frequently found on the skin, *Staphylococcus aureus* and Gram-negative bacilli. Nine of the studies were used to demonstrate how pathogens transferred on the hands of health care workers. For instance in one study, flourescein powder, which can be seen under ultraviolet light, was dusted on

infants in a nursery. The powder was later found on all the hands of the nurses caring for the babies and in some instances on another nurse, a bar of soap, a towel dispenser and even outside the nursery. (Scanlon and Leikkanen 1973 in Reybrouck 1983). Another study demonstrated that transmission of staphylococcal infection from the nose of a carrier occured by physical transfer on hands (Mortimer et al 1966 in Reybrouck 1983). The author concluded that enough circumstantial evidence existed to link the role of hand hygiene to HAI infection (Reybrouck 1983).

This link was also demonstrated in a later study undertaken by Pittet, Hugonnet, Harbath, Mouruga, Sauvan, Touveneau and Perneger (2000) in which HAI rates were used as one of the outcome measures. There was a hospital wide programme of posters and performance feedback designed to promote hand hygiene and in particular the use of alcohol based hand rubs. This was because the authors had observed a relationship between hand hygiene compliance and increased workload and it was hypothesised that the use of alcohol hand rubs, which are less time consuming than hand washing, may improve compliance. The outcome measures were hand hygiene rates, HAI rates and incidence of methicillin resistant staphylococcus aureus (MRSA). The authors found that over a four year period overall hand hygiene rates rose from 47.6% to 66.2%, HAI rates fell from 16.9% to 9.9% and the number of MRSA infections fell from 2.16 to 0.93 episodes per 10,000 inpatient days (Pittet et al 2000). However while this study found that an association may exist between levels of hand hygiene and overall infection rates the researchers did not discuss whether there were any uncontrolled variables such as changes in antibiotic prescribing policy, infection control personnel, staffing levels at ward level or housekeeping policies that could have had an impact on the study outcomes.

In summary, there is evidence to suggest that hands are transmitters of infection. This conclusion relies mainly on studies that have found the same micro flora on the hands of healthcare workers as on patients (Bauer et al 1990; Pittet et al 1999; Moolenaar et al

2000) and decreases in infection rates when hand hygiene has been increased (Black et al 1981; Reybrouck 1983; Pittet et al 2000).

2.5 Hand hygiene rates

Although the importance of adequate hand hygiene in the control of infection has been recognised for the last 150 years (Selwyn 1991), and evidence exists that hands have an important role in the transmission of infection, there is also a large body of evidence that demonstrates that health care workers hand hygiene rates remain persistently at sub-optimal levels.

In a search of the literature from 1996 to 2003, keywords used included hand washing, infection control and compliance. When combined 356 articles were revealed. This represents a large number of studies that have been undertaken in the past six years alone and includes studies designed to improve hand hygiene rates. The debate is not confined to the scientific and medical journals either. A National Audit Office Report (2000) found that effective hand hygiene was not always observed and this was a view that had already been expressed by the Hand Washing Liaison Group (1999). The studies discussed in this section of the literature review are good examples of the large number of the papers examined and give an overview of hand hygiene rates in the last eight years.

To begin in 1996, Tibballs (1996) found a hand washing rate before and after patient contact of 12.4% and 10.6% respectively that increased to 32.7% and 33.3% during overt observation and then to 68.3% and 64.8% following feedback (Tibballs 1996). This study is discussed in Section 2.7.3. In the same year Gould, Wilson-Barnett and Ream (1996) recorded a hand decontamination rate 28.78% of patient contacts and 49.85% following heavy contamination (Gould et al 1996).

A later observation study by Rachel Sen Keaney, Trail, Howard and Chadwick (1999) reported an overall hand washing rate of 37% while Muto, Sistrom and Farr (2000) recorded an overall hand washing rate of 60% which actually decreased to 52% after the introduction of alcoholic hand rub. However Sharir, Tatler, Lavi and Raz (2001) recorded a hand washing rate of 76% that the researchers attributed to intensive education programmes (Sharir et al 2001). Finally Earl, Jackson and Rickman (2002) recorded a hand hygiene rate that increased from 39.6% before the introduction of alcoholic hand rub to 57% at ten to fourteen weeks after the intervention.

In summary these studies show that there are wide variations in hand washing and hand hygiene rates from 10.6% (Tibballs 1996) to 76% (Sharir et al 2001). These findings are similar to papers reviewed by Pittet (2000) in a discussion on the reasons why hand hygiene is poor overall and strategies that could be adopted to improve it. In 11 papers cited by Pittet (2000) going back 20 years hand hygiene compliance ranged from 29 to 81%. The mean hand hygiene rate for the first ten years was 38% and for the second ten years 41% (my figures) which suggested that despite a number of strategies aimed at improving hand hygiene rates they have remained stubbornly sub-optimal.

2.6 Factors Influencing hand hygiene behaviour

The hand hygiene rates reported in Section 2.5 has led to speculation about the reasons why hand hygiene should be so poor and remain stubbornly so. In the literature on hand hygiene and infection control practice a number of themes recur and they are; resources in terms of time available to perform hand hygiene and facilities; the damage that hand hygiene does to the skin of hands and the opinion of significant others such as peers. In this section of the review a search was conducted on Medline for the years 1990 to 2003 combining the key words; hand hygiene and infection control and 798 papers were highlighted. On closer inspection there were 126 that fulfilled the criteria of this section of the literature review. Therefore the papers reviewed here are a representative selection.

A useful starting point for this section would be to discuss two literature reviews on the reasons for non-compliance in hand hygiene by healthcare workers. They are Pittet (2000) and Farr (2000). In Pittet (2000) a number of barriers to appropriate hand hygiene were discussed. There was a review of 13 articles and a list of 20 reasons given for poor hand hygiene compliance. Among them skin irritation and dryness, poor accessibility to hand hygiene facilities, lack of time, lack of a role model and a lack of knowledge.

The article by Farr (2000) took a more historic perceptive and began by suggesting that non-compliance is a human failing recognised since Adam and Eve were expelled from the garden of Eden and present today in the populations' failure to comply with warnings on smoking, drink driving and other destructive behaviour. Although Farr (2000) acknowledged that there are a number of practical reasons why physicians have poor hand hygiene compliance he also listed entropy, chaos, nihilism, 'giving into the dark side' and an assumption that infection control procedures are optional, as factors. In addition the concept that hands play a vital role in preventing the spread of infection is a recent phenomena. The Association of Practitioners in Infection Control guideline issued in 1995 was the first to call for hands to be washed between every patient contact (Farr 2000). For this reason there is, certainly among physicians according to Farr (2000), no general history of compliance.

2.6.1 Resources

The time consuming nature of hand hygiene

A number of researchers have commented on the time consuming nature of hand hygiene. For instance a study by Voss and Widmer (1997) estimated that increasing compliance from 40% to 100% would require the equivalent in time of two extra full time nurses or 16 hours. The figures were based on a model intensive care unit of 14 beds with 12 health care workers per day. For the hand hygiene the figures were based on two or three hand

washes an hour with average hand hygiene duration of 40 to 80 seconds for hand washing and 20 seconds for alcoholic disinfection. These times included travelling between the sink and the bed area. However while the authors also concluded that using an alcoholic hand rub would consume only three hours per shift it is not clear whether this would replace a hygienic hand wash or a social hand wash and what the microbial advantages of the alcoholic hand rub were (Voss and Widmer 1997).

Inadequate hand hygiene facilities

As well as the time consuming nature of hand hygiene, researchers report concerns over a lack of adequate hand hygiene facilities. In a letter to the British Medical Journal following an editorial by the Hand Washing Liaison Group (1999), Kesavan (1999), gave inadequate hand washing facilities as a major reason why hand washing was not carried out. With colleagues he surveyed 264 sinks on 19 elderly care wards in seven hospitals in the United Kingdom. They found 11% of sinks were inaccessible either because they were blocked by equipment or because they were badly placed and twelve per cent of sinks were without a decontaminating agent. In addition a study by Darley, Barnett and Jones (2000) surveyed physicians and surgeons who had recently sat professional medical examinations and asked them about the facilities available to them for hand hygiene between clinical examinations. In every case the doctors felt that the time allowed for hand hygiene and the facilities were inadequate. One surgeon was supplied with alcohol hand rub and told it was 'optional' (Darley et al 2000)

Inadequate supplies of soap and towels

A study into nurses' hand hygiene rates, their opinions on hand hygiene and the facilities available for hand hygiene was carried out by Gould (1995). Gould (1995) found that although medicated soap, which was ordered by nurses from pharmacy, was usually in plentiful supply, wall soap replenished by domestic staff frequently ran out and 41% of the nurses surveyed experienced difficulty in obtaining adequate supplies of hand

decontamination agents. In addition, the nurses reported that they had to use paper towels that were harsh on their skin and did not dry adequately (Gould 1995).

2.6.2 Skin Damage

The damage that frequent hand hygiene does to the skin of their hands is also a reason given by health care staff for performing hand hygiene at less than optimal levels. Gould (1995) found that sore hands was one reason given for failure to wash hands and this reason was highlighted in two other studies reviewed (Larson, Friedman, Cohran, Treston-Aurand and Green 1997; Boyce, Kelliher and Vallande 2000).

The study by Larson et al (1997) used questionnaire and visual inspection of the hands to assess the prevalence of skin damage on the hands of 410 nurses. The study found that one fourth (n=106) met the criteria for damaged hands and this finding correlated significantly with the type of hand soap used at work (Larson et al 1997). A later study examined the effect on the hands of nurses of two hand hygiene regimes; soap and water and alcohol gel (Boyce et al 2000). The study found that hand washing with the soap supplied by the hospital caused greater dryness to the skin compared to the alcohol hand rub both on self-assessment scores and on measurement of the epidermal water content of the skin. These studies both suggest that drying of the skin on the hands can be associated with certain types of hand hygiene and hand hygiene products.

2.6.3 Peer Pressure

Finally a number of authors have commented on the importance of peer pressure as a factor influencing hand hygiene rates. A study by Godin, Naccache and Fortin (1998), found that physicians' intention to wear gloves as an infection control measure was mainly determined by the perceived behavioural norm of their colleagues. This study is examined in more depth in Section 2.9. In addition, in the study by Muto et al (2000)

discussed in Section 2.5, physicians' hand washing compliance was predictive of all others attending on the Doctors round.

However, in an interesting study by Seto, Ching, Yeun, Chy and Seto (1991) it was suggested that the influencing individual does not necessarily need to be a senior member of staff. Seto et al (1991) investigated whether the implementation of a guideline for urinary catheter care would be enhanced by the inclusion of opinion leaders. Opinion leaders are persons in a social group who, according to social psychologists, exert a significant amount of social influence over others (Seto et al 1991). The opinion leaders were identified within each ward and given the task of helping to disseminate the information to the other nursing staff. It was found that using opinion leaders with an educational campaign was the most effective way of ensuring compliance with the technique while opinion leaders or an educational campaign alone were not as effective. In addition it may not even be colleagues who can influence hand hygiene behaviour. In a study by McGuckin, Waterman, Porten, Bello, Caruso, Juzaitis, Krug, Mazer and Ostrawski (1999), also discussed in Section 2.7.4, soap usage, which was used as a measure of hand washing practice, increased by an average of 34% after patients began asking their health care workers if they had washed their hands. A similar study carried out in Britain found the same effect (Storr 2000).

2.6.4 Summary

It would appear that the acknowledged non-compliance of health care workers in infection control matters, if hand hygiene compliance is anything to go by, is due to a number of complex and inter-related factors. These factors include poor resources, damage to the skin and peer pressure and are found in studies reviewed that introduced a strategy to improve hand hygiene.

2.7 Interventions to improve hand hygiene

There have been a number of strategies employed to improve hand hygiene rates. In a search of the literature, the key words hand hygiene, hand washing, infection control and compliance were used. When these words were combined 277 references were displayed however only 15 dealt directly with an intervention to improve hand hygiene compliance and a review of reference lists was also carried out.

2.7.1 Overview of the literature on interventions to improve hand hygiene

To provide an over view of the literature on the subject of strategies adopted to improve hand hygiene compliance among health care workers it is useful to begin with a literature review carried out by Naikoba and Hayward (2001). The aim of the review was to establish how effective the interventions used were at increasing hand hygiene compliance. They found 2978 papers that mentioned hand washing however only 21 fulfilled the criteria for the review which was studies examining an intervention aimed at improving hand hygiene among health care workers. The reviewers concluded that there was a paucity of well-conducted studies examining the effect of interventions on hand washing. Many of the studies had a small sample size that was not justified, did not leave sufficient time between the intervention and a follow up assessment, failed to have sufficient control among the subjects or extraneously, did not blind participants to the nature of the observation and ignored rates of HAI as a measurable outcome. However if this is the case it is difficult to see how any conclusions can be drawn on the efficacy of interventions. A number of interventions are nonetheless evaluated on the available evidence. These are; the effect of educational campaigns; feedback on hand hygiene rates and hospital acquired infection rates; patient empowerment; improvements in facilities and attitude change.

2.7.2 Educational campaigns

In the studies reviewed, educational programmes and poster campaigns were frequently employed to improve hand hygiene rates. The strategy of education to improve hand hygiene is endorsed by researchers such as Horton (1992) who, following a study of the infection control training given to student nurses, concluded that more attention should be given to the subject of microbiology and its relation to HAI and control. In addition, Government Reports, such as the National Audit Office Report (2000) also regard training as an important strategy in raising awareness of the role of hand hygiene in preventing HAI.

Assessing training needs

Although training is regarded as an important strategy to raise hand hygiene rates, Seto (1995) suggested that in order to maximise effectiveness, training the workforce for infection control should be treated as a form of adult education. For this reason a 'total quality management' survey should be used to identify the services and topics staff want to know about and a 'task analysis' performed so that the education programme will give staff knowledge they can use. In addition, Seto (1995) recommended that training should concentrate on the patient care practices that need altering. The changes planned should be categorised depending on the ease with which it is anticipated that the change can be implemented. The ease at which change can be implemented will depend on a number of factors such as availability of resources and staff resistance to the changes (Seto 1995).

A similar approach to training was described by Gould, Kelly and White (2004). Gould et al (2004) argued that before training is undertaken the training needs of the population should be assessed using training needs analysis. Training needs analysis is the first part of a cyclical process as the training is constantly reviewed and adjusted in order to meet the needs of the organization and the staff. However, as Gould et al (2004) point out, the purpose of training needs analysis is unclear since it has been used in the past to plan an

individuals career or fulfil the requirements of professional updating. Latterly, training needs analysis has become associated with identifying the training needs of the workforce from the perspective of an employing organization. Therefore, although through training needs analysis, the trainee has the opportunity to identify personal training needs, these may conflict with the training needs of the employing organization. In this instance, if the employee does not share the training objectives of their employer, it may be difficult to bring about change through training alone (Seto 1995; Gould et al 2004).

Studies that used an educational campaign

Unfortunately, there is little compelling evidence that educating staff in infection control matters with a view to improving compliance has any impact when measured against hand hygiene rates over the long term. Invariably hand hygiene rates improve and then fall back to pre study levels or do not significantly improve at all. This was the finding of a study into the effect of education and group feedback on hand washing compliance (Dubbert, Dolce, Richter, Millerand Chapman 1990). It was found that although hand washing rates improved initially after the education phase of the study, compliance fell back to pre study levels within four weeks. However, when staff were informed of the number of hand washing 'errors' they had made as a team, hand washing compliance improved and the improvement was sustained for the following two weeks until the study ended.

The difficulty of sustaining improvements in hand hygiene rates after an educational campaign has finished was also the finding of a review of articles by Larson and Kretzer (1995) that dealt with compliance with hand washing and barrier precautions. Larson and Kretzer (1995) cited four studies in which direct education of the workforce was used as a strategy to improve hand hygiene and barrier precautions. Although there were improvements in knowledge there were not sustained changes in infection control behaviour. This mismatch between knowledge and actual behaviour suggests that, as Seto (1995) points out, the success of an educational campaign depends in part on the whether

the 'student' feels they have a need to know. If staff do not think they have an educational need with respect to their hand hygiene rates and technique, a campaign to inform the workforce of hand hygiene practice in order to improve compliance is likely to fall on deaf ears. This should be borne in mind since a number of studies have found that health care personnel have an inflated opinion of their hand washing practices (Gould and Ream 1993; Tibballs 1996; Harris, Samore, Nafziger, DiRosario, Roghmann and Carmel 2000) and Weeks (1999) in a letter to the British Medical Journal stated that he had not seen any compelling evidence for the need to wash his hands between patient contacts and considered it too time consuming.

A later study carried out by Falsey, Criddle, Kolassa, McCann, Brower and Hall (1999) used respiratory infection rates in an elderly care centre as an outcome measure following a campaign to improve hand hygiene rates. The researchers introduced a one-hour educational session that explained about the transmission of respiratory viruses and the importance of hand washing in preventing transmission. In addition during a period of supplemental intervention staff were given packs of a virucidal alcohol foam and instructed to use it in addition to hand washing. The sites of the supplemental intervention were rotated on a monthly basis between the study sites. The infection rates at the time of the intervention were then compared with the infection rates at the non-intervention time. In addition, to assess the effects of the educational programme, the infection rates during the four-month study period were compared with the infection rates of the previous three winter seasons. There was a significant drop in the respiratory infection rate during the study period compared to the preceding three winters ($p<0.0001$). However infection rates were not significantly different between the periods when staff had access to virucidal foam and when they did not. The researchers concluded that the overall drop in infection rates was due to the educational campaign since the introduction of the virucidal foam did not affect infection rates. However there was no attempt to measure actual hand hygiene rates, the authors did not discuss whether the staff were aware of the study being conducted and the impact this might have had on the staffs' behaviour (a phenomena

known as observer reactivity discussed in Section 3.5.2). In addition as there was no long term-follow it is not clear whether the effects of the educational campaign were sustained over a longer period.

Finally, the view expressed by Weeks (1999) was the central theme of an article by Farr (2000) in which he suggested that there are a number of reasons physicians have such poor hand hygiene compliance rates. To begin with it is in our natures not to comply. Secondly there is a lack of awareness that the frequency of infections in hospital is related to the physician's own practice and finally an assumption that infection control guidelines are optional. The need to inform healthcare workers of the importance and efficacy of hand hygiene in preventing HAI would appear obvious, the mystery is, why doesn't it work?

The Theory practice gap

The failure of educational campaigns to improve hand hygiene rates, for whatever reasons, highlights an issue present in nursing for some time and that is the theory practice gap. This theory practice gap was defined by Colley (2003) as the difference between the theories developed by nursing academics and actual practice. Colley (2003) argued that the lack of in-put by ward-based nurses into nursing theory had made it difficult for nursing theory to be applied in practice. In addition many ward-based nurses do not have the training or experience to assimilate nursing theory into their practice (Colley 2003). The key to developing an interest among ward-based nurses in nursing theory lies, according to Colley (2003), in promoting nursing theory as a priority, since it is the responsibility of each nurse to understand the nursing theory that provides the foundations of their professional practice. In addition, nurses should participate and support the development of nursing theory because it improves the recognition of nurses' contribution to healthcare (Colley 2003).

The view that nurses should support the development of nursing theory puts the onus on ward-based nurses to keep up to date with, and integrate into practice, current nursing theory rather than expecting nurse theorists to address the concerns ward-based nurses have. It may be that the ward-based nurses consider the theorists and teachers to be out of touch with the reality of actual practice and the constraints imposed upon practice by limited resources (Lindsay 1990). This is a negative view of the theory practice gap because it implies a lack of understanding and appreciation between the theorists and teachers, and the practitioners (Lindsay 1990). In this light the resistance of healthcare workers to changing their infection control practice following educational campaigns, could be due to the fact that they do not believe the educators have direct experience of the environment in which they are expected to carry out these improved practices and as such, lack peer authority.

A more positive view of the theory practice gap is that although theory does not equal practice, this is because theory is constantly forging ahead with new ideas and concepts and practitioners are following behind (Lindsay 1990). In this view, theorists and practitioners are a partnership exchanging ideas and experiences for the benefit of all. The onus is then on the theorists and educators to impart this knowledge to the practitioners in a meaningful and helpful way. In addition, professional nurses will take an interest in nursing theory and introduce it to their practice (Colley 2003). As Seto (1995) points out, practitioners need to feel they need this new knowledge and find it relevant to their practice before they will assimilate the information.

2.7.3 The effect of feedback

While the effect of a concentrated educational campaign on influencing hand hygiene rates, particularly if it is not specific to the staff group and addresses their perceived educational needs, is questionable, the effect of feedback on hand hygiene compliance has been more positive.

In the review of articles by Larson and Kretzer (1995), it was found that feedback on a one-time basis was unlikely to have an effect on compliance with hand hygiene. However there was evidence to suggest that sustained feedback was effective in improving infection control practices although when the improvement was followed up long term, the results of the two studies cited in Larson and Kretzer (1995) were contradictory since one study reported a sustained improvement while the other study did not. Other studies have also had conflicting results.

A study conducted by Tibballs (1996) used a combination of unobtrusive observation, overt observation and performance feedback to study the effect on the hand washing of medical staff in an intensive care unit. He found that seven weeks after performance feedback, unobtrusive observation revealed a hand washing rate that was moderately increased on the pre study base line level, although the statistical significance of this was not calculated and the sample size was relatively small. In addition, by the end of the study period only 14 of the original 19 subjects were still participating. This finding suggests two things. Firstly, that the medical staff were unaware of the poor level of hand washing until it was pointed out to them and secondly, if turn over in the unit was high, then a constant feedback programme needed to be in place to maintain awareness of the importance of hand hygiene in preventing HAI. It may also be that the medical staff were not as ignorant of the final unobtrusive observation as the researcher supposed. However, in a study carried out in Brazil to determine whether an infection surveillance programme would reduce HAI rates in five hospitals, the HAI rate was significantly reduced after the introduction of the surveillance and feedback to health care staff (Starling, Couto and Pinheiro1997).

That HAI may be reduced by surveillance and feedback was discussed by Lovatt and Massanari (1999). Lovatt and Massanari (1999) put forward the opinion that surveillance and measurement on their own were not enough unless the information gathered was

transformed into knowledge and change. The researchers argued that facilitating change in health care practices depended on factors such as a supportive work culture, commitment to change and consensus on achieving the best solution for the group regardless of personal goals. This, the researchers believed, would facilitate learning within the organization (Lovatt and Massanari 1999).

Does this mean that surveillance and measurement of HAI rates should be used in conjunction with informing and educating the workforce? As already discussed, in order to maximise effectiveness in training the workforce for infection control Seto (1995) suggested that the education programme should give staff knowledge they could use and depend on a number of factors such as availability of resources and staff resistance to the changes. In addition practitioners need to feel they need this new knowledge and find it relevant to their practice before they will assimilate the information (Seto 1995). However, the three major reports discussed in Section 2.3.4 all emphasised the importance of surveillance as a strategy to reduce HAI.

2.7.4 Patient participation

The idea that health professionals will alter their hand hygiene behaviour when they believe they are being observed, as already discussed in the study by Tibballs (1996) has been expanded into the area of patient empowerment. A study by McGuckin et al (1999) found that soap usage, which was used as a measure of hand washing practice, increased by an average of 34% after patients began asking their health care workers if they had washed their hands. It was also found that 54% of patients in the study claimed to have asked health care workers if they had washed their hands. This study was carried out in America but has been replicated in England. In the English study soap usage also increased by 34% and 90% of the patients in the study claimed that they had asked a nurse if they had washed their hands. Interestingly, only 28% of patients had asked a doctor about their recent hand washing (Storr 2000).

This concept is an interesting one. However, not all patients are in a position to remind carers to wash their hands. The patients most vulnerable to HAI are the most seriously ill and debilitated and the least likely to notice what their carers are doing at the hand basin let alone comment on it.

2.7.5 Improvement in facilities

A number of studies have investigated whether improving the hand hygiene facilities by introducing alcoholic hand rubs would improve hand hygiene compliance. The reasons why alcohol hand rub have been suggested are threefold. Firstly, alcohol hand rub has been found to have an anti-microbial effect (Paulson, Fendler, Dolan and Williams 1999; Zaragoza, Salles, Gomez, Bayas, and Trilla 1999; Larson 2001). Secondly alcohol hand rub appears less drying to the skin (Larson et al 1997; Boyce et al 2000) and thirdly, decontaminating the hands with alcohol hand rub is less time consuming than hand washing with soap and water (Voss and Widmer 1997; Pittet et al 2000). However, the results on hand hygiene rates after the introduction of an alcoholic hand rub have been conflicting.

Introducing alcohol hand rub improves hand hygiene compliance

The researchers Falsey et al (1999) already cited, carried out a study that combined the introduction of an educational programme and alcoholic hand foam. Hand hygiene compliance was not measured. Although the respiratory infection rate among elderly patients at four day-care centres did decrease when compared to previous years, this reduction in respiratory infection was attributed by the researchers to the educational intervention rather than the alcoholic foam.

A study by Bischoff , Reynolds, Sessler, Edmond and Wenzel (2000) also compared the effect an educational programme and the introduction of alcoholic hand rubs had on hand hygiene rates in a medical intensive care unit, cardiac intensive care unit and general

medical ward. Hand hygiene was poor before the interventions, only six percent before a defined event and 17.5% after a defined event. Following the educational programme hand hygiene rates rose to 11.5% before a defined event and 25% after a defined event. However when alcohol hand rubs were then introduced hand hygiene rates rose significantly to 23% before an event and 48% after an event by the time the hand rubs were available at every bed area ($p<0.05$) (Bischoff et al 2000). The researchers also gave out patient leaflets encouraging patients to ask health care workers to wash their hands. However although the patient leaflets were one of the interventions, the significance of this intervention was not discussed at any great length. Another limitation of the study was the way it was reported. There was no long term follow up of hand hygiene rates so it was not known whether the improvements seen with the alcoholic hand rub were sustained after the novelty wore off. However the study by Pittet et al (2000) and discussed earlier found that a sustained improvement in hand hygiene, and a reduction in HAI, could be achieved with a poster campaign and the introduction of an alcoholic hand rub.

This was also the experience of Earl et al (2002). They conducted a three phase observational study in which they established baseline soap and water hand washing rate among staff of intensive care units before introducing a rinse free alcoholic gel. They then followed up the intervention with two more observational studies at two to six weeks post intervention and 10 to 14 weeks post intervention. The hand hygiene rate increased from 39.6% before the intervention to 52.6% at two to four weeks and to 57% at ten to fourteen weeks. The overall significance of the increase was not given. However, in one of the units studied it was $p<0.001$. These findings are very encouraging although it should be noted that compliance at the end of the study had still only reached 57% overall. In addition the authors acknowledged that the observer effect (discussed in Section 3.5.2) could have led to the compliance rates being artificially high.

Introducing an alcoholic hand rub does not improve hand hygiene compliance

The positive effect of introducing alcoholic hand rub was not the experience of Muto et al (2000) who carried out an educational and motivational campaign prior to the introduction of an alcoholic hand rub. They found that overall, hand hygiene compliance rates dropped after the intervention. However, although nurses' hand hygiene compliance rose from 60% to 67%, physicians' rates fell from 83% to 29%. This fall may have been due to a change in rotation by medical staff and therefore they were not subjected to the same educational and motivational campaign as the other, permanent, staff members. When physicians hand hygiene rates are removed from the calculations, hand hygiene rates went from 51% before the intervention to 50% after the intervention (my calculation based on percentages given). However Muto et al (2000) do make some interesting observations and it was that some health care workers complied 100% with hand hygiene practice while others were complete non-compliers. In addition, when an attending physician complied with hand hygiene the entire team with the physician also complied. When an attending physician did not carry out hand hygiene after attending a patient, neither did their team.

2.7.5 Changing attitudes

It would appear from the study by Muto et al (2000) that there are health care workers who are habitual non compliers in hand hygiene practices. It would also appear that giving staff feedback on infection rates and hand hygiene compliance can be a useful motivating factor for improving hand-washing rates. Other researchers (Williams and Buckles 1988, Bartzokas and Slade 1991) have suggested that the attitude of health care workers needs to change before lasting improvements in hand washing rates will be seen. However, a study by Alvaran, Butz and Larson (1994) found little correlation between staff attitudes to hand washing and their self reported behaviour ($p=0.55$). In addition there was no significant relationship between infection control knowledge and reported hand washing practice ($p=0.21$) or attitudes ($p=0.46$). It must be noted that this study used

staffs' self-assessment of their hand washing rates and this is acknowledged to be unreliable (Gould and Ream 1993; Tibballs 1996; Harris et al 2000).

2.7.7 Using a multi-faceted approach

It would appear that a multifaceted approach to improving hand hygiene compliance is required (Larson and Kretzer 1995; Larson et al 1997; Pittet et al (2000). Pittet (2000) conducted a review of six articles that had used various methods to improve hand hygiene compliance. These were; educational programmes; information leaflets; workshops and lectures; automated dispensers and performance feedback on hand hygiene compliance. Pittet's conclusion, based on six articles, was that the improvement in hand hygiene rates after these interventions was transient and suggested that interventions on both an individual and organizational level should be considered in order to bring about behavioural change. In addition, multi-faceted campaigns that have to be maintained can be difficult to sustain over long periods of time and are likely to be expensive. A more effective strategy would be to identify the factors that influence staff hand hygiene behaviour (Pittet 2000).

2.7.8 Summary

It would appear that attitudes to hand hygiene are an unreliable predictor of actual hand hygiene behaviour and therefore it is safe to assume that a campaign aimed at changing staff attitudes to hand hygiene is not going to be effective (Alvaran 1994). Indeed, Farr (2000) cynically suggests that it is human nature to be non-compliant and that lack of adherence to hand hygiene guidelines is not unique. It would also appear that educational campaigns have a short term effect if one at all (Larson and Kretzer 1995; Falsey et al 1999; Farr 2000) and need to be planned so that the health care workers targeted by the information find it specific to their needs and addressing a current dilemma that they have identified (Seto 1995; Gould et al 2004). Performance feedback can also improve

compliance but again needs to be sustained (Larson and Kretzer 1995; Tibballs 1996; Starling et al 1997; Lovatt and Massanari 1999). In addition, patient participation has had some success (McGuckin et al 1999; Storr 2000) but is not suitable for all patient groups. Finally improvements in facilities, such as availability of alcoholic hand rubs, appear to bring about improvements in hand hygiene compliance although whether this improvement is without additional poster and educational campaigns is not clear (Falsey et al 1999; Bischoff 2000; Pittet et al 2000; Muto et al 2000; Earl et al 2002).

2.8 Alternative strategies- behavioural models

The difficulties associated with improving hand hygiene rates and maintaining an improvement over a long period, has led to some commentators in the field of infection control to suggest that the way forward is by asking what the behavioural sciences have to offer (Kretzer and Larson 1998, Seto 1995). It is argued that in order to change the hand hygiene of health care providers, it is necessary to first understand the hand hygiene behaviour and several models of behaviour have been put forward (Kretzer and Larson 1998; Seto 1995).

2.8.1 The Elaboration Likelihood Model

A model that focuses on understanding what motivates people to act in the way they do is the Elaboration Likelihood Model. This model assumes that when people are given a message designed to persuade them to change their behaviour, they will use the minimum mental energy required to decide whether the message is valid or not. In addition, staff have different levels of motivation and ability to process 'persuasive communications'. Bartzokas and Slade (1991) proposed this model after an educational campaign failed to bring about a sustained improvement in infection control behaviour. The researchers concluded that this was because there was no measurable improvement in attitudes and that in order to plan an effective strategy for change, they needed to understand the

motivational process. It was suggested that, using the Elaboration Likelihood Model, a campaign could be launched that would use persuasion techniques to change the attitudes and motivation of health care workers, thereby effecting an improvement in infection control practices (Bartzokas and Slade 1991).

The model has sinister overtones that suggest that staff can be brainwashed into behaving in a 'better' way for infection control purposes. While the model acknowledges the impact of role models on behaviour and the importance of adequate resources, the idea that staff should have persuasion tactics directed at them is nonetheless distasteful and the model has not reappeared in the literature since this article. As Seto (1995) commented, 'the individuality of the hospital staff must be respected. They must not be manipulated simply to achieve compliance.'

2.8.2 Organisational Behaviour Theory

Seto (1995) also suggested that other models in the behavioural sciences should be looked at to assess whether they could be utilised to understand and change health care workers infection control practices. He looked at models from organizational behaviour, consumer behaviour and social psychology.

Organisational behaviour

Participatory decision-making is an example of an organisational behaviour theory, which describes different types of decision-making style from 'no participation' to 'full participation' of the workforce. Interestingly, a questionnaire survey found nurses in favour of participating in decisions about infection control policy through a ward representative (Seto 1995).

Consumer behaviour

In consumer behaviour research, it has been found that certain individuals exert a significant amount of influence upon others in their social group. The study by Seto et al (1991) reported on in Section 2.6.3 found that ward opinion leaders were able to enhance the implementation of a new infection control policy. This study suggested that people were motivated to behave in certain ways because of a wide range of influences that were not all under the control of the policy and decision makers. It is also an example of a bottom up strategy to implement change whereby the workforce are engaged in the change because they are able to decide on the policies, and are supported by their peers. This is in contrast to the Elaboration Likelihood Model where an attempt is made to change the attitudes and thereby the behaviour, assuming there is a link between the two, of the workforce by persuasion.

2.8.3 The health belief model

The Health Belief Model (HBM) has been used by a large numbers of researchers in the health care field. The model proposes that an individual's response to a health threat depends on; how susceptible to the threat they perceive themselves to be; how severe they perceive the threat to be; whether they believe the recommendations to avoid or reduce the threat and whether the costs of avoiding, or reducing, the threat outweigh the benefits to be gained. Individuals also have to be motivated and have the necessary resources and capability to engage in the behavioural change (Polit and Hungler 1999).

The HBM has implications for the effectiveness of infection control programmes aimed at improving compliance. According to the model, health care workers carry out infection control practices depending on whether they perceive a threat to their own health or the health of the patients they care for. It has been seen that, in some instances, health care workers are not convinced they pose an infection risk to patients (Weeks 1999). In addition they may over estimate the quantity and quality of infection control they provide

(Gould and Ream 1993; Tibballs 1996; Harris et al 2000). Also, the cost to health care workers in terms of the time taken (Gould 1995; Voss and Widmer 1997; Weeks 1999) and the damage they perceive frequent hand washing does to their skin (Gould 1995, Larson et al 1997; Boyce et al 2000) may mean that the perceived benefits in infection control are not outweighed by the perceived drawbacks. Finally, a number of commentators have drawn attention to the inadequacy of resources for infection control and the health belief model recognises this as an influence on behaviour (Voss and Widmer 1997; Kesavan 1999; Darley et al 2000).

The health belief model has been used in a wide range of studies in connection with, for example, whether breast examination classes are effective, predicting adolescent compliance with dental appointments and predicting cardiovascular risk reduction (Kretzer and Larson 1998). However in a review of studies by Kretzer and Larson (1998), the authors assessed whether the Health Belief Model could be applied to infection control practices. Although they concluded that the model alone was of limited use for predicting what initiates or motivates infection control behaviour, the reasons for the conclusions were not clear from the argument they put forward. However a more comprehensive argument is discussed in Section 2.8.4.

2.8.4 Social psychology and behavioural theories

A number of commentators have suggested that a social psychological theory of behaviour could be a useful way of understanding infection control behaviour. Seto (1995) and Kretzer and Larson (1998) have both identified the Theory of Reasoned Action

The Theory of Reasoned Action

The Theory of Reasoned Action was first proposed by Ajzen and Fishbein (1980) in an attempt to explain the gap between stated attitudes and actual behaviour. The so-called

attitude behaviour problem, where people say one thing when faced with a pen and paper measure of attitudes and then do another thing in practice, has long been recognised by attitude researchers. This mismatch between stated attitudes and actual behaviour was demonstrated when Wicker (1971) found that <10% of behaviour could be explained by attitude measures. However researchers now recognise that a stated attitude will be related to a number of factors such as the situation in which the attitude research is conducted, whether the attitude is specific to the behaviour, what constraints are put on the behaviour and the social situation the individual is in when the behaviour takes place (Eagley and Chaiken 1993).

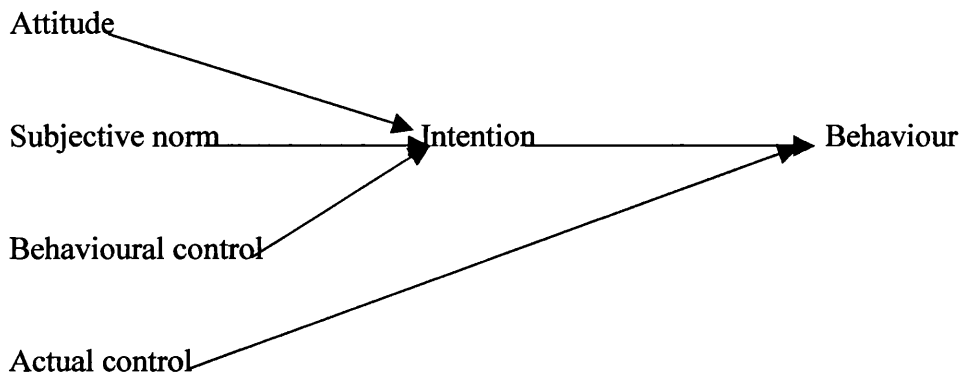
Ajzen and Fishbein (1980) developed the Theory of Reasoned Action in order to integrate all the features that might influence the relationship between a stated attitude and actual behaviour. They neatly resolved the issue of how an attitude was transformed into an actual action by putting another event, the formation of an intention, between the two. Intention, which represents a person's conscious plan and motivation to carry out a behaviour is the greatest predictor of the behaviour actually taking place. However by suggesting that the behaviour is under conscious control, Azjen and Fishbein (1980) restricted the theory to voluntary behaviours.

The Theory of Planned Behaviour.

The Ajzen and Fishbein (1980) Theory of Reasoned Action was criticised because it could only be used for behaviours that were entirely voluntary (Eagley and Chaiken 1993). As well as habitual behaviours, a number of commentators argued that any behaviour that also required expert knowledge, skills and resources would also be excluded (Eagley and Chaiken 1993). For this reason Ajzen substantially revised the Theory of Reasoned Action to the Theory of Planned Behaviour (Azjen 1988). Azjen's Theory was developed to deal with concerns expressed about behaviour not entirely under volitional control. For instance, an individual may plan to donate blood but have their attempt thwarted by an unforeseen event such as illness when the transfusion unit is in

town (Giles and Cairns 1995). The behaviour therefore, according to Ajzen (1988) becomes a goal and intention to perform the behaviour depends on a number of contributing factors. These are; the attitude towards the behaviour; the perceived attitudes of others, known as the subjective norm and the amount of control over the behaviour, known as the perceived behavioural control. In addition, actual control can have a direct bearing on whether the behaviour takes place (Figure 1) (Azjen 1988).

Figure 1. Ajzen's Theory of Planned Behaviour.



The attitude to the behaviour

The attitude towards the behaviour is described by Azjen and Fishbein (1980) as an individuals feelings, favourable or not, towards performing a behaviour.

The subjective norm

The subjective norm deals with the influence of the social environment on intentions and behaviour. It refers to an individual's *perception* of whether other people, who are important to him, think he should or should not perform the behaviour (Azjen and Fishbein 1980).

Behavioural control

The behavioural control is the perception an individual has about how much control he has over whether or not he will perform the behaviour (Giles and Cairns 1995).

Actual control

Actual control is external factors that might prevent the behaviour occurring and over which the individual has no control (Giles and Cairns 1995).

Azjen's Theory and the Health Belief Model.

It was discussed in Section 2.8.3 that Kretzer and Larson (1998) apparently concluded that the HBM was an inappropriate tool for predicting infection control behaviour and suggested Azjen's Theory instead. Two other authors, comparing the efficacy of the HBM and Azjen's Theory in predicting health behaviour, have reached the same conclusion.

In a study by Bish, Sutton and Golombok (2000), the health belief model was compared to Azjen's Theory in predicting cervical smear uptake among a group of 142 women. The authors found that Azjen's Theory predicted 50% of screening intentions compared with only four per cent explained by the HBM. A similar conclusion was drawn by Stroebe (2000) who argued that, unless the predictive strength of a specific model such as the HBM is greater than the predictive strength of a more general model such as Azjen's Theory, it is unlikely to be better at predicting behaviour. He also pointed out that Azjen's Theory includes subjective norm, that is not part of the HBM, and could influence health behaviour such as smoking cessation (Stroebe 2000). In relation to health behaviour, it would appear that the predictive value of a general theory such as Azjen's Theory has advantages over more specific theories such as the HBM.

2.9 Azjen's Theory and Hand Hygiene: Literature review

A number of researchers have suggested Azjen's Theory as a model that could be used to understand infection control behaviour (Seto 1995; Kretzer and Larson 1998) and a number of studies within the healthcare field have used Ajzen's Theory to explain the behaviour of both healthcare workers and clients. In the field of infection control two studies were found that used the theory, Dilorio (1997) and Godin et al (1998). In addition three other studies were found that were published after this current study had taken place. They were O'Boyle, Henly and Larson (2001), Watson and Myers (2001) and Jenner, Watson, Miller, Jones and Scott (2002).

The study by Dilorio (1997) used Azjen's theory to examine the factors that influenced neurosciences nurses' intention to care for people who were known to have HIV/AIDS. The study found that perceived behavioural control had the most significance in predicting nurses' intentions to care for people with HIV/AIDS and subjective norm and personal attitudes were less important. The study is interesting because it assumed that caring for a person with HIV/AIDS was a volitional behaviour when it could be argued that this is not the case. Nurses are not generally in a position where they can deny treatment to a group of patients. However, the author suggested that an intention to care for patients with HIV/AIDS increased when the perception that the resources and support were available, increased (Dilorio 1997). In addition, since this was a postal survey it was not clear from the study report whether any attempt had been made to ascertain whether nurses had cared for patients with HIV/AIDS or whether there was a relationship between intention and actual behaviour. The author acknowledges that to fully test the theory some measure of actual behaviour needs to be done (Dilorio 1997).

A later study by Godin et al (1998) used Ajzen's Theory to identify the factors that influenced physicians' glove wearing intentions. The researchers presented a questionnaire to 1880 physicians in Canada. The response rate was 40%. The study found

that physicians that had a high intention to wear gloves, also saw glove wearing as the norm among their colleagues, had a positive attitude to glove wearing and saw a high risk of infection from not wearing gloves. Interestingly, the most important factor influencing glove use was subjective norm followed by attitude and perceived behavioural control. Unfortunately, although the physicians were asked to give the proportion of times they wore gloves in the last ten episodes when they had contact with patients or body fluids, physicians actual glove wearing behaviour was not directly observed. It is thought that health care workers over estimate their hand washing behaviour (Gould and Ream 1993; Tibballs 1996; Harris et al 2000) and the implication is that the same would be true of glove wearing, especially when the subjects are being asked to give a retrospective account. This is important because if the stated intention does not bear a significant relationship to the behaviour under examination the theory cannot be said to be a useful tool in planning strategies to change behaviour. However this is a comprehensive study that has validity because of the proximity of the questionnaire to Ajzen and Fishbein's original format and it highlighted issues that might influence infection control behaviour.

Finally, three studies were found that used Ajzen's Theory to examine adherence to hand hygiene recommendations (O'Boyle et al 2001; Watson and Myers 2001; Jenner et al 2002).

The study by O'Boyle et al (2001) took place in adult medical/surgical intensive care units and 120 nurses participated. Nurses were recruited through the staff meetings and after recruitment given a copy of the Hand Assessment Inventory which was a questionnaire designed in line with Ajzen's recommendations (Azjen and Fishbein 1980). Following this, and at a later date, the participants' hand washing compliance was observed. The participants were also asked to give a self-report of the percentage of times they performed hand hygiene when it was indicated.

The authors found that overall compliance was 70% and the relationships predicated by Azjen's Theory were supported. Although intention to perform hand hygiene did not predict actual hand hygiene there was a relationship to self-reported hand hygiene rates. The association between reported hand hygiene rates and actual hand hygiene rates was low ($r = 0.22$). Finally there was a significant negative association between the level of activity in the units and actual hand hygiene compliance indicating that hand hygiene rates decreased as the study units got busier (O'Boyle et al 2001).

There were some limitations to the study acknowledged by the researchers (O'Boyle et al 2001). They used a convenience sample and nurses volunteered to participate in the study knowing the nature of it. This convenience sample may have been reflected in higher compliance rates than the rates found in the studies reported on in Section 2.5. In addition, the reason for a sample size of 120 was not given. Previous studies using Ajzen's Theory have had sample sizes of around 160 (Giles and Cairns 1995). The researchers also stated that Ajzen's Theory was proposed to account for motivation to perform a volitional behaviour however according to Eagle and Chaiken (1993) it is because there are factors outside an individuals control that the Theory of Reasoned Action was modified to become Ajzen's Theory. The researchers acknowledged this by describing the level of activity on the study units as an actual control on hand hygiene behaviour taking place. Finally, the researchers suggested that measuring intention before behaviour may have influenced hand hygiene compliance rates however informed consent had also been given (O'Boyle et al 2001). It may also be that the difference in time between completing the questionnaire and the observation period (a range of four weeks to four months) had an adverse effect on the study outcomes.

A study reported the same year (Watson and Jenner 2001) used Ajzen's Theory to examine intended glove use among health care workers in a variety of clinical settings ranging from accident and emergency to general medical wards. There were 103 registered nurses enrolled into the study. The participants completed a questionnaire that

included reported actual glove use, perceived barriers to glove use and Ajzen's Theory variables. The researchers found that the model was successful in predicting over 45% of the variance in intention and 61% of the variance in actual glove use. In addition, both the attitudes variable of the Ajzen's Theory and the perceived behavioural control, contributed significantly to glove use intentions. Finally the study found that specific barriers, such as the amount of contact with blood anticipated, significantly contributed to the explanation of behaviour and intentions.

This study is interesting because it used Ajzen's Theory to examine nurses' intentions and reported actual behaviour towards an infection control procedure, wearing gloves, during patient contact, although actual glove use was not observed The researchers noted that educational-based interventions to increase glove usage had limited long term impact on behaviour but went on to suggest that further educational efforts needed to be undertaken to improve glove usage. In addition the sample size was only 103 and although the results were statistically significant the power of this sample was not given.

A later study, also involving Watson, used an extended application of Ajzen's Theory to explain hand hygiene practice of health care workers (Jenner et al 2002). Again, the sample size was similar at 104 although 304 questionnaires were initially sent out. The model used the variables found in Ajzen's Theory but also included a measure of personal responsibility and specific behavioural controls drawn from the literature such as, availability of time to perform hand hygiene. The researchers found that the model successfully predicted intention to perform hand hygiene in 70% of cases with personal responsibility contributing a further 2% and specific barriers a further 7%.

The authors concluded that Ajzen's Theory could be used as a theoretical framework to predict and understand hand hygiene behaviour among health care workers. Although self-report behaviour was used as a means of assessing actual behaviour and this was acknowledged as potentially unreliable, the study showed that health care workers do

admit to sub-optimal levels of hand hygiene practice. In addition the researchers acknowledged that the sample size was sub-optimal although it was within the expected range. However while the researchers reported on a series of nursing studies where the average sample size was 100, they did not comment on what the studies were or what relevance they had to a study using a psychological model.

These studies have all used Ajzen's Theory to examine a particular behaviour among healthcare personnel; hand hygiene, Jenner et al (2002) and O'Boyle et al (2001), glove wearing Godin et al (1998) and Watson and Myers (2001) and behaviour towards a particular patient group Dilorio (1997). The studies all adopted a quantitative non-experimental approach with questionnaire being the main data collection tool along with a measure of the behaviour under examination. The only study that did not take a measure of behaviour was Dilorio (1997). However, only O'Boyle (2001) directly observed behaviour. In addition, Ajzen (1988) states that an intention to perform a behaviour will not become a behaviour if there is an actual control, such as a paucity of knowledge or resources. Among the studies that used Azjen's Theory to study infection control and hand hygiene behaviour, there was no evidence that the researchers attempted to ascertain the level of hand hygiene and infection control knowledge of the participants. This despite O'Boyle et al (2001) stating that knowledge of hand hygiene has been recognised as a factor that influence healthcare workers adherence to hand hygiene recommendations. In addition, although all the studies reported on perceived behavioural control, none of them commented on the facilities available to the nurses at the time of the study and only O'Boyle et al (2001) reported on the intensity of nursing. It appears that, in view of these findings, further exploration of Ajzen's Theory is needed to improve understanding of hand hygiene behaviour.

2.10 Summary of the literature review

This literature review has discussed a number of issues surrounding the non-compliance of healthcare workers in hand hygiene, the evidence that hands are vectors for infection and HAI is expensive both financially and distressing for patients and their families. It is because of the recognised importance of HAI that a number of initiatives have taken place. These have included the formation of organisations such as the Hospital Infection Society, the Infection Control Nurses Association, and the Hand Washing Liaison Group (in Great Britain) and government publications such as the Department of Health UK Anti-microbial Resistance Strategy and Action plan (2000). On a broader level infection control policy has been influenced by national initiatives such as clinical governance (Crinson 1999).

However despite these initiatives reports by a number of sources such as The Second National Prevalence Survey of Infection in Hospitals (Emmerson et al 1996) and the National Audit Office (2000) and suggest that overall rates of HAI have not decreased significantly in recent years. Hand hygiene rates remain at sub-optimal levels and strategies to improve hand hygiene compliance have had varied success. It has been suggested in order to understand hand hygiene behaviour in healthcare workers Ajzen's Theory should be applied. Examples of the components of the theory, attitude towards the act, subjective norm and perceived behavioural control can all be found in the literature and are discussed in Section 4.9.4. However, according to Ajzen (1988), these components are the precursors to the intention to perform the behaviour. In addition, an intention to perform a behaviour will not be realised if factors outside an individual's control prevent the behaviour occurring (Azjen 1988).

There was no evidence that Ajzen's Theory had been directly applied hand hygiene behaviour until O'Boyle et al (2001) although a number of commentators such as Kretzer and Larson (1998) and Seto (1995) had suggested it as a model. In addition, no attempt

had been made to assess health care workers' intentions and the factors that form intentions towards hand hygiene, such as knowledge about hand hygiene and resources available to healthcare staff at the time the hand hygiene should take place. Finally, although a number of studies have been done in the field of health care that use Ajzen's Theory (Dilorio 1997; Godin et al 1998; O'Boyle et al 2001; Watson and Myers 2001; Jenner et al 2002), only one study attempted to relate intentions to actual observed behaviour (O'Boyle et al 2001).

This poses an interesting question. If the actual behaviour is not known because it has either been sought through questioning respondents (which can not guarantee accuracy) to the study, or not at all, how can the measured intentions be deemed to bare any relation to the behaviour? In order for Ajzen's Theory to be assessed as to its usefulness in understanding hand hygiene behaviour it is essential to establish that a relationship exists between intention toward the act of hand hygiene and actual behaviour. In addition, it is also essential to examine the environment in which the hand hygiene takes place.

The purpose of this research was to establish if nurses' hand hygiene behaviour could be examined using Ajzen's Theory and to explore the actual hand hygiene practices of nurses and the context in which they occurred. This was achieved by designing a descriptive explorative study using a multi-method approach. The research questions were;

1. Can nurses' hand hygiene behaviour be examined using Ajzen's Theory of Planned Behaviour?
2. What are the hand hygiene practices of nurses in the clinical environment?
3. What are the hand hygiene resources available to nurses in the clinical environment?
4. Do nurses believe that time and workload constraints influence their hand hygiene practices in the clinical environment?

CHAPTER THREE

LITERATURE RELATING TO THE SELECTED METHODS

3.1 Introduction

It will be recalled that the aim of this study was to explore whether Ajzen's Theory could be used to understand nurses' hand hygiene behaviour. To fulfil the objectives and answer the research questions described in Section 2.10 a multi-method study was designed. Data was collected via non-participant observation, field notes taken at the time of the observation, a self-report questionnaire, a quiz on hand hygiene knowledge, and an audit of the hand hygiene facilities available to each participant at the time of the observation. A semi-structured interview was conducted after all other data collection had been completed.

This section of the literature review discusses the research approach adopted for this study. There is a review of the literature relating to the data collection tools including a discussion on the reliability and validity of existing tools, the ethical issues surrounding a study of this type and the theory behind the statistical tests used. It should be noted that ethical issues related to the conduct of the study are discussed specifically in Chapter 4 as is the construction of the data collection tools.

3.2 Justification of the research approach

3.2.1 Introduction

In research design there are two approaches, qualitative and quantitative (Polit and Hungler 1999). Qualitative research is descriptive, explorative, may be hypothesis generating although not hypothesis testing. Quantitative research is hypothesis testing and

data are collected in such a way as to be measurable and subject to statistical analysis (Polit and Hungler 1999). In addition, in quantitative studies, researchers may adopt an experimental or non-experimental approach (Polit and Hungler 1999). In the experimental approach the researcher studies the effect of a particular intervention on a group of subjects and compares the effect with another group who have not received the intervention. In non-experimental studies, data is collected in a quantifiable way so as to be measurable but the researcher is looking at already occurring phenomena and not intervening in any way (Polit and Hungler 1999). Finally a study can be cross-sectional, when all data are collected at one point in time, or longitudinal when data are collected at more than one point in time (Polit and Hungler 1999).

In this study the aim was to understand whether Ajzen's Theory could be used to explain nurses' hand hygiene behaviour and describe actual behaviour as it occurred within the context of a naturalistic setting. Since data on each participant were collected at one point in time, this study was cross-sectional. Some of the data collected were quantitative using a self-report questionnaire (Fishbein and Azjen 1980), observing actual hand hygiene behaviour, auditing the facilities available for hand hygiene at the time of the observation and testing nurses' knowledge of hand hygiene (hand hygiene quiz). Explorative and descriptive data were collected through recording notes on the context within which the hand hygiene occurred and a semi-structured interview following collection of the quantitative data. This multi-method approach is discussed in Section 3.2.2

3.2.2 Triangulation and multi-methodology

In a study such as this one that employed more than one method of collecting data, triangulation and multi-method research should be discussed (Polit and Hungler 1999).

Triangulation

Denzin (1970) described triangulation as an approach to research that improves the likelihood that the findings from the data collected have convergent validity. There are four types of triangulation (Denzin 1970):

- Methodological triangulation: When several different methodologies are employed and can be with-in method, when a researcher uses varieties of the same method, or between-method, when a researcher uses different methods to examine a phenomenon.
- Theoretical triangulation: Involves the use of different theories to analyse the same set of data. In this way an hypothesis can be tested against a rival hypothesis (Redfern and Norman 1994).
- Data triangulation: Uses different sampling strategies to collect data. For instance, person data can be collected from individuals and groups and the data from one group used to validate the data from another (Redfern and Norman 1994).
- Investigator triangulation: Involves the use of more than one investigator observing a situation. The benefit of this is that the reliability of the observations can be tested for observer bias (Denzin 1970).

The main advantage of triangulation is, according to Denzin (1970), that when greater convergence can be obtained through triangulation of theories, methods, data and investigator, there can be greater confidence in the validity of the findings. In addition Redfern and Norman (1994) also point out that it allows for the development and validation of instruments and methods, provides greater understanding of phenomena and is ideal for investigating complex social issues.

Nevertheless, triangulation is not without its difficulties (Dootson 1995; Begley 1996). For instance, Redfern and Norman (1994) suggest that triangulation is no guarantee of

internal and external validity or that it will compensate for researcher bias and the expense that using multiple methods, theories data and investigators involves. However Begley (1996) suggests that these issues are not confined to triangulation and occur with any type of research and argues that the reason for employing methodological triangulation is to bring breadth and depth to analysis, not to support validity (Begley 1996).

Another difficulty with triangulation according to Dootson (1996) is its complexity since each type of triangulation or method used must be investigated and understood properly to avoid bias. This can increase the amount of time and expense of a study and experience required. In addition Dootson (1996) describes two paradigms; the rationalistic that follows a quantitative approach; and the naturalistic that follows a qualitative approach. He argues that there is insufficient evidence that triangulation of paradigms is the way forward for researchers (Dootson 1996).

Multi-methodology

If, as Dootson (1996) states, there is insufficient evidence that triangulation of paradigms is the way forward for researchers, can more than one paradigm be adopted in a study? As already discussed, triangulation is the adoption of a number of methods, data sources or theories to examine a single phenomena (Denzin 1970). However, multi-methodology is described as the employment of a number of data collecting devices that could be quantitative, qualitative, or both, in order to examine different areas of interest within the same study (Polit and Hungler 1999); for instance using a questionnaire to measure the attitude of a nurse to hand hygiene with an audit tool to examine the environment within which (s)he works

Triangulation and multi-methodology are similar but should not be confused. The difference lies in the reasons they are adopted. Triangulation is adopted to understand single phenomena using a variety of methods, data sources or theories (Denzin 1970). For

the multi-methodology approach the aim is to examine a number of phenomena using a variety of methods within the context of a single study (Polit and Hungler 1999). In this study a multi-method approach was adopted because the aim of the study was to explore nurses' hand hygiene behaviour and their intention to perform hand hygiene within the context that the hand hygiene took place.

3.2.3 Adopting a multi-method approach

In this study, the aim was to understand whether Ajzen's Theory could be used to explain nurses' hand hygiene behaviour within the context of the clinical environment and, as noted, a multi-method approach adopted. Studies using Ajzen's Theory are discussed and reported in Section 2.9. Those that dealt with the infection control behaviour of healthcare staff are discussed specifically; that is Dilorio (1997); Godin et al (1998); O'Boyle et al (2001); Watson and Myers (2001); and Jenner et al (2002). These studies are all of a quantitative, non-experimental design with a self-report questionnaire used as the main data collection tool. However only O'Boyle et al (2001) used direct observation of hand hygiene as a measure of actual behaviour and there is no evidence that an attempt was made to ascertain the level of infection control and hand hygiene knowledge among the participants or the facilities available to the participants at the time of O'Boyle's et al (2001) study.

As previously argued (Section 2.8.4) Ajzen's Theory appears to be an appropriate framework within which to study nurses' hand hygiene because:

- Ajzen (1988) states that an intention to perform a behaviour (in this instance, hand hygiene) is a significant predictor of the behaviour occuring.

- An intention can be prevented from becoming behaviour because of an actual control over the behaviour, such as availability of resources and knowledge (Eagley and Chaiken 1993).
- Commentators on hand hygiene such as Seto (1995), Kretzer and Larson (1998) discussed in Section 2.8.4 have suggested that Ajzen's Theory should be used to examine hand hygiene.
- At the outset of this study, no evidence was identified that Ajzen's Theory had been used to examine hand hygiene behaviour.

Therefore in order to examine these issues and to answer the research questions stated in Section 2.10 a multi-method approach was adopted and the methods were:

- A self report questionnaire using the format described by Azjen and Fishbein (1980) and Giles and Cairns (1995).
- Field notes describing the environment in which the hand hygiene was performed.
- A test of nurses' hand hygiene knowledge using a hand hygiene quiz.
- Observation of nurses' hand hygiene behaviour in the clinical environment in which hand hygiene took place.
- An audit of the hand hygiene facilities available to nurses at the time of the observation.
- A semi-structured interview at the end of the formal data collection process.

3.3 Reliability and validity

In order to reduce bias and improve the generalisability of a study the researcher has to be able to demonstrate the quality of the data. As already discussed this may be achieved by adopting triangulation in order to examine the same phenomena from a variety of positions. However data quality also relies on the validity and reliability of the data collection tools (Oppenheim 1992; Polit and Hungler 1999). In this section reliability and validity are discussed in depth. The reliability and validity of the data collection tools are discussed in Sections 3.5 and 4.9.

3.3.1 Reliability

Reliability is described as the extent to which a measurement tool can be relied upon to measure the same thing at the same value on different occasions (Miller 1996). There are a number of ways that the reliability of a data collection tool can be tested and they relate to the stability, internal consistency and equivalence of the instruments (Polit and Hungler 1999).

Stability

An instrument is regarded as stable if the results obtained remain the same on repeat administration (Polit and Hungler1999) and can be tested statistically. A statistical test of the stability of the instrument is done by test-retest reliability whereby the same instrument is administered to participants on more than one occasion. A reliability coefficient, an objective measure of how close the test-retest scores are and a measure of the stability of the instrument, is then performed. Reliability coefficients' scores usually run from 0.00 to 1.00 and the higher the coefficient, the more stable the instrument. However for the reasons described below an instrument which scores above 0.70 is considered stable (Polit and Hungler1999).

There are several reasons why instruments are very rarely completely stable; that is with a reliability coefficient of 1.0. To begin with, when an instrument is retested after a time interval, there is always the possibility that the attribute being measured may have changed in some way, for example, an attitude. For this reason the retest should normally take place less than two months after the first test (Polit and Hungler 1999). Secondly, the subjects' responses on the second test may be as a result of remembering responses given on the first test and this results in a high reliability coefficient that is inaccurate. Finally, the subjects' responses may be less considered on the second test because of familiarity and this leads to an inaccurately low reliability coefficient (Polit and Hungler 1999).

The test-rest procedure can be used to estimate the stability of a data collection tool and is most appropriate for attributes that are unlikely to change significantly over time such as height (in adults) (Polit and Hungler 1999). However for attributes such as attitude that could change over time, the internal consistency of a data collection tool should be measured using the split-half method described below (Oppenheim 1992).

Internal consistency

An instrument, such as a questionnaire, that has been designed to use a number of items to test a particular attribute should be evaluated for its internal consistency. This is a measure of how well the individual items measure the same attribute (Oppenheim 1992, Polit and Hungler 1999). For instance, in an attitude questionnaire, if the items are consistent with each other it demonstrates that they are all measuring the same attribute. In order to demonstrate that the items in an instrument are consistent with each other, the split-half technique can be used. In the split-half technique, the items in an instrument are split into two groups and scored separately. The separate scores are then used to calculate a correlation coefficient, commonly Cronbach's alpha or the Kuder-Richardson formula20. The result is presented and interpreted in the same way as the reliability co-efficient with a score between 0.70 and 1.00 regarded as indicative of high internal consistency (Polit and Hungler1999).

Equivalence

In some situations it is necessary to determine the reliability of an instrument by using the equivalence approach. This is done either by two researchers using the same instrument to measure the same phenomena at the same time, or when two instruments, assumed to measure the same thing, are used to gather data at the same time (Polit and Hungler1999). This is particularly pertinent when the data collection method is observation and there is a risk that the observer may introduce bias or error.

Inter-rater reliability is the method used to determine the reliability of an observation schedule and the observer. This is achieved by having two observers witness the same phenomenon and recording it using the same observation schedule. A reliability coefficient can then be calculated to determine the reliability of both the observation schedule and the observer. As with the reliability coefficients discussed previously, an instrument with a score between 0.70 and 1.00 is considered reliable (Polit and Hungler1999).

3.3.2 Validity

The validity of an instrument is, according to Oppenheim (1992), the degree to which it measures what it is supposed to measure. Polit and Hungler (1999) state that in order to decide whether an instrument is valid it should be accurate, the values measured should correspond with the true values, and the tool should be specific such that the instrument measures what it is supposed to measure and nothing else.

As with reliability there are a number of ways validity can be established including content validity, criterion-related validity and construct validity.

Content validity

According to Polit and Hungler (1999), content validity relates to how representative the

items selected to measure a construct are. Content validity can be established using two methods. First a researcher may explore a number of themes through open-ended questioning. The themes that emerge as strongest are incorporated into the final items on the instrument that collects the data. A second approach is that a researcher may canvass the opinions of experts on the subject. The number of experts could be as few as three but could be more. If the experts assign a score to the items according to how relevant they think it is to the topic, it is then possible to compute a content validity index. This is the percentage of items considered by the experts to be relevant or very relevant. An instrument that scores over 80% is considered to have good content validity (Oppenheim 1992; Polit and Hungler 1999).

Criterion-related validity

When a researcher attempts to establish the criterion-related validity of an instrument, they are looking for a relationship with some other criterion that also measures the attribute under investigation (Oppenheim 1992; Polit and Hungler 1999). For instance a child's arithmetic test has higher criterion related validity if it correlates strongly (>0.80) with their teacher's assessment of how well they should do (Oppenheim 1992). For this reason finding an appropriate instrument with which to compare the instrument under construction is very difficult because it has to be established first that the instrument with which the comparison is being made is also valid. (Oppenheim 1992; Polit and Hungler 1999).

Construct validity

Construct validity, according to Polit and Hungler (1999), is the most difficult but important type of validation to perform. This is because the question being asked, 'is this instrument actually measuring the phenomenon under investigation?' often refers to a measure of an abstract concept such as grief, fear or empathy (Polit and Hungler 1999). However if these concepts are to be measured scientifically then validating the instrument is vital. Construct validity therefore demonstrates how well an instrument relates to a theoretical assumption about an abstract concept (Oppenheim 1992).

Establishing the construct validity of an instrument can be approached in a number of ways; for instance, the known-groups technique that compares two groups that would be expected to score differently on a set of attributes. If the groups have a similar score, the validity of the instrument is questionable (Oppenheim 1992; Polit and Hungler 1999).

3.3.3 Other considerations

Although it is important to establish the reliability and validity of an instrument that is to be used to collect quantitative data, these are not the only considerations. Polit and Hungler (1999) also discuss other criteria that need to be considered when designing or deciding upon an instrument; that is efficiency and sensitivity.

Efficiency

Efficiency refers to the balance that has to be achieved between producing an instrument that is efficient and one that is reliable (Polit and Hungler 1999). For instance, a questionnaire that has 100 questions may score very highly on a reliability coefficient but be too long to be considered efficient. The researcher can use a reliability coefficient calculation to reduce the number of questions used so that efficiency is improved while reliability is maintained (Polit and Hungler 1999).

Sensitivity

Sensitivity in an instrument is achieved when small variations of the attributes in study participants can be detected by assessing statistically the degree to which each item in an instrument is contributing to the instrument's overall ability to detect variations between participants (Polit and Hungler 1999). This is particularly important when a physiologic attribute is under investigation or when the difference being looked for is between two treatment options and important decisions are to be made on the basis of the results (Polit and Hungler 1999).

3.3.4 Summary

It is essential if a piece of research is to be regarded as robust and rigorous that the reliability and validity of instruments used to collect data are established. It is up to the researcher to establish that instruments are both reliable and valid. For this reason the reliability and validity of the data collection tools used in this research are discussed in relation to each of the data collection tools used in this study (Section 3.5 and 4.9).

3.4 Ethical considerations

3.4.1 Ethical issues and research

While medical ethics has been debated since Hippocrates, modern ethical regulation of research on human subjects dates back to the Nuremberg War Crimes Trials. During a judgement at the trials a code was laid down which came to be known as the Nuremberg Code. It set out 10 principles physicians should adhere to when carrying out human experiments and these were later incorporated into the Declaration of Helsinki drawn up by the World Medical Association in 1964 (Smith 1999).

Beauchamp and Childress (2001) describe Ethics as a generic term for examining a moral life that has a background in philosophy and religion. Although there may be differences between cultures on moral norms of behaviour, basic principles are recognisable such as the principle of not killing or harming another person (Beauchamp and Childress 2001). However there is a difference between common morality that is societal, and professional morality with standards of conduct specific to a particular professional group such as the nursing profession (Beauchamp and Childress 2001). Common and professional morality provides a framework for the principles basic to ethical research (Beauchamp and Childress 2001). They are the principles of respect for autonomy, nonmaleficence, beneficence and justice.

Respect for autonomy

Autonomy is variously described as self-governance, individual freedom and self-rule free from constraints that prevent meaningful choice (Beauchamp and Childress 2001). When a person has autonomy they are free to make their own choices, hold views and behave in a way congruent with their beliefs and ideals. To uphold personal autonomy, the ethical researcher should be truthful, respect personal privacy, protect confidential information, obtain consent and help others make informed decisions (Beauchamp and Childress 2001). The onus is on the researcher to obtain the informed consent of any participant before research is carried out. Informed consent is obtained when enough information has been disclosed about the research to a prospective participant for them to make an informed decision. However if the success of the research depends on some information being withheld from participants then, according to Beauchamp and Childress (2001), non-disclosure of information to research participants is permissible if:

- It is vital to obtain certain information.
- No harm will come to the participants through it, the participants are aware that a certain amount of deception is involved and have consented on that basis (Beauchamp and Childress 2001).

In this study it was necessary to obtain information on hand hygiene compliance while minimising observer reactivity discussed in Section 3.5.2. Therefore there was an element of non-disclosure in that the participants were not aware of the exact nature of the observation until after it had taken place. However they were aware of this non-disclosure when they consented to take part in this study.

Respect for autonomy also includes protecting the privacy and confidentiality of participants in research. This is covered by the Data Protection Acts of 1984 and 1998 (Section 3.4.2). In this study the information held on participants was anonymised and accessable only to the researcher. No information about the behaviour of participants

during the observation period or their responses to the questionnaire was disclosed to a third party.

The principles of nonmaleficence and beneficence

The principle that research should do the participant no harm is described by Beauchamp and Childress (2001) as the principle of nonmalefience and is supported by rules that include not killing, not causing pain and suffering and not giving offence. However the obligations of nonmaleficence also include not exposing another individual to the risk of harm and this includes psychological as well as physical harm.

Closely associated with nonmaleficence but distinct from it is the principle of beneficence, described as protecting from harm (Beauchamp and Childress 2001). In ethical research the principles of nonmaleficence and beneficence include not causing and preventing both physical and psychological harm (Beauchamp and Childress 2001). For instance, participants should not feel any embarrassment or discomfort and should leave the research situation with their self-esteem intact (Bannister, Burman, Parker, Taylor and Tindall 1994). In this study no physical harm to participants was anticipated. However psychological harm could occur due to the nature of the observation and the non-disclosure involved. According to Polit and Hungler (1999), researchers can minimise psychological harm by debriefing participants after the period of study and giving them an opportunity to ask questions and obtain information on contacting the researcher. In this study a debriefing semi-structured interview was held with all participants after the observation period and collection of field notes, the administration of the self-report questionnaire and hand hygiene quiz and the audit of hand hygiene facilities. In addition a letter was sent to the study nurses at the completion of the data collection period thanking them for their participation and giving them details on how they could contact the researcher (Appendix VII). It should be noted that none of the study nurses contacted the researcher after the study had finished.

The principle of justice

The principle of justice is the fair and equitable treatment of persons according to what they are due (Beauchamp and Childress 2001). Beauchamp and Childress (2001) describe distributive justice as the fair distribution of resources, opportunities and privileges. In research this has come to include fair access by patients to research opportunities (such as new experimental drugs) that are beneficial to a patient, as well as avoiding unfairness of non-therapeutic research harmful to patients (Beauchamp and Childress 2001). Polit and Hungler (1999) also include the right to privacy and informed consent that for Beauchamp and Childress (2001) are issues of autonomy.

In ethical research, the principle of justice is upheld by the fair selection of potential participants to a research study and by not discriminating against those who decline to take part (Polit and Hungler 1999). In addition, participants have the right to withdraw from a study at any time without prejudice (Polit and Hungler 1999). In this study all trained nurses within the Surgical and Medical Directorates at the study hospital at the time of recruitment, were invited to volunteer for the study. Since the study was anonymised as soon as data collection had taken place, it was not possible for anyone to identify who had taken part. In addition, the study nurses understood they had the right to withdraw from participation at any time.

The development of ethical guidelines for research

A number of professional bodies and organisations have sought to formalise these ethical principles into codes of conduct (Polit and Hungler 1999). In Britain, the Royal College of Physicians recommended that, all research involving human subjects should be reviewed by ethics committees (Smith 1999). However it was not until 1991 that it became a requirement of the Department of Health that every Health District should have an Ethics Committee (Smith 1999). Since then non-medical bodies, such as the American Psychological Association and the British Psychological Society, have also published ethical guidelines for conducting research.

Three basic principles from the Belmont Report (1978) cited in Polit and Hungler (1999) and Smith (1999) and adopted by the British Psychological Society in 1993 have emerged:

- Research should do the participants no harm either physically or psychologically and should be of benefit to the participants and the wider community.
- The participants' dignity should be respected through their informed consent to the study.
- The participants have a right to have their privacy protected. Any information given to the researcher by participants during the course of the research should be treated in the strictest confidence and publication of results should be in a form that guarantees anonymity for the participants (Polit and Hungler 1999; Smith 1999).

For this study there were ethical issues relating to the data collection methods, particularly the observation of nurses' hand hygiene behaviour. Although general ethical issues have been discussed, specific ethical issues relating to data collection methods are discussed in Sections 3.5 and 4.9 as each tool is presented.

Data Protection Act.

In addition and relating to, the ethical issues of research, consideration had to be given as to responsibilities under the Data Protection Act (1984 and 1998).

The Data Protection Act was first introduced in 1984 and its purpose was to protect individuals from having information about them misused by restricting what those who held the held the information could do with it, and to whom they could pass that information onto. The 1998 Act, which became law in 2000, extended the 1984 Act and harmonised legislation with other countries in the European Union. The most important

change that came about from the 1998 Act was that it was extended to cover information stored in non-computerised systems. In addition much more emphasis was put on seeking the permission of individuals before collecting, processing or passing on information about them. Therefore individuals had to be given the opportunity to opt in to information being passed on rather than opting out (Glasgow University Computing Service 2003).

The implications of the above for this study relate to;

- How consent was obtained from participants.
- How information was collected from participants.
- How it was stored and processed and at what point it was destroyed.

These issues are dealt with specifically in Section 4.7.

3.5 The literature relating to the data collection tools

3.5.1 Introduction

This was an explorative, descriptive study to examine whether Azjen's Theory could be used to explain nurses' hand hygiene behaviour. A multi-methodological approach was adopted in order to collect quantitative and qualitative data. The data collection tools were an observation schedule, a self-report questionnaire, a hand hygiene quiz, an audit tool, field notes and a semi-structured interview.

3.5.2 Observation as a method of data collection

In order to obtain a quantitative measure of hand hygiene behaviour it was necessary to observe and record nurses' actual behaviour as it occurred in a naturalistic setting. A number of issues relating to the observational method are discussed including observational methods, the observer effect, otherwise known as the Hawthorne effect,

ethical issues arising from an observational study and the reliability and validity of the method adopted.

Type of observational method used

In observational research the aim of the observer is to collect objective data while remaining apart from the situation being observed and usually two approaches are described (Pretzlik 1994). The molar approach involves observing large sets of behaviour and analysing behaviour as a single entity while the molecular approach is more specific in that there are particular behaviours of interest (Pretzlik 1994). In addition observation can be unstructured, where all behaviour is observed in order to understand experiences, or structured where specific events are observed and recorded on a form that has been prepared in advance (Turnock and Gibson 2001). According to Pretzlik (1994), the molar and molecular approaches often overlap in that recording interactions and conversations can take place at the same time as measuring actions. Unstructured observation is flexible and arguably allows a holistic view to be taken of a situation while structured observation provides data that are measurable and quantifiable (Pretzlik 1994). In addition Denscombe (1998) suggests that unstructured observation, in the form of field notes, can be taken to supplement structured observation.

In structured observation the researcher needs to decide how and when the observation is to take place. For this reason a time sampling method may be used in which the data on the behaviour of interest are collected within a pre-determined time frame. In an alternative method known as event sampling, the researcher observes the participant until a pre-decided number of behaviours have taken place (Polit and Hungler 1999).

Although all the studies on hand hygiene reviewed for this thesis adopted a molecular, structured approach to observing hand hygiene, there was no consensus on the duration of the observation period. For instance Graham (1990) used a time sampling method when hand hygiene frequency and duration were observed on a total of 884 patient contacts,

during six periods of three hours each, over two weeks. Pittet et al (2000), who also used a time sampling method, reported over 20,000 hand hygiene opportunities during observation periods of 20 minutes each, in a study that took place over three years. The researchers in both the above studies were not observing specific staff but the hand hygiene practice of any health care worker who was present in the study area at the time. O'Boyle et al (2001) used a combination of event sampling and time sampling and observed 1,246 hand washing indications for individual nurses for a total of 120 minutes or until 10 hand washing indications for each nurse had arisen. There was no attempt by O'Boyle et al (2001) to classify the hand hygiene by the type of patient contact as in Graham (1990), although the type of activities observed was given in the data.

In this study a direct measure of participants' hand hygiene was required in order to ascertain whether it would be possible, in any future multi-centre study, to find a relationship between nurses' intention to perform hand hygiene and their actual hand hygiene behaviour. Therefore direct observation of each participant's hand hygiene was the method used to obtain hand hygiene compliance data. A molecular approach was adopted since there was a specific behaviour of interest. In the studies reviewed for this thesis, only a study by Gould and Ream (1993) and subsequently Gould et al (1996) provided a rationale for using a time sampling approach. Gould et al (1996) specified the length of the observational period of each nurse to be two hours on the basis of the need to reduce observer fatigue. Previous pilot studies and a study cited in Gould et al (1996) by Casewell and Phillips (1977) had shown that this was enough time for cross-infection to take place. Therefore a time sampling approach was used in this study based on the observational method used by Gould et al (1996).

Criteria for judging hand hygiene compliance

Since this study was observational using a molecular approach, a decision had to be made as to the criteria used for judging hand hygiene and the amount of information on hand hygiene to be included during the observation. Again, among researchers, a variety of

criteria were used to measure hand hygiene compliance. For instance, in the study by Graham (1990), the duration and appropriateness of each hand hygiene act was recorded as well as the rates among all staff within the unit. However in the study by Tibballs (1996), the observer recorded the hand hygiene rates of doctors during the daily physicians' round, recording compliance only and no data were given on the duration or efficacy of the hand hygiene technique. The study by Pittet et al (2000) also recorded hand hygiene compliance for all health care workers only in a variety of locations within an acute care teaching hospital.

While the majority of the studies examined did not give a rationale for the timing and duration of the observation, as noted earlier Gould and Ream (1993) and subsequently Gould et al (1996), did provide a rationale for the time taken for observing hand hygiene episodes as well as criteria for the hand hygiene performance. Both studies assessed nurses' hand decontamination performance. The efficacy of the hand hygiene technique was scored either as a 'rigorous approach' (Albert and Condie 1981, cited in Gould and Ream 1993) or a 'liberal approach' (Broughall et al 1984 cited in Gould and Ream 1993). The technique of hand washing was judged on five elements of hand washing performance (agent chosen, duration, number of surfaces covered, hand drying and disposal of hand towel) identified through pilot work (Gould and Ream 1993). Each component of the hand washing technique was given a score out of 12 since the relative importance of each component was unknown. Although no rationale was given for attributing each component of the hand washing technique a score of 12, when a relationship was looked for between the five aspects of hand washing, a significant positive correlation was found ($p<0.005$). This suggested that nurses performing well in one aspect of hand hygiene technique, performed well in other areas of hand hygiene technique. For this reason, the criteria for hand hygiene and efficacy of hand hygiene developed by Gould and Ream (1993) and Gould et al (1996) were adopted for this study. Modifications were made to the observation tool for the purpose of this study and related to the hand hygiene policy of the study hospital (see Section 4.9.1).

Amount of data required

The amount of data a researcher decides to collect during a study and the size of the sample selected depends on the power of the statistical test to detect a significant difference between two sets of data (Miller 1984). It is noticeable that the studies reviewed for this thesis and published before 1998, did not give a rationale for their sample size, amount of data collected based on the statistical power of the statistical tests used or the confidence intervals of the population under study. Indeed no reasons are given as to why a particular sample size was chosen or why a certain amount of data collected. For example, how did Tibballs (1996) decide that five months of observation was the appropriate length of data collection or that 939 patient contacts were sufficient data upon which to base his findings? Why did Pittet et al (2000) need to conduct a study over three years and collect information on 20,000 hand hygiene instances when Graham (1990) took five weeks and observed 884 patient contacts? This does not mean that there was not a reason why these times and numbers were chosen but simply that in the papers reviewed, they are not discussed.

In this study the aim was to explore whether Ajzen's Theory could be used to understand nurses' hand hygiene behaviour. Therefore the results obtained were descriptive only. However a secondary aim of the study was to generate enough data to calculate a sample size that would have enough power to detect a difference between sets of data. For this reason the amount of data collected (the sample size) was on the advice of a senior statistician.

Participant or non-participant observation

According to Pretzlik (1994) and Swanwick (1994) there is a distinction between participant and non-participant observation. During participant observation the researcher actually takes part in the activity under observation while in non-participant observation the researcher is passive and maintains a distance between themselves and the

participants being observed (Pretzlik 1994; Swanwick 1994). The difficulty with participant observation, identified by Pretzlik (1994), is that the researcher can become over-involved in the activity they are participating in to the detriment of the research. In addition, the researcher can begin to identify with the group they are observing and this can introduce the possibility of bias (Swanwick 1994).

For the purpose of this study non-participant observation was adopted since with this approach it is possible to focus on the particular behaviour of interest reducing the possibility of bias (Swanwick 1994). In addition inter-observer reliability can be measured statistically (see Section 3.3.1). However as Pretzlik (1994) points out, it may be harder to maintain non-participant status than anticipated and for this reason the role of the researcher is critical.

The role of the researcher

Although Pretzlik (1994) and Swanwick (1994) make a distinction between participant and non-participant observation authors such as Turnock and Gibson (2001) argue that an individual in a situation, whether obtrusive or not, may find it difficult to adopt a role as an observer and maintain it throughout the period of observation. For this reason the role of the researcher needs to be discussed.

According to Endacott (1994), the role of the researcher needs to be defined since there are practical issues to be addressed. In non-participant observation, social etiquette needs to be observed since the researcher cannot expect to enter a situation with other individuals without engaging in conversation of some sort, albeit on a superficial level, for instance about the weather (Swanwick 1994). In this study the researcher was a registered nurse observing hand hygiene in a clinical situation and consideration had to be given to her obligation under the then United Kingdom Central Council for Nursing and Midwifery Council (UKCC) Code of Conduct (1992). Particularly pertinent was clause one of the Code where the nurse is charged to 'act always in such a way as to promote

and safeguard the well-being and interests of patients/clients (UKCC 1992). Therefore, although the researcher in this study was non-participant in that her role was to record the hand hygiene performance of the participants, it was recognised that a certain amount of interaction with the people she came into contact with, for instance, nurses and patients, would take place for social etiquette purposes. In addition, since the researcher was in a clinical situation, it was recognised that there could be times when she was called upon to act within the UKCC Code of Conduct (1992) in order to safeguard the well being of a patient.

The Observer Effect (The Hawthorne Effect)

As well as the practical effects of non-participant observation, the effect upon participants of being observed also need to be considered. This is described as the observer effect in Polit and Hungler (1999) and the Hawthorne effect in Endacott (1994) and Pugh and Hickson (1989).

The Hawthorne effect was first described by Elton Mayo in the 1930s. Mayo was carrying out an experiment involving the workers of the Hawthorne Plant in Philadelphia in which he was investigating the effect of lighting on productivity in two groups of workers, one an intervention group and one a control. Mayo noticed that whatever was done to the lighting in the intervention group, productivity rose in both groups. One of the conclusions drawn was that the actual participation in an experiment led to increases in productivity (Endacott 1994; Pugh and Hickson 1989). This effect is also known as the observer effect when the subject of an observation changes their behaviour because they know they are being observed (Polit and Hungler 1999). For the purpose of this study this effect is referred to as the observer effect.

That the observer effect can have influence behaviour is suggested in the study carried out by Tibballs (1996) and reported in Section 2.5. Tibballs (1996) found that hand hygiene compliance went from 10.6% after patient contact when observation was covert to 32.7%

when staff knew hand hygiene was being observed. However after feedback and overt observation, the rate was up to 68.3% and remained at 54.6% when covert observation was carried out 20 weeks after the initial observation period. This suggests that having knowledge of an observation affects a participant's behaviour since hand hygiene compliance fell during covert observation. However it does not explain why hand hygiene rates in Tibball's study (1996) remained above the initial baseline level of 10.6% 20 weeks later.

Amount of information given to participants

With any type of observation but particularly when it is intensive and specific, a decision has to be made as to whether the participants will be aware of being observed and the nature of the observation at the time it is taking place (Banister et al 1994). However in the studies on hand hygiene reviewed (Section 2.9) researchers varied in the amount of information given to participants about the nature of the study. For instance in Tibballs (1996), one of the aims of the study was to record the difference in hand hygiene compliance during overt and covert observation while in the studies conducted by Gould and Ream (1993), Muto et al (2000), and Pittet et al (2000) and it was not clear whether staff were aware of the nature of the observation. However, Bischoff et al (2000) did not tell the participants that hand hygiene was being observed while O'Boyle et al (2001) actively recruited participants to the hand hygiene study and hand hygiene behaviour was observed with the knowledge of participants.

In the studies where the researchers discuss whether participants are aware of the nature of the observation, Tibballs (1996); Bischoff et al (2000) and O'Boyle et al (2001), give the observer effect as the reason for their decision. In the study by Tibballs (1996), one of the aims of the study was to measure the effect of observation and performance feedback on hand hygiene rates. Therefore the study participants were initially unaware that hand hygiene was being observed, and then aware of the nature of the observation. Bischoff et al (2000) informed staff of the nature of the study after an initial observation period had

taken place and O'Boyle et al (2001) informed study participants of the nature of the observation when participants were recruited. Gould et al (1996) give ethical considerations. The ethical approval for Gould et al's study (1996) was dependant on nurses being told that hand hygiene and sharps disposal was being audited.

For the purpose of this study, in order to reduce observer effect, the study nurses were aware that they were being observed and had consented to the observation, although the exact nature of what part of their behaviour was being observed was not revealed to them until after the observation had taken place. However as acknowledged previously, in addition to the effect observation can have on the behaviour of participants, there are ethical considerations since participants should not come to any harm through the process of being involved in research that involves being observed (Mulhall 2003).

Ethical issues relating to an observational method

It is discussed in Section 3.4 that research should do the participants no harm either physically or psychologically and be of benefit to the participants and the wider community (Banister et al 1994; Smith 1999). The participants in this study were unaware of the nature of the observation until after it had taken place. (Section 3.5.2). The ethical issues surrounding observation therefore are related to; the amount of knowledge the participants had regarding the nature of the observation and protecting the participants and their anonymity (Banister et al1994).

According to Banister et al (1994), good research is only possible if there is mutual respect and confidence between participant and researcher and this is achieved by giving participants the information they need in order to be able to give informed consent. In addition participants have the right to withdraw from the observation at any time. Banister et al (1994) also describes how participants should be protected during the research process. For instance, it is important that the participants understand the role of the researcher and that the participants are in charge of how much information they give

the researcher. Finally the anonymity of the participants, in which their identity is unknown should be guaranteed (Banister 1994).

In the hand hygiene studies reviewed (Section 3.5.2) only one author discussed the ethical issues relating to this method of data collection or mentioned that ethical approval was dependent on the participants being aware that hand hygiene and sharps disposal were being audited (Gould et al 1996). It is unknown whether consideration of ethical issues relating to observation method was given by other researchers such as Gould and Ream (1993), Tibballs (1996), Muto et al (2000) and Pittet et al (2000) as it is not reported on in their papers. However more current literature would be expected to pay due consideration to the ethical issues of a study.

In this study ethics approval was sought and granted from the Ethics Committee of the study hospital (see Section 4.7.1). The participants were informed that they would be observed during the course of their normal nursing duties at the outset of the study and were asked to opt out of the study if they didn't want to be considered for the study. This study was commenced before the implementation of the 1998 Data Protection Act that specifies that individuals should opt in to allowing information about them to be collected. It is recognised that asking potential participants to opt out of a study would not now be considered acceptable. However participants were free to withdraw at any time and given an assurance that the study data would be anonymised. In addition any data collected on the participants was accessible to the researcher and for the purpose of the study only, in accordance with the 1984 and 1998 Data Protection Acts. All paper and computer records were destroyed on completion of the study.

Reliability and validity of an observational method

According to Banister et al (1994) using an observational method can lead to problems with external validity since the results can depend more upon whom the researcher is rather than the situation being observed. For this reason the behaviour being observed

needs to be identified clearly and where possible a schedule for observation that has been tested for reliability and validity used (Banister et al 1994). In addition the reliability and efficacy of an observational study is enhanced by a schedule that has been effectively constructed (Banister et al 1994).

In this study an observation schedule was adapted from that designed by Gould et al (1996) and Gould and Ream (1993) (Section 4.9.1). The observation schedule designed and used by Gould and Ream (1993) was used also because the criteria included in the schedule, such as duration, agent used, surfaces decontaminated and thoroughness of drying, had demonstrated a positive correlation ($p<0.0005$) with Spearman's Rank Correlation Coefficient and could be considered a reliable and valid tool for assessing hand decontamination performance. In addition, the length of the observational period of each nurse was taken from that described by Gould et al (1996) at two hours since the rationale was given for this based on pilot work and a previous study by Casewell and Phillips (1977). Therefore in this study the observation schedule had been previously tested and found to be reliable and valid and the length of the observation period of two hours had also been previously tested and found to be reliable and valid.

Summary

In this section a number of issues relating to observational method are discussed. It is clear that there is little consensus among the authors reviewed on what the ideal duration of an observational study should be, how much information should be collected, what criteria should be used to judge compliance of hand hygiene and the amount of information that should be given to participants. However when planning and designing a study, due consideration needs to be given to the reliability and validity of the data collection tools used and based on available evidence. If reports on previous studies do not contain a rationale for decisions made, they cannot be used as a basis upon which to design further studies.

In this study a non-participant molecular approach using structured observation with a time sample methodology was used. The participants were aware and had consented to the observation. However they were not aware of the full nature of the observation until after it had taken place. The observation schedule and tool were adapted (see Section 4.9.1) from one that had been previously validated by Gould and Ream (1993) and Gould et al (1996) because:

- Gould and Ream (1993) adopted an observation technique whereby a single subject was observed for a set period of time. It was planned to observe one nurse at a time because this would allow a comparison to be made between individual intention and behaviour.
- Gould and Ream's observation schedule had been designed to evaluate hand hygiene technique and this was a prime area of interest in this study (Gould and Ream 1993).
- In the observation schedule developed by Gould and Ream (1993), the technique of hand washing was judged on hand hygiene performance (agent chosen, duration, number of surfaces covered and hand drying) (Gould 1993).
- Hand hygiene was observed for a single two-hour period which was found to give the optimum number of patient contacts observed before observer fatigue led to errors (Gould and Ream 1993; Gould et al 1996).

3.5.3 Field Notes

As already discussed one of the aims of this study was to understand and explore the issues surrounding nurses' hand hygiene behaviour and the context in which it takes place. Therefore qualitative data needed to be collected because qualitative research is 'an attempt to capture the sense of what lies within, and that structures what we say and what we do' (Banister et al 1994 p3). For Miles and Huberman (1994), data are qualitative since the data refer to descriptions of people and situations based on observation,

interview or documents accessed through field-work. Banister et al (1994) also believed that since human behaviour occurs within a social setting, the setting should be described and evaluated. In addition Carson and Fairbairn (2002) argued that research that depends completely on, for example a questionnaire survey, or an interview schedule, is in danger of not getting the right answers. Therefore in order to capture the sense of what lies behind nurses' hand hygiene behaviour, the situation within which the behaviour takes place needed to be described and this was done in this study through field notes.

Field notes are described by Miles and Huberman (1994) as a form of record keeping at the time of an unstructured participant observation. However Denscombe (1998) regards any notes taken during any observation as field notes. In this study, formal structured observation took place in order to collect quantitative data on hand hygiene compliance. This also gave an opportunity to collect unstructured observational data in the form of field notes (Denscombe 1998). However the method of recording the field notes evolved as the study progressed and described in Section 4.9.2.

3.5.4 Self-report questionnaire as a data collection tool

Introduction

Questionnaires are a popular and common method of gathering data for analysis. In this Section of the literature review, reference to the guidelines given by Fishbein and Azjen (1980) on questionnaire construction and studies that have used Ajzen's Theory are discussed.

Type of Questionnaire Used

The purpose of the questionnaire in this study was to explore the intentions of the participating nurses towards performing hand hygiene appropriately and to explore whether nurses' hand hygiene behaviour could be examined using Azjen's Theory of Planned Behaviour.

According to Hall and Hall (1996) the type of questionnaire used for collecting quantitative data can be for self-completion, with or without a researcher present; or as a structured interview schedule, either face-to-face with the researcher or over the telephone. However Oppenheim (1992) and Polit and Hungler (1999) differentiate between a questionnaire completed by a study participant, otherwise known as a self-report questionnaire, and a questionnaire completed by a researcher referred to as a structured interview. In this study the questionnaire was for self-completion by the study nurse and the researcher was not present.

The self-report questionnaire for use in Azjen's Theory

In 'Steps in the construction of a standard questionnaire' Azjen and Fishbein (1980) describe how a questionnaire should be produced in order to examine the relationship between an intention and a behaviour. An example questionnaire is given by Azjen and Fishbein (1980) and researchers, such as O'Boyle et al (2001) and Giles and Cairns (1995), refer to these guidelines in their research reports.

In the sample questionnaire by Azjen and Fishbein (1980), which is on voting intention in a ballot, 58 statements are given and the responses are scored on a semantic differential scale. Both positive and negative statements are used. One question directly asks respondents their voting intention in the forthcoming ballot and there are three questions relating to respondents attitude to voting 'yes' in the ballot. There follows 20 statements, with *'extremely good'* to *'extremely bad'* as the end points on a semantic differential scale, on outcome evaluations with a corresponding 20 statements on behavioural beliefs with *'extremely likely'* to *'extremely unlikely'* as the end points on a semantic differential scale. This is followed by one direct question related to the subjective norm also with *'extremely likely'* to *'extremely unlikely'* as the end points on a semantic differential scale followed by seven questions on normative beliefs and a corresponding seven statements

on motivation to comply, all with *'extremely likely'* to *'extremely unlikely'* as the end points on a semantic differential scale.

It should be remembered that the questionnaire described by Azjen and Fishbein (1980) were designed to fulfil the criteria for the Theory of Reasoned Action (section 2.8.4) and predates Azjen's Theory. In order to construct a questionnaire to for use with Azjen's Theory it is necessary to examine studies that describe perceived behavioural in some detail and Giles and Cairns (1995) and Armitage and Connor (1999) do this.

The study by Giles and Cairns (1995) used Azjen's Theory to examine blood donating intentions and behaviour. In the methods section of the study report they describe in detail the construction of their questionnaire including the statements used. In order to gain a measure of perceived behavioural control, the questionnaire formulated by Giles and Cairns (1995) posed three statements at separate points that asked respondents to evaluate the amount of control they had over their blood donation. In addition, a later study Armitage and Connor (1999) use seven statements to measure behavioural control beliefs on a seven point semantic differential scale. The internal consistency for this section of their questionnaire was tested using Cronbach's alpha coefficient and found to be 0.78 (Armitage and Connor 1999). Using these two studies it is possible to find a form of words for testing the amount of perceived behavioural control a respondent has over behaviour.

A justification of the self-report questionnaire used in this study

For the purpose of this study a self-report questionnaire was designed using Azjen and Fishbein's guidelines (1980) because;

- The Azjen and Fishbein (1980) guidelines stipulate a self-report questionnaire format;
- The self-report questionnaire method of data collection ensures a high response rate (Oppenheim 1992);

- Interview bias is minimised as the questions are pre-set and the response options prescribed while at the same time the interviewer is available to give explanations (Oppenheim 1992).
- At the time the study was commenced no questionnaire using Azjen's Theory to examine hand hygiene intentions existed.

The validity and reliability of existing self-report questionnaire

As already discussed (Section 2.9) a number of studies have tested the construct validity of Ajzen's Theory in infection control behaviours (Dilorio 1997; Godin et al 1998; O'Boyle et al 2001; Watson and Myers 2001 and Jenner et al 2002), and found strong support for the theory and also suggested that perceived behavioural control is an important factor in an individual's motivation. It should be noted that O'Boyle et al (2001), Watson and Myers (2001) and Jenner et al (2002) were published after the questionnaire for this current study had been constructed and are therefore reviewed retrospectively.

All the studies (Dilorio 1997; Godin et al 1998; O'Boyle et al 2001; Watson and Myers 2001 and Jenner et al 2002), refered to Ajzen and Fishbein's guidelines in the construction of a questionnaire (Azjen and Fishbein 1980). The reliability of the questionnaire was described in all the studies except one through the use of Cronbach's Alpha coefficient and found to be reliable. The study by Godin et al (1998) did not report an assessment of the questionnaires reliability and there was no indication that test-retest was performed. In addition a measure of each variable in the Godin et al study (1998) was taken with only one or two statements and this is not in line with the recommendations of Azjen and Fishbein's, 'Steps in the Construction of a Standard Questionnaire' (1980).

Although reliability was established in all the studies that used Azjen's Theory to examine infection control behaviour (Dilorio (1997); O'Boyle et al (2001); Watson and Myers (2001); and Jenner et al (2002)), there was very little discussion in these studies as

to how the validity of the questionnaires was established. However the studies all found that Azjen's Theory was able to establish a relationship between intentions towards a behaviour and the actual behaviour taking place although the strength of the relationship varied between the studies. For instance, O'Boyle et al (2001) found a significant relationship ($p < 0.01$) between intention to perform hand hygiene and reported hand hygiene adherence, while Godin et al (1998) also reported a significant relationship ($p<0032$) between intention to wear gloves and reported glove usage. For this reason the construct validity of the questionnaire design can be said to have been established since the questions, which were both measuring intentions towards an infection control procedure, had similar results.

The studies that examined infection control behaviour specifically, Dilorio (1997), Godin et al (1998), and O'Boyle et al (2001), Watson and Myers (2001) and Jenner et al (2002) all used the original wording and format of questionnaire described by Azjen and Fishbein (1980). However, since the studies examined different aspects of infection control behaviour, the actual content of the questionnaires varied. Therefore, although the questionnaire designed and used in this study followed the format and wording described by Azjen and Fishbein (1980) and therefore had structural reliability and validity, the reliability and validity of the content of this questionnaire required establishing. This process is described in Section 3.3. The reliability of the questionnaire used in this study was established after the study had taken place through Cronbach's Alpha Coefficient and the results discussed in Section 4.9.4.

Questionnaire measurements

When self-report closed questions are used in a questionnaire to ascertain the attitudes of a respondent to a particular item, a linear scale of measurement is used (Oppenheim 1992). The scale described by Azjen and Fishbein (1980) is the semantic differential scale. The semantic differential scale allows participants to place themselves on a scale, for instance from '*strongly agree*' to '*strongly disagree*', in response to a statement. The

scale usually runs from one to five for scoring purposes. In addition a Likert Scale is described by Giles and Cairns (1995) in the attitude hand hygiene component of the self-report questionnaire (see Section 4.9.4). In the questionnaire guidelines given by Azjen and Fishbein (1980) the scale runs from one to seven. However, according to Oppenheim (1992), scoring systems more complex than one to five have not been found to confer any advantage. Therefore a scoring system of one to five was adopted for this study rather than the one to seven suggested by Azjen and Fishbein (1980).

The ethical issues relating to a self-report questionnaire.

As with observation the ethical issues relating to a self-report questionnaire revolve around the governing principle that this data collection method should do the participants no harm (Oppenheim 1992). However according to Smith (1999) there is little official guidance on questionnaire studies and the Royal College of Physicians are unusual in devoting five lines to the subject (Smith 1999). This is surprising given that questionnaires, clumsily constructed, can cause great offence and distress (Smith 1999). Smith (1999) also points out that some questions can be of a personal nature that raise issues of confidentiality such as questions relating to patients' sexual activity, or may raise expectations of improvements in service, be intrusive (have you ever attempted suicide?) or have a distressing subject such as work-related practices associated with premature labour (Smith 1999). In addition, although it may appear that informed consent is not required for questionnaires, since completing the questionnaire implies consent, the Royal College of Physicians recommends that consent be obtained before administration (Smith 1999). Finally, participants have the right to withdraw from the questionnaire at any point and should have their anonymity respected as discussed in Section 3.4 (Oppenheim 1992).

In this study the participants were aware that there was to be a self-report questionnaire when they were approached to take part. In addition they were able to discontinue participation in the study at any time. The anonymity and confidentiality of the

participants was respected at all times and the questionnaires destroyed when the data had been analysed. In accordance with the Data Protection Acts (1984 and 1998), the information contained in the questionnaires was available to the researcher only.

3.5.5 Quiz on hand hygiene as a data collection tool

One of the reasons that Ajzen gives for revising the Theory of Reasoned Action to the Theory of Planned Behaviour is to take into account behaviour that is not entirely volitional (Eagley and Chaiken 1993). This includes behaviour for which a certain amount of knowledge and skill is required (Eagley and Chaiken 1993). For example, from the discussion in Section 2.7.2, it appears there is a feeling among researchers such as Horton (1992) that a lack of knowledge in infection control matters is a barrier to effective hand hygiene. For this reason a hand hygiene quiz was given to the participants following the self-report questionnaire.

The validity and reliability of existing hand hygiene quizzes

In this study a hand hygiene quiz was designed to test the hand hygiene knowledge of participants for although there are a number of studies that use education as a strategy to improve hand hygiene compliance (Dubbert et al 1990; Larson and Kretzer 1995; Falsey et al) only two studies were found that actually tested hand hygiene knowledge (Williams and Buckles 1988; Gould et al 1996).

In the study by Williams and Buckles (1988) to investigate the actual knowledge of health care staff in infection control matters, a 42 statement questionnaire was presented to which respondents could answer 'true', 'false' or 'don't know'. Williams and Buckles (1988) did not discuss the reliability of their questionnaire or how validity was established; nor was actual infection control knowledge among the participants reported; only that knowledge improved after an educational campaign (Williams and Buckles 1988). In a later study by Gould et al (1996) a questionnaire was designed to assess

nurses' infection control knowledge. In this questionnaire eight short answer questions were scored for accuracy and completeness from an answer guide prepared by a panel of four experts. The questionnaire therefore had content validity but reliability was not reported (Gould et al 1996). Since there was not a hand hygiene quiz available that was known to be reliable and valid, a quiz was designed based on the hand hygiene policy written in the procedure manual of the study hospital and is discussed in Section 4.9.4.

3.5.6 Audit as a data collection tool

Introduction

In this study an audit of the hand hygiene facilities was undertaken following the observation period and administration of the self-report questionnaire. An audit was carried out as a number of researchers have suggested that lack of resources is a barrier to good hand hygiene practice (Falsey et al 1999; Bischoff et al 2000; Pittet et al 2000; Muto et al 2000; Earl et al 2002).

The term 'audit' usually describes the process that organizations go through when they have their financial records 'examined officially' by a third party. In health care audit usually refers to a process designed to analyse clinical practice (Malby 1995) and provides information on quality of care (Kogan, Redfern, Kober, Norman, Packwood and Robinson 1995). In this way the audit process becomes a cycle whereby expectations of quality are defined, compared with reality and changes made to bring reality in line with expectations (Kogan et al 1995).

The audit process in the NHS came about as a result of initiatives from the Conservative Government in the 1980s aimed at improving medical performance through competition (Humphries and Littlejohns (1995). The aim was to give incentives through financial, quality and productivity measures to improve overall performance (Malby 1995). Since the 1990s medical audit has become well established and because it has involved other

disciplines allied to medicine it has become more widely known as clinical audit (Kogan et al 1995).

Clinical audit covers three distinct areas but all are quality control measures. Firstly, generic audit measures overall quality in a unit or a ward. Secondly problem-specific audit measures quality relating to a specific clinical topic and thirdly activity-specific audit refers to measuring quality of care given by a particular person or group of people (Kogan et al 1995).

Although audit within the health service is commonly associated with clinical performance and standards of clinical care, it has been adapted across the health environment with the result that any area of activity within a hospital, for example, can be subject to the audit process (Malby 1995). In conjunction with this there have been national standards for good practice developed (Malby 1995). An example of audit tools that have been developed with the aim of normalising standards across hospital trusts is infection control audit tools. Only two such tools were identified in the literature; and Crawford (1994) and Millward, Barnett and Thomlinson (1995).

Previous tools used to audit hand hygiene facilities

The tool described by Crawford (1994) was developed by the Glasgow Infection Control Nurses' Association (1994) and used by the Infection Control Nurse at the study hospital. The tool was designed to assess the working environment and performance of staff within ward areas (Crawford 1994). The audit criteria were based on research, legislation and conventional wisdom (Crawford 1994). For these reasons it could be regarded as having content validity through expert opinion (Polit and Hungler 1999) although it is not clear what the term 'conventional wisdom' refers to. In addition, Crawford (1994) stated that some of the criteria used in his audit tool were ambiguous so that the definition of satisfying the criteria remained with the individual Infection Control Nurse who was applying it to a variety of clinical situations. For instance, the audit tool used by the

Infection Control Nurse in the study hospital stated that 'sufficient hand basins should be available for staff use' without specifying how many hand basins would be considered 'sufficient'. This ambiguity leaves Crawford's audit tool open to the charge that it is unreliable since the reliability of an instrument designed to collect quantitative data refers to how consistently and accurately it measures the attribute it is supposed to measure. Crawford (1994) did not discuss whether the reliability of the tool was established and no further literature was identified in relation to the audit tool. However it was the tool employed by the study hospital and therefore was adopted for this study.

A later tool was described by Millward et al (1995). Again criteria used were based on current legislation or hospital policy and the tool therefore had content validity. The reliability of the instrument was established by two Infection Control Nurses auditing wards simultaneously and scoring the audit tools independently (Millward et al 1995). This would appear to make this instrument more robust than that described by Crawford (1994). However as Malby (1995) pointed out, although developing national standards is an ideal goal, much of what can be achieved in bringing services up to the nationally agreed standard depends on the resources and priorities of individual health trusts. In addition the standards the audit is measuring need to be agreed and adopted by the funding authority so that action can be taken if the target standards are not met (Malby 1995).

As already discussed, in the tool described by Crawford (1994) the definition of the criteria for each item on the audit was left to the nurse conducting the audit. However the tool described by Millward et al (1995) specified the criteria upon which each item in the audit should be judged. In addition the reliability of the audit tool was established. For this reason the audit tool used in this study was the one adopted by the Infection Control Nurse of the study hospital from Crawford (1994). However the criteria specified by Millward et al (1995) were used to judge the items on the tool and is detailed below.

Table 1. Items on the audit tool used in this study with the criteria to be met

Item on audit tool	Audit criteria to be met
Is policy guidance available to all staff?	The hospital policy manual should be easily visible and accessible to all staff
Are there sufficient hand basins for staff to use?	There need to be enough hand basins for all staff to be able to access easily
Does the position of the hand basins should allow for easy access?	Hand basins should be visible and not obstructed in any way
Are the hand basins should be of an adequate size?	The hand basins should be big enough for a pair of hands to move freely beneath the taps.
Are the wash hand basins are intact?	The wash hand basin should be free from cracks and chips
Do the wash hand basins have elbow/wrist operated taps?	The wash hand basins should have taps that can be turned off using the wrist or elbow (avoiding recontamination of the hand by touching the taps).
Do the wash hand basins have mixer taps?	The water should come from a single tap that mixes hot and cold water. The user is then able to regulate the temperature of the water.
Is there liquid soap or an alternative available at all sinks in clinical areas?	The soap should be in soap dispensers and not bars of soap.
Are the soap dispenser nozzles clean?	The nozzles on the soap dispensers should be clean and not crusted with dry soap.
Paper towels at all sinks?	Paper towels should be available at all wash hand basins.
Is alcohol hand rub available?	Alcohol hand rub should be available in all clinical areas

3.5.7 Semi-structured interviews as a data collection tool

Interviews can be structured, semi-structured or unstructured according to Banister et al (1994) and Polit and Hungler (1999). For the purpose of collecting qualitative data the interview should be semi-structured or unstructured (Banister et al 1994). A semi-structured interview is one in which the topic of the interview and areas within that topic that the interviewer would like to discuss have been decided before the interview starts (Banister et al 1994). However the interviewer is also able to explore issues raised by the

interviewee. In this way interviewing is concerned with getting to the meanings participants give to a topic and can allow issues to be explored that are too complex to investigate through quantitative methods (Banister et al 1994). Unstructured interviews are conversational and usually take place within a naturalistic setting (Polit and Hungler 1999). This does not mean that the conversation progresses aimlessly, but that the responses given by the interviewee to an initial question, guide and inform subsequent questions (Polit and Hungler 1999). In addition, with the semi-structured and unstructured interview, issues of rigour and data saturation need to be addressed.

Qualitative researchers will often use the term rigour rather than reliability and validity (Coolican 1999). Rigour is established in semi-structured and unstructured interviews through a number of checks on the researchers' data, findings and interpretations of data. For instance;

- Making all field notes and transcripts of interviews publicly available so that other researchers can draw conclusions from the findings.
- Using a multiple method or triangulation approach to collecting data (Section 3.2.2).
- Achieving data saturation.

Data saturation is achieved by continuing with data collection through semi-structured or unstructured interview until no new themes and patterns in the data are emerging. In addition, the reoccurring themes and patterns in the data that have emerged are analysed during the data collection process. This process of constant data analysis and collection until no new information emerges contributes to decisions about the size of a qualitative study sample and issues of rigour (Tuckett 2004).

In this study a debriefing interview was planned after the period of observation and administration of the questionnaire. This was in order to adhere to the principles of ethical research by providing participants with an opportunity to discuss the research with the researcher (Polit and Hungler 1999). The initial aim of the interview was that it

should be a discussion of any issues that arose during the data collection process. However, following the pilot study a prompt schedule was introduced as an 'aide memoire' (Appendix XIII), to cover all the pertinent points and therefore the interview emerged at the end of the study as a semi-structured interview (Section 4.9.4). In addition it is recognised that, due to the size of the sample used in this study, data saturation in the semi-structured interview was not achieved. However, a multiple-method approach to data collection was used and transcript notes taken at the time of the semi-structured interview. This is discussed further in Section 6.3

3.6 Data analysis

Data analysis involves the organization and testing of research data. In this study quantitative data were collected from non-participant observation, a self-report questionnaire, a quiz on hand hygiene knowledge, and an audit conducted of the hand hygiene facilities available to each participant at the time of the observation. Qualitative data were collected using a semi-structured interview approach and field notes taken at the time of the observation.

In qualitative data analysis the aim is to organise and explain a record of speech or behaviour. This is not done by reducing the data to scores but by categorising the data and looking for common themes (Coolican 1999).

In quantitative data analysis statistical methods are used for two reasons; to summarise data (descriptive statistics) and to test a hypothesis, known as significance testing (inferential statistics) (Coolican 1999). In this study both statistical methods were used. For the purpose of describing the data descriptive statistics were used. For the purpose of testing the reliability of the data collection tools inferential statistics were used.

The inferential statistics used for the purpose of determining the reliability of the data collection tools are described in Section 3.3 and the result of the test is given for each data collection tool tested in the Section of Chapter Five pertaining to that particular tool. Therefore the statistical tests described in this section are the ones used for descriptive purposes.

3.6.1 Descriptive statistics

Descriptive statistics are a way of presenting a summary of data so that the person reading the summary is able to understand what the researcher is saying about the gathered data set (Coolican 1999). In order to obtain descriptive statistics the data is organised into data types.

Data types

There are four data types:

- Nominal level data. The data falls into categories and the categories given an arbittary score. The score does not measure anything but is a label for the category (Coolican 1999). An example of nominal level data is the subjects' sex.
- Ordinal level data. When it is possible to separate subjects' positions on a variable then that variable is measured (Coolican 1999). For instance the responses scored on a Likert Scale represent ordinal level data.
- Interval level data. With interval level data the intervals between the measurements should be equal. The most common example of interval data is weight and height since the interval between, for instance kilograms, is the same (Coolican 1999).
- Ratio level data. As with interval level data, the intervals between the measurements should be equal. However ratio level data has a rational

and meaningful zero. Therefore weight is ratio level data since zero weight is a possibility (Polit and Hungler 1999).

Techniques for summarising data

In addition to the organisation of data types three things need to be presented when providing a summary of many items of data:

- The central tendency - the central value of the data set
- The dispersion – how spread out are the data around this central point.
- The frequency of scores within a data set – an array of the responses available with a count of the number of times each response was obtained (Polit and Hungler 1999).

Measuring the central tendencies of a data set

The central tendencies of a data set are measured in three ways:

- The mode measures the most frequently occurring item. It is considered an unreliable measure of a small data set. However in this study the mode is used in the description of the data and the presentation of frequencies in the data sets (Cooligan 1999).
- The median is the central value in a data set, once the data has been ordered, and is an ordinal measure. The median is calculated using the formula $(n + 1)/2$ when n = the number of values in the set. The median is more representative of the data set than the mode. However when the data does not have an even distribution (the data is skewed), the median can be misleading. In this study the median of the data set is presented (Cooligan 1999).
- The mean is calculated by adding up the scores and dividing by the number of scores there are. The mean is the most sensitive measure of the data set and in this study the mean for the data sets is calculated and presented in the findings (Cooligan 1999).

Measuring the dispersion of a data set

In order to understand how values in a data set of differ from each other the dispersion of the data set needs to be calculated and three calculations are made (Cooligan 1999):

- The range is a measure of the difference between the top value and the bottom value in a data set. However the range does not describe the way scores are spread out within that range (Cooligan 1999). In this study the range of the data sets are presented in the findings.
- The variation ratio is a measure of data that have been treated as frequencies where the mode has been used as the central tendency (Cooligan 1999). Although the mode was used in the data sets obtained for this study, the variation ratio was not calculated.
- The standard deviation calculates the degree to which the scores in a data set deviate from each other and gives the degree of variability within a data set (Cooligan 1999). In this study the standard deviation of the data sets is calculated and presented with the range in the findings.

Frequencies

The frequencies are used to demonstrate the distribution of responses to an item in a data set (Cooligan 1999). In this study frequencies are formulated and presented in Chapter Five.

3.6.2 Qualitative data analysis

In qualitative data analysis the most common method of analysing the data is content analysis (Coolican1999). In this technique the data is analysed closely and a coding system developed. In this way the qualitative data can be converted into quantitative data and subjected to statistical analysis, known as content analysis.

3.6.3 Analysis of the demographic data

The demographic data was collected at the time of the self-report questionnaire. The data were treated as nominal level data and the frequency of the scores within the data set calculated

3.6.4 Analysis of the observation data

The preparation of the data for analysis is described in Section 4.11.3. In this study the data from the observation period were scored in two ways:

- Nominal level scores were given to the observation categories activity, hand hygiene performed, agent used, surfaces covered, and drying.
- Interval level score was given to the time taken to perform hand hygiene.

The data from the observation of hand hygiene are presented as tables of frequencies and mean, range and standard deviation are given where appropriate (Section 5.5).

3.6.5 Analysis of the field notes

The field notes were taken at the time of the observation. They were not subjected to content analysis and were used to illustrate the environment within which the hand hygiene took place. The field notes are presented throughout Chapter Five.

3.6.6 Analysis of the self-report questionnaire

In this study the self-report questionnaire was scored on an ordinal scale with some of the statements negatively weighted and some positively weighted. For instance the statement 'I will try my best to hand wash at every hand washing episode' with the response '*very likely*' scoring five to the response '*very unlikely*' scoring one, is positively weighted. The statement 'I would find it difficult to change my hand hygiene behaviour' with the response '*strongly agree*' scoring one to '*strongly disagree*' scoring five is negatively weighted. The weightings given to the statements in the self-report questionnaire for this study can be found in Appendix VIII.

The scores for the self-report questionnaire in this study were summed according to the method described by Azjen and Fishbein (1980). The mean and range of the scores for the self-report questionnaire were calculated and are presented in Section 5.6

3.6.7 Analysis of the hand hygiene quiz

In this study the data for the hand hygiene quiz were treated as nominal data. The responses were scored one for a correct answer and zero for an incorrect answer. The scores were summed and a mean score for each study nurse calculated. The findings of the hand hygiene quiz are presented in Section 5.7.

3.6.8 Analysis of the audit of hand hygiene facilities

In this study the data from the audit of hand hygiene facilities were treated as nominal data. The audit was scored one if the item on the audit was present and zero if the item was absent (see Section 3.5.6). The scores for the audit of hand hygiene were summed and a mean score calculated for each audit that took place. The findings of the audit of hand hygiene facilities are presented in Section 5.8.

3.6.9 Analysis of the semi-structured interview.

The semi-structured interview contained seven questions. Three of the questions were to remind the researcher to give the study nurses information regarding the study and future outcome. One question asked the study nurses about their experiences of the research process. Three questions asked the study nurses about their hand hygiene. The responses given to the three questions that asked the nurses about their hand hygiene were categorised and frequency tables produced (see Section 5.9). The responses to the semi-structured interview were also used to give flavour to the presentation of the findings in Chapter Five.

3.6.10 Calculation of a sample size for multi-centre study.

In this study the sample size was small since the aim was to explore the feasibility of employing Azjen's Theory to understand hand hygiene behaviour. For the purpose of a larger study a sample size calculation was undertaken and is discussed in Section 5.10.

3.7 Summary of literature review pertaining to the methods.

This study was undertaken to explore whether Ajzen's Theory of Planned behaviour could be used to understand nurses' hand hygiene behaviour. For this reason a multi-method study was designed that used a number of data collection tools to examine different aspects of the research questions. These methods were;

- Non-participant observation in order to describe nurses' actual hand hygiene behaviour;
- A self-report questionnaire designed according to the wording and format described by Azjen and Fishbein (1998);

- An audit of hand hygiene facilities using an adapted audit tool described by Crawford (1994) and used by the Infection Control Nurses at the study hospital;
- Field notes taken at the time of the observation;
- A semi-structured interview in order collect additional qualitative data and fulfil the demands of ethical research.

Attention was given to the reliability and validity of the research approach as well as the instruments used for data collection. In addition, following an exploration of the issues involved in conducting research the ethical issues surrounding this study were explained and the strategies adopted to accommodate them described. Finally, the data collection tools available to a study of this kind were explored in order to introduce the data collection tools adopted in this study and the data analysis methods that would be used to handle data of this type were described. In the following chapter there is a description of how the methodology described in this chapter was used to fulfil the research questions of this study.

CHAPTER FOUR.

MATERIALS AND METHODS

4.1 Introduction

This study examined nurses' hand hygiene behaviour. In this chapter there follows; methods used including the population and sample size, the study site and the recruitment strategy. There is also a discussion of the ethical issues involved and how they were overcome before a description of the data collection process is given. Finally there is a description of the data analysis process.

4.2 Research questions and aims

4.2.1 Aim of the study

As discussed in the literature review, Ajzen (1988) states that behavioural intention to perform behaviour, not under complete volitional control, is the best prediction of the behaviour actually taking place. Intention to perform a behaviour is influenced by these factors; attitude towards the behaviour; perceptions of significant others' about whether to perform the behaviour (subjective norm); and perceived control over performing the behaviour. In addition, actual control such as the availability of resources can have a direct bearing on whether the behaviour takes place. The literature review revealed that although a number of researchers such as Kretzer and Larson (1998) and Seto (1995) had suggested that Ajzen's Theory be used to understand the hand hygiene behaviour of healthcare professionals, at the time that this study was undertaken, there was no evidence that such a study had taken place. The aim of this study therefore was to examine nurses' hand hygiene behaviour using Ajzen's Theory as a model.

4.2.2 Research Questions

1 Can nurses' hand hygiene behaviour be examined using Ajzen's Theory of Planned Behaviour?
2 What are the hand hygiene practices of nurses in the clinical environment?
3 What are the hand hygiene facilities available to nurses in the clinical environment?
4 Do nurses believe that time and workload constraints influence their hand hygiene practices in the clinical environment?

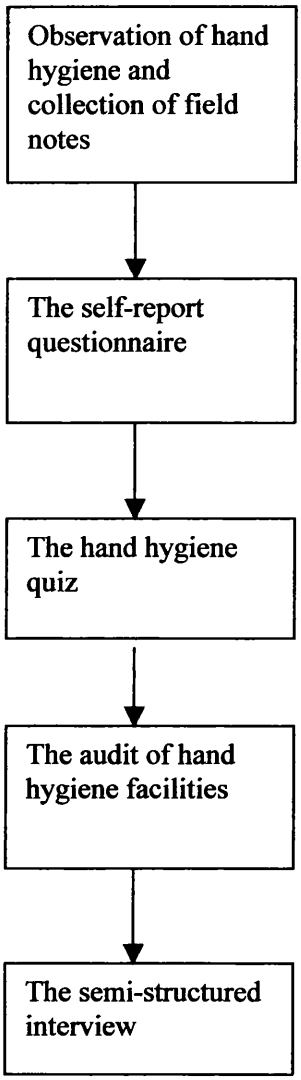
4.3 Overview of study design

This was a multi-method, cross sectional study that was descriptive and explorative in nature (Section 3.2). Data were collected based on;

- Formal, non-participant observation of nurses' hand hygiene behaviour in a naturalistic setting. Field notes were also taken at the time of the observation.
- The administration of a self-report questionnaire including demographic data.
- A hand hygiene quiz.
- An audit of the hand hygiene facilities at the time of the observation.
- A semi-structured interview.

The sequence of data collection is shown in Figure 2.

Figure 2. The sequence of data collection



4.4 Study site

This study took place within the Medical and Surgical Directorates of a large University Teaching Hospital Trust in the West of Scotland. The study site hospital had 876 beds and employed approximately 1,200 trained nurses at the time of the study. It provides general acute services to its local population as well as the West of Scotland. There are also a number of regional specialities within the Trust.

4.5 The research environment

4.5.1 The soap and towels available

The wards in the Surgical and Medical Directorates of the study hospital were supplied with soap from the Pharmacy Supplies Department, the Domestic Services and General Stores. The soap supplied by the Pharmacy was an anti-septic soap (Hibiscrub™) containing chlorhexidine, intended for anti-septic (hygienic) hand hygiene, and ordered from pharmacy by the nursing staff. The soap supplied by Domestic Services was a general-purpose soap, intended for social hand hygiene, and replenished by the Domestic Assistant to each ward. In addition bar soap, intended for individual patient use, was available from General Stores. At each hand basin there was a paper towel dispenser. The paper towels were supplied and replenished by the Domestic Services Department. Finally the wards were able to order Hibisol™ from Pharmacy Supplies Department. Hibisol™ was the alcohol hand rub in use in the study hospital at the time the study took place. The indications for using each of these products are discussed in section 4.9.1

4.5.2 Surgical Directorate

Nine surgical wards within the Surgical Directorate were included in the study. They admitted routine and emergency general surgical, orthopaedic urology and ophthalmic

cases. The surgical intensive care and accident and emergency unit were excluded as the nature of the nursing introduced the possibility of uncontrolled variables such as the appropriateness of hand washing during an emergency situation. In addition the male surgical ward on which the author was then a permanent member of staff was also omitted as the author felt unable to observe close colleagues objectively.

Seven of the nine wards in the Surgical Directorate had been upgraded within the last five years and divided into wards with four bays of three, five and six beds each. Each bay had two hand basins. There was a central nurses' station, which also had a hand basin and a sink in the sluice area. Three of the wards had two side rooms each with a wash hand basin within an en-suite shower room. Because of the rise of patients with MRSA, in the last five years these single rooms were predominantly used for isolation of MRSA cases.

The two wards within the Surgical Directorate that had not been upgraded were of a Nightingale design. In both wards there were 19 beds. There was a nurses' station in the middle of the ward with a hand basin. At one end of the wards were the service areas (sluice, treatment room and offices). At the other end of the ward there was a hand basin and this area led off to patients' washrooms. There were no single rooms in these wards.

4.5.2 Medical Directorate

Five wards in the Medical Directorate of the study hospital were included in the study, one of which was an acute receiving ward. The patients admitted were suffering from general medical conditions predominantly of the chest and heart and stroke. The medical intensive care unit was not included as the nature of the nursing introduced the possibility of uncontrolled variables such as the appropriateness of hand washing during an emergency situation. Three of the medical wards had been upgraded while two wards had not and remained in their original Nightingale design. The upgraded wards were divided into bays with between four and ten beds in each bay. The larger bays with up to ten beds

had two sinks available for hand washing while the smaller four bed bays only had one. There were two single bedrooms in each of the upgraded wards that were used for patients who were in the last stages of their illnesses or infected with MRSA. There was also a central nurses' station but no sink in that area. The clean utility area was separate from the main body of the wards.

The wards that had not been upgraded were divided into two sections each with 14 beds and were of a Nightingale design. Each section had one sink and this was positioned behind where the nurses sat. These wards did not have any single rooms.

4.6 Access to the study sample

Access was obtained through the Deputy Director of Nursing (Appendix I) at the study hospital who gave permission for trained nurses in the Medical and Surgical Directorates to be approached and recruited to the study. She also gave permission for the names, grades and areas of work for all the nurses included in the sample population to be accessed from the salaries' databases. As discussed in section 3.4.2 this information was obtained before the implementation of the Data Protection Act (1998) that states that personal data can only be processed if the subject has given consent. It is recognised that the nurses' consent would now be needed before their names and grades could be released to another individual for the purpose of research.

Following the consent of the Deputy Director of Nursing a letter was sent by the researcher to the Senior Nurse Managers of the Surgical and Medical Directorates requesting permission to have access to the names of the trained (registered and enrolled) nurses within their respective directorates (Appendix II). In addition, the researcher met with the Senior Nurse Managers so that the research proposal and recruitment strategy could be discussed. At the meetings the Senior Nurses expressed interest in the project and agreed that the trained nurses could be accessed. There was general agreement that

hand hygiene was an important area of research. The Senior Nurse Managers also raised the study at their monthly Senior Staff Meetings and although there was no feedback from these meetings, permission was given for the names, grades and place of work of the trained staff within their directorates to be accessed and the lists released.

A letter was then sent by the researcher to all the Charge Nurses of the wards in the Medical and Surgical Directorates involved, requesting their permission to observe nurses while on duty (Appendix III). This was followed up with a phone call to give Charge Nurses an opportunity to ask any questions and to verify their willingness to allow access to the wards. All Charge Nurses gave verbal permission for the study to take place on their ward.

Recruitment to the study was good initially. However, for some study nurses there was a gap of up to three months between receiving the letter and a phone call requesting participation. This was seen as a bar to effective recruitment because it was thought that the study had become distanced in potential study nurses' memories. In addition, another study requiring nurses to complete a questionnaire began half-way through this study and it was noticeable that there was an increased reluctance to take part following this. There was also concern among nurses that the study would take time and some commented that they were too busy. The letter requesting their participation was adjusted to inform nurses of the amount of time taken to participate based on the pilot study (see Section 4.10.4).

4.7 Ethics approval and ethical considerations

4.7.1 Ethics Approval

Approval for the study was sought from the Ethics Committees of the study Hospital with a letter written to the Secretary of the Ethics Committee (Appendix IV). Permission to carry out the study as proposed was granted in January 2000 (Appendix V).

4.7.2 Ethical considerations

In carrying out this research ethically, two objectives needed to be achieved. First it was important to adhere to the ethical principles outlined by Beauchamp and Childress (2001). Secondly it was important to adhere to the code of conduct of any professional bodies that the researcher belonged to, in this case, the then UKCC (1992). Therefore the ethical concerns that were considered, related to the design of the study and the role of the researcher and underpinned the application for ethics approval.

The study design

This study was of a multi-method, cross sectional design and had to be designed in such a way as to adhere to the principles described by Beauchamp and Childress (2001). However, the ethical dilemma concerned the participation of nurses in an observational study, the nature of which was unclear to them whilst the study was going on. If the participants were aware of the nature of the observation before it took place, it was inevitable that their behaviour would be modified as a result of that knowledge, an effect known as observer reactivity (Section 3.5.2).

The principle of respect for autonomy

According to Beauchamp and Childress (2001) respecting an individual's autonomy means that the ethical researcher needs to tell the truth, respect personal privacy, protect confidential information, obtain consent and help others to make informed decisions.

In this study it was necessary to obtain information on hand hygiene compliance while minimising observer reactivity (Section 3.5.2). Therefore, when the informed consent of the study nurses was obtained, it was on the basis that the exact nature of the observation would not be disclosed to the study nurses until after the observation period had taken place (Appendix VI). The privacy of the study nurses was protected through anonymising

the data collected and it was accessible only to the researcher. No information about the behaviour of individual study nurses during the observation period, or their responses in the questionnaire was disclosed to a third party.

In order to protect the participants' autonomy, involvement in the study was entirely voluntary. In the letter sent to each nurse (Appendix VI), nurses had the opportunity to opt out of the study by completing the slip at the bottom of the letter and returning it to the researcher. The nurses that did not return the opt-out slips were randomised (see Section 4.8) and those selected were contacted by phone on the ward where they worked. Those nurses who agreed to remain in the study also gave verbal consent to being observed during the telephone conversation following randomisation. The study nurses could opt out at any time during the study and were made aware of this during the telephone conversation with the researcher. This was especially important since full co-operation was required to complete the questionnaire and to obtain their participation in the debriefing semi-structured interview.

The principles of nonmaleficence and beneficence.

The principles of nonmaleficence and beneficence protect the participant in research from harm and this includes psychological as well as physical harm (Section 3.4.2).

In this study no physical harm to participants was anticipated. However there was a potential psychological harm due to the nature of the observation and the non-disclosure involved (Section 3.5.2). All the study nurses were de-briefed in the period immediately after the questionnaire was administered via a semi-structured interview (Section 3.5.7). Each study nurse was given an opportunity to make any comments and ask questions. Secondly the study nurses and Charge Nurses of the wards where the data collection took place were contacted by letter from the researcher on completion of the study and the findings discussed (Appendix VII). A contact number was given in this letter should any of the study nurses, or the Charge Nurses who gave permission for the study to take place

on their ward, want to discuss the study further. None of the study nurses or Charge Nurses of the wards where the data collection took place contacted the researcher. This is discussed further in the Discussion Chapter.

The study nurses also needed to know that the information gained about them during the data collection would not be used against them in any way. For this reason the study nurses were informed, that information gathered about them was anonymised.

In addition it was important that nurses' time should not be exploited and that their colleagues, particularly the charge nurses, should not find the study inconvenient or disruptive of nursing care. The study nurses were informed as to how long the observation period would be and given an estimate of the time required to complete the questionnaire, based on the pilot study data.

Finally, the study nurses needed to be confident that the research would contribute to improving infection control and nursing practice. Therefore it is hoped that the findings of this study can be disseminated to a wider audience through a journal publication.

The principle of justice.

The principle of justice according to Beauchamp and Childress (2001) is the fair and equitable treatment of persons according to what they are due. In this study all trained nurses within the Surgical and Medical Directorates of the study hospital at the time of recruitment were invited to take part in the study and inclusion was entirely voluntary. All study nurses had the right to withdraw from participation at any time.

Study nurses were assured that their privacy would be protected and information gathered during the study would be anonymised and their behaviour was discussed only with the research supervisor of this study. The study nurses had a right to fair treatment particularly as the full nature of the study was unclear to them until they began the

questionnaire. Again this meant that full debriefing in the form of a semi-structured interview was essential (see Section 4.9.6). Finally all data were anonymised.

The Data Protection Act

In addition consideration had to be given as to responsibilities under the Data Protection Act (1984). Under this act individuals had a right to access any information that has been recorded about them on a computer or as a written note. In addition information about an individual could not be passed onto a third party without that individuals' consent.

At the time that this study took place, the 1998 Data Protection Act was not in force and it is recognised now that potential participants to this study would have had to be invited to opt into the study rather than opt out of it.

The role of the researcher

In this study the researcher's role was non-participant. However the researcher is also a Registered Nurse and has duties and responsibilities under the then UKKC Code of Conduct (1992), see Section 3.5.2. In addition, Swanwick (1994) and Endacott (1994) state that an observer also has to fulfil social obligations towards the people involved in the situation she is observing.

In this study therefore, while the researcher was in her role as non-participant observer, she was also in her role as a nurse and as a member of a social group. For these reasons the researcher participated in conversations with members of staff and the public with whom she had contact and was aware of and responded to the needs of patients where appropriate. These interactions and the impact they had on the observation process are discussed in Sections 5.3 and 6.4.

4.8 Population and sample

Before discussing the population from which the sample was drawn it is important to establish how the population was chosen and what the eligibility criteria were.

4.8.1 Eligibility criteria

According to Polit and Hungler (1999), eligibility criteria are determined by a number of factors; the cost involved in collecting data from a particular client group; difficulties in gaining access to particular groups; a person's ability to participate in a study; and a need to have a homogenous sample in order to control extraneous variables. The criteria were therefore, in line with Ethics Approval (Appendix IV and V):

Inclusion criteria:

- Registered and enrolled nurses directly responsible for patient care.
- Registered and enrolled nurses currently employed within the Surgical and Medical Directorates of the study hospital.

Exclusion Criteria:

- Registered and enrolled nurses currently employed within Intensive care, high dependency and accident and emergency wards.
- Registered and enrolled nurses working in the ward that the researcher was also employed on.

4.8.2 Population

The target population was the 206 registered and enrolled nurses in the Medical and Surgical Directorates of the study hospital who were directly involved with patient care and met the study criteria. The study population was recruited by writing to the 206

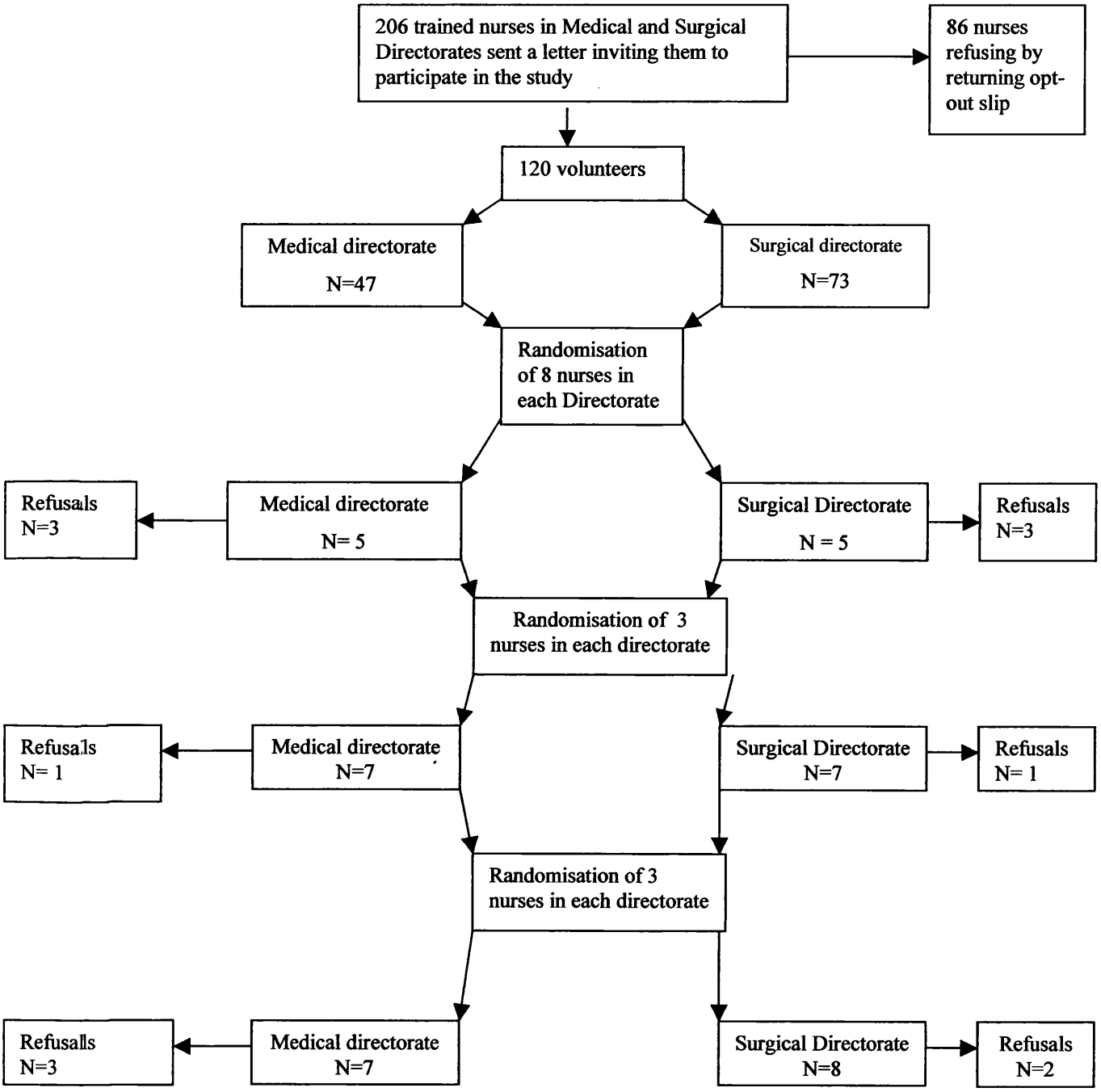
registered and enrolled nurses in the Medical and Surgical Directorates of the study hospital and requesting their participation (Appendix VI).

4.8.3 Study recruitment and sample

The invitation to participate (Appendix VI) specifically asked nurses to opt out of the study and 86 nurses did so. However 120 nurses did not return the reply slip on the bottom of the letter and therefore they became the study population. There were 47 nurses from the Medical Directorate and 73 nurses from the Surgical Directorate. The recruitment process is summarised in Figure 3.

The names of the 47 nurses from the Medical Directorate and 73 nurses from the Surgical Directorate were put into separate containers and a simple randomisation performed whereby the names of eight nurses were pulled from each container.

Figure 3. Flow chart showing details of recruitment procedure for pilot and main study



The nurses (n = 16) selected randomly were then contacted by telephone on the ward where they worked and asked if they would be prepared to participate in the study (see section 4.7.2).

Following the telephone conversation five nurses from each Directorate agreed to participate. A further simple randomisation took place whereby the names of three nurses from each Directorate were pulled from each container. These six nurses were contacted by telephone on the ward where they worked and two nurses from each Directorate agreed to participate.

A final randomisation of three nurses from each Directorate took place. These six nurses were contacted on the ward where they work. No nurses agreed to participate from the Medical Directorate and one nurse agreed to participate from the Surgical Directorate. This bought the number of nurses participating in this study to 15. The advice of a senior statistician was sought when deciding the size of the study sample. The sample size was determined by the need to generate sufficient data for a power calculation to be made for a future multi-centre study and the time available for the study. For the purpose of calculating a sample size for a larger multi-centre study, the data from all 15 study nurses was used. However the first eight nurses recruited through the randomisation process were used for the pilot study and the remaining seven nurses were used for the main study.

All the nurses who agreed to participate in this study at telephone contact following randomisation were able to continue with participation until data collection was complete. The nurses that agreed to take part in the study became the sample population. Those that declined to participate at contact following randomisation gave sickness, maternity leave, annual leave or disinclination to participate as reasons for refusal. The difficulties encountered with recruiting nurses to the study are explored further in Section 6.5.1.

4.9 Construction of data collection tools

The data collection tools were constructed prior to the pilot study in order to test them before the main study.

4.9.1 The observation of hand hygiene tool (Appendix VIII)

The observation tool for this study was designed following a literature review (Section 3.5.2). A molecular approach was adopted using a time sampling method based on the observational method used by Gould et al (1996). In addition the criteria for hand hygiene and efficacy of hand hygiene developed by Gould and Ream (1993) and Gould et al (1996) were also adopted for this study. These methods had been found to be reliable and valid (Section 3.5.2). Modifications were made to the observation tool for the purpose of this study and related to the hand hygiene policy of the study hospital as discussed below.

Structure of the observation tool

The tool was designed so that ten hand hygiene instances could be recorded on a single A4 sheet of paper. Following the pilot study the tool was adapted to accommodate field notes (Appendix VIII).

On each single A4 sheet of paper was a box with six columns of tens rows each. Each column related to a specific component of the hand hygiene process and each row related to a single hand hygiene episode. Beneath the box were codes for the purpose of scoring the hand hygiene episodes as they took place. When a clinical contact occurred, the researcher entered codes in the columns for the components of the hand hygiene episode which were; type of hand hygiene contact; whether hand hygiene was performed; the agent used; the number of surfaces covered; the time taken to perform hand hygiene and efficacy of hand drying. These codes were then used for data analysis (Section 3.6.3 and 4.11.4).

In addition to the box for recording hand hygiene episodes a further box was added, following the pilot study, for recording general observations in the form of field notes (see Section 4.9.2). The study nurses were also allocated a number that was recorded on the tool for the purpose of anonymous data analysis and this number recorded on all the other data collection tools.

Content of the observation tool

As previously discussed in this section, the data collection tool allowed the researcher to record the components of each hand hygiene episode as they occurred. Therefore in line with Gould et al (1996) there was a need to define hand hygiene. This was because the hand hygiene performed by each participant required rating according to how appropriate it was to the clinical contact the participant experienced.

A clinical contact is an instance when a study nurse comes into physical contact with a patient or comes into physical contact with an item that has been in contact or subsequently comes into contact with a patient (Gould et al 1996). In the literature two types of clinical contacts are identified (Gould et al 1996) and they are; social hand hygiene and hygienic hand hygiene (Section 3.5.2). In this study the two types of hand hygiene identified and the criteria for when each type of hand hygiene should occur were taken from the hand hygiene policy manual of the study hospital as set out below.

<u>The social hand wash</u>

Consisting of a liquid soap and water hand wash or application of an alcoholic hand rub (Hibisol ™) undertaken when associated with low contact activity such as;

- Before commencing work for the day; visiting another department; eating or handling food or drinks; preparing and giving medications; patient contact; leaving for home.
- After visiting the toilet; patient contact; handling bedding; cleaning equipment.

The hygienic hand wash

Associated with high contact activity and involves washing hands with antiseptic hand cleanser (Hibiscrub ™) or a social wash followed by antiseptic hand rub (Hibisol ™) undertaken when associated with;

- Before aseptic procedures; contact with immunocompromised patients
- After contact with patients in source isolation; contact with contaminated articles; contact with contaminated equipment.

Therefore the observation tool specified the type of hand hygiene appropriate for each type of clinical contact and this was recorded under activity. For social hand hygiene activity the code was 1, and for hygienic hand hygiene activity the code was 2 (Appendix VIII).

In addition to the type of hand hygiene that should be performed according to the clinical contact, hand hygiene technique was also assessed according to Gould and Ream (1993). Four techniques were assessed; the agent used to perform hand hygiene; surfaces covered; time taken for hand hygiene; and completeness of drying. For whether hand hygiene was performed the options were 'yes', which was coded 1, or 'no', which was coded 2.

For the agent used to perform hand hygiene six options were available and they were coded one to six; Hibisol ™ (1) (alcoholic hand rub); Hibiscrub ™ (2) (antiseptic soap); wall soap (3) (see section 4.5.1); bar soap (4) (see Section 4.5.1); none (5); and not seen (6).

For the surfaces covered four options were given and were coded one to four; palmer only (1); dorsal (back of the hand) and palmer (2); dorsal, palmer and inter-digital (3); and not seen (4). The time taken to perform hand hygiene was recorded using a stop-watch.

For the thoroughness of drying the options were; hands dried thoroughly (1); hands not

dried thoroughly (2); not seen (3); and not relevant (4), for instance following hand hygiene with alcoholic hand rub only. The options were coded one to four as noted in brackets.

Administration of the observation of hand hygiene tool

The tool was used by the researcher for the purpose of recording the hand hygiene behaviour of the study nurses. As discussed the observation of hand hygiene tool was designed so that ten hand hygiene instances could be recorded on a single A4 sheet of paper. The tool was single sided for ease of use and the number of sheets used during the observation recorded.

Notes were made during observation over a period of seven observation sessions. Detail on the actual process is to be found in Section 4.11

4.9.2 The collection of field notes (Appendix VIII)

While non-participant observation was taking place field notes were kept (Section 3.5.3). The field notes were recorded on the observation of hand hygiene tool (Appendix VIII). The information was recorded in an unstructured freestyle and included the number of patients on the ward, the number of staff on duty at the time of the observation and the skill mix (untrained and trained), the activities undertaken by the nurse under observation including meal breaks taken, drugs administered etc, and observations on the general level of activity on the ward, such as the number of intravenous infusions and the number of patients going to theatre.

4.9.3 The self-report questionnaire (Appendix IX)

For the purpose of this study a specific self-report questionnaire was constructed. In the literature review (Section 3.5.4) it was found that in the studies using Ajzen's Theory, the main data collection tool was a self-report questionnaire and was described in detail by Azjen and Fishbein (1980). For this reason the construction of the questionnaire as set out by Azjen and Fishbein (1980) and described in Section 3.5.4 was closely followed. In addition the format for assessing perceived behavioural control was taken from Giles and Cairns (1995) and Armitage and Connor (1999).

The structure of the self-report questionnaire

In section 3.5.4 it was noted that in the self-report questionnaire described by Azjen and Fishbein (1980) the behavioural intentions of respondents were measured with statements scored on a semantic differential scale of seven points. It was also discussed that for the purpose of this study a scoring system of one to five be adopted since Oppenheim (1996) did not find an advantage in a more complex scoring system (Section 3.5.4).

The questionnaire constructed for this study had 63 statements related to the Theory of Planned Behaviour. The five constructs tested were; intention to perform the behaviour; the attitude towards hand hygiene; the attitude towards the act of hand hygiene; subjective norm and perceived behavioural control. It should be noted that at the time this self-report questionnaire was constructed, the term hand washing was used to denote hand hygiene behaviour. However if this self-report questionnaire were constructed today, the term hand hygiene would be used to include hand cleaning with alcoholic hand rub. This applies also to the observation of hand hygiene tool (Section 4.9.1) and the hand hygiene quiz (Section 4.9.4).

The first page of the self-report questionnaire contained instructions for the study nurses on how to complete the questionnaire and included an example question (unrelated to

hand hygiene). The self-report questionnaire was structured so that the statements on the components of Azjen's Theory were grouped together; for instance the statements relating to attitude to hand hygiene were grouped together as were the statements on the subjective norm. However in order to reduce questionnaire fatigue for the study nurses, the questions directly related to the study nurses' intention to perform hand hygiene were spaced throughout the self-report questionnaire (*statements 1, 9 and 30*). In addition as discussed in Section 3.6.5 statements were both negatively and positively weighted. For instance a statement such as 'I will try my best to hand wash at every hand washing episode' is a positively weighted statement while 'It is inconvenient for me to hand wash at every hand washing episode' is an example of a negatively weighted statement. The score attributed to each statement can be found in Appendix XIV. At the end of the self-report questionnaire the study nurses were asked for demographic data (Appendix X).

For the purpose of data analysis there was a section on the right hand side of each page for scoring. The nurses' personal identification number was also put onto each page of the self-report questionnaire for administrative and data analysis purposes.

The content of the self-report questionnaire

The purpose of the self-report questionnaire was to measure the constructs of Azjen's Theory (Section 2.8.4). As noted before, the five constructs were; attitude to hand hygiene; attitude to the act of hand hygiene; subjective norm and behavioural control beliefs. There were also three statements that directly asked study nurses' intentions towards hand hygiene as noted below.

The direct measure of intention towards hand hygiene

In order to obtain a direct measure of hand hygiene intention, three statements were put concerning the study nurses' intention to act in respect of hand hygiene. They were "I will try my best to hand wash at every hand hygiene episode" (*statement 1*); "I intend to hand wash at every hand washing episode" (*statement* 9); and "I am aiming to hand wash at

every hand hygiene episode" (*statement* 30). These three statements were rated on a five point semantic differential scale with *likely* and *unlikely* as the end points.

The measure of attitude to hand hygiene

A direct measure of attitude was obtained from seven statements using a five-point Likert scale with *strongly agree* and *strongly disagree* as the endpoints (*statements 2-8*). For example 'Hand washing at every episode is beneficial to patient care'.

The measure of the attitude to the act of hand hygiene

The next section of the questionnaire assessed attitude towards the act of hand hygiene. According to Ajzen and Fishbein (1980), attitude towards the act, is the result of behavioural beliefs, which are the perceived consequences of performing the act and outcome evaluations, which represent how likely a respondent, believes a consequence will be, as a result of the behaviour. Nine salient points were constructed and content validity was established based on evidence in the literature.

- Hand hygiene has long been recognised as an important factor in preventing the spread of infection in hospitals (Gould 1995).
- This includes wound infections Emmerson et al (1996).
- Orchard (1998) discusses the importance of adequate hand hygiene in preventing the spread of MRSA.
- Larson et al (1997) and Boyce et al (2000) both found that skin problems, particularly soreness, are a reason why health care workers hand wash less than they should.
- Personal hygiene issues has been cited as a reason for wearing gloves by Godin et al (1998).
- Reducing the risk of health care personnel acquiring an infection and inadvertent contact with body fluids was also cited by Godin et al (1998).
- A large body of evidence such as the National Audit Office report (2000) has shown that hospital acquired infection is expensive in terms of additional

treatments required.

- The Public Health Laboratory Service Report (1999) and The National Audit Office report (2000) also showed that in-patient times were prolonged.
- However there is also evidence that health care workers find infection control procedures time consuming (Voss and Widmer 1997; Weeks 1999).

The nine points above were then used to construct ten outcome measures (*statements 10 19*). Participants were asked to rate on a semantic differential scale how *good* or *bad* it would be if hand hygiene at every episode led to these outcomes occurring. Ten corresponding behavioural belief statements were then constructed. Participants were asked to rate on a semantic differential scale of five points how *likely* or *unlikely* it would be that hand washing would lead to these behavioural beliefs occurring (*statements 20 29*). Attitude towards the act of hand hygiene was obtained by summing the behavioural belief and outcome evaluation scores and multiplying them.

The measure of the subjective norm

The next section of the questionnaire dealt with subjective norm. The subjective norm is an individuals *perception* that most people important to them think they should or should not perform the behaviour (hand hygiene at every hand hygiene occasion). In order to identify individuals (known as referent individuals) whose opinion on hand hygiene would be important to the study nurses, as recommended by Azjen and Fishbein (1980), ten of the researchers' immediate nursing colleagues were asked the following questions. In this way the statements achieved content validity;

- Are there any people who are likely to think that, when there is a hand hygiene episode at your work, you should perform hand hygiene?
- Are there any people who are unlikely to think that, when there is a hand hygiene episode during your work, you should perform hand hygiene?
- Who comes to mind when you think about hand hygiene at every hand hygiene episode?

Analysis of the responses to the above questions was carried out and the seven most cited referent individuals incorporated into statements measuring subjective norm. The referent individuals identified were; nursing colleagues, the Charge Nurse for the place of work, the Infection Control Nurse, the Director of Nursing, the Consultants on the ward, the patients on the ward and the patients' relatives.

The measure of subjective norm is obtained, according to Azjen and Fishbein (1980), by finding the sum of the normative beliefs and multiplying it with the sum of the motivation to comply. Seven statements using a semantic differential scale of five points assessed normative belief with *very likely* to *very unlikely* as the end points (*statements 32-38*). Seven statements using a semantic differential scale of five points assessed motivation to comply with *strongly agree* to *strongly disagree* as the end points (*statements 39-45*).

In addition two statements measured overall subjective norm (*statements 31 and 46*). First study nurses were asked to assess how *likely* or *unlikely* it was that 'Most people who are important to me think that when there is a hand washing episode during my work I should hand wash' (*statement 31*). Secondly participants were asked to assess whether most people who are important to them would *strongly approve* or *disapprove* on a five point semantic differential scale, if they were to hand wash at every hand hygiene episode (*statement 46*).

Perceived behavioural control

The final section of the self-report questionnaire tested the construct perceived behavioural control. Two measures of perceived behavioural control were constructed. First study nurses were asked directly how much control they believed they had over their hand washing behaviour using the format of Giles and Cairns (1995). They were asked, using five point semantic differential scales: 'Overall, how much control would you say you have over whether you hand wash at every hand washing episode?' (*very little*

control-complete control; statement 47). 'For me to hand wash at every episode is' (*very easy-very difficult; statement 48*). 'If I wanted to I could hand wash at every episode' (*very likely-very unlikely; statement 49*). 'It is mostly up to me whether or not I wash my hands at every hand hygiene episode' (*strongly agree-strongly disagree; statement 50*). 'There is very little I can do to make sure I wash my hands at every hand hygiene episode' (*strongly agree-strongly disagree; statement 51*).

Secondly, study nurses were asked, on a five point scale of *strongly agree* to *strongly disagree,* to rate 12 beliefs dealing with factors that might interfere with hand hygiene. In order to establish the content validity of this section of the self-report questionnaire reference was again made to the literature;

- The time involved in performing hand hygiene at every hand hygiene opportunity (Voss and Widmer 1997; Weeks 1999; Pittet 2000) (*statements 53, 56,& 57*)
- Convenience and availability of facilities (Gould 1995; Kesavan 1999; Darley et al 2000) (*statements 54, 55, 59 & 60*).
- The effect of hand hygiene on hands (Gould 1995; Larson et al 2000; Boyce et al 2000) (*statement 58*).
- The amount of knowledge on hand hygiene (Horton 1992; Pittet 2000) (*statement 61*).
- Hand hygiene habits (Muto 2000) (*statements 62 & 63*)

Reliability of the self-report questionnaire used in this study

The overall reliability coefficient for the self-report questionnaire designed for this study was tested using Cronbach's Alpha. In addition individual constructs (direct measure of attitude, attitude towards the act of hand hygiene, subjective norm, and perceived behavioural control) were also tested for reliability using Cronbach's Alpha coefficient. The results are presented here.

- For the entire self-report questionnaire, the reliability co-efficient was 0.79.
- For the attitude to hand washing the reliability co-efficient was 0.66

- For the attitude to act of hand washing the reliability co-efficient was 0.75
- For the subjective norm the reliability co-efficient was 0.85
- For the behavioural beliefs the reliability co-efficient was 0.89

Validity of the self-report questionnaire used in this study

As reported in Section 3.5.4, a number of studies have established the construct validity of the self-report questionnaire described by Azjen and Fishbein (1980). However in order for this self-report questionnaire to have content, construct and criterion validity (Section 3.3.2), reference needed to be made to the literature on hand hygiene because, at that the time that the self-report questionnaire was designed, studies using Azjen's Theory to examine hand hygiene had not been published. As noted previously in this section, reference was made to the literature on hand hygiene when constructing the questions. The Infection Control Nurse of the study hospital, who has expert knowledge on hand hygiene, also reviewed the questionnaire.

Demographic data

At the end of the self-report questionnaire respondents were asked to complete demographic data (Appendix X). This included age, sex, years since completing general nurse training and years since last infection control training as Ajzen and Madden (1985) acknowledged that lack of training and knowledge could act as an actual control on intention and behaviour.

Administration of the self-report questionnaire

The self-report questionnaire was administered after the observation of hand hygiene took place, and was filled in by hand by the study nurses independently of the researcher.

4.9.4 Knowledge of hand hygiene quiz. (Appendix XI)

In keeping with the goal to identify whether lack of knowledge of hand hygiene procedure could act as an actual control on hand hygiene intention and behaviour, a short hand hygiene quiz was presented at the end of the self-report questionnaire.

Structure of the knowledge of hand hygiene quiz

The hand hygiene quiz was designed specifically for this study. There was a brief explanation of the quiz and how the study nurses should complete it. There were ten questions in the quiz and next to each question were optional answers. The study nurses were to tick the box of the answer they felt was most appropriate for the question. The answers were coded for data analysis purposes and there was a box for the study nurses' identification number.

Content of the hand hygiene quiz

Participants were given a list of ten events that involved hand hygiene at some point. They were;

- Before patient contact; starting work (shift); an aseptic procedure; commencing a drug round; going home.
- After giving a bed bath; handling unsoiled linen; cleaning equipment; contact with a patient with MRSA; short patient contact, for instance, taking a temperature.

The participants were asked to identify the correct hand hygiene procedure for the ten tasks from the options given. The options given were; social handwash; hygienic handwash; no handwash and don't know.

The content validity of the quiz was established through the expert knowledge of the Infection Control Nurse at the study hospital and reference to the hand hygiene policy of

the study hospital. The reliability of the hand hygiene quiz was not tested. It is recognised that in a larger study the reliability of the hand hygiene quiz would need to be established.

Administration of the hand hygiene quiz

The hand hygiene quiz was attached to the back of the self-report questionnaire and completed immediately after the self-report questionnaire.

4.9.5 The audit of hand hygiene facilities tool (Appendix XII)

The purpose of the audit was to establish the hand hygiene facilities available to each study nurse at the time observation of hand hygiene took place. The audit of hand hygiene facilities tool employed in this study was the tool already used by the Infection Control Nurse at the study hospital and adapted from an audit tool designed by the Glasgow Infection Control Nurses Association and reported by Crawford (1994) (Section 3.5.6).

Structure of audit of hand hygiene tool

The audit tool was a box containing five columns. The first column contained a series of questions relating to the hand hygiene facilities. The second column was to be ticked if the facility was available, the third column was to be ticked if the facility was not available. The third column was to be ticked if the facility was not applicable and the fourth column was for scoring and data analysis purposes. The audit tool also had an area for the study nurses' identification number. The audit tool was contained on a single side of A4 paper.

Content of the audit of hand hygiene facilities tool

Although the audit tool used by the Infection Control Nurse in the study hospital was used for this study, the audit tool contained ambiguities that left it open to interpretation by Infection Control Nurses (Section 3.5.6). Therefore clarification of the criteria used to judge the hand hygiene facilities was required. This was done using a tool described by

Millward et al (1995) that was found to be both reliable and valid (Section 3.5.6). The questions used and their interpretation is discussed in Section 3.5.6 (Table 1). However for the reader's convenience they are reproduced here.

Item on audit tool	Audit criteria to be met
Is policy guidance available to all staff?	The hospital policy manual should be easily visible and accessible to all staff
Are there sufficient hand basins for staff to use?	There need to be enough hand basins for all staff to be able to access easily
Does the position of the hand basins allow for easy access?	Hand basins should be visible and not obstructed in any way
Are the hand basins an adequate size?	The hand basins should be big enough for a pair of hands to move freely beneath the taps.
Are the wash hand basins intact?	The wash hand basin should be free from cracks and chips
Do the wash hand basins have elbow/wrist operated taps?	The wash hand basins should have taps that can be turned off using the wrist or elbow (avoiding recontamination of the hand by touching the taps).
Do the wash hand basins have mixer taps?	The water should come from a single tap that mixes hot and cold water. The user is then able to regulate the temperature of the water.
Is there liquid soap or an alternative available at all sinks in clinical areas?	The soap should be in soap dispensers and not bars of soap.
Are the soap dispenser nozzles clean?	The nozzles on the soap dispensers should be clean and not crusted with dry soap.
Paper towels at all sinks?	Paper towels should be available at all wash hand basins.
Is alcohol hand rub available?	Alcohol hand rub should be available in all clinical areas

It should be noted that the question 'is alcohol hand rub available' did not appear on the audit tool used by the Infection Control Nurse of the study hospital and was added to the audit tool following the pilot study. It should also be noted that no reference was found in Crawford (1994) or Millward et al (1995) as to what 'sufficient hand basins' meant. For the purpose of this study the researcher judged that there should be a hand basin in each clinical area (ward, clean utility area, dirty utility area, nurses' station, patients' single rooms, patients' wash areas) with one hand wash basin for every six beds in a ward area. The clinical area in this study was judged to be any area in the ward where patient care or

patient-care related activities took place. Therefore, for example, patient care or patient-care activities took place in the clean and dirty utility areas but not in the linen room or the nurses' office.

Administration of the audit of hand hygiene facilities tool

The researcher completed the audit of hand hygiene facilities by hand after the observation of hand hygiene had taken place.

4.9.6 The semi-structured interview schedule (Appendix XIII)

The semi-structured debriefing interview was carried out in order to fulfil the obligations of conducting ethical research described in Section 3.4

Structure of the semi-structured interview schedule

A prompt schedule for the interview was drawn up following the pilot study. There were seven questions or prompt statements on a single A4 sheet of paper and space beneath the questions for the researcher to record each study nurse's responses.

The content of the semi-structured interview schedule

There were four questions relating to the study nurse's experience of the research process and their hand hygiene practices, that is; whether they had been aware of what part of their nursing activities were being observed; whether they thought much about hand hygiene when at work; whether they performed hand washing at every occasion; and how often did they think they hand washed (out of ten) compared to when they should.

During the course of the semi-structured interview the researcher also needed to give the study nurse some information about the study and this was included on the prompt schedule. It informed study nurses about the nature of the study, the possibility of a larger study, that they would find out about the outcome of the study and they were asked not to

tell colleagues about the nature of the observation (to minimise observer reactivity).

Administration of the semi-structured interview

The researcher recorded the study nurses' responses on the prompt schedule by hand while the semi-structured interview was taking place.

4.10 The pilot study

After the observation schedule, self-report questionnaire, hand hygiene quiz and audit tool had been developed they were tested during a pilot study. The objectives of the pilot study were to:

1. Test the structure, content and administration of the observation tool.
2. Test the structure, content and administration of the self-report questionnaire.
3. Test the structure, content and administration of the audit tool.
4. Identify the information needed to be collected during the field notes and at the de-briefing interview.
5. Test the feasibility of the study design.

4.10.1 Sample

The sample for the pilot study was the first eight nurses who, following simple randomisation, agreed to participate in this study as described in Section 4.6. At the initial telephone contact and after the study nurse had agreed verbally to take part in the study, a time was arranged for observation of hand hygiene, administration of the self-report questionnaire and hand hygiene quiz and audit of hand hygiene facilities.

It was decided to pilot across all three hospital shifts because this gave the widest opportunity for a mutual time for data collection to be arranged. The distribution of the pilot study nurses over the three shifts worked in the study hospital was as follows. For

the Medical Directorate they were; one night shift (time of observation 22.00hrs-24.00hrs); two early shifts (09.00hrs-11.00hrs); and one late shift (19.00hrs-21.00hrs). From the Surgical Directorate they were; one night shift; one early shift; and two late shifts.

4.10.2 The role of the researcher

Upon arrival at the study site, the researcher introduced herself to the nurse under observation and to the senior member of nursing staff on the ward. The researcher wore her hospital identification badge and also carried her university matriculation card. The researcher dressed in smart casual, civilian clothes in order to appear informal and because the researcher did not want to be identified either as a nurse or appear 'official' to staff, patients and visitors. It was hoped that this casual but smart mode of dress would allow the researcher to observe the study nurses without attracting too much attention from other staff, patients and patients' visitors while at the same time appearing professional.

4.10.3 The data collection process

Pilot of the observation of hand hygiene tool

After the researcher had introduced herself to the study nurse an explanation of the observational process was given. The study nurse was told that the researcher was going to observe her as she went about her usual nursing duties and that this observation would be continual for two hours and include tea breaks. During the observation the study nurse was told that the researcher would be making notes on a sheet of paper attached to a clipboard. The stop-watch for recording the time taken to perform hand hygiene was also attached to the clip-board. The study nurse was also told that although it was important for the researcher to be able to see what the study nurse was doing, intimate nursing care would be not be observed. In addition the researcher would not communicate verbally

with the study nurse unless she needed to for the purpose of the observation or in an emergency, such as a patient requiring assistance. An assurance was given that the observation process would not interfere with the nursing care the study nurse was giving.

Upon commencement of the observation period the researcher endeavoured to maintain a discreet distance while maintaining visual contact with the study nurse. The observation was of all activities undertaken during the two-hour period and included tea breaks. However the observation was arranged so that extended meal breaks such as lunch were avoided. The dignity and privacy of the patients was maintained at all times. It was not deemed necessary for the researcher to observe intimate nursing; only to be aware that it was taking place. On certain occasions it was deemed necessary to ask the study nurse the nature of the task to be undertaken and this avoided a dog-like following of the study nurse who might, for instance, be returning to the sluice for a forgotten item. The elements of the hand hygiene observation were scored during the observation period as discussed in Section 4.9.1. (Appendix VIII)

Identifying the information to be collected during the field notes

As discussed previously field notes were collected while observation was taking place. During the pilot study it became apparent that the general level and type of activity on the ward should be commented on as discussed in Section 4.9.2 and included, number of staff including skill mix at the time of the observation, number of patient in the ward, number of patients receiving intravenous infusions, enteral feeding and with urinary catheters in situ. In addition other events were noted such as patients going to and from theatre, patients requiring a high level of nursing care, doctors' rounds and patient visiting.

Pilot of the self-report questionnaire

Following the observation period and at a suitable junction in the study nurse's nursing care, the self-report questionnaire was administered and it was at this point that the nature of the observation was revealed. The self-report questionnaire was administered away

from the main body of the ward, commonly in the ward office or the treatment room in order that the study nurses could complete it without interruption. While the study nurse completed the self-report questionnaire, the researcher left the room to carry out the audit of hand hygiene facilities on the ward.

Pilot of the hand hygiene quiz

The hand hygiene quiz was attached to the self-report questionnaire and was administered at the same time as the self-report questionnaire. The study nurses completed it in the same area of the ward that they completed the self-report questionnaire. The researcher was not present when the hand hygiene quiz was completed since she was carrying out the audit of hand hygiene facilities. The hand hygiene quiz took no more than five minutes to complete.

Pilot of the audit of hand hygiene facilities

While the participant was completing the self-report questionnaire the audit of hand hygiene facilities was undertaken. The audit of hand washing was carried out on each occasion a study nurse was observed and while they completed the questionnaire. This was because the relationship between nurses' hand washing behaviour and hand washing facilities was examined at the time the actual behaviour was taking place.

In order to carry out the audit of hand hygiene facilities the researcher visited all the clinical areas of the ward on which the observation of hand hygiene took place. The areas visited included; all the patient areas (bed areas, bathrooms and dayrooms); the clean utility room; the dirty utility room; the nurses' station and the ward office. All areas were inspected for the criteria described in Section 4.9.5.

Pilot of the semi-structured interview

In order to fulfil the aim of conducting ethical research a semi-structured, debriefing interview was conducted following administration of the self-report questionnaire and the

audit of hand hygiene facilities. During the pilot study the interview schedule described in Section 4.9.6 was not used since it was the experience of conducting the semi-structured interview during the pilot study that led the researcher to develop the interview schedule used in the main study. However the questions asked and responses given by the study nurses were recorded on a sheet of A4 paper and the notes taken identified with the study nurses' identification number. During the semi-structured interview the study nurses were encouraged to make comments and observations on the nature of the study, its subject and the experience of being involved in a study of this nature. The researcher used the semi-structured interview to explain to the study nurse the nature of the study, its background and overall aims. The study nurses were also asked not to discuss the nature of the study with colleagues in order to avoid the possibility of nurses in the subsequent main study being aware that they were participating in a study on hand hygiene.

4.10.4 Changes to study design post pilot study

Information given to study nurses in recruitment letter (Appendix VI)

Following the pilot study the letter asking nurses to participate (Appendix VI) was adjusted to give to amount of time the study nurse could expect the self-report questionnaire to take to complete.

Necessity of field notes and way of recording them

During the pilot study it became apparent that what was happening on the ward during the observation of hand hygiene was important to the overall understanding of hand hygiene and that this should be recorded formally. In order to reduce the amount of paper the researcher had to handle during the observation period, the observation tool was structured to a landscape format so that a box could be included for field notes without compromising the amount of hand hygiene data (10 hand hygiene instances per sheet) that could be recorded (Appendix VIII).

Effectiveness of self-report questionnaire design

It was found that the questionnaire was easy to read, legible and took no more than 10 minutes to complete. There were no changes made to the self-report questionnaire following the pilot study.

Effectiveness of the hand hygiene quiz design

It was found that the hand hygiene quiz was also easy to read, legible and took no more than five minutes to complete. There were no changes made to the hand hygiene quiz following the pilot study.

Effectiveness of the audit of hand hygiene facilities tool design

The audit tool was found to be insufficient for the purpose of assessing hand hygiene facilities since it did not include whether an alcohol hand rub was available for the nurses to use. Therefore for the main study the audit tool was modified to include this (Appendix XII). The audit took no more than 15 minutes to complete.

Necessity of developing a schedule for the semi-structured interview

As noted in Section 4.10.3, it became apparent during the pilot study that a prompt was required for the researcher when carrying out the semi-structured interview. This was developed following the pilot study and also provided space for the researcher to record the study nurses' responses to the questions more easily since she did not have to also write down the question she was asking. The semi-structured interview schedule also ensured that the questions asked of the study nurses were uniform across all study nurses (Appendix XIV).

Overall feasibility of the study

Overall the study design was found to be feasible, with the tools adapted and specifically designed for this study easy to use and allowing for comprehensive recording of data. The recruitment process encountered some difficulties and these are discussed in Section 6.5.

The two-hour observation period was of sufficient time to allow for a range of clinical contacts and hand hygiene episodes to be witnessed.

During the observation of hand hygiene the researcher did not have any difficulties observing the activities undertaken by the study nurses and was able to do so from a discreet distance. Although the researcher attempted to be as non-participant as possible during the observation of hand hygiene, her attention was drawn to events on the ward and patients and visitors did approach her for assistance on occasions. At these times the researcher was able to break off momentarily from her observation of the study nurse to give the assistance required. This included; directing a visitor to their relative on the ward; directing visitors to the senior member of staff on the ward; directing doctors to patients and staff members; fetching a urinal for a chair bound gentleman; fetching a towel for a patient. In addition a number of patients were curious about the researcher and her role and engaged her in conversation. The researcher was polite and friendly but found it difficult to talk to these patients who were obviously trying to find out what was going on and were also taking her attention away from the observing the study nurse. The researcher would tell patients who asked that she was observing the study nurse for research. The danger for the researcher was that if she divulged too much information, the patient might let it slip to the study nurse before the observation period was over and this could have had an impact on the study nurses hand hygiene behaviour.

The self-report questionnaire was administered while the researcher carried out the audit of hand hygiene facilities and this was convenient for both the researcher and the study nurses. None of the study nurses had any difficulties that were expressed to the researcher about the clarity of self-report questionnaire.

During the de-briefing semi-structured interview, the study nurses were interested in the study and generally thought hand hygiene a worthwhile topic that merited further research. There was some embarrassment among study nurses when they realised that

their hand hygiene had been observed specifically and their comments and the estimates they gave of their hand hygiene rates are discussed in Section 5.9.

4.11 The main study

Following the pilot study and modification of the observation schedule, audit tool and development of questions for a semi-structured interview, a main study took place.

4.11.1 The main study sample

The participants of the main study were the seven nurses remaining from the original 15 recruited, after the pilot study had taken place. The distribution of the main study nurses over the three shifts worked in the study hospital was as follows. For the Medical Directorate there was one night shift (time of observation 22.00hrs-24.00hrs), one early shift (09.00hrs-11.00hrs) and one late shift (19.00hrs-21.00hrs). From the Surgical Directorate there was one night shift, two early shifts and one late shift.

4.11.2 The role of the researcher

The researcher approached the main study in the same way as she approached the pilot study. That is the researcher introduced herself to the nurse under observation and to the senior member of nursing staff on the ward. The researcher wore her hospital identification badge and also carried her university matriculation card. The researcher dressed in smart casual civilian clothes in order to appear informal and because the researcher did not want to be identified either as a nurse or 'official' to staff, patients and visitors.

Comments on the observational process.

The researcher found that while carrying out the observation, a number of situations arose

that the researcher had to give some consideration and deal with. Many of the wards were extremely busy and the nursing staff stretched to provide care. On one occasion, while the nursing staff dealt with another patient, a confused elderly gentleman attempted to climb out of bed with his intravenous infusion and urinary catheter still attached. The researcher was not a member of staff but also had a duty to prevent an accident from occurring. This incident is described in more detail in Section 5.3. As a nurse it is very difficult to stand back from situations that appear to demand the immediate attention of someone who is not there. The researcher was aware of her responsibilities towards the health and safety of other individuals on the ward (staff, visitors and patients) and the (then) UKCC Code of Conduct (1992) while remaining detached in order to achieve non-participant observation.

As well as the situation described above the researcher found, as in the pilot study, that as she was attempting to observe the study nurses the patients would engage her in conversation to find what the researcher was doing. As with the pilot study, the researcher answered the patients' questions and informed the patients that she was carrying out research that involved nurses at work. The researcher also dealt with queries regarding patients and members of staff from visitors to the ward.

Finally, the pilot study nurses were asked not to discuss the nature of the study with colleagues until after all the data collection process had taken place (Section 4.10.3). However, the researcher acknowledges the possibility that some cross-contamination may have taken place between the pilot study nurses and the main study nurses and that the main study nurses may have been aware that a hand hygiene study was taking place.

4.11.3 The data collection process

The observation of hand hygiene

The observation of hand hygiene was carried out as described in the pilot study (Section 4.10.3) and following changes to the observation tool discussed in Section 4.10.4. The explanation given to the study nurse before the commencement of the observation period remained as in the pilot study. As with the pilot study the observation period included tea breaks. The changes to the observation tool meant that the information from the observation of hand hygiene was simple to record (Appendix VIII). There were no times when the researcher felt that she was going to miss a hand hygiene occasion because she was recording the previous one, even when the study nurses were moving quickly between tasks. The elements of the hand hygiene observation scored during the observation period are discussed in Section 4.9.1.

The field notes

The field notes as discussed in Section 4.10.4 were recorded on the observation of hand hygiene tool (AppendixVIII). The areas of interest that were noted in the field notes were as in the pilot study. Since the observation tool had been adjusted to include field notes it was possible make notes as the observation of hand hygiene progressed and these were elaborated on at the end of the data collection period.

The self-report questionnaire

The self-report questionnaire was not changed at all following the pilot study. The administration of the questionnaire also remained unchanged from the pilot study and was completed by the study nurse away from the main body of the ward commonly in the ward office or the treatment room. All the study nurses were able to complete the self-report questionnaire. While the study nurses completed the self-report questionnaire the researcher carried out the audit of hand hygiene facilities.

The hand hygiene quiz

The hand hygiene quiz was unchanged following the pilot study. Administration of the hand hygiene quiz also remained unchanged. All the study nurses were able to complete the hand hygiene quiz. The hand hygiene quiz took no more than five minutes to complete.

The audit of hand hygiene facilities

The audit of hand hygiene facilities was changed after the pilot study as discussed in Section 4.10.4. However the administration of the audit of hand hygiene facilities remained unchanged following the pilot study and was carried out while the participant was completing the self-report questionnaire. The audit of hand washing was carried out on each occasion a participant was observed and completed the questionnaire.

As with the pilot study, the researcher visited all the clinical areas of the ward on which the observation of hand hygiene took place. All areas were inspected for the criteria described in Section 4.9.5.

The semi-structured interview

In order to fulfil the aim of conducting ethical research a semi-structured debriefing interview was conducted following administration of the self-report questionnaire, the hand hygiene quiz and the audit of hand hygiene facilities. As noted in Section 4.10.4 the semi-structure interview schedule was changed following the pilot study. The semi-structured interview schedule (Appendix XIII) is described in Section 4.9.6. During the semi-structured interview the study nurses were encouraged to make comments and observations on the nature of the study, its subject and the experience of being involved in a study of this nature. The researcher used the semi-structured interview to explain to the participant the nature of the study, its background and overall aims. The semi-structured interview schedule also ensured that the questions asked of the study nurses were uniform across all study nurses. The semi-structured interview took between 10 and

15 minutes to complete.

4.11.4 Data analysis

Following the data collection period, the data from the observation tool, self-report questionnaire, hand hygiene quiz, field notes, audit tool and semi-structured interview were scored for analysis. The scoring systems used for the purpose of analysing the data are given in Section 3.6. It should be noted that although the sample size in this study was small, because of the amount of data generated, for instance in the observation of hand hygiene, the findings are calculated as percentages.

Data analysis of the observation of hand hygiene data

As discussed in Section 3.6.3 a nominal level score was given for the observation categories activity. Therefore it was possible to calculate the number of hygienic and social contacts experienced by each study nurse and a mean score across the sample calculated expressed as a percentage. These figures are discussed in Section 5.5.1.

Following the witness of a clinical contact, whether hand hygiene was performed or not was recorded and the appropriateness of the hand hygiene noted. Again a nominal score was attributed to this (Section 3.6.3). This allowed the hand hygiene rate of each study participant to be calculated as well as a mean score for the hand hygiene rate of the whole sample. In addition it was possible to calculate the appropriateness of the hand hygiene for the clinical contact (based on the appropriateness of the agent used to perform hand hygiene) for both the individual study nurses and the sample as a whole. These findings are presented in Section 5.5.2.

For the efficacy of hand hygiene the study nurses were scored on the number of hand surfaces covered during hand hygiene, the time taken to perform hand hygiene and the efficacy of their drying technique. For the number of hand surfaces covered a nominal

level of scoring was again applied. Following this it was possible to calculate mean score of the number of hand surfaces covered across the sample. For the time taken to perform hand hygiene an interval level score was applied. Therefore the mean time taken (in seconds) to perform hand hygiene was calculated for each individual study nurse as well as a mean hand hygiene time for the sample. For the efficacy of the drying technique a nominal level of score was applied. This allowed a frequency calculation to be made on the most commonly applied drying technique among the sample. If the researcher was unable to observe the number of surfaces covered during hand hygiene the data was recorded as missing.

Data analysis of the field notes

The field notes were not subjected to data analysis. Rather they were used to provide background and colour to the observation and are presented throughout Chapter Five as vignettes illustrating the environment in which the hand hygiene took place.

Data analysis of the self-report questionnaire.

The questionnaire contained 63 statements based on a five-point semantic differential scale and Likert Scale and scored on an ordinal scale discussed in Section 3.6.2. The questions were either negatively weighted or positively weighted. The scores therefore were 'five' for the most positive response to a question whether negatively or positively weighted to 'one' for a negative response. For instance if the participant replied 'quite bad' to the question, how good or bad would it be in your opinion, if you were to wash your hands at every episode and the level of cross infection in the ward was reduced, the answer would score two. However if they responded that it was 'quite bad' if, after they washed their hands on every occasion, their hands became sore, this would score four. The scores attributed for each statement can be found in Appendix XIV and are in line with the recommendations of Azjen and Fishbein (1980).

Following the guidelines set out by Azjen and Fishbein (1980) the scores were calculated as follows:

- For the direct measure of intention to perform hand hygiene the scores for statements 1, 9 and 30 were summed and the mean, median and range scores calculated across the sample.
- For the attitude to hand hygiene the scores for statements 2-8 were summed and a score produced for each study nurse. From this it was possible to calculate the mean, median and range scores across the sample.
- For the measure of the attitude to the act of hand hygiene, the scores for statements 10 to 19 were summed and the scores for statements 20 to 29 were summed. The two scores obtained were then multiplied to obtain an overall score for the attitude to the act of hand hygiene. Mean, median and range scores across the sample were then calculated.
- For the measure of the subjective norm the scores for the statements 32 to 38 were summed and the scores for the statements 39 to 45 were summed and the two scores multiplied to obtain an overall measure of the subjective norm. Mean, median and range scores were then calculated across the sample.
- For the measure of perceived behavioural control the scores for the statements 47 to 63 were summed. The scores were then used to calculate mean, median and range scores across the sample.
- To obtain an overall score of the study nurses' intention to perform hand hygiene the scores of the attitude to hand hygiene, the attitude to the act of hand hygiene, the subjective norm and the perceived behavioural control were summed. A mean, median and range were calculated from these scores across the sample.

Data analysis of the knowledge of hand washing quiz

The scores for the hand hygiene quiz were treated as nominal data (Section 3.6.7). A score of 'one' was given for a correct answer and a score of 'zero' for an incorrect answer. For this reason it was possible to calculate individual scores for the study nurses as well as mean, median and range of scores across the sample.

Data analysis of the audit of hand hygiene facilities

The scores for the audit of hand hygiene facilities were treated as nominal data (Section 3.6.8). A score of 'one' was given if the item on the audit was present and 'zero' if an item was absent. The mean score for the audit of hand hygiene were obtained for each study nurse. It was then possible to obtain a mean, median and range of scores across the sample.

The semi-structured interview

While three of the questions in the semi-structured interview were to remind the researcher to give the study nurses information regarding the study and future outcomes, and one question asked the study nurses about their experiences of the research process, three questions asked the study nurses about their hand hygiene. The responses given to the three questions that asked the nurses about their hand hygiene were categorised and frequency tables produced (see Section 5.9). The responses to the semi-structured interview were also used to give flavour to the presentation of the findings in Chapter Five.

4.12 Summary of Materials and Methods

In this chapter the materials and methods used to answer the research questions of this study have been described. The aim of the study was to investigate whether nurses' hand hygiene behaviour could be examined using Azjen's Theory. Therefore it was necessary to design a study that was able to use a self-report questionnaire to measure nurses' hand

hygiene intentions and direct observation of hand hygiene behaviour to ascertain actual hand hygiene behaviour. In addition, the context within which the hand hygiene took place also needed to be described and for this reason field notes at the time of the observation were taken as well as an audit of the hand hygiene facilities available to the nurse under observation.

In all research it has been recognised that the research process must be conducted ethically if participants in research are to be protected. For this reason a description of the ethical issues considered were discussed and a de-briefing at the end of the data collection period planned. In addition, the researcher was a nurse and had to abide by a Code of Conduct. Finally, the Data Protection Act (1984) had to be adhered to.

In all this were the nurses who participated and the patients they cared for. The nurses were recruited from the medical and surgical directorates of the study hospital following approval from the hospital's Ethics Committee and the permission of the Director of Nursing. The dignity and safety of the patients was always paramount and this led to some unexpected situations that are described.

The materials and methods described in this chapter were designed to fulfil the research questions. The findings from the data collected are discussed in the next chapter. There will be a discussion of the efficacy of the data collection tools and the data collection process in the Discussion Chapter.

CHAPTER FIVE

PRESENTATION OF THE FINDINGS

5.1 Introduction

This study examined nurses' hand hygiene behaviour and aimed to investigate whether a model of behaviour, Ajzen's Theory of Planned behaviour, could be used to understand nurses' hand hygiene behaviour. The study was exploratory and descriptive in nature because the sample size was not sufficient to allow conclusions to be drawn regarding the significance of relationships between the variables. It is recognised that the sample size is small and therefore underpowered and consequently the findings cannot be generalised. However, the purpose of this study was to explore issues around nurses' hand hygiene and to test the feasibility of using Azjen's Theory to understand nurses' hand hygiene behaviour. The research questions were:

1. Can nurses' hand hygiene behaviour be examined using Ajzen's Theory?
2. What are the hand hygiene practices of nurses in the clinical environment?
3. What are the hand hygiene resources available to nurses in the clinical environment?
4. Do nurses believe that time and workload constraints influence their hand hygiene practices in the clinical environment?

Nurses who fulfilled the entry criteria described in Section 4.8 participated in this study. They were drawn from a target population of 206 registered and enrolled nurses in the Medical and Surgical Directorates of the study hospital.

In this chapter the order in which the findings are presented does not follow the order in which the data were collected. This is because the author of this thesis wanted to describe for the reader the environment in which hand hygiene took place before presenting the

findings from the observation of hand hygiene, self-report questionnaire, hand hygiene quiz, audit of hand hygiene facilities and semi-structured interview. Therefore this chapter begins with a description of the research environment taken from the field notes recorded at the time of the observation of hand hygiene. The field notes are also presented as vignettes throughout this chapter to support the findings. The role of the researcher is described with an example of a situation encountered by the researcher during an observation of hand hygiene. The findings are then presented in the order in which data were collected; that is non-participant observation; self-report questionnaire; hand hygiene quiz; audit of hand hygiene facilities and semi-structure interview.

5.2 A description of the research environment taken from the field notes

In Section 4.5 the physical environment where this research took place was described. In addition, during observation of hand hygiene unstructured field notes were taken (Section 3.5.3 and 4.11.3). Therefore information was collected which included the number of patients on the ward, number of staff on duty at the time of the observation, skill mix (untrained and trained), the activities undertaken by study nurse under observation and observations on the general level of activity on the ward. While these field notes are presented throughout the findings, this section gives a flavour of the work environment of the study nurses and the context within which hand hygiene took place.

As noted in Section 4.5, the wards where the observation of hand hygiene took place were within the Medical and Surgical Directorates of the study hospital. Generally the patients were either acutely unwell or recovering from an acute illness or operation. The tasks the nurses performed while they were being observed reflected this; for instance managing patients' intravenous infusions. The organisation of the work was patient allocation on all the study wards with the study nurses responsible for between five and eight patients. The study nurses would often have another member of staff working with them and that staff member could be either trained or untrained. During two observation periods the assisting

staff member was an agency nurse.

All the study nurses were observed administering medications. This ranged from a drug round of routine oral medications and intravenous antibiotics, to administration of controlled drugs as a regular prescription or 'as required basis' (for instance as post-operative pain relief). In addition the study nurses managed intravenous infusions of clear fluids such as 0.9% saline solution and intravenous infusion pumps delivering medication to patients such as heparin or morphine. During one observation period a patient was receiving a blood transfusion.

As well as being responsible for patient medications, the study nurses observed were also involved in the personal hygiene of patients. These study nurses performed bed baths, assisted with showering and were involved in bed making. The study nurses also assisted patients with their toilet needs by escorting patients to the toilet or bringing a commode to the bedside. In addition they assisted patients to move around the patient's bed or with walking and transferring from bed to chair.

One of the study nurses' tasks was to accompany and assist doctors. This ranged from attending the daily doctors' ward round, to assisting a doctor with a procedure on a patient. They also liased with doctors regarding patient treatment and care. In addition they performed procedures on patients; for example inserting urinary catheters, naso-gastric tubes, dressing wounds, removing catheters and removing venflons.

The most common procedure study nurses were observed carrying out was the taking and recording patients' observations. This would most commonly consist of temperature, pulse and blood pressure. One patient receiving intravenous morphine via a patient controlled pump had their respiratory rate monitored every hour and the amount of morphine they received recorded. This pump was discontinued during the observation period.

The study nurses were also observed communicating directly to patients and on the telephone. However talking directly to patients' relatives and friends was observed as well as to other members of the multi-disciplinary team. All the study nurses were observed using written communication through the nursing notes. The nursing notes were used to record any information relevant to the patients' medical and nursing care.

5.3 Role of the researcher

It will be recalled that the researcher in this study was a trained nurse. While observing, the researcher, who was not in uniform (Section 4.11.2), was conscious of her responsibilities as a trained nurse and duty to adhere to the (then) UKCC Code of conduct (1992), (Section 4.11.2). The researcher's dual role as a nurse and researcher and the implications for the research process are discussed in Sections 4.11.2 and 6.4. However, the researcher was not able to ignore her responsibilities as a nurse and one incident highlighted this.

It was during an observation when the nurse under observation was attending a patient with a colleague in another area of the ward, although still within sight of the researcher. At this point the researcher was the only person who was not a patient or patient's relative in this ward area. There was an elderly man who was very confused and had been throwing faeces around the ward. Since it was visiting time, the nurse caring for the patient had pulled his bed curtains to screen him from visitors. It became apparent to the researcher that the gentleman was making a lot of noise and seemed to be engaged in tearing up paper. The researcher went through the curtains and observed the gentleman tearing up his nursing notes that had been hung on the end of his bed. In addition he was becoming very agitated and was attempting to climb out of the end of the bed. The researcher felt this was dangerous for him as she didn't know how mobile he was and he could be at danger from falling. In addition he was attached to an indwelling urinary

catheter and he also had an intravenous infusion in situ. As the researcher had a responsibility to prevent this gentleman from coming to any harm, she pressed the nurse call bell and released the catheter bag that was hanging on the side of the bed preventing the catheter from being over-stretched. In addition, she engaged the man in conversation until nursing staff could come and assist (Field note 05). The role of the researcher is reflected on Section 6.4.

The environment in which the hand hygiene took place gives a flavour of the work environment of the study nurses and the context within which hand hygiene took place. However it also important to describe the demographic composition of the study nurses performing the hand hygiene.

5.4 Demographics

The sex, age and years since completion of general training of the participants is presented in Table 2. All the study nurses were female. The majority of the nurses were < 40 (n=6) and just over half had completed their general training >11 years ago (n=4).

Table 2. Nurses age, years since completing general training and years since infection control training.

Age range	N (%)
21-30	3 (43%)
31-40	3 (43%)
41-50	1 (14%)
Years since training	
1-5	3 (43%)
6-10	0
11-15	3 (43%)
16-20	1 (14%)
Years since infection control training	
0-5	6 (86%)
6-10	1 (14%)

5.5 Observation of hand hygiene: clinical contacts, hand hygiene rate and hand hygiene technique

The observation of hand hygiene was carried out in order to answer two of the research questions. Firstly, in order to answer the research question, 'What are the hand hygiene practices of nurses in the clinical environment?' the hand hygiene of the nurses in the study was observed. Hand hygiene (see Section 4.9.1), was judged on; type of clinical contact; whether hand hygiene was performed (hand hygiene rate); the agent used to perform hand hygiene (for instance, the type of soap used see Section 4.5.1); number of hand surfaces covered; time taken to perform hand hygiene and efficacy of drying.

Secondly, in order to answer the question 'Can nurses' hand hygiene behaviour be examined using Ajzen's Theory of Planned Behaviour?' a measure of the behaviour, hand hygiene, needed to be taken.

5.5.1 Type of clinical contact

Im Section 4.9.1 a clinical contact was defined as an instance when a study nurse comes imto physical contact with a patient or comes into physical contact with an item that has been in contact or subsequently comes into contact with a patient (Gould et al 1996). Table 3 below describes the two types of clinical contact (see Section 4.9.1) and the hand hygiene appropriate for each type.

Table 3. Types of clinical contact and appropriate hand hygiene

Type of clinical contact	Type of hand hygiene required
Low contact • Beginning of shift • Giving and preparing medication • Handling unsoiled medication • After short patient contact (eg taking observations)	Social hand hygiene • Hand washing with liquid soap and water (see Section 4.5.1) • Alcoholic hand rub only (Hibisol™ see Section 4.5.1)
High contact • Prior to aseptic procedure • Prior to contact with immune-suppressed patients • After contact with contaminated linen or equipment • After prolonged patient contact (e.g a bedbath)	Hygienic hand hygiene • Hand washing with antiseptic soap (Hibiscrub ™ see Section 4.5.1) • Social hand wash followed by alcoholic hand rub (Hibisol™ see Section 4.5.1).

During the observation of hand hygiene, seven nurses were observed for two hours each producing 96 clinical contacts. As can be seen from Table 4, of the 96 clinical contacts observed, 86 were low clinical contacts that required a social hand hygiene and 10 were high clinical contact that required hygienic hand hygiene.

Table 4. Total number of clinical contacts (low and high) requiring hand hygiene (social and hygienic)

Number of participants (n=7)	Total	Range	Mean	SD
Total number of clinical contacts (low and high)	96 (100%)	8-17	13.7	3.55
Total number of low contact activities observed requiring social hand hygiene	86 (82.6%)	7-16	12.2	3.02
Total number of high contact activities observed requiring hygienic hand hygiene	10 (9.6%)	0-3	1.4	1.27

However closer inspection of the clinical contact figures is interesting. It could be assumed that the higher the workload the study nurse experienced, the more clinical contacts they would have. However this was not necessarily the case. For example, during the observation period of one study nurse three of the patients were suffering from a gastroenteritis virus. The field notes from this observation can be seen below. However this study nurse had only 10 clinical contacts because she spent most of the observation period accompanying the Doctors on the ward round.

Ward is very busy. There are three patients with acute viral gastroenteritis and another suspected. The Doctors are doing a ward round. There is a patient very unwell who has her family with her. The Infection Control Nurse has just arrived and wants to talk to the nurse I am observing about hygiene. Two patients are confined to bed and on therapeutic mattresses and one of them has diarrohoea. There is another lady waiting to have her leg ulcer dressed after the doctors have seen it. There are two untrained nurses and two trained nurses in this area of 12 patients but one of the trained nurses is from an agency. They do not have enough commodes for the patients and have had to borrow from another ward. (Field note 04)

On the other hand, another study nurse had 17 clinical contacts associated with drug administration and taking patients' observations (temperature, pulse and blood pressure) (see Field Notes 05 below). In this case the nurse, moving between patients had frequent, but short, clinical contacts.

Ward is not busy. There are two patients confined to bed because of the severity of their illness. There is one blood transfusion in progress. Tasks consist of taking patients observations, drawing up and giving intravenous drugs and changing bags of intravenous fluid x3 (Field Note 05)

Therefore while the ward on which the observation of hand hygiene took place could appear to be busy or quiet, this was not necessarily reflected in the number of clinical contacts that took place during the observation. Rather the number of clinical contacts that took place during the observation of hand hygiene reflected the tasks the study nurse was engaged in and her proximity to actual patient care. For this reason the study nurse from Field Note 04 who was engaged on a doctors' ward round during an outbreak of gastroenteritis had fewer clinical contacts than the study nurse from Field Note 05 who was engaged in direct patient care on a relatively quiet ward.

5.5.2 Hand hygiene rate

Although clinical contact requiring either hygienic hand hygiene (high contact) or social hand hygiene (low contact) was observed 96 times over 14 hours, hand hygiene took place on only 41 occasions. Therefore the hand hygiene rate from 96 clinical contacts was 39.45%. The failure to perform hand hygiene is discussed in Chapter Six. As shown below in Table 4 when the clinical contacts were divided up into low clinical contact requiring social hand hygiene and high clinical contact requiring hygienic hand hygiene, there was a marked difference between the two rates. Hand hygiene relating to a high clinical contact occurred almost twice as frequently. In addition as can also be seen from Table 5 below there was a wide range of hand hygiene rates (social and hygienic) following both high and low contact.

Table 5. Hand hygiene rate relating to high and low contact activity

Clinical contacts	Range of hand hygiene rates relating to clinical contact	Mean hand hygiene rate for clinical contacts
All clinical contacts (low and high)	15.4%-70%	39.45%
Low clinical contacts requiring social hand hygiene	15.4% - 66%	38.4%
High clinical contact requiring hygienic hand hygiene	50%- 100%	80%

In summary these findings show that;

- The number of clinical contacts experienced by study nurses varied.
- The hand hygiene rate also varied between study nurses.
- The overall hand hygiene rate for this group of study nurses was 39.45%.

5.5.3 Hand hygiene technique

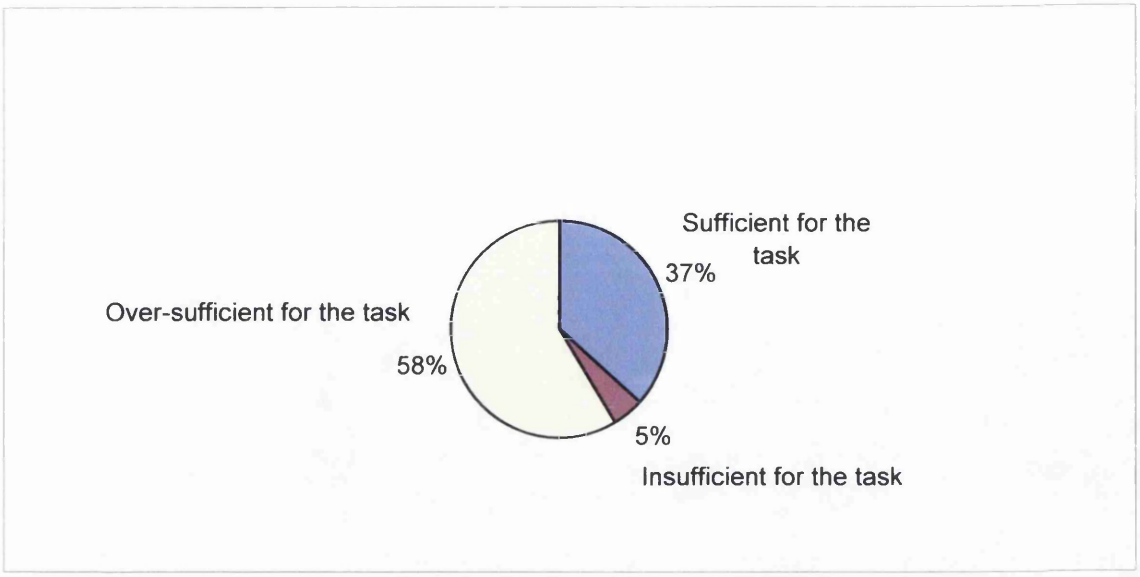
Hand hygiene technique was judged on the appropriateness of the agent used for hand hygiene based on the nature of the clinical contact that took place. In addition length of time taken to perform hand hygiene, number of surfaces covered and efficacy of drying was recorded.

Appropriateness of agent used

The hand cleansing agents available on the study wards were; liquid soap, antiseptic hand cleanser (Hibiscrub ™) and alcoholic hand rub (Hibisol ™) (Section 4.5.1). The availability of these agents to the study nurses at the time the observation of hand hygiene took place was assessed during the audit of hand hygiene facilities and is reported in Section 5.8. As discussed in Section 4.9.1 when performing a social hand wash associated with low clinical contact, liquid soap and water or alcoholic hand rub (Hibisol™) should be used. The hygienic hand wash associated with high clinical contact involves washing hands with antiseptic hand cleanser (Hibiscrub™) or a social wash followed by antiseptic hand rub (Hibisol ™).

In this study the appropriate agent for the type of clinical contact that took place was used on 36.6% (n=15) of occasions. As can be seen in Figure 4 on two occasions the agent was insufficient for the task; that is, a soap and water hand wash only was performed in association with a high contact activity rather than an antiseptic hand wash or soap and water wash followed by alcoholic hand rub. On 58.5% (n=24) occasions the agent used was over-sufficient because, without exception, hands were washed with an antiseptic agent for a social contact event (low contact activity) rather than liquid soap. The implications of these findings are discussed in Section 6.2.3.

Figure 4. Appropriateness of agent used for the clinical contact



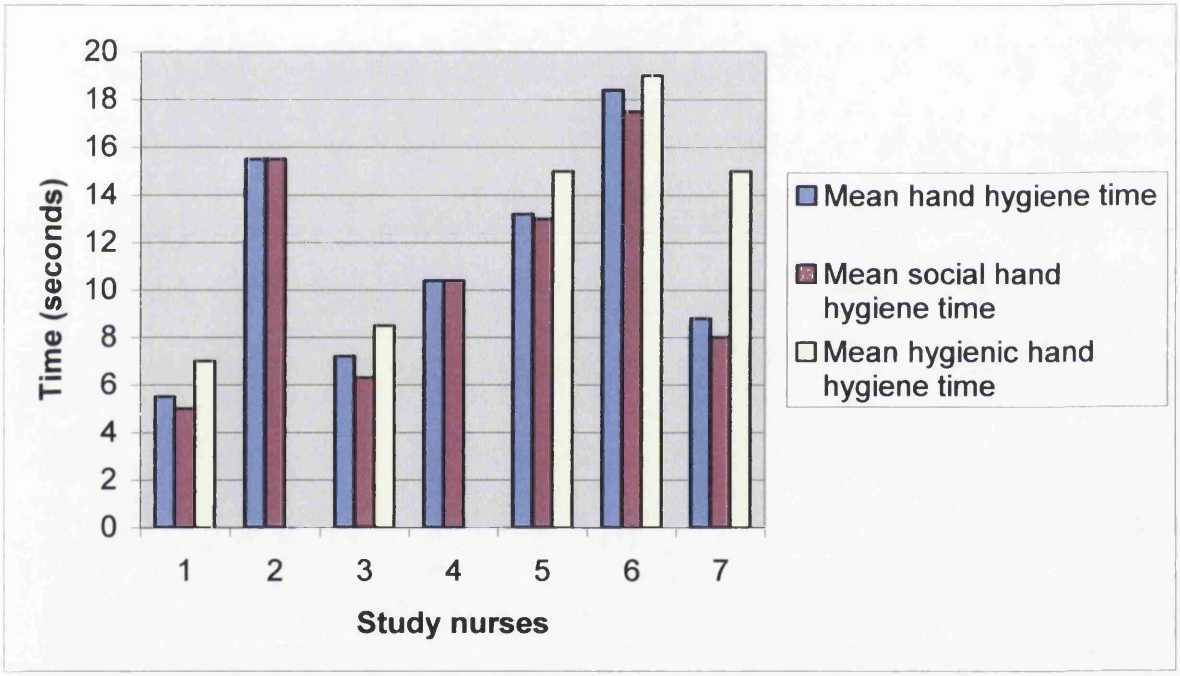
In addition, there was a wide variation of scores for the agent used. One study nurse used the correct agent on every occasion (100%), while another nurse didn't use the correct agent ever (0%).

5.5.4 Length of time taken to perform hand hygiene

The duration of each hand hygiene episode was timed using a stop-watch. The mean time to perform hand hygiene was judged to be the total time taken (in seconds) divided by the number of times hand hygiene actually took place. This was to describe the hand hygiene practices of the nurses in the clinical environment (research question 2).

As can be seen from Figure 5 there was a wide variation in the length of time taken to perform hand hygiene both after a high contact and low contact activity.

Figure 5. Mean duration of each study nurses' hand hygiene time



The mean time taken of all the study nurses to perform both social and hygienic hand hygiene was 10.8 seconds and 56% of all hand hygiene took more than 10 seconds. The maximum time taken to perform hand hygiene was 22 seconds for a hygienic hand hygiene following a high clinical contact. The minimum time taken was 3 seconds using a alcoholic hand rub for social hand hygiene following a low clinical contact. The mean

time to perform hand hygiene following a low clinical contact was 10.6 seconds and to perform hand hygiene following high clinical contact 13.9 seconds. These findings are discussed further in Chapter 6.

It was also of interest to examine the study nurses' individual hand hygiene times to see if any patterns emerged by calculating the standard deviation for each nurse's mean hand hygiene time. This can be seen in Table 6. What seems to emerge is that usually the time study nurses took to hand wash did not change greatly between hand hygiene episodes ($p=0.001$; student t-test). This suggests that the time study nurses took to perform hand hygiene remained constant and may be habitual in nature. This suggestion is explored further in Section 6.2.2 and also relates to the findings of the next section of this chapter.

Table 6. Mean hand hygiene times and standard deviations from means for each study nurse

Study nurses (n=7)	Range (seconds)	Mean hand hygiene time (seconds)	SD (seconds)
1	5-7	5.5	0
2	10-21	15.5.	7.78
3	5-10	7.2	1.92
4	7-15	10.43	2.37
5	5-15	13.43	3.78
6	17-22	18.4	2.70
7	3-15	8.73	3.80

In summary therefore the main findings from the length of time taken to perform hand hygiene were;

- The mean time taken to perform both social and hygienic hand hygiene was 10.8 seconds and 56% of hand hygiene episodes were longer than 10 seconds.

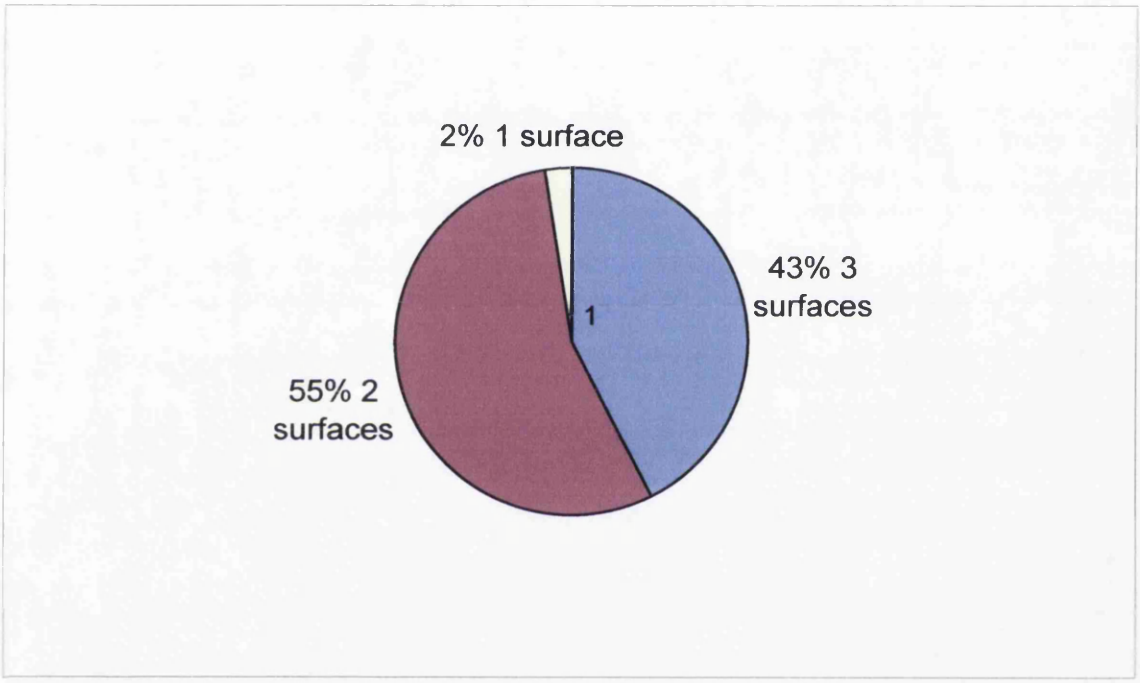
- There was a wide variation between study nurses in the time taken to perform hand hygiene.
- However there was not a wide variation in time taken to perform hand hygiene for each study nurse and this suggested that the hand hygiene of the study nurses followed a set pattern.

These findings are discussed in Chapter Six.

5.5.5 Number of hand surfaces decontaminated

For the purpose of observing, three hand surfaces were considered. They were, the palms, the back of the hands and between the fingers. When correct hand hygiene procedure is carried out, at least three surfaces should be covered. The findings are displayed in Figure 9. As can be seen from Figure 6, three surfaces (dorsal, palmer and inter-digital) were covered on 43% of hand hygiene occasions which suggested that hand hygiene technique among this group of nurses was good.

Figure 6. Surfaces covered during hand hygiene episodes



In addition, when the number of surfaces covered each time hand hygiene was performed was examined for each study nurse, a pattern emerged that suggested that each participant covered the same amount of their hand every time they performed hand hygiene. For instance, one study nurse performed hand hygiene on four occasions and covered two surfaces of her hands on every occasion while another performed hand hygiene on seven occasions and covered three areas of her hands every time. This finding is interesting,

considering the findings of Section 5.5.4, and are discussed further in Chapter Six.

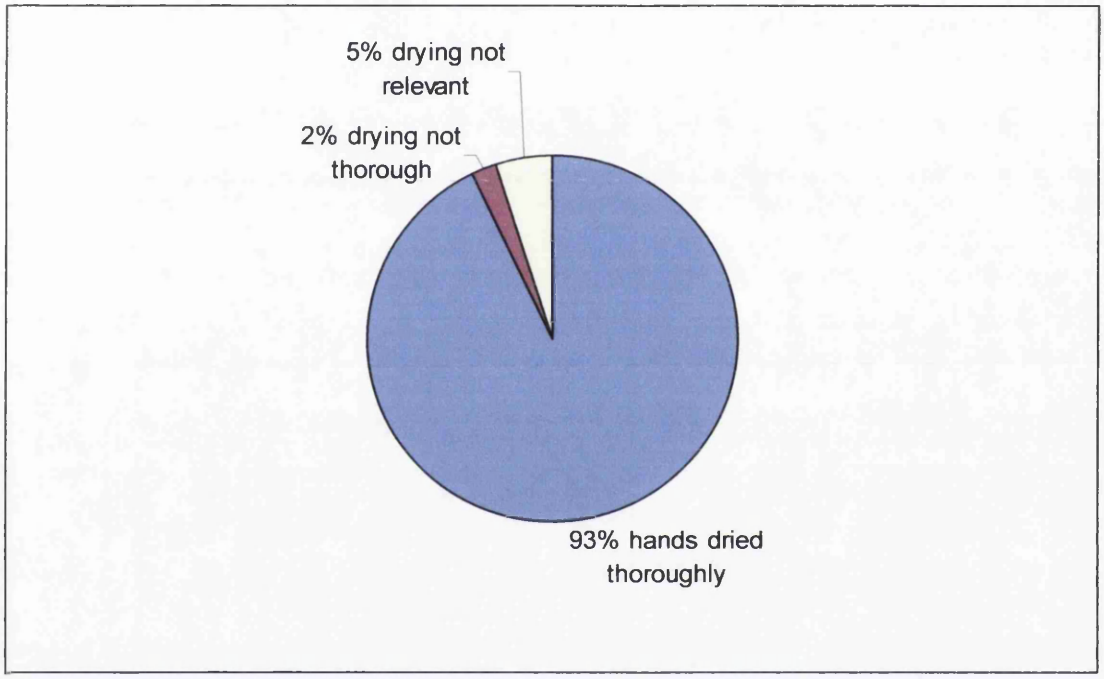
In summary these findings suggest that:

- The number of surfaces covered during hand hygiene by this group of nurses was adequate.
- Each study nurse usually covered the same areas of her hand every time she performed hand hygiene.

5.5.6 Efficacy of hand drying

For the purpose of observation four options were considered and they were hands dried thoroughly; not thoroughly; not seen and not relevant (for instance after using alcoholic hand rub). As can be seen from Figure 7 on the majority of occasions hand drying was thorough after hand hygiene.

Figure 7. Efficiency of hand drying after all hand hygiene occasions



5.6 The findings from the self-report questionnaire

In order to answer the research question 'Can nurses' hand hygiene behaviour be examined using Azjen's Theory of Planned Behaviour?' a self-report questionnaire was administered. As discussed in Section 4.9.3 the questionnaire constructed for this study had 63 statements related to the Theory of Planned Behaviour. The score attributed to each statement can be found in Appendix XIV.

The constructs tested were; intention to perform the behaviour; attitude to hand hygiene; attitude towards the act of hand hygiene; subjective norm and perceived behavioural control. The questions were all rated on a five-point semantic differential or Likert scale. Note that as discussed elsewhere, the term hand washing was used during this self-report questionnaire. In addition when describing when hand hygiene should take place this is referred to in the self-report questionnaire as a hand washing episode. Therefore when reporting directly from the self-report questionnaire the terms used in the self-report questionnaire are used.

5.6.1 The study nurses' intention to perform the act of hand hygiene

The study nurses' intention to perform hand hygiene was measured in two ways. Firstly there was a direct measure of hand hygiene. Secondly the overall score of the self-report questionnaire was a measure of the study nurses' intention to perform hand hygiene.

The direct measure of intention towards performing hand hygiene

In Section 4.9.3 it was stated that three direct questions were asked concerning the study nurses' intention to act in respect of hand hygiene. These statements were rated on a five point semantic differential scale with *likely* and *unlikely* as the endpoints and appeared at different points in the questionnaire.

The maximum score obtainable from the three questions was 15 and a study nurse who scored 15 would have a very high intention to perform hand hygiene at every hand hygiene episode. On the other hand, a study nurse who scored 3 would have a very low intention to perform hand hygiene at every hand hygiene episode while a study nurse who scored 9 would have a moderate intention to perform hand hygiene. In this study the range of scores achieved by the participants was 11 to15. While one study nurse thought it was neither *likely* or *unlikely* that she would aim to hand wash at every hand washing

occasion, the other study nurses (n=6) answered *quite likely* or *very likely* to all the questions and had a strong intention to perform hand hygiene. However while in the self-report questionnaire the study nurses reported a strong intention to perform hand hygiene on every hand hygiene occasion, during the semi-structured interview (reported in Section 5.9) they admitted to less than optimal hand hygiene rates as shown by the vignette below. This disparity is discussed further in Chapter Six.

> *Researcher 'Do you think you hand wash every time you should?'*
> *Study nurse 'No definitely not'*
> *Researcher 'If you were supposed to wash your hands ten times, how many times would you actually do it?'*
> *Study nurse 'Oh, about twice probably' (laughs) (Semi-structured interview 2)*

5.6.2 The study nurses' attitude to hand hygiene

In the self-report questionnaire two measures of attitude to hand hygiene were taken (Section 4.9.3); a direct measure of the attitude to hand hygiene and a measure of an attitude to the act of hand hygiene. The attitude to the act of hand hygiene was determined by the beliefs about hand hygiene and evaluations of the outcomes that could be expected if hand hygiene took place (Section 4.9.3).

Findings of the direct measure of attitude to hand hygiene

In the direct measure of attitude to hand hygiene the seven statements were scored five for a positive and one for a negative response (Appendix VIX). Therefore the maximum score a study nurse could achieve was 35 for a highly positive attitude to hand hygiene and the minimum was seven for a highly negative attitude.

In this study the range of scores was 31 to 35 and the mean score 32.3. One nurse scored

35. Therefore there was a strong positive attitude to hand hygiene.

Findings of the measure of attitude towards the act of hand hygiene

The next section of the questionnaire assessed attitude towards the act of hand hygiene. Ten questions were constructed for behavioural beliefs about hand hygiene and ten corresponding questions for evaluations of the outcomes that could be expected if hand hygiene took place (see Section 4.93). To obtain a score for the attitude towards the act of hand hygiene, the scores for the behavioural beliefs were summed and multiplied by the summed scores of the outcome evaluations.

Behavioural beliefs

Examination of the responses to the behavioural belief questions is interesting. Although the majority of responses to the ten attitude belief statements were positive, one study nurse thought it would be '*quite good*' if she hand washed at every hand washing episode and her hands became sore, while another thought it would be '*quite good*' if hand washing at every hand washing episode led to her having less time for other nursing duties and still another thought it would be *'quite good'* if she had less time to talk to patients. These findings suggest two things. Either the study nurses believed these statements to be true or, more likely, they may not have read the statement properly. However, the pilot did not identify any similar problems and therefore these statements have been treated as 'true' for the purposes of this study. It nevertheless identifies the importance of sample size in that these small numbers may skew findings.

Outcome evaluations.

Again, closer inspection reveals some interesting responses. For instance, five study nurses thought it was '*likely*' or '*very likely*' that their hands would become sore if they performed hand washing at every hand wash episode. All participants thought it was '*likely*' or '*very likely*' that infection rates, including MRSA, would go down on their ward if they performed hand washing at every hand wash episode. However only one

study nurse thought it *'likely'* would make her feel cleaner. Three study nurses thought it was '*likely*' or '*quite likely'* they would have less time for other nursing duties if they performed hand washing at every hand wash episode while two thought it '*quite unlikely'* that performing hand washing at every hand wash episode would save the study hospital money. These findings suggest that while most of the study nurses thought the amount of hand hygiene they performed affected how sore their hands became, all the study nurses recognised the importance of hand hygiene in controlling the spread of infection, particularly MRSA, although this would not necessarily save the hospital money.

Summary of findings for the attitude towards the act of hand hygiene

The maximum score achievable for the attitude towards the act of hand hygiene was 2,500 and the minimum score achievable 100. The range of scores was 1,426-1,927; median score = 1,677; mean score = 1,652. These findings suggest that the study nurses had a positive attitude towards the act of hand hygiene and that, while they thought hand hygiene responsible for making their hands sore, they recognised the importance of hand hygiene in controlling infection although it would not save their hospital money.

5.6.3 The findings of the measure of subjective norm

To achieve a measure of subjective norm, study nurses were questioned about their normative belief towards and motivation to comply with the seven-referent individuals identified in Section 4.9.3; that is nursing colleagues, the Charge Nurse for the place of work, the Infection Control Nurse, the Director of Nursing, the Consultants on the ward, the patients on the ward, the patients' relatives.

The sum of normative belief multiplied by the sum of the motivation to comply gave a measure of subjective norm (see Section 4.9.3). In addition two statements were a direct measure of subjective norm.

The direct measure of the subjective norm

All the study nurses stated that they thought that it was *'likely'* or *'very likely'* most people important to them would think that when there was a hand washing episode on the ward, that they should hand-wash. They also all thought that people who were important to them would '*approve'* or '*strongly approve'* if they were to hand wash at every hand wash episode.

The findings from the normative belief statements

When the responses to the normative belief were examined it was interesting to note that although all the study nurses gave a positive response to most of the statements that referred to referent individuals, some (n=3) thought it was '*neither likely or unlikely*' or '*quite unlikely'* that the consultants on their ward thought that when there was a hand washing episode during their work, that the study nurses should hand wash. This suggests that some of the study nurses did not believe that the Consultants on their ward had an opinion about whether they performed hand hygiene at every hand wash episode.

Motivation to comply

It was also interesting to note study nurses' motivation to comply with the referent individuals. These findings are presented as frequencies to comply with the referent individual in Table 7 below.

Table 7. Number of study nurses motivated to comply with referent individuals

Referent Individual	Study nurses motivated to comply N=7
Nursing colleagues	6
Charge nurse of the ward	6
Infection Control Nurse	7
Director of Nursing	5
Consultants on the ward	4
Patients	5
Patients' relatives	5

These findings suggest that while the study nurses acknowledged that all the referent individuals would expect them to hand wash when there was a hand wash episode, they were more motivated to comply with nursing colleagues, the Charge Nurse of their ward and the Infection Control Nurse.

Total scores for the subjective norm

The maximum score achievable from the direct measure of subjective norm plus the normative beliefs multiplied by the motivation to comply was 1,235. The minimum score was 51. The range of scores achieved by this group of nurses was 550-1,235; mean score = 884.4; median score = 825. These scores suggest that nurses were motivated and influenced by referent individuals to perform hand hygiene at every hand hygiene episode.

Summary of the findings of the subjective norm

The findings of the subjective norm component of the self-report questionnaire suggest that:

- Some of the study nurses (n=3) did not believe that the Consultants on their ward had an opinion about whether they performed hand hygiene at every hand hygiene opportunity or not.
- The study nurses were more motivated to comply with some referent individuals notably close colleagues and the Infection Control Nurse.
- Nurses overall were motivated to comply with people important to them and the referent individuals identified in this self-report questionnaire.

5.6.4 The findings of the measure of the perceived behavioural control

Two measures of perceived behavioural control were constructed. First the study nurses were asked directly in five statements how much control they believed they had over their hand washing behaviour. Secondly they were asked to rate 12 beliefs dealing with factors that may interfere with hand hygiene. The scores were summed to obtain a measure of perceived behavioural control (Section 4.9.3).

Direct measure of perceived behavioural control

In the direct measure of perceived behavioural control, most study nurses (n=6) thought they had '*complete control*' or '*a lot of control*' over whether they could hand wash at every hand wash episode. One study nurse thought she only had '*some control*' over whether she could hand wash at every episode. One study nurse thought it was '*quite difficult*' to hand wash at every episode while all the study nurses thought it was *'likely'* or *'very likely'* that if they wanted to, they could hand wash at every episode. All the study nurses thought that it was mostly up to them whether they hand washed at every hand wash episode while only one study nurse thought there was very little she could do to make sure she hand washed at every hand wash episode. The suggestion from these

findings is that the study nurses thought they had a high degree of control over their hand hygiene behaviour.

Behavioural control beliefs

The behavioural control beliefs responses are interesting because of their variety and are presented in a table of frequencies below (Table 8)

Table 8. Frequency of responses to the behavioural control belief statements.

Behavioural belief statement	Study nurses who agreed	Study nurses who disagreed	Study nurses who neither agreed or disagreed
Hand washing at every episode is too demanding for me	0	6	1
Lack of time prevents me from washing my hands at every episode	3	4	0
It is inconvenient for me to hand wash at every hand washing episode	2	4	1
There is always a basin nearby for washing my hands when required	5	2	0
When I am going to wash my hands I sometimes get distracted to other things	7	0	0
I wash my hands less often when the ward is busy	4	2	1
I wash my hands less often when they are sore	2	3	2
The basins in the ward for hand washing are always easy to get to	4	2	1
The soap and towels are convenient to use	3	2	2
I wash my hands at every hand washing episode because my knowledge of infection control is up to date	4	2	1
I would find it difficult to change my hand washing behaviour	3	4	0
Washing my hands is a conscious decision that I make at every hand washing episode	6	0	1

Range = 51-67; mean = 59; median = 60.

The maximum score obtainable for this section of the self-report questionnaire was 80.

The message that emerges from these findings is that although study nurses thought they had, on balance, a high degree of control over their hand hygiene behaviour, they recognised that there were factors in their environment and own behaviour that were a control on hand hygiene actually taking place. This is interesting since it will be recalled that in Section 5.5.2, the overall hand hygiene rate for this group of study nurses was reported at only 39.45%. Therefore, although the study nurses believed they had a high degree of control over their hand hygiene this was not reflected in the observed hand hygiene rate. In addition, in Section 5.9 it is reported that the study nurses admitted to sub-optimal hand hygiene rates. These findings are discussed in Section 6.2.

5.6.5 The study nurses' overall intention to perform hand hygiene

In order to obtain a single score for the study nurses' intention to perform hand hygiene, scores for the direct measure of intention, direct measure of attitude to hand hygiene, measure of the attitude to the act of hand hygiene, measure of subjective norm and measure of perceived behavioural control were summed (Section 4.9.3). Maximum score obtainable was 3,865 for a strong intention to perform hand hygiene and a minimum score of 187 for a weak intention to perform hand hygiene. The range of scores was from 2,088 to 2,925 (mean =2,642; median score 2,834). The suggestion from the self-report questionnaire is that this group of nurses had a strong intention to perform hand hygiene.

Summary of the findings of the self-report questionnaire

These findings suggest that among this group of nurses there was:

- A strong intention to perform hand hygiene on every hand hygiene occasion.
- A positive attitude towards hand hygiene and the act of hand hygiene.
- A motivation to comply with the perceived opinions of the study nurses' closest colleagues.
- A perception of a high degree of control over their hand hygiene behaviour

although they recognised that there were factors in their environment that could prevent hand hygiene taking place.

However, although these scores are interesting they do not indicate whether the intention to perform hand hygiene translates into hand hygiene actually taking place in the clinical environment. In addition, although there are perceived barriers to hand hygiene taking place, actual barriers such as access to resources and knowledge may prevent hand hygiene from taking place. These findings are discussed in Chapters Six.

5.7 Hand hygiene knowledge

In order to examine whether lack of knowledge might serve as an actual control on the intention to perform hand hygiene (Section 3.5.5), a hand hygiene quiz was administered.

The hand hygiene quiz (Appendix XI) was based on the Infection Control Manual of the study hospital and contained ten questions. The study nurses were asked to identify the correct hand hygiene procedure for a series of tasks (Section 4.9.4). A correct answer scored one and an incorrect answer zero. The maximum score achievable was 10.

The frequency of correct answers for the hand hygiene quiz from the study nurses are presented in Table 9 below.

Table 9. Frequency of correct answers given by all study nurses in the hand hygiene quiz

Event	Correct answer	Number of correct answers (%)
After short patient contact	Social	6 (86%)
After contact with a patient with MRSA	Hygienic	7 (100%)
After cleaning equipment	Social	0 (0%)
After handling unsoiled bed-linen	Social	1 (14%)
After giving a bed-bath	Hygienic	5 (71%)
Before going home	Social	2 (29%)
Before the drug round	Social	7 (100%)
Before an antiseptic procedure	Hygienic	7 (100%)
Before commencing shift	Social	6 (86%)
Before patient contact	Social	5 (71%)

Range 5-7; mean = 6.3

The theme that emerges from the results of this hand hygiene quiz is that the study nurses believed they should perform a hand hygiene procedure (social or hygienic) more rigorous for a task than was actually indicated. This may be because the study nurses were not sure of the answer and erred on the side of caution. However this result is interesting because the observation of hand hygiene demonstrated also that study nurses often performed a hand hygiene more rigorous that needed for the clinical contact (Section 5.5.3).

5.8 Findings of the audit of hand hygiene facilities

An audit of the hand hygiene facilities available to each study nurse observed, at the time of the observation, was carried out. This audit tool (Appendix XII) is described in Section 4.9.5. The audit of hand hygiene facilities contained 11 items.

The audit of hand hygiene facilities was carried out to answer the research question 'What are the hand hygiene facilities available to nurses in the clinical environment?' Azjen's Theory recognises that a behaviour may not take place, even when a strong intention to perform the behaviour exists, if an external control is present. Such a control could be the availability of the resources required to perform the behaviour and this has been recognised by authors reviewed Section 2.6.1.

The study nurses were observed in six wards in the Medical and Surgical Directorates with only one ward audited twice. An audit was carried out on each occasion an observation took place since it was the facilities available to each nurse that was being examined (Section 4.9.5). All 11 items on the audit tool had to be present in order for the audit to be awarded full points.

The frequency of audit criteria met for the seven audits that took place are presented in Table 10 below.

Table 10. Frequency of audit criteria met per item on audit tool

Item on audit tool	Total (n=7)
Yes, policy guidance is available to all staff.	7
Yes, there are sufficient hand basins for staff to use.	6
Yes, the position of the hand basins allows for easy access.	2
Yes, the hand basins are of an adequate size.	7
Yes, the wash hand basins are intact.	6
Yes, the wash hand basins have elbow/wrist operated taps.	6
Yes, the wash hand basins have mixer taps.	5
Yes, there is liquid soap or an alternative available at all sinks in clinical areas.	7
Yes, the soap dispenser nozzles are clean.	0
Yes, paper towels are at all sinks.	7
Yes, alcohol hand rub is available in all clinical areas.	0

As can be seen above, most of the wards audited (n=5) did not have hand basins that allowed for easy access and none of the wards had clean nozzles on the soap dispensers or alcohol hand rub available in all clinical areas.

The findings of the audit of hand hygiene become more interesting when they are examined in conjunction with the field notes taken at the time of the observation of hand hygiene. For instance as can be seen from Table 10, on one occasion there were insufficient hand basins for staff to use in the clinical areas. However the field note

(below) associated with that audit gives deeper insight into the hand hygiene facilities available to this study nurse at the time the observation of hand hygiene took place. It is noticeable that this ward was of a Nightingale design and had not been upgraded as described in Section 4.5. This suggests that the number of hand basins in a clinical area is increased when wards are up-graded.

> *The ward is of a Nightingale design with 20 beds. There is one hand basin situated at the other end of the ward to the treatment and sluice area and one behind the nurses station half way up the ward. This is insufficient. Neither the basin at the end of the ward or the one behind the nurses' station are convenient to use. (Field Note 01)*

However even where there were sufficient hand basins in the clinical area, on five occasions the basins, soap dispensers and hand towel holders were obstructed by curtains or arm chairs as these field notes reveal.

> *The hand basin in the bay is obstructed by a curtain so that it is not visible and the curtain, which is grubby has to be moved to access the soap dispenser and the towels and the bin for hand towels is not close enough for easy access (Field Note 02).*
>
> *There are curtains across the window, where the sink is located, obstructing the soap dispenser (Field Note 04).*
>
> *The sink is obstructed by an armchair, occupied by a patient (Field Note 05)*

In addition although all the hand basins were all found to be of an adequate size and were intact (without chips or cracks in the porcelain), on one occasion two sinks on the same ward were surrounded by plasterwork that was cracked and mouldy.

> *Plasterwork around two sinks is cracked and the paint chipped with evidence of mould (Field Note 02)*

The findings of the audits of hand hygiene facilities were also examined on a ward-by-ward basis. One ward scored only 55% and had obstructed hand basins, basins without wrist or elbow operated taps or mixer taps, crusted nozzles on the soap dispensers and Hibisol™ (alcoholic hand rub) not available in all the clinical areas. As can be seen from the field note below, patients on this ward were suffering from an outbreak of viral gastro-enteritis at the time that the audit took place.

> *The ward is very busy. There are three patients with viral gastro-enteritis with another unconfirmed (Field Note 04).*

However none of the wards scored full marks for the audit of hand hygiene facilities. Scores ranged from 55% to 73% of audit criteria fulfilled with a mean score of 69%.

Summary of the findings of the audit of hand hygiene facilities

The findings from this audit indicate that the hand hygiene facilities available to the study nurses at the time the observation of hand hygiene took place, were inadequate. The most commonly failed criteria of the audit were the dispenser nozzles of the soap dispenser that, without fail, were dirty and crusted, and the lack of Hibisol ™ which was not available in all the clinical areas. These findings are discussed in more detail in Chapter Six.

5.9 The findings of the semi-structured interview

The semi-structured interview was carried out to fulfil the obligations of conducting ethical research (Section 3.4). The interview was conducted following the completion of all other the data collection.

Findings of the semi-structured interview

At the semi-structured interview the researcher began by thanking the study nurse for agreeing to take part. They were then informed of the nature of the study. The study

nurses were then asked whether they were aware of what actions were being observed (ie hand hygiene). Most (n=5) said were not aware that it was their hand hygiene that was being observed and were surprised that this was the nature of the observation. One of the study nurses thought it was her verbal interactions with patients that was being observed since this had been the subject of a previous study.

The study nurses were asked whether hand hygiene was something they thought much about when they were working. While four said they did not think about it very much because it was so routine, one nurse thought about hand hygiene every time she touched a patient and two reported that they thought about hand hygiene in relation to particular procedures, for instance, a dressing; or when they thought their hands might be contaminated.

The study nurses were also asked if they noticed how often their colleagues performed hand hygiene. The study nurse who thought about her hand hygiene all the time reported that she felt she was aware of the hand hygiene practices of her colleagues. Two participants thought they would notice if their colleagues were bad at hand hygiene while the remainder (n=4) claimed not be aware of how well their colleagues performed hand hygiene.

Finally the study nurses were asked to estimate how often, if there were ten occasions when hand hygiene should be performed, they would actually perform it. The findings are presented as a table of frequencies (Table 11).

Table 11. Frequency of times study nurses estimated they performed hand hygiene (out of ten contacts)

Number of times study nurses estimated that they performed hand hygiene (out of ten contacts)	Frequency of responses
Once	1
Twice	0
Three times	3
Four times	2
Five times	1

Summary of findings from the semi-structure interview

The findings of the semi-structured interview suggest that;

- Most of the nurses were unaware that their hand hygiene was being observed.
- This finding appears to be supported by the claim of more than half the study nurses who said that hand hygiene was not something they thought about very much.
- Most of the nurses also claimed not to be aware of how well colleagues performed hand hygiene.

These findings are explored further in Chapter Six.

5.10 Summary of findings

In this presentation of the findings, data from the non-participant observation of hand hygiene practice, a self-report questionnaire, hand hygiene quiz, audit of hand hygiene facilities, field notes and semi-structured interview were used to describe nurses' hand hygiene practices, the environment it took place in, the facilities available to nurses for hand hygiene, their knowledge of hand hygiene practice and their attitudes, beliefs and intentions towards hand hygiene. The themes that have emerged from these findings are;

- Nurses had a strong intention to perform hand hygiene and believed it under their control.
- Hand hygiene facilities were often inadequate and this was reflected in the perceptions of some nurses about the facilities available to them.
- Nurses were not completely aware of which type of hand hygiene was appropriate for different procedures. They may state a more rigorous type of hand hygiene than was actually required and this was reflected in their choice of hand cleanser during actual hand hygiene.
- Nurses exhibited a pattern in their hand hygiene technique, particularly related to number of surfaces covered during hand washing and time taken to perform hand hygiene
- Nurses believed they would find it difficult to change their hand hygiene behaviour.
- Nurses thought they performed hand hygiene less when the ward is busy.
- The number of clinical contacts experienced by each participant varied.
- The hand hygiene rate for this group of nurses was sub-optimal.

These points are now explored further in the discussion chapter with reference to the relevant literature.

CHAPTER SIX
DISCUSSION OF THE FINDINGS

6.1 Introduction

It will be recalled that the principal aim of this study was to explore and describe nurses' hand hygiene behaviour and the context within which it took place. It was also hoped to investigate whether a model of behaviour, Ajzen's Theory of Planned behaviour, could be used to understand nurses' hand hygiene behaviour. The four research questions were;

1. Can nurses' hand hygiene behaviour be examined using Ajzen's Theory of Planned Behaviour?
2. What are the hand hygiene practices of nurses in the clinical environment?
3. What are the hand hygiene resources available to nurses in the clinical environment?
4. Do nurses believe that time and workload constraints influence their hand hygiene practices in the clinical environment?

In this chapter there follows an over-view of the principal findings of this study with reference to literature reviewed in Chapter 2. Consideration of the implications of the study for current theory and nursing practice and a discussion of the limitations of the study and impact on reliability and validity are also included.

6.2 Discussion of the findings relating to the research questions

It is recognised that due to the sample size, the findings of this study are not generalisable. However, this study raises new questions for further research and has implications for nursing practice, which are addressed in Section 7.2. In addition the multi-method approach adopted for this study has led to combining of data that validates

and gives robustness to the findings.

6.2.1 Nurses' hand hygiene and Ajzen's Theory of Planned Behaviour.

This question set out to explore whether Nurses' behaviour could be examined using Azjen's Theory of Planned behaviour. In the studies reviewed in Section 2.9, (O'Boyle et al 2001; Jenner et al 2002), it was demonstrated that Azjen's Theory can be used to examine hand hygiene behaviour. However as also discussed, the only study that actually took a measure of hand hygiene was O'Boyle et al (2001) and the participants in the study were aware of the nature of the observation when it took place. In addition, the participants had volunteered for O'Boyle et al's study knowing it examined hand hygiene and the authors admitted that this could have introduced an element of bias into the study. It was argued (Section 2.10) that in order to examine whether a relationship exists between an intention to perform hand hygiene and actual hand hygiene behaviour an accurate measure of actual hand hygiene behaviour should be obtained. In addition, although Azjen and Fishbein (1980) suggest that self-reporting behaviour can be used to measure behaviour, O'Boyle et al (2001) did not find a relationship between self-report behaviour and actual hand hygiene.

In this study, in order to obtain a measure of hand hygiene behaviour, hand hygiene was observed through non-participant observation where study nurses knew they were being observed but were unaware of the exact nature of the observation until after it had taken place (Section 3.5.2). This method of obtaining a measure of hand hygiene behaviour is not without its difficulties, principally the ethical issues surrounding this type of observation as discussed in Section 3.5.2. In addition, in order to observe hand hygiene, the observation had to take place before the self-report questionnaire was completed and this posed a second issue since Azjen and Fishbein (1980) recommend that a measure of intention should be taken before the behaviour of interest is measured.

It would appear therefore that there are two issues relating to the way data was collected in this study and any future study would need to be designed with these data collection issues in mind. The first issue relates to the ethical dilemma of an observation study, the nature of which is unclear to the study nurses at the time the observation takes place. However, although hand hygiene can be measured, the measurement needs to be a valid and reliable reflection of actual hand hygiene behaviour and this is difficult to obtain without using a covert observation technique with its attendant ethical dilemmas.

The second issue relating to the way data were collected was observation of hand hygiene before completion of the self-report questionnaire. This may have led to subsequent bias in the study nurses' responses in the self-report questionnaire as they attempted to achieve congruence between their hand hygiene rates and their self-report questionnaire responses and is explored further in Section 6.3.3.

However, while there are methodological issues that need to be overcome before this theory can be utilized to its full extent, there are components within the theory that help explain hand hygiene behaviour and they are; nurses' views on the influence colleagues and others have on their hand hygiene behaviour, the amount of control participants believe they have over their behaviour, the perceived restraints in terms of time and facilities on the behaviour taking place, nurses intention to perform hand hygiene.

The influence of colleagues on hand hygiene behaviour

The influence peer pressure has on infection control behaviour was explored by Seto (1991) and McGuckin (1999). Seto (1991) found that an infection control procedure could be effectively introduced using a ward opinion leader (Section 2.6.3) and McGuckin (1999) was able to raise hand and soap usage among a group of healthcare workers by encouraging patients to ask staff to wash their hands (Section 2.7.4). In this study it is interesting to note that the study nurses were more motivated to comply with some referent individuals, notably close colleagues (Section 5.6.3). It is interesting to

speculate therefore whether a strategy that used peer pressure to improve hand hygiene compliance might be designed. The value of Azjen's Theory is that it would be possible to identify who the most influential referent individual was prior to beginning such a strategy.

The perceived amount of control and restraints over hand hygiene

The amount of control and the perceived restraints the study nurses felt they had over their hand hygiene behaviour is discussed in Section 6.2.4. However it is interesting to note that Azjen's Theory was able to identify the restraints study nurses perceived they had on their hand hygiene practices. This does not mean that the restraints were actually there, (although as is seen in Section 5.8, in some cases they were), but simply that they were perceived as such by the study nurses. This perception might have led them to not attempting hand hygiene at all since they perceived hand hygiene as too difficult. In order to improve hand hygiene performance, the perception hand hygiene is too difficult to attempt would need to be overcome. However, the study nurses reported a positive attitude to hand hygiene and intended to perform hand hygiene on each occasion.

Nurses intention to perform hand hygiene

That nurses had a positive attitude to hand hygiene and intended to perform hand hygiene at each hand occasion is encouraging, given the findings discussed in Section 5.5.2 of the hand hygiene rate of the study nurses. This study had a small sample and it cannot be assumed that the positive attitude to hand hygiene found in this study related to hand hygiene performance given that Azjen's Theory was developed because of the acknowledge discrepancy between stated attitudes and actual behaviour (Wicker 1971; Alvaran 1994). In this study it appeared that there was no relationship between stated attitude to hand hygiene and actual hand hygiene rate although this was not tested statistically. Therefore, it is possible to speculate that attempting to change attitudes towards hand hygiene, as suggested by Williams and Buckles (1988) and Bartozokas and Slade (1991), may not improve hand hygiene compliance.

In addition to a positive attitude towards hand hygiene and the act of hand hygiene in this study (Section 5.6), participants also reported a strong intention to perform hand hygiene. In the studies reviewed in Section 2.9, O'Boyle et al (2001) did not find a relationship between stated intention to perform hand hygiene and actual hand hygiene rates although there was a relationship between self-reported hand hygiene rates and intention. However Watson and Jenner (2001) did find that Azjen's Theory was able to predict 45% of intention although glove use, the subject under investigation, was self-reported and not observed. This lack of information on actual glove use was a major flaw in Watson and Jenners' study given the findings reported by O'Boyle et al (2001) that there was no relationship between stated hand hygiene and actual hand hygiene among the group studied and means that, at this time, there is no concrete evidence that the stated intention of healthcare workers towards an infection control practice, whether it is glove use or hand hygiene performance, bares any relationship to actual practice.

Azjen's Theory was able to demonstrate that nurses have a high intention to perform hand hygiene. In a larger study, with an adequately powered sample size, it should be possible to use regression analysis to determine which components of Azjen's Theory (the attitude to hand hygiene, subjective norm or perceived behavioural control) has the most influence on nurses hand hygiene behaviour.

In summary, this study has shown that although there are some issues surrounding the valid and reliable collection of data when applying Azjen's Theory to hand hygiene behaviour, there is also no doubt that the constructs found in Azjen's Theory allow some useful insights into hand hygiene practices and intentions. Specifically; the role of peers in determining hand hygiene behaviour, the perceived restraints by nurses on their hand hygiene, and the major influences on nurses intentions to perform hand hygiene and their actual hand hygiene behaviour.

6.2.2 The hand hygiene practices of nurses in the clinical environment.

In the studies reviewed in Section 2.5 hand hygiene rates ranged from 10.6% (Tibballs 1996) to 81% (Pittet 2000). In this study, nurses performed hand hygiene at a rate of 39.45% of what it should have been, had they followed the hand hygiene policy of the study hospital. It would appear that, for this small group of nurses, hand hygiene rates were similar to those found ten years ago although it is not possible to speculate on whether this is true of the nursing population as a whole, due the small sample size. In addition, in the de-briefing interviews, nurses admitted to performing hand hygiene at a sub-optimal level and reflects the finding of Jenner et al (2002) who also reported that health-care workers admitted to sub-optimal levels of hand hygiene. However, this does not correspond with the findings of other studies such as Gould (1993), Tibballs (1996) and Harris et al (2000) who found that healthcare workers over estimated their actual hand hygiene rates.

As well as finding that the study nurses under-estimated their hand hygiene rate, the use of multiple methods of data collection, discussed at the beginning of this section, gives validity and robustness to the suggestion that the study nurses' hand hygiene performance was habitual in nature. For instance, following the observation of hand hygiene, it is interesting to note that each nurses' hand hygiene performance appeared to follow a set pattern in that the time taken to perform hand hygiene and the number of surfaces covered remained consistent for each hand hygiene episode (Section 5.5.5). This finding was not tested statistically because of the small sample size although the standard deviation from the mean was calculated for each nurse's hand hygiene time which suggested only a small variability in the time taken to perform hand hygiene for each study nurse (Section 5.5.4). In addition, in the findings on the questionnaire, it should be noted that three nurses thought that it would be difficult to change their hand hygiene behaviour (Section 5.6.4) and that in the semi-structured interview, more than half (n=4) of study nurses reported that they did not think about their hand hygiene much because it was so automatic

(Section 5.9).

Azjen's Theory (1980) does not take into account habitual behaviour as a control on actual behaviour taking place. However, Muto (2000) also noted that some health care workers complied 100% with hand hygiene practice while others were complete non-compliers (Section 2.9). Whether this was because some health care workers were compliers or non-compliers because of their hand hygiene habits was not clear. However what is clear is that this is an area that needs to be explored in further research; that is if actual hand hygiene performance is habitual, are the triggers that result in hand hygiene actually taking place, habitual too?

6.2.3 The hand hygiene resources available to nurses in the clinical environment.

It will be recalled that Azjen recognised that an actual control, such as a dearth of facilities and knowledge, could be a factor in preventing an intended behaviour from taking place (Eagley and Chaiken 1993). Therefore it was important to describe the environment in which hand hygiene took place and study nurses' existing knowledge of correct hand hygiene practice.

The hand hygiene facilities

None of the wards audited for hand hygiene facilities, at the time the observation, fulfilled all the audit criteria (Section 5.8). It was also noted that one ward, which was of a Nightingale design and had not been upgraded (see Section 4.5), did not have sufficient hand basins for staff to use. The suggestion was that when upgrading of a ward takes place, additional hand basins are supplied. However, that does not explain why the nozzles on the soap dispenser were without fail, encrusted and dirty, and most of the wards audited (n=5) did not have hand basins that allowed for easy access or alcohol hand rub available in all clinical areas.

In the review of the literature (Section 2.6.1), the hand hygiene facilities available to healthcare workers were cited as a reason why hand hygiene was performed at sub-optimal levels (Gould 1995; Voss and Widmer; 1997 Kesavan 1999; Weeks 1999; Pittet 2000). In addition, in the self-report questionnaire, as reported in Section 5.6, study participants thought a lack of resources a barrier to hand hygiene taking place. Although the sample size in this study was not large enough for a significant relationship to be found between nurses' perception of barriers to hand hygiene (the perceived behavioural control) and actual control as measured through the audit of hand hygiene facilities, this would be an aim of future research with a larger sample. However it is interesting that the perceptions of the study nurses' regarding the availability of resources, both fixed (such as hand basins) and non-fixed (such as alcohol hand rub) appear to be supported in the findings of the audit. Finally, as discussed in Section 6.2.1, nurses perceived a barrier to hand hygiene and that perception might have prevented them from attempting to perform hand hygiene. In order to address the perception among nurses that hand hygiene facilities are inadequate and a barrier to hand hygiene, the hand hygiene facilities must be improved.

Another finding of the audit of hand hygiene facilities was that none of the wards had alcohol hand rub (Hibisol™) in all the clinical areas. The reason for this is not clear although there is evidence to show that alcohol hand rub is effective in reducing hand flora (Paulson et al 1999; Zaragoza et al 1999; Larson 2001). In addition Larson (1995), Falsey et al (1999), Pittet et al (2000), Bischoff et al (2000) and Earl et al (2002) found that the introduction of alcoholic hand rub was a contributing factor in improving hand hygiene rates, although this was not the experience of Muto et al (2000). It should be noted that on the original audit tool, which was used by the Infection Control Nurse at the study hospital, the question 'is Hibisol ™available in all clinical areas?' was not present. This question was added following the pilot study (Section 4.9.5). It is possible therefore that since alcohol hand rub was not an audit criteria for the Infection Control Nurse at the study hospital, it was not considered an essential facility for hand hygiene at that time.

Nurses knowledge of hand hygiene

In addition to restraints on hand hygiene performance relating to facilities, this study found that participants; did not always answer correctly when asked to state the type of hand hygiene required for a particular task (Section 5.7); over estimated the type of hand hygiene required for the task (Section 5.7); performed hand hygiene at a sub-optimal level (Section 5.5.2) and admitted that their hand hygiene rate was sub-optimal (Section 5.9).

The findings that the study nurses did not always answer correctly when asked to state the type of hand hygiene required for a particular task and over estimated the type of hand hygiene required for the task could be related to the amount of knowledge study nurses had about hand hygiene policy and suggests that this group of nurses need to be educated about correct hand hygiene techniques. A number of authors have commented on this (Williams and Buckles 1988; Horton 1992; Falsey et al 1999).

However, there is very little evidence that educating the workforce is a strategy that improves hand hygiene rates in the long term (Dubbert et al 1990; Larson and Kretzer 1995). It should be noted that the studies reported in Section 2.9.1 related to educational campaigns to improve hand hygiene rates. In this study the hand hygiene quiz presented to participants of this study asked them about *how* they would perform hand hygiene and not *whether* they would perform hand hygiene. In other words, the quiz related to hand hygiene technique and not the frequency of hand hygiene. The findings of this quiz could be misleading because, as is discussed in Section 6.2.2, if hand hygiene is habitual, an educational campaign to improve hand hygiene rates might not have any effect on habitual technique, while a campaign to improve technique may not address the triggers that influence hand hygiene frequency.

The findings from this multi-method study also found that the study nurses' hand hygiene was sub-optimal and that the study nurses acknowledged their sub-optimal hand hygiene rates. The poor hand hygiene rate of this group of nurses again raises the possibility that

they were unaware of when they should perform hand hygiene. Seto (1995) recommended that staff would need to recognise low hand hygiene rates as a problem that applied to them before they would take on the message of an educational campaign. Since the study nurses openly admitted that their hand hygiene rates were sub-optimal (Section 5.9), it poses an interesting question: that is, if they already knew that they should perform hand hygiene at a rate above what they were currently achieving, what would an educational campaign be aimed at and what would it achieve?

The other finding, related to the hand hygiene quiz results, is that in the observation it was noted that the study nurses often used a hand hygiene technique that was over-sufficient for the task (Section 5.5). This is of interest because in the hand hygiene quiz the study nurses over-estimated the type of hand hygiene required for a task and suggests that this group of nurses need to be educated on their hand hygiene technique. In the studies reviewed (Section 4.9.1), four studies examined hand hygiene technique; Graham (1990); Gould and Ream (1993); Gould (1995) and Gould et al (1996). However none of the studies reported commented on whether the hand hygiene technique was appropriate for the task undertaken. For instance, Gould and Ream (1993) used a scoring system to judge the appropriateness of hand hygiene technique but only reported on overall scores and the failures of hand hygiene technique were not discussed. Again this finding is related to knowledge of hand hygiene and the particular hand hygiene policies of the study hospital. However if hand hygiene practice is habitual as suggested in Section 6.2.2, and the chlorhexidine hand scrub (Hibiscrub™) easier to use than the wall soap, because of accessibility, for instance, an educational campaign might raise awareness of the correct hand hygiene to use for different tasks but there is no guarantee this will be translated into a change in practice. Finally it should be noted that more than half (n=4) of the nurses reported in the self-report questionnaire that they washed their hands at every hand washing episode because their knowledge of infection control was up to date. This brings the discussion back to Seto (1995). This group of nurses did not appear to be aware of the gaps in their knowledge and they would need to acknowledge these gaps

before an educational campaign would be successful.

6.2.4 The constraints related to time and workload put on nurses' hand hygiene practices in the clinical environment?

In this study, nurses reported that they were aware of constraints on their hand hygiene performance such as the time they had available for hand hygiene, the workload of their ward and possibility of being distracted when about to perform hand hygiene. (Section 5.6.4). This is not an unusual finding since a number of the authors reviewed in Section 2.8.1 (Voss and Widmer 1977; Weeks 1999) also commented on the amount of time available to perform hand hygiene. In addition, O'Boyle et al (2001) reported that in their study hand hygiene rates decreased as the study units got busier. In this study the hand hygiene rates varied between study nurses with no apparent correlation between rates and workload. For instance the range for all clinical contacts among the study nurses was 8 to 17 and the hand hygiene rate 15.5% to 70%. The sample size in this study was not sufficient to allow relationship between study nurses' workload and the number of clinical contacts they experienced to be tested statistically, and it should be noted that the assessment of workload was subjectively assessed, based on study nurses' perceived workloads and field notes taken at the time of the observation. However, in a larger study with an adequately powered sample size, it would be possible to test whether workload is an actual control on hand hygiene behaviour if an objective measure of workload could be developed.

During the self-report questionnaire participants were also asked about perceived controls on their behaviour such as workload and time constraints. Although more than half of the study nurses (n=4) agreed that they washed their hands less often when the ward was busy, and all agreed that, when going to wash their hands they sometimes got distracted by other things, all participants thought it was 'likely' or 'quite likely' that if they wanted to, they could hand wash on every hand wash episode (Section 5.6.4).

This is interesting because it suggests that although the participants acknowledged constraints on their hand hygiene such as an increased workload, they still thought that if they wanted to, they could perform hand hygiene. This may mean nurses make a conscious decision to perform hand hygiene less frequently when they perceive their workload to be increasing. Interestingly though Farr (2000) speculated that non-compliance with hand hygiene is a human failing and he also argued that physicians assume infection control procedures are optional. This raises the possibility that nurses, when prioritising their chores, do not give a high priority to hand hygiene when other tasks, perceived as more urgent, present themselves. Although this may be the case, there is no evidence to support this theory and it does not explain why, when clinical contacts were relatively light, hand hygiene rates remained poor in this study (Section 5.5.1).

6.3 Limitations of the study: Sources of bias associated with reliability and validity

6.3.1 Introduction

During the data collection process limitations of the study came to light that could have introduced bias into the data and had an impact on the generalisability of the findings. These limitations are now discussed.

6.3.2 Sample size

It is recognised that the sample size in this study was small and insufficient to make generalisations about findings. However it should be recalled that at the time this study was designed and data collected, there was no evidence that Azjen's Theory had been used to examine hand hygiene intentions and behaviour, although it had been suggested by a number of authors (Kretzer and Larson 1998; Seto 1995). The main aim of the study

was to examine whether hand hygiene behaviour could be examined using Azjen's Theory and this was achieved.

The small sample size allowed a large range of data to be collected using the multi-method approach described in Section 3.2.3. It could be argued that in a larger study with a sample size sufficient to calculate significances between variables the richness of this data would be lost since its volume would have been unmanageable. How, for instance would one examine nurses' hand hygiene technique in such detail? In a larger study using Azjen's Theory the measure of behaviour would be reduced to simply whether clinical contact initiated hand hygiene, or not, because the main aim of the study would be to determine whether a relationship exists between nurses stated intention to perform hand hygiene and actual hand hygiene behaviour, and not hand hygiene technique.

6.3.3 Methodological issues related to study design

Bias in the observation

In this study a measure of hand hygiene performance was taken before the participants completed the self-report questionnaire and not in accordance with the data collection sequence advised by Fishbein and Azjen (1980). This was in order to minimise observer reactivity discussed in Section 3.5.2 since it had been found by a previous study (O'Boyle et al 2001) that self-report behaviour does not always reflect actual behaviour and it was felt that obtaining a measure of actual behaviour was crucial to this study. However, it is possible that bias was then introduced as participants attempted to give responses to the self-report questionnaire that were congruent to what they thought their hand hygiene behaviour had been. In other words, in trying to eliminate bias in one area of the study, it may have been inadvertently introduced in another. In addition, it is possible that nurses participating in the main study were aware of the nature of the study before the observation took place through conversations with pilot study nurses.

Another area of bias that became apparent as the data collection process proceeded was in the collection of the observation data since only one observer was used for this. It was discussed in Section 3.5.2 that a single observer can lead to problems of external validity since what is being observed can depend on the observer. It was stated that this difficulty was overcome to a large extent by the use of a schedule for observation that had been tested for reliability and validity (Gould and Ream 1993; Gould et al 1996). However inter-rater reliability was not tested in this study (Section 4.9.1). This was because of constraints within the study on time and resources. It is recognised that if a larger multi-centre study were to take place then inter-rater reliability would need to be established.

Bias in the self-report questionnaire

In the self-report questionnaire two sources of bias were identified relating to the reliability of the instrument and data collection procedure.

The first area of bias identified concerned the issue, discussed above, that an element of bias could have been introduced into the data if participants had attempted to achieve congruence between their hand hygiene rates and their self-report questionnaire responses. Upon reflection, it would have enhanced the reliability and validity of the questionnaire responses if a re-test had been carried out among some of the participants to establish the reliability of the questionnaire and the method in which it was administered relating to the period of observation. Therefore, if some of the participants had repeated the questionnaire some time after the initial completion and responses were found to have convergence with Chronbach's Alpha Co-efficient, then it would have been possible to say with some confidence that the methodology and order of data collection was reliable and valid. However if convergence was not achieved this would lead to speculation that the act of being observed for hand hygiene behaviour had influenced study nurses' responses in the self-report questionnaire.

The second area of bias concerns the self-report questionnaire itself. It was discussed in

Section 3.5.4 that this questionnaire achieved reliability and validity through adherence to the questionnaire format specified by Fishbein and Azjen (1980) and reference to current literature when formulating the statements used. The questionnaire was also subjected to statistical analysis in that Cronbach's Alpha Co-efficient was applied to the questionnaire as a whole and achieved a satisfactory reliability score of 0.793. In addition the separate sections of the questionnaire were tested for reliability and it will be recalled that the attitude to the act of hand washing achieved a score of 0.663. This means that the attitude to the act of hand washing section in the self-report questionnaire was not as reliable as the other sections. However with a larger sample size the Chronbach' Alpha Co-efficient may have achieved a higher reliability score. It is recognised that if this self-report questionnaire is used again, then the attitude component would need to be re-designed and piloted. Again, a test re-test of all the sections of the self-report questionnaire would also improve its reliability.

Bias in the audit

When the decision was made to use the audit tool used by Infection Control Nurses in Scotland (Crawford 1994) it was acknowledged that at the time the tool was developed, the reliability of the tool was not reported. However, although the tool was in use at the hospital where the study took place, in a future study the reliability of the tool would need to be more firmly established using the inter-rater technique described in 3.5.2.

6.4 Reflections of a researcher

In Section 3.5.2, Pretzlik (1994) was of the view that maintaining the role of non-participant observer may be harder than anticipated; Turnock and Gibson (2001) argued that an individual in a situation, whether obtrusive or not, may find it difficult to adopt a role as an observer and maintain it throughout the period of observation. In this study the researcher was a registered nurse observing hand hygiene in a clinical situation and consideration had to be given to her obligation under the then United Kingdom Central Council for Nursing and Midwifery Council (UKCC) Code of Professional Conduct (1992).

For these reasons the following aspects of the role of the researcher in this study are explored; the role as the researcher and an employee at the study hospital, the difficulty of maintaining the role of a researcher and non-participant observer when some of the study nurses were known to the researcher as colleagues and the role of the researcher as a trained nurse.

6.4.1 The researcher's role as an employee at the study hospital

The researcher carried out the study in the hospital in which she was employed as a registered nurse. Therefore the researcher had an obligation towards her employer in maintaining the safety and well being of colleagues and patients. This included not allowing colleagues to come to any harm through the research process as well as adhering to hospital policies and procedures. This study was designed to adhere to the ethical principles outlined in Sections 3.4 and 4.7, where it was discussed that the research should not cause physical or psychological harm to the study nurses (Beauchamp and Childress 2001). However for any member of staff or patient who came into contact with the researcher during the study the same principles applied.

6.4.2 The researcher's role as a colleague

Related to the above point, some of the study nurses were known to the researcher as colleagues, although staff on the ward in which the researcher worked were omitted from the recruitment process. The researcher needed to consider whether this would introduce an element of bias into the data collection if the researcher had pre-conceived ideas about how the study nurse would behave that coloured the interpretation of the observation. The criteria for the observation of hand hygiene was precise and didn't allow for subjective interpretation. However it highlights the need to establish inter-rater reliability as discussed in Section 3.5.2.

6.4.3 The researcher's role as a trained nurse

The researcher is a trained nurse. In Section 5.3 a situation was described that required the researcher to use her nursing skills and act within the UKCC Code of Conduct (1992). This highlights two points. Firstly, if the researcher was observing as a 'non-participant' and became involved in the nursing care of a patient, did she then become 'participant'? Since the situation described did not involve the research participant in clinical contact, it was not part of the observation processs and, therefore, non-participation was maintained. Secondly, it should be considered whether the researcher's knowledge of nursing care and process introduced bias into her interpretation of clinical contact and hand hygiene performance. It will be recalled that the observation criteria were well defined however the inter-rater technique described in Section 3.5.2 would enhance the reliability of the observation and reduce bias.

6.4.4 The researcher's reflections

In this study the researcher kept a field diary during the data collection. The purpose of the field diary was to record the thoughts and feelings of the researcher as the study

progressed.

One aspect of the data collection process discussed in the field diary are the difficulties encountered during the recruitment process. The researcher contacted by phone the nurses selected during randomisation in order ask them if they would be prepared to take part in the study. The potential study nurses were difficult to contact because of their varying shift patterns. The researcher was also aware that these nurses were busy and was anxious not to take up too much of the nurses' time. Finally, half of the nurses contacted at the telephone call declined to take part and the researcher did not feel able to ask why they did not want to participate. This telephone call left the researcher feeling uncomfortable at times and wondering if this was an aspect of the recruitment process that should be modified in order to enhance recruitment.

Another aspect of the data collection process discussed in the field diary was the actual collection of the data. The researcher felt nervous about visiting wards and collecting the data initially. However as the study progressed and her confidence grew, this nervousness diminished. In addition the study nurses were, without exception, friendly and interested in the study. The other staff members and patients on the wards visited were also friendly and helpful.

The researcher also reflected in the field diary on her role as a non-participant observer. She concluded that for the purpose of observing hand hygiene, non-participation was maintained. However, because of her dual role as researcher and registered nurse, the researcher felt that it was not possible to remain completely non-participant and that proved to be the case as described in Section 5.3.

Finally the researcher reflected on the nature of the observation and the dilemmas involved described in Section 3.5.2. She wondered if recruitment would have been easier if the nurses had known the exact nature of the study before they agreed to take part? This

was not certain. The researcher also considered whether she would have agreed to take part in a similar study, had she been approached, and concluded that she would have done. However the dilemma of minimising observer reactivity when collecting data on behaviour remains. The researcher concluded that, if a future study is designed, observer reactivity would need to be considered as a known variable when examining the findings.

6.5 Conduct of the study

6.5.1 Recruitment

In this study, participants were recruited by writing and asking them to opt out of the selection process (Section 4.8). It is recognised that this would not be a suitable method of recruitment under the Data Protection Act 1998 (Glasgow University Computing Service 2003). Recruitment to the study was good initially. However, for some participants there was a gap of up to three months between receiving the letter and a phone call requesting participation. This was seen as a bar to effective recruitment because it was thought that the study had become distanced in participants' memories. In addition, another study requiring participants to complete a questionnaire began half way through the study and it was noticeable that there was an increased reluctance to take part following this (Section 4.8). Although nurses were not asked for a reason why they were not willing to participate some gave one. Their reasons for not participating included; being too busy (on the ward); forgetting to return the opt-out slip; not receiving the recruitment letter; about to move job; about to go on maternity leave.

It was found that the recruitment strategy did not yield a large number of willing participants to the study and a future study would need to address this difficulty. It may be that the methodological advantage of having as random a sample as possible (albeit a self-selecting one to a certain extent) needs to be sacrificed in order to recruit enough subjects to have an adequately powered sample size particularly when participation relies

entirely on the good-will of participants. It may also be the case that giving prospective participants more information about the exact nature of the study will encourage participation. Future studies should also recruit and collect data within a shorter time frame than the one allowed for in this study.

6.5.2 The data collection process

In this study a multi-method approach was adopted (Section 3.2.3). The researcher was not in uniform and the data collection process took approximately three hours. The sequence of data collection and the possibility of bias being introduced are discussed in section 5.3.2.

Collection of observation data

The tool for collecting observation data was designed so that ten hand hygiene events could be recorded on a single sheet that included the observation criteria (Section 4.9.1) This allowed the recording of observation data to be fast and efficient which was important when clinical events were occurring quickly, simplified analysis and worked well.

One of the hand hygiene criteria was the number of hand surfaces covered during hand hygiene. Observation of this proved problematic at times when the nurse under observation had her back to the researcher obscuring the view of the study nurse's hand hygiene performance, particularly the number of surfaces covered. The dilemma for the researcher was this. If all the data for a hand hygiene episode was not available, should that hand hygiene episode be deleted completely (clinical contact and hand hygiene performance) or should the missing data be noted as such. It should be remembered that it was noted (Section 5.5.3) that hand hygiene performance for each nurse appeared to follow a set pattern. Therefore, for 'number of hand surface covered' during hand

hygiene, a reasonable guess could be made if hand surfaces covered had already been observed on a participant. However the researcher did not consider this acceptable and for the purpose of this study included all hand hygiene episodes while noting missing data.

In the event of a larger study taking place that uses Azjen's Theory, the data on number of hand surfaces covered during hand hygiene would probably be excluded in the interests of reasonable data management. However if a study were designed that investigated nurses' hand hygiene habits, the exact nature of the hand hygiene performance would be critical. In addition, in a future study that involves observation of nurses hand hygiene the nurses would be aware that hand hygiene is under scrutiny. However if hand hygiene is habitual in nature, it could be argued that after an initial period of observation, nurses would return to their usual hand hygiene regime.

Collection of the Self-report questionnaire data

In most instances the self-report questionnaire data proved to be the easiest to collect since it had been piloted and found to be easy to use and complete. Indeed while nurses completed the self-report questionnaire it was possible for the researcher to carry out the audit of hand hygiene facilities on the ward.

The analysis of data from the self-report questionnaire was more complicated since it contained 63 items. However although the small sample size meant that the findings gave a flavour of the hand hygiene intentions and opinions of participants, the researcher was able to identify areas of interest from the self-report questionnaire. These were; nurses opinions on the facilities available to them for hand hygiene, discussed in Section 5.6.4; barriers to hand hygiene, discussed in Section 5.8 and the importance of the peer group to nurses, discussed in Section 5.6.3.

Collection of the hand hygiene quiz and audit data

The hand hygiene quiz and audit data was simple to collect and analyse and went well. The hand hygiene quiz was attached to the self-report questionnaire and completed at the same time. The audit tool was also easy to use. The issues relating to the reliability of the audit tool are discussed in Section 4.9.3.

Recording of field notes and the de-briefing interview

The field notes were recorded during the observation period on the observation tool. The amount and type of data recorded was influenced by the researchers personal experiences as a nurse and this is discussed in Section 6.4.3. The de-briefing interview was semi-structured and there was an exchange of information between researcher and participant. Recording the field notes and responses from the semi-structured interview went well.

6.6 Calculation of sample size for a larger study

Given the quality of the data produced for this explanatory study, it was decided that Azjen's Theory could be used as a theoretical base for a multi-centre study. The sample size for a larger multi-centred study was calculated at 136 nurses. This gave the study a 90% power at a 5% level of significance using a 2-sided 2-sample t-test to detect a difference in the means of the percentage of activities that lead to hand hygiene of 15% between the two groups defined as having either 'good' or 'poor' behavioural control beliefs regarding hand hygiene.

6.7 Summary of the discussion of findings

In this study it was found that Azjen's Theory of Planned behaviour could be used to understand nurses hand hygiene behaviour. The usefulness of Azjen's Theory hinges on the components to the intention to perform hand hygiene. In this study it has been found that adherence to hand hygiene policy was poor among participants although it reflected the studies reviewed in Section 2.7. However attitude to the act of hand hygiene was good and intention to perform hand hygiene when required was strong. These poor hand hygiene rates could have been influenced by a number of factors since the facilities on the wards where the hand hygiene took place were poor. Participants also felt constrained by time limitations and workload although there was not an obvious relationship between hand hygiene rates and perceived workload. In addition, participants did not appear to know which was the correct hand hygiene type for a number of specified tasks and this confusion was reflected in the hand hygiene technique where participants used a hand hygiene technique that was over sufficient for the task.

These findings are interesting because they raise a number of other issues that will need to be the subject of further study. These are issues around the habitual element of hand hygiene technique and rates, the relevance of educational programmes in improving hand hygiene rates and the priority hand hygiene is given compared to other essential nursing duties.

Although there are areas of this study, in the design of the data collection tools and method of data collection, particularly the observation, in which an element of bias has emerged, it should be recalled that the tools were validated through reference to the current literature and with regard to the resources available at the time of the study. These issues have now been highlighted and can be accommodated with the result that, if a larger study was to be conducted, the data collection tools and procedures can be made more robust and the reliability and validity of the study strengthened.

In a larger study, appropriately powered, it would be possible to examine the relationships between the variables tested. For instance, it would be possible to examine whether a relationship existed between participants intentions to perform hand hygiene and actual hand hygiene behaviour. It would also, through regression analysis, be possible to examine which of the components of Azjen's Theory, (attitude, subjective norm and perceived behavioural control), have the largest influence on intention to perform the behaviour and actual behaviour. However, although the sample size in this study is small and underpowered, a number of questions have emerged through the findings and should be explored further.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

This study has shown is that it is possible to use a general theory of behaviour, such as Azjen's Theory of Planned behaviour to examine a specific nursing behaviour such as hand hygiene. It has also highlighted the complex nature of nurses' hand hygiene behaviour and that a number factors are involved. These include availability of resources, both material and human, and improved knowledge of appropriate hand hygiene technique. However there are other factors that need to be taken into account and explored further.

7.1 Recommendations for research

7.1.1 Exploring the relationship between intention to perform hand hygiene and actual hand hygiene behaviour

It would appear from this small study that there is a strong intention by nurses to perform hand hygiene when required but this is not reflected in actual practice. This relationship needs to be explored further in order to ascertain whether a relationship exists between the strength of the intention and actual behaviour. It would also be interesting to explore, using statistical techniques such as regression analysis, what components of Azjen's Theory (attitude, subjective norm or perceived behavioural control) have the most effect on intention.

7.1.2 Exploring the habitual nature of hand hygiene

Another interesting point that has come up during this study was the impression during the observation of hand hygiene, that there was a habitual element to the act of hand hygiene in terms of the amount of time taken to perform the hand hygiene and the number

of hand surfaces covered. It was speculated that the triggers that led to the hand hygiene being performed might also be habitual. This is an area that warrants further research since Azjen's Theory does not take into account the role of habitual behaviour. However theories have been developed by behavioural psychologists to explain this phenomenon.

7.1.3 Exploring the role of education in improving hand hygiene rates

It has also become clear that the nurses in this study were aware of their poor hand hygiene but also that they were unsure about what the correct hand hygiene should be for the task. Implementing an educational programme to raise awareness would appear the obvious answer but this has not been successful in the past. This campaign would need to be planned and monitored so that the needs of the nurses receiving the education are identified and met. In this educational theory should be involved. However it might be interesting to draw on other disciplines such as Marketing Theory. In marketing the aim is to influence consumer buyer behaviour. This may involve introducing a customer to a need they didn't realise they had and so it is with hand hygiene. The nurses have to be introduced to their need for training before the training will be successful.

7.2 Implications for practice

7.2.1 Improving hand hygiene rates

The findings of this study suggest that nurses' hand hygiene rates have not improved significantly in the past decade despite a number of strategies (Pittet 2000). This poses a conundrum for infection control teams who need to improve infection rates and know that the hands of healthcare personnel are significant vectors for infection (Moolenaar et al 2000). In addition, the suggestion, from the de-briefing interview in this study, is that nurses know their hand hygiene rates are poor and Jenner et al (2002) also found that health-care workers admit to sub-optimal levels of hand hygiene.

When nurses admit to sub-optimal levels of hand hygiene the theory practice gap discussed in Section 2.7.2 is thrown into sharp relief. This gap occurs when what practitioners are doing does not relate to what theorists and educators state the practice should be (Lindsay 1990), and may be because theory needs to be incorporated into practice, before practice will change. However how this can be done effectively in the case of hand hygiene remains unclear since, as Seto (1995) points out, practitioners have to feel a need for the knowledge before they will assimilate the information.

The challenge is this. If practitioners have the knowledge and have assimilated it, how can change be bought about? In addition, if, as has been suggested by this study, there is an element of habit in nurses' hand hygiene behaviour, at what point in their nursing career does this habit become fixed and can it be changed? It would be sensible to suppose that a thorough induction of correct hand hygiene habits during nurse training is needed, while nurses who are post training, are lost to good hand hygiene habits. There are two problems with this supposition. Firstly it assumes hand hygiene habits are learnt at some point in a nursing career, probably near the beginning, when it may be a habit nurses bring with them having acquired it earlier in their lives. Secondly, it also assumes that changing this habit it insurmountable, which it is not. The difficulty is not can hand hygiene be changed, but how.

7.2.2 Improving hand hygiene facilities

It seems self-evident that facilities for hand hygiene should be improved although there are wider implications since improving facilities will require resources. However it was discussed in Section 2.3.4 that, following the publication of the Culyer report (1994) and the subsequent government proposals for clinical governance (Crinson 1999), practice was to be based on best scientific evidence and for Culyer (1994), the research and development this required should be integral but funded separately from the NHS. This was to enable staff to deliver care based on best available evidence (Section 2.3.4). In

addition it was also discussed that the cost to the NHS of HAI is estimated to be in the region of £930 million for in-patients alone (National Audit Office 2000).

The implications for practice are this. The cost of HAI infection is acknowledged to be considerable and hands are known to be major vectors of infection. Hand hygiene should be one of the most important strategy in hospitals' fight against infection yet as recently as 2000 when the audits for this study were done, facilities were found to be largely inadequate. However, although the funds required to improve facilities are not within the control of most nurses, there are other measures nurses can take. They should continue to highlight the evidence for hand hygiene as best infection control practice for the prevention of HAI and its' attendant financial implications. In addition nurses should insist that basins are kept free from obstruction, alcohol hand rub is available in all clinical areas and colleagues aware of the hand hygiene policies of the hospital.

The findings in this study relating the research question, 'what are the constraints related to time and workload put on nurses' hand hygiene practices in the clinical environment?' appear to conflict. On the one hand nurses believe they can perform hand hygiene when they want to, if they so wish, while four of the participants thought they performed hand hygiene less when the ward was busy. In the review of literature a number of authors cited the time consuming nature of hand hygiene as a reason for poor compliance rates (Voss and Widmer 1997; Kesavan 1999; Weeks 1999). However some studies found that increasing access to facilities such as alcohol hand rub could improve rates (Bischoff et al 2000; Pittet 2000 et al; Earl et al 2002), although hand hygiene rates did not rise above 57%.

It would appear that improved resources such as better staffing levels and access to alcohol hand rub might improve hand hygiene rates. However it should be noted that even the nurses in this study who admitted they were not busy in their work had sub-optimal hand hygiene rates. In addition nurses had a strong intention to perform hand hygiene.

Therefore any campaign will need to address the apparent mis-match between nurses stated intentions and actual behaviour.

7.3 Conclusion

Although the sample size for this study was small it has been shown that a behavioural theory, Azjen's Theory of Planned Behaviour can be used to examine nurses' hand hygiene behaviour. It has also suggested that nurses have a strong intention to perform hand hygiene when it is required and believe they have control over their hand hygiene behaviour although they admit to sub-optimal hand hygiene practices. However it is also been suggested that the facilities available for hand hygiene are often poor and nurses are aware of this constraint on their hand hygiene practice. In addition nurses are not always aware of appropriate hand hygiene for a clinical contact and this was found in not only in the observation of hand hygiene but also in the responses nurses gave to the hand hygiene quiz.

The study has raised questions that need to be addressed. To begin with, would an intention to perform hand hygiene have a relationship to actual hand hygiene and what components of Azjen's Theory (attitude to hand hygiene, subjective norm and behavioural control) are the strongest predictors of hand hygiene taking place. Secondly, what is the role and importance of habit in nurses hand hygiene behaviour. Thirdly, what role does education have in improving hand hygiene and is it feasible, given the failure of previous educational campaigns, to use an educational programme in a strategy to improve hand hygiene rates.

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Appendix I: Letter to the Director of Nursing

Miss M Henderson
Director of Nursing and Quality,
Southern General Hospital NHS Trust
1345 Govan Road
Glasgow
G51 4TF

14th December 1999.

Dear Miss Henderson,

I am a Staff Nurse within the Surgical Directorate currently undertaking a MSc by research at Glasgow University. The title of my proposal is '*A study into the Intentions and Actions of Nurses' Infection Control Behaviour Using Hand Washing as the Intended Act'.*

This study aims to investigate the issues arising from the acknowledged non-compliance of nurses in infection control matters. It will involve observing nurses' hand-washing behaviour in the wards followed by a self-report questionnaire. There will be no direct contact with patients and I anticipate liaising closely with the Infection Control Team.

I have developed this proposal with my supervisor, Professor Lorraine Smith, at the Nursing & Midwifery School and applied to the Chief Scientist Office for a grant to undertake the research. Please find enclosed a copy of a project outline submitted to the Chief Scientist Office and the letter recommending that we proceed to a full grant application. The study will need to be piloted for statistical and methodological reasons before a main grant application can be made.

Professor Lorraine Smith received an agreement in principle from Miss Barr to the nursing staff within the Medical and Surgical directorates being approached by myself to take part in this study. (Letter dated 31st July 1998).

I am writing to request your permission to access between 50 to 60 trained nurses (Registered and Enrolled) from the Medical and Surgical Directorates, 16 of whom will be used in an initial study and a further 34 in a larger multi-centre study.

I have been in contact with Mr. McGuire of the Ethics Committee and he has requested a covering letter plus copies of any correspondence to you so that the study can be discussed at the next meeting of the Ethics Committee in January.

If any of these issues require further clarification I will be happy to meet and discuss it with you at your convenience.

With many thanks,

Yours sincerely

Fenella Connell

Appendix II: Letter to the Clinical Nurse Managers

Miss G Donnelly
Clinical Nurse Manager
Surgical Directorate
Southern General Hospital
134 Govan Road
Glasgow
G51 4TF

16th February 2000

Dear Miss Donnelly

I am writing to you following a meeting with Miss Barr on Thursday 10th February. The purpose of the meeting was to gain permission to access the trained nurses within the Medical and Surgical Directorates in order to carry out my proposed research '*A study into the Intentions and Actions of Nurses' Infection Control Behaviour Using Hand Washing as the Intended Act'*. The research is based on a psychological model of behaviour and involves a period of observation followed by the administration of a questionnaire.

I have had permission from Miss Barr to approach nurses within the Surgical and Medical Directorates and recruit them to the study. A total of 16 trained nurses over the two directorates will be required. Their inclusion is entirely voluntary and they will be aware of when they are being observed which will be for a total of two hours. The questionnaire will be administered at the end of the observation period and takes approximately 10 minutes to complete. I will not however divulge the nature of the observation until the questionnaire is delivered as this could bias the results. All information gathered during this study is anonymised.

I would be grateful if I could have a list of trained nurses who are currently working on the surgical, orthopaedic, urology and eye ward with their grade and area of work included so I may begin recruiting nurses to my study.

I would be willing to come and talk to the Charge Nurses at the next Unit meeting if you think this would be appropriate. I will also write to them explaining the nature of the research and requesting permission to observe on their wards. I hope this is satisfactory to you.

Yours sincerely

Fenella Connell

Appendix III: Letter to the Charge Nurses

Dear Charge Nurse

I am a Staff Nurse on Ward 3 at the Southern General Hospital currently doing a MSc by research at Glasgow University.

The small project involves a period of observation followed by a questionnaire. All information gathered will be entirely confidential.

The Deputy Director of Nursing has given permission for me to approach trained nurses in the Medical and Surgical Directorates to see if they would become involved. Their participation is entirely voluntary and nurses will know when they are being observed. The questionnaire will be given out at the end of the observation period and take about 10 minutes to complete.

When the study has finished I would like to give you feedback on the findings. Individual nurses and wards will not be identified at any time during the study or after it has been finished.

I am writing, therefore, to ask for your permission to come into your ward to study any nurses who agree to be involved. Your support would be most appreciated. I will be in touch by phone for your reply.

With many thanks,

Yours sincerely

Fenella Connell

Appendix IV: Letter to the Ethics Committee

Mr F McGuire
Ethics Committee
Management Building
Southern General Hospital NHS Trust
1345 Govan Road
Glasgow
G51 4TF

13th December 1999

Dear Mr McGuire

I am writing to you following our recent conversation about my intended research. The title of my proposal is '*A study of the Intentions and Actions of Nurses' Infection Control Behaviour Using Hand Washing as the Intended Act.*'

The main aim of the study is to investigate the issues surrounding the acknowledged non-compliance of nurses in infection control matters. It involves direct observation of nurses' hand washing behaviour followed by the administration of a questionnaire. There will be no direct contact with the patients and I anticipate liaising with the hospital's Infection Control Team. Agreement has been given in principal by Miss Barr for the nursing staff within the Medical and Surgical Directorates being approached by myself to take part in the study.

I have enclosed a letter that I sent to Miss Henderson today requesting permission to access trained nurses for both the pilot and main study. Also included is a copy of the outline and letter recommending proceeding to a full grant application from the Chief Scientist Office.

Please contact me either at the University School of Nursing and Midwifery, Ward 3 SGH, or my home Tel 946 3543, if any of these issues require further clarification.

Yours sincerely

Fenella Connell

Appendix VI: Letter to prospective participants

Dear Colleague

I am a staff nurse on Ward 3 at the Southern General Hospital currently doing an MSc by research at Glasgow University.

I am doing a small study which involves a period of observation followed by a questionnaire. All information gathered will be entirely confidential and your anonymity will be protected.

The Deputy Director of Nursing has given permission for me to approach trained nurses in the Medical and Surgical Directorates to see if they would become involved. Your participation is entirely voluntary. You will know when you are being observed. The questionnaire will be given out at the end of the observation period and will take about 10 minutes to complete.

When the study has finished I would like to give you feedback. Individual nurses and wards will not be identified at any time during the study or after it has been finished.

If you are willing to take part in the study I will contact you at work before the end of April (if you have been selected). *If you don't want to be considered* please complete and return the slip below in the envelope provided. Your support would be most appreciated.

With many thanks,

Fenella Connell

.....

I do not wish to be included in the study.

Name .....

Ward .....

Appendix VII: Letter from researcher to study nurses

Southern General Hospital
1345 Govan Road
Glasgow
G51 4TF

16th November 2000

Dear Colleague

I am writing to you following the hand hygiene study you participated in last May or June. I would like to take this opportunity to thank you for all your help and update you on the progress of the study so far.

As you may remember, the study you took part in was a pilot study for a larger study that will be taking place next year if funding is secured. The purpose of the pilot study was to check that the way of collecting data actually worked and to generate enough data so that a sample size for the larger study could be calculated.

The method of data collection worked quite well although a few adjustments have been made to the tools I was using. Using the data collected from observing nurses and their questionnaire scores, the sample size for the larger study ahs been calculated at 136.

The purpose of the larger study is to investigate whether there is a relationship between nurses' intention to perform hand hygiene as expressed in the questionnaire and actual hand hygiene behaviour. When the larger study has been completed I would like to give you feedback on the findings. All information gathered has been anonymised.

If you would like to make any comments about your experience of the study, both positive and negative, I would very much like to hear form you. You can contact me on Ward 4 SGH or email f.c.Connell@talk21.com.

I would like to thank you again for taking part, your co-operation was very much appreciated.

Yours sincerely

Fenella Connell

Appendix VIII: Observation of hand hygiene tool

OFFICE USE ☐☐☐

ACTIVITY	H.WASHED	AGENT	SURFACES	TIME	DRYING

CODE.

ACTIVITY: 1. Social hand wash (low contact activity) – with soap and water
Prior to; commencing work(shift), visiting another department, eating or drinking, giving and preparing medicines, patient contact, going home.
Following; visiting toilet, patient contact, handling (unsoiled) bedding, cleaning equipment.

2. Hygienic hand wash (high contact activity) – with antiseptic hand cleanser/social hand wash and antiseptic hand rub
Prior to; aseptic procedures, contact with immuno-suppressed patients
Following; contact with patient in source isolation, contact with contaminated articles and equipment, prolonged patient care.

HANDS WASHED **1.** Yes **2.** No

AGENT; 1. Hibisol **2.**Hibiscrub, **3.** Wall soap, **4.** Bar soap, **5.** None, **6.** Not seen

SURFACES; 1. Palmer only **2.** Dorsal & palmer **3.** Dorsal, palmer & inter-digital **4.** not seen
DRYING; 1. Hands dried thoroughly **2.** Not thoroughly **3.** Not seen **4.** Not relevant

Adapted from D.Gould 1993

Appendix IX: Self-report questionnaire

A QUESTION OF HAND WASHING INTENTIONS

INTRODUCTION

This questionnaire asks what your intentions are towards hand washing and what influences your hand washing behaviour. The term 'hand washing episode', which is used throughout the questionnaire, refers to any occasion when hands should be washed such as before an aseptic technique or after changing a bed and is based on the SGH Infection Control Policy (no.6).

All data gathered in this study will remain anonymous.

GENERAL INSTRUCTIONS

In the questionnaire you will be asked questions that make use of a five-point scale; you are to make a mark at the point that best describes your opinion. For example, if you thought the weather in Glasgow very good it would look like this:

The weather in Glasgow is

good	☑	☐	☐	☐	☐ bad
	Very	quite	neither	quite	very

In making your marks please remember to;

1. Answer all the questions-please don't leave any out.
2. Only tick one box per question.

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☐☐☐
1 2 3

1. I will try my best to hand wash at every hand washing episode

likely ☐ very ☐ quite ☐ neither ☐ quite ☐ very ☐ unlikely ☐4

2. Hand washing at every episode is beneficial to Nurses.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐5

3. Hand washing at every episode is beneficial to patient care.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐6

4. It is necessary to hand wash at every hand washing episode.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐7

5. Nurses could make more effort to hand wash at each hand washing episode.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐8

6. Washing hands at every hand washing episode is an effective way to stop infection being passed between patients.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐9

7. Hand washing is an important part of nursing care.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 10

8. All nurses have a duty to control the spread of infection with thorough attention to hand washing.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 11

9. I intend to wash my hands at every hand washing episode

likely ☐ very ☐ quite ☐ neither ☐ quite ☐ unlikely very ☐ 12

***How good or bad would it be,* in your opinion, if you were to hand wash at every episode and the following happened?**

10. The level of cross infection in the ward was reduced.

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 13
	quite	neither	quite		

11. The incidence of MRSA was reduced.

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 14
	quite	neither	quite		

12. Your hands became sore.

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 15
	quite	neither	quite		

13. You felt cleaner.

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 16
	quite	neither	quite		

14. You had less time for other nursing duties

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 17
	quite	neither	quite		

15. The Trust saved money because infection rates went down.

Good very				Bad very	
☐	☐	☐	☐	☐	☐ 18
	quite	neither	quite		

***How good or bad would it be,* in your opinion, if you were to hand wash at every episode and the following happened?**

16. Patients spent less time in hospital.

Good					Bad	
very	quite	neither	quite	very		☐ 19

17. You had fewer infections yourself.

Good					Bad	
Very	quite	neither	quite	very		☐ 20

18. You had less time to talk to the patients.

Good					Bad	
very	quite	neither	quite	very		☐ 21

19. The incidence of wound infections went down.

Good					Bad	
Very	quite	neither	quite	very		☐ 22

How likely is it, in your opinion, that your hand washing at every hand washing episode *would lead to:*

20. The level of infection on the ward reducing.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 23
very	quite	neither	quite	very	

21. The incidence of MRSA being reduced.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 24
very	quite	neither	quite	very	

22. Your hands becoming sore.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 25
very	quite	neither	quite	very	

23. You feeling cleaner.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 26
Very	quite	neither	quite	very	

24. You having less time for other nursing duties.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 27
very	quite	neither	quite	very	

25. The Trust saving money.

Likely ☐	☐	☐	☐	☐ Unlikely	☐ 28
very	quite	neither	quite	very	

How likely is it, in your opinion, that your hand washing at every hand washing episode *would lead to:*

26. The amount of time patients spend in hospital being reduced.

Likely ☐ ☐ ☐ ☐ ☐ Unlikely ☐ 29
Very quite neither quite very

27. Your chances of picking up an infection being reduced.

Likely ☐ ☐ ☐ ☐ ☐ Unlikely ☐ 30
very quite neither quite very

28. You having less time to talk to patients.

Likely ☐ ☐ ☐ ☐ ☐ Unlikely ☐ 31
very quite neither quite very

29. The number of wound infections on the ward being reduced.

Likely ☐ ☐ ☐ ☐ ☐ Unlikely ☐ 32
very quite neither quite very

30. I am aiming to wash my hands at every hand washing episode

definitely ☐ ☐ ☐ ☐ ☐ definitely not ☐ 33
very quite neither quite very

What do you think other people would like you to do?

Do you think it likely that:

31. Most people who are important to me think that when there is a hand washing episode during my work I should hand-wash.

Likely					Unlikely	
very	quite	neither	quite	very		☐ 34

32. My nursing colleagues think that when there is a hand washing episode during my work I should hand wash

Likely					Unlikely	
very	quite	neither	quite	very		☐ 35

33. The Charge Nurse on my ward thinks that when there is a hand washing episode during my work I should hand wash.

Likely					Unlikely	
very	quite	neither	quite	very		☐ 36

34. The Infection Control Nurse thinks that when there is a hand washing episode during my work I should hand wash.

Likely					Unlikely	
very	quite	neither	quite	very		☐ 37

35. The Director of Nursing thinks that when there is a hand washing episode during my work I should hand wash.

Likely					Unlikely	
very	quite	neither	quite	very		☐ 38

What do you think other people would like you to do?

Do you think it likely that:

36. The Consultants on the ward think that when there is a hand washing episode during my work I should hand wash.

Likely ☐	☐	☐	☐	☐	Unlikely	☐ 39
very	quite	neither	quite	very		

37. The patients on the ward think that when there is a hand washing episode during my work I should hand wash.

Likely ☐	☐	☐	☐	☐	Unlikely	☐ 40
very	quite	neither	quite	very		

38. The patient's relatives think that when there is a hand washing episode during my work I should hand wash.

Likely ☐	☐	☐	☐	☐	Unlikely	☐ 41
very	quite	neither	quite	very		

How much do you agree with these statements?

39. Generally speaking I want to do what most of **my colleagues** think I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 42

40. Generally speaking I want to do what my **Charge Nurse** thinks I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 43

41. Generally speaking I want to do what the **Infection Control Nurse** thinks I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 44

42. Generally speaking I want to do what the **Director of Nursing** thinks I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 45

43. Generally speaking I want to do what the **Consultants** on my ward think I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 46

44. Generally speaking I want to do what the **patients** think I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 47

How much do you agree with these statements?

45. Generally speaking I want to do what the **patient's relatives** think I should do

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐ 48

46. If I was to hand wash at every hand-washing episode most people who are important to me would

☐ strongly approve ☐ approve ☐ neither ☐ disapprove ☐ strongly disapprove ☐ 49

47. Overall, how much control would you say you have over whether you hand wash at every hand washing episode

Very little control				Complete control	
☐	☐	☐	☐	☐	☐ 50
	little	some	a lot		

48. For me to hand wash at every episode is

Easy				Difficult	
☐	☐	☐	☐	☐	☐ 51
very	quite	neither	quite	very	

49. If I wanted to I could hand wash at every episode.

Likely				Unlikely	
☐	☐	☐	☐	☐	☐ 52
Very	quite	neither	quite	very	

50. It is mostly up to me whether or not I wash my hands at every hand washing episode.

☐	☐	☐	☐	☐	☐ 53
strongly agree	agree	neither	disagree	strongly disagree	

51. There is very little I can do to make sure I wash my hands at every hand washing episode.

☐	☐	☐	☐	☐	☐ 54
strongly agree	agree	neither	disagree	strongly disagree	

52. Hand washing at every episode is too demanding for me.

☐	☐	☐	☐	☐	☐ 55
strongly agree	agree	neither	disagree	strongly disagree	

53. Lack of time prevents me washing my hands at every episode.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐56

54. It is inconvenient for me to hand wash at every hand-washing episode.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐57

55. There is always a basin nearby for washing my hands when required.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐58

56. When I am going to wash my hands, I sometimes get distracted to other things.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐59

57. I wash my hands less often when the ward is busy.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐60

58. I wash my hands less often when they are sore.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐61

59. The basins in the ward for hand washing are always easy to get to.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐62

60. The soap and towels on the ward are convenient to use.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐63

61. I wash my hands at every hand washing episode because my knowledge of infection control is up to date.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐64

62. I would find it difficult to change my hand washing behaviour.

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐65

63. Washing my hands is a conscious decision that I make at every hand washing episode

☐ strongly agree ☐ agree ☐ neither ☐ disagree ☐ strongly disagree ☐66

Appendix X: Demographic data

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Please fill in these questions

1. Age

1	2	3	4
☐	☐	☐	☐
21-30	31-40	41-50	51-60

2. Gender

1	2
☐	☐
M	F

3. How many years is it since you finished your nurse training?

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐
1-5	6-10	11-15	16-20	21-25	26-30	>30

4. When did you last have infection control training?

1	2	3	4
☐	☐	☐	☐
0-5yrs	6-10yrs	11-15yrs	never except when?.....)

Appendix XI: Hand hygiene quiz

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Knowledge of hand washing information

For this study it is important to find out how much information nurses have about hand washing. This information is entirely confidential and is only used as data for the study. It is based on the SGH Infection Control Manual (pg 6).

Below is a list of events that would involve hand washing at some point. There are two types of hand washing recognized as appropriate in ward setting. The social hand wash (with liquid soap and water) and the hygienic hand wash (with antiseptic soap e.g. Hibiscrub and water *or* a social hand wash and application of an antiseptic hand rub e.g. Hibisol). Which type of hand wash do you think is most appropriate for each event if at all. (The code and score are for computer analysis).

EVENT Code	*SOCIAL* 1	*HYGIENIC* 2	NOT AT ALL 3	DON'T KNOW 4	Score
Before patient contact					
Before starting work (shift)					
Before an aseptic procedure					
Before commencing the drug round					
Before going home					
After giving a bed bath					
After handling (unsoiled) linen					
After cleaning equipment					
After contact with a patient with MRSA					
After short patient contact eg. Taking temp					

Appendix XII: Audit of hand hygiene facilities tool

Code	YES (1)	NO (2)	N/A (3)	Score
1. Policy guidance available to staff				
2. Sufficient wash hand basins available for staff use				
3. Position of wash hand basins allows for easy access (unobstructed)				
4. Wash hand basins of adequate size				
5. Wash hand basins intact				
6. Wash hand basins have elbow/wrist operated taps				
7. Wash hand basins have mixer taps				
8. Liquid soap or alternative available to all sinks in clinical areas				
9. Dispenser nozzle clean				
10. Paper towels available at all sinks				
11. Hibisol				
Score				

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Appendix XIII: Semi-structured interview schedule.

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1. Were you aware of what was being observed?

2. Information about study
    - Study aims
    - Azjen's Theory
    - Relationship between what nurses intend to do and what they actually do

3. Is hand washing something you think about much when you are at work

4. Do you think you hand wash every time you should?

5. If there were 10 times when you were supposed to hand wash, how many times, out of ten would you actually do it?

6. Will let you know what the findings of this study were.

7. Please don't tell colleagues what the study is about until it is finished.

Appendix XIV: Questionnaire scores by statement

Intention to perform hand hygiene	Very likely	Quite likely	neither	Quite unlikely	Very unlikely
1. I will try my best to hand wash at every hand wash episode.	5	4	3	2	1
Attitude to hand hygiene	Strongly agree	agree	neither	disagree	Strongly disagree
2. Hand washing at every episode is beneficial to nurses.	5	4	3	2	1
3. Hand washing at every episode is beneficial to patients.	5	4	3	2	1
4. It is necessary to hand wash at every episode.	5	4	3	2	1
5. Nurses could make more effort to hand wash at every hand washing episode.	5	4	3	2	1
6. Washing hands at every hand washing episode is an effective way to stop infection being passed between patients	5	4	3	2	1
7. Hand washing is an important part of nursing care.	5	4	3	2	1
8. All nurses have a duty to control the spread of infection with thorough attention to hand washing.	5	4	3	2	1
9. I intend to wash my hands at every hand washing episode.	5	4	3	2	1

Attitude to the act of hand hygiene- Behavioural beliefs					
How good or bad would it be, in your opinion, if you were to hand wash at every episode and the following happened:	Very good	Quite good	Neither	Quite bad	Quite good
10.The level of cross infection in the ward was reduced.	5	4	3	2	1
11. The incidence of MRSA was reduced.	5	4	3	2	1
12. Your hands became sore.	1	2	3	4	5
13. You felt cleaner.	5	4	3	2	1
14. You had less time for other nursing duties.	1	2	3	4	5
15. The trust saved money because the infection rates went down.	5	4	3	2	1
16. Patients spent less time in hospital.	5	4	3	2	1
17. You had fewer infections yourself	5	4	3	2	1
18. You had less time to talk to the patients	1	2	3	4	5
19. The incidence of wound infections went down.	5	4	3	2	1

Attitude to the act of hand hygiene – Outcome evaluations					
How likely is it, in your opinion, that your hand washing at every episode *would lead to*:	Very likely	Quite likely	Neither	Quite unlikely	Very unlikely
20. The level of infection on the ward reducing.	5	4	3	2	1
21. The incidence of MRSA being reduced.	5	4	3	2	1
22. Your hands becoming sore.	1	2	3	4	5
23. You feeling cleaner.	5	4	3	2	1
24. You have less time for other nursing duties.	1	2	3	4	5
25. The trust saving money.	5	4	3	2	1
26. The amount of time patients spend in hospital being reduced.	5	4	3	2	1
27. Your chances of picking up an infection being reduced.	5	4	3	2	1
28. You having less time to talk to patients.	1	2	3	4	5
29. The number of wound infections on the ward being reduced	5	4	3	2	1

Intention to perform hand hygiene	Very definitely	Quite definitely	Neither	Quite definitely not	Very definitely not
30. I am aiming to wash my hands at every hand washing episode.	5	4	3	2	1
Measure of subjective norm	Very likely	Quite likely	Neither	Quite unlikely	Very unlikely
What do you think other people would like you to do? Do you think it likely that:					
31. **Most people** who are important to me think that when there is a hand washing episode during my work I should hand-wash	5	4	3	2	1
Normative belief					
32. **My nursing colleagues** think that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
33. **The charge nurse** on my ward thinks that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
34. **The infection control** nurse thinks that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
35. **The director of nursing** thinks that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
36. **The consultants** on the ward think that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
37. **The patients** on the ward think that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1
38. **The patient's relatives** think that when there is a hand washing episode during my work I should hand wash.	5	4	3	2	1

Motivation to comply	Strongly agree	agree	Neither	disagree	Strongly disagree
How much do you agree with these statements					
39. Generally speaking I want to do what most of **my colleagues** think I should do.	5	4	3	2	1
40. Generally speaking I want to do what my **charge nurse** thinks I should do.	5	4	3	2	1
41. Generally speaking I want to do what the **infection control nurse** thinks I should do.	5	4	3	2	1
42. Generally speaking I want to do what the **director of nursing** thinks I should do.	5	4	3	2	1
43. Generally speaking I want to do what the **consultants** thinks I should do.	5	4	3	2	1
44. Generally speaking I want to do what the **patients** think I should do.	5	4	3	2	1
45. Generally speaking I want to do what the **patient's relatives** think I should do	5	4	3	2	1
	Strongly approve	approve	Neither	Disapprove	Strongly disapprove
46. If I was to hand wash at every hand washing episode **most people who are important to me** would.	5	4	3	2	1
Behavioural control beliefs					
	Very little control	Little control	Some control	A lot of control	Complete control
47. Overall, how much control would you say you have over whether you hand wash at every hand washing episode.	1	2	3	4	5
	Very easy	Quite easy	Neither	Quite difficult	Very difficult
48. For me to hand wash at every episode is	5	4	3	2	1
	Very likely	Quite likely	Neither	Quite unlikely	Very unlikely

49. If I wanted I could hand wash at every episode.	5	4	3	2	1
	Strongly agree	Agree	Neither	Disagree	Strongly disagree
50. It is mostly up to me whether or not I wash my hands at every hand washing episode	5	4	3	2	1
51. There is very little I can do to make sure I wash my hands at every washing episode.	1	2	3	4	5
52. Hand washing at every episode is too demanding for me.	1	2	3	4	5
53. Lack of time prevents me washing my hands at every episode.	1	2	3	4	5
54. It is inconvenient for me to hand wash at every hand washing episode.	1	2	3	4	5
55. There is always a basin nearby for washing hands when required.	5	4	3	2	1
56. When I am going to wash my hands, I sometimes get distracted by other things.	1	2	3	4	5
57. I wash my hands less often when a ward is busy.	1	2	3	4	5
58. I wash my hands less often when they are sore.	1	2	3	4	5
59. The basins in the ward for hand washing are always easy to get to.	5	4	3	2	1
60. The soap and towels on the ward are convenient to use.	5	4	3	2	1
61. I wash my hands at every hand washing episode because my knowledge of infection control is up to date.	5	4	3	2	1
62. I would find it difficult to change my hand washing behaviour.	1	2	3	4	5
63. Washing my hands is a conscious decision that I make at every hand washing episode.	5	4	3	2	1