Infection Prevention and Control: A Psychosocial Model of Influences on Adherence to Standard Precautions

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Doctor of Philosophy

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November 2014
I certify that this thesis, entitled:

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I also certify that any material in this thesis that has been accepted for a degree or diploma by any university or institution is identified in the text.

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<td>AIDS</td>
<td>Acquired Immunodeficiency Syndrome</td>
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<tr>
<td>AIHW</td>
<td>Australian Institute of Health and Welfare</td>
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<td>AMR</td>
<td>Antimicrobial Resistance</td>
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<td>BBV</td>
<td>Blood Borne Virus</td>
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<td>BSI</td>
<td>Body Substance Isolation</td>
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<td>CDC</td>
<td>Centers for Disease Control</td>
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<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
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<td>DOT</td>
<td>Directly Observed Therapy</td>
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<td>DPSS</td>
<td>Disgust Propensity and Sensitivity Scale</td>
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<td>ED</td>
<td>Emergency Department</td>
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<td>EPP</td>
<td>Exposition Prone Procedure</td>
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<td>FIASPS</td>
<td>Factors Influencing Adherence to Standard Precautions Scale</td>
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<td>HBM</td>
<td>Health Belief Model</td>
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<td>HCAI</td>
<td>Healthcare Associated Infections</td>
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<td>HIV</td>
<td>Human immunodeficiency Virus</td>
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<td>ImpSS</td>
<td>Impulsive and Sensation Seeking Scale</td>
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<td>MDR-TB</td>
<td>Multi-drug Resistant Tuberculosis</td>
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<td>MERS-CoV</td>
<td>Middle Eastern Respiratory Syndrome Coronavirus</td>
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<tr>
<td>NDM-I</td>
<td>New Delhi metallo-beta-lactamase-1 producing Enterobacteriaceae</td>
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<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<tr>
<td>OEB</td>
<td>Occupational Exposure to Blood and Body Fluids</td>
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<td>PBC</td>
<td>Perceived Behavioural Control</td>
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<td>PCA</td>
<td>Principal Component Analysis</td>
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<td>PNG</td>
<td>Papua New Guinea</td>
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<tr>
<td>PPE</td>
<td>Personal Protective equipment</td>
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<td>RDH</td>
<td>Royal Darwin Hospital</td>
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<td>RN</td>
<td>Registered Nurse</td>
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<tr>
<td>SARS</td>
<td>Severe Acute Respiratory Syndrome</td>
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<td>SCT</td>
<td>Social Cognitive Theory</td>
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<td>SP</td>
<td>Standard Precautions</td>
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<td>SSS</td>
<td>Sensation Seeking Scale</td>
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<td>TPB</td>
<td>Theory of Planned Behaviour</td>
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<td>TRA</td>
<td>Theory of Reasoned Action</td>
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<tr>
<td>TTM</td>
<td>Trans-Theoretical Model of Health behaviour Change</td>
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<tr>
<td>UP</td>
<td>Universal Precautions</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>XDR-TB</td>
<td>Extensively-Drug resistant Tuberculosis</td>
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<td>ZKPKQ</td>
<td>Zuckerman-Kuhlman Personality Questionnaire</td>
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ABSTRACT

Infection prevention and control is an important component of healthcare delivery. Healthcare workers are potentially exposed to infections on a daily basis which can pose a threat to their health, as well as to the health of patients under their care. Strategies to decrease risks to healthcare workers and to patients alike have been developed in the form of Standard Precautions (SP). The implementation of SP by healthcare workers is far from being systematic and staff often follow an ad-hoc risk assessment of patients, putting themselves and their patients at risk. While researchers have established some of the factors that influence healthcare workers’ adherence to SP, there are no scales designed specifically to assess the factors affecting adherence neither has any theoretical model been used to predict adherence. The aims in this thesis were to: (1) establish the factors that affect healthcare workers and in particular nurses’ and medical doctors’ adherence to SP guidelines; (2) develop and psychometrically test a scale to measure these factors, and (3) test a model of adherence to SP among healthcare workers to further our understanding of the factors which predict their adherence. Study One is a qualitative study of 31 healthcare workers designed to ascertain knowledge of SP guidelines, healthcare workers’ behaviours and the factors influencing their behaviours with respect to adherence. Six males (\(M\) age = 36.83 years; \(SD = 8.93\)) and 25 females (\(M\) age = 41.36 years; \(SD = 10.25\)) were recruited. Seven primary themes emerged from the data. The emergent themes were used to construct a scale to examine the factors influencing adherence to SP. In Study Two, the new scale was administered alongside the Impulsive and Sensation Seeking Scale (ImpSS) using a repeated measure design, to determine the factor structure, internal reliability and convergent
validity of the Factors Influencing Adherence to SP Scale (FIASPS), and to test its temporal stability over a four-week interval. Three hundred and sixty-three participants completed the questionnaires (49 males) at Time One. Principal Component Analysis of the FIASPS revealed five independent factors: Judgement, Leadership, Culture/Practice, Contextual Cues and Justification. There were no gender differences on these five factors however nurses scored higher on Leadership but lower on Justification for non-use and Contextual Cues than medical doctors. Retest data revealed the FIASPS was stable over a four-week interval. In study Three, the factor structure of the FIASPS was confirmed with a sample of 384 participants (53 males) \( M \) age = 43.75; \( SD = 9.74 \). In Study Four, a theoretical model based on an extension of the Theory of Planned Behaviour, factors identified in the literature and the five factors of the FIASPS as predictors of adherence to SP guidelines was tested. Two hundred and fifty participants (31 males) were recruited \( M \) age = 44.40 years; \( SD = 9.60 \). Modifications to the original model yielded a good fit of the data to the model which explained 35% of the variance in adherence to SP. Leadership, Knowledge and Culture/Practice have a direct positive effect on adherence and Justification for not using SP has a direct negative effect. Subjective Norm and Negative Attitude were the only constructs of the TPB to have an effect on adherence, albeit indirectly. Conscientiousness also had a positive indirect effect on adherence via Knowledge. The implications from these studies are discussed, especially the role of education, individual, and organisational factors in promoting adherence to SP as a means of infection control. Limitations of the studies and suggestions for future research are discussed.
CHAPTER ONE

Infection Control, Historical Overview and the Development of Standard Precautions

Infection control has evolved greatly over the last few centuries. Improved hygiene, living standards, the discovery of vaccination, antibiotics and medical progress generally have given rise to hopes that infections and communicable diseases might be fully controlled. Threats from new pathogens as well as resistance to antibiotics and the development of multi-resistant microorganisms have dented such hopes.

The potential for healthcare workers to be exposed to blood borne viruses and other pathogens from patients is a daily risk in most healthcare facilities. Ethical guidelines for registered health professionals dictate that care should be provided without inflicting harm to the patient receiving such care, but at the same time the healthcare worker also needs to be protected (Medical Board of Australia, 2014; Nursing and Midwifery Board of Australia, 2008).

Universal Precaution (UP) guidelines and, subsequently the guidelines they evolved to, Standard Precautions (SP) were developed following the onset of Human Immunodeficiency Virus (HIV) to prevent transmission of this disease from patients to healthcare workers and from healthcare workers to patients.

SP guidelines require contact precautions be taken to minimise risks of exposure to blood and body fluids by the use of Personal Protective Equipment (PPE). SP include the use of appropriate PPE such as gloves, waterproof gowns or aprons, eye protection, and masks as well as safe needle disposal principles and hand hygiene. These precautions, while based on the risk of contact with patients’ body fluids, are to be adopted regardless of whether or not a patient has been diagnosed
with an infection. These precautions have been shown to control infections via reduced viral and microbial transmission from patients to staff and staff to patients (Siegel, Rhinehart, Jackson, & Chiarello, 2007).

The potential cross-transmission of pathogens to patients from healthcare workers increases the burden of disease and adds strain to the healthcare system. This burden includes added bed days for in-patients, increased morbidity and mortality, as well as increased patient stress and anxiety. It is estimated that there are around 200,000 healthcare associated infections annually in acute healthcare facilities across Australia (Cruickshank & Ferguson, 2008). Although estimating the cost of healthcare associated infections is challenging, Graves, Halton, and Robertus (2008) estimated the overall burden from surgical site infections alone to be around $21 million per year.

Healthcare workers who sustain an Occupational Exposure to Blood and Body Fluids (OEB) are at risk of a lifelong infection. Such infections contribute to the global burden of disease via additional healthcare costs, reduced productivity and sick days taken, stress while waiting for test results, and the potential loss of trained staff to the workforce. Although there are no Australian data on costs of exposure to blood borne viruses, in the United States the estimated costs per exposure ranged from US$71 to $4838 depending on the patient source (O’Malley et al., 2007).

Despite the use of SP being mandated by healthcare organisations, there is a wide body of empirical evidence showing that healthcare workers do not always follow these guidelines, potentially putting their patients and themselves at risk of infection. Research informs us that many healthcare workers seem to undertake an ad hoc assessment of the patient before deciding whether or not to implement SP (Cutter & Jordan, 2004, 2012; Knight & Bodsworth, 1998) and that, despite working
in the same conditions with the same level of knowledge, different healthcare
workers will not display the same level of adherence (DeJoy, Murphy, & Gershon,
1995; Gershon et al., 2007).

Researchers have established that factors such as lack of knowledge of the
guidelines, the organisation’s safety climate, lack of availability of PPE, lack of time
or patient/situation assessment have an impact on adherence to SP (Girou et al.,
2004; Reda, Fisseha, Mengistie, & Vandeweerd, 2010; Tait, Voepel-Lewis, Tuttle, &
Malviya, 2000). Attempts to develop instruments to assess healthcare workers’
knowledge of SP (Lam, 2014) and factors influencing adherence to SP have been
made (DeJoy, Searcy, Murphy, & Gershon, 2000; Valim, Marziale, Richart-
Martínez, & Sanjuan-Quiles, 2014), but to date there is no standardised tool to assess
these psychosocial factors. Rabaud et al. (2000) looked at the relationship between
sensation seeking traits and OEB, but aside from this, very little attention has been
given to the role of personality traits in adherence to occupational guidelines in
healthcare. Furthermore research looking at factors affecting adherence is seldom
framed using health behaviour theories.

The aims in the current studies are to investigate the reasons why healthcare
workers fail to adopt guidelines designed to protect them and protect their patients.
A series of studies will be conducted to identify factors influencing adherence, to
develop and test a scale based on this information, and to test a theoretical model of
adherence based on an extension of the Theory of Planned Behaviour (Ajzen &
Madden, 1986).

The results of these studies may have important implications for infection
control among healthcare workers. The findings will inform educational
interventions aimed at increasing adherence to occupational guidelines at the
individual and organisational levels, and enhance knowledge in the area of infection control.

**Infection Control: An Historical Overview**

The World Health Organization (WHO, 2011) estimated that the global burden of Health Care Associated Infections (HCAIs) in 2010 increased patient length of hospital stay from five to 30 additional in-patient days. Many of these HCAIs are preventable (Pittet et al., 2000) and if prevented would reduce both patient and staff trauma and the fiscal costs of associated healthcare. Occupational exposure to pathogens also puts healthcare workers at risk of contracting an infectious pathology, which has cost implications for the individual, the healthcare organisation as well as increasing morbidity and mortality. Measures to prevent infections in both patients and healthcare workers is not a new concept but adherence rates are still less than optimal (Garner, 1996). In this chapter, an overview of the history of hospital infection control will be presented as well as current strategies aimed at protecting healthcare workers and patients.

**Hygiene as a Disease Avoidance Strategy**

Infections were described by the Egyptians as early as 3000 BC (Minnaar, 2008) at which time they were viewed as a punishment brought about by demons. Treatment of disease at that time relied on incantations to ward off such demons in conjunction with medications concocted from substances of human, animal, and/or vegetal origin, and even the use of microorganisms including moulds or chemicals such as lactic acid (Jean & Loyrette, 2001).

The need for personal hygiene was emphasised on papyrus scrolls of the time as early as c.3000 BC (V. Smith, 2007) although no formal links were made between
disease and a lack of personal hygiene. Personal hygiene, also called personal grooming or pampering, was described as central to cleanliness and, according to V. Smith (2007) also to what was to become the practice of medicine. V. Smith argued that these early grooming practices in humans evolved from animal grooming practices which animals use instinctively to get rid of poisonous or unwelcome parasites.

Drainage and toilet structures were also found in Egypt and dated as early as 3000 BC (Minnaar, 2008). These facilities, together with grooming practices and burying the dead, are practices which Curtis (2007) described as “instinctive” disease avoidance strategies, although there is no evidence that a direct link was known at that time.

The practice of personal hygiene has also been reported in Greek history, with V. Smith (2007) arguing that Greek’s personal hygiene was a philosophy of life going far beyond grooming. Personal grooming was performed in the name of Hygeia, the Greek high priestess of health. The contemporary word hygiene derives from the name of this Greek priestess (Macquarie, 2006) which, in turn is derived from the term ‘hygienic wholesomeness’. The original definition of Hygeia, described the “whole and sound (or perfect) human body, set within a whole and sound (or perfect) environment” (V. Smith, 2007, p. 95).

Cleanliness and Healing

The first descriptions of healing and medicine were also rooted in cleanliness with the sick body being described as an impure body (V. Smith, 2007). In Greece, Hippocratic medicine, described from the 5th century BC onwards, used the principles of ‘hygienic wholesomeness’ to extend and enrich the lives of patients
Pre-Hippocratic medicine in Ancient Greece is referred to as priestly Asklepian medicine and it relied on dreams and faith (Bailey, 1996). Physicians practising Asklepian Medicine had close links with religion. Asklepian Medicine was also practised in the Roman Empire and for a longer period of time, from around 1500 BC to 500 AD (Bailey, 1996). Compared to Asklepian Medicine, Hippocratic medicine was based on a rational way of thinking and an holistic approach to patient care which incorporated observation, reasoning and beliefs in the “healing power of Nature” (Marketos, 1997). Both forms of medicine coexisted for a time in Ancient Greece in what was termed Hellenic Medicine.

Despite Hippocratic Medicine being rooted in a rational way of thinking, its practitioners were thought to recognise the divine influence as much as factors such as nature (Marketos, 1997). Bailey (1996) argued that, despite the general belief that modern medicine stems from Hippocratic medicine, Asklepian medicine has had a strong influence on modern society’s expectations in that physicians are expected to practise without regard for the social status of their patients, personal risks or financial gains.

In Roman times (27BC to 500AD), hygiene, sanitation and potable water were considered essential. Large military camps had hospitals, and clean water was provided to towns and cities via aqueducts (Newson, 2004). Despite the emphasis on sanitation and medical care to fend off diseases during the Roman Empire, childhood mortality rates were high and very few working class people lived past 50 years of age (Jackson, 1988). The fall of the Roman Empire also saw a fall in hygiene standards and as a result evil spirits and miasmas were blamed for the occurrence of what are now known as infectious diseases (Selwyn, 1991).
As hygiene facilities in private homes were typically lacking, steam baths and bath houses were reported to be commonplace in Europe in the 12th century. While designed to promote cleanliness, V. Smith (2007) argued that they soon became unsanitary and centres for debauchery. As a result, diseases such as syphilis spread, and this lead to the demise of bath houses by the end of the fifteenth century (Ayliffe & English, 2003).

The Birth of Hospitals and Early Infection Control Measures

Considering the Greeks’ practice of medical hygiene, it is not surprising that Greece was among the first countries to organise hospitals for the care of the sick. According to Selwyn (1991), hospitals were described as early as 500 B.C., and countries including India, Egypt, Palestine and Greece established hospitals much earlier than countries in Christian Europe. Despite the lack of knowledge of the transmission of pathogens at the time, these hospitals were designed specially to allow for plenty of fresh air, with patient bathing and hygiene considered very important (G. Lee & Bishop, 2010).

The first hospitals in the medieval times were found in Syria and Baghdad in the 9th century (Brewer, 2004). Medicine in the Arab world was more advanced than in Europe due to the Koranic prescription for body cleanliness. This prescription permeated through everyday life while the Christian church emphasised the purity of the soul with minimal attention to physical hygiene (Ayliffe & English, 2003). In Christian Europe the first hospitals were not established until the 12th century and these were associated with the church and monasteries (Selwyn, 1991; Thompson & Goldin, 1975). They were very often overcrowded, with several patients in the same bed and reports of more than 50% of inpatient deaths during that time are not
uncommon (G. Lee & Bishop, 2010). Towards the beginning of the 18th century, patients were still nursed six or eight in a bed and it was not until 1739, when the Edinburgh Royal Infirmary was founded, that beds were designed to hold only one person (Selwyn, 1991).

Infection control principles via public health measures were also implemented during the medieval era (Velimirovic & Velimirovic, 1989). Among these were the collection of dead bodies and the establishment of out of town mass graves to bury the victims of disease outbreaks. These public health measures were used at times of plague outbreaks in attempts to avoid the spread of epidemics (P. W. Smith, Watkins, & Hewlett, 2012). Quarantining parts of the city and restricting people’s movements were also measures commonly used during such outbreaks, as it was suspected that there was an element of person to person transmission of the disease (Velimirovic & Velimirovic, 1989). Hospitals of that time are now described as unhealthy environments contributing to infection transmission due to overcrowding which was exacerbated in times of epidemics (Velimirovic & Velimirovic, 1989).

The Study of Hospital Acquired Infections.

The scientific study of hospital acquired infections began early in the 18th century, originating in Scotland with John Pringle whose aim was to prevent infections which were a “common and fatal consequence of a large and crouded [sic] hospital” (cited in Selwyn, 1966, p. 268). Pringle was not alone in this quest and other Scottish scientists’ contributions to the fight against hospital infections are illustrated in Table 1.1.
Table 1.1

Scottish Contributions to Infection Control

<table>
<thead>
<tr>
<th>Pioneer</th>
<th>Dates</th>
<th>Main achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Pringle</td>
<td>1740-1780</td>
<td>Pioneered antiseptics and reformed military hospitals</td>
</tr>
<tr>
<td>James Lind</td>
<td>1745-1790</td>
<td>Eradicated scurvy from naval hospitals, introduced isolation wards</td>
</tr>
<tr>
<td>Francis Home and Thomas Young</td>
<td>c.1750-1780</td>
<td>Appreciated the contagious nature of puerperal fever</td>
</tr>
<tr>
<td>Alexander Hamilton</td>
<td>1760-1800</td>
<td>Wrote observations on puerperal fever</td>
</tr>
<tr>
<td>Alexander Gordon</td>
<td>1790-1795</td>
<td>Established the contagious nature of puerperal fever and preventive measures</td>
</tr>
<tr>
<td>A. Menzies and David Paterson</td>
<td>1790-1798</td>
<td>Trial of air disinfection in hospital ships</td>
</tr>
<tr>
<td>John Bell</td>
<td>1790-1820</td>
<td>Observations on surgical sepsis</td>
</tr>
<tr>
<td>James Y. Simpson</td>
<td>1830-1870</td>
<td>Investigated hospital infections</td>
</tr>
<tr>
<td>Joseph Lister</td>
<td>1860-1900</td>
<td>Antiseptic and aseptic surgery</td>
</tr>
<tr>
<td>Alexander Ogston</td>
<td>1875-1920</td>
<td>Discovered the staphylococcus group</td>
</tr>
<tr>
<td>Watson Cheyne</td>
<td>1875-1925</td>
<td>Set up the first known hospital bacteriological laboratory</td>
</tr>
</tbody>
</table>

Although pioneer efforts occurred prior to Lister (1828-1912), he is one of the more frequently acknowledged contributors to hospital infection control. According to Newson (2002a), Lister’s recognition was based on his successful use of antiseptics during surgery for the treatment of compound leg fractures. Lister based his work on the discoveries of Pasteur who showed that particles in the air, rather than the air itself caused infection as previously assumed (Newson, 2002b). Lister pioneered the practice of antisepsis using lint soaked in carbolic acid which was then applied to post-operative wounds. The earliest citing of such a practice is with “James G.”, an eleven year old boy whose leg had been fractured by a cart wheel. As a result of the treatment with carbolic acid, suppuration of the wound did not occur and a complete cicatrisation was obtained within six weeks which was
very unusual for the period (Lister, 1867a). Lister described four similar cases, again with better than expected outcomes after the carbolic acid treatment, although there were some complications in the second case he described. Lister's work was controversial at the time and criticisms aimed at him were not unlike those that surrounded Semmelweis’ work on hand washing, which occurred around the same time in Austria.

Semmelweis is considered by many as having invented infection control when he averted the transmission of nosocomial infections after instigating a mandatory hand washing policy for medical students and physicians (Best & Neuhauser, 2004). This programme of hand washing stemmed from Semmelweis’ investigations into the high rates of puerperal fever in obstetric wards in Vienna’s university hospital in 1846. Out of three wards caring for pre- and post-partum patients, one run by medical students, one by midwives and one by the Professor, the first had the worst rate of post-partum death secondary to puerperal fever. This higher death rate was attributed to medical students who went from performing autopsies to attending ward patients (Newson, 2001). Semmelweis, through his observations and subsequent trials, established that making all staff and students wash their hands with chlorinated lime after autopsies and before attending deliveries reduced the transmission of puerperal fever. As a result mortality rates dropped from 11.4% to 3% (Dunn, 2004).

The medical establishment at the time did not consider Semmelweis’ findings valid as they went against the theory of miasmas where “a bad component in the air” was considered to be the cause of death of women post-partum (J. T. Miller, Rahimi, & Lee, 2005). It was only after Lister, Koch, and Pasteur provided more evidence for
germ theory and the successful use of antiseptic techniques that Semmelweis’ work was acknowledged (Best & Neuhauser, 2004).

There are however, some controversies around the originality and accuracy of Semmelweis’ work as pointed out by Wainwright (2001). Although Semmelweis is credited with identifying that puerperal fever was transmissible by medical students from cadavers to post-partum women, Holmes (1843) in the United States, had made similar observations three years before Semmelweis’ work was published. As well as the cadaveric transmission of infection, Holmes (1843) also recognised that infections could be transferred between patients: “The disease known as Puerperal Fever is so far contagious as to be frequently carried from patient to patient by physicians and nurses” (p. 3). Semmelweis disagreed with this statement and according to Wainwright (2001), he argued that the cadaveric principle alone where an infection is conveyed by decomposing organic matter was responsible for puerperal fever. Selwyn (1991) noted that many contemporary critics of Semmelweis also had noticed a link between puerperal fever, scarlet fever and erysipelas and that there seemed to also be an airborne element to the transmission of such diseases. While we now know that an airborne element was involved, such a premise lends more credence to Holmes “patient to patient by physicians and nurses” claim than the more direct cadaveric to patient theory of Semmelweis.

Impact of Hospital Environment on Disease

The end of the 19th century was a turning point in hygiene in hospitals. In England, Florence Nightingale published Notes on Nursing (Nightingale, 1860). She argued that there were five essential components to a healthy environment: pure air, pure water, efficient drainage, cleanliness and light. Although Nightingale did not
endorse the germ theory when it came to the origins or transmission of diseases, the sanitary measures she advocated were useful in improving the conditions in healthcare facilities. The implementation of these simple sanitary measures led to reduced mortality rates for nosocomial infections from 50% to 3% (G. Lee & Bishop, 2010; Nightingale, 1860). Those measures included clean linen, fresh air, sewage disposal and hand washing with soap and water. Nightingale also gave advice on hospital design in the same attempt to reduce mortality rates. Drawing on “many years” experience of hospitals in various countries and climates (Nightingale, 1863, p. 7) she was able to identify defects influencing mortality rates in hospitals and also to which hospital specific diseases could be attributed. These “defects” were said to be the agglomeration of the sick under one roof, a lack of space per bed, and a deficiency of fresh air and light, all of which she argued contributed to in-hospital death rates of over 50% (Nightingale, 1863).

Advice on how to reduce the impact of those defects through principles of good hospital construction were detailed by Nightingale (1863). She provided advice on kitchen design, the number of beds per ward, and the minimum space needed between beds, something which is still currently an issue today. Some areas of her work are controversial in terms of current standards around patient safety. For example, Nightingale (1863) advocated wards of 40 patients to allow for one nurse to look after the whole ward rather than contemporary practice of nurses looking after smaller wards.

By 1891, single rooms and isolation wards were recommended when certain cases could endanger other patients or when sharing rooms would be detrimental to patients themselves, such as in cases of hysteria (Burdett, 1891; cited in Thompson and Goldin, 1975). This practice of smaller wards or single rooms to reduce the risk
of nosocomial transmission of infections is still considered beneficial today (Ayliffe & Lowbury, 1982; Chaudhury, Mahmood, & Valente, 2004). Despite subsequent changes in thinking and practice such as ward size, Nightingale’s work was remarkable for the time as she investigated mortality rates and their potential link to hospital design and hygiene.

**London and the Cholera**

While Nightingale remained unconvinced about the germ theory of disease transmission, there was mounting evidence at the time that some diseases were transmitted by faecal-oral transmission (Newson, 2005). In the 1840s, London had undergone some radical transformations: public hygiene was widely promoted and included the provision of clean water and public baths, and encouraging exercise (V. Smith, 2007). Despite the benefits, the mass introduction of water-flushed latrines resulted in an enormous amount of faecal matter being discharged into the Thames. Parallel with the development of water flushed latrines, two competing water companies were supplying water drawn from the Thames to the central district of London (Brody, Rip, Vinten-Johansen, Paneth, & Rachman, 2000).

One company, Southwark and Vauxhall supplied water pumped downstream from where sewage was discharged into the Thames, the other company Lambeth had located its pumping station upstream at a cleaner portion of the river (Brody et al., 2000). Lambeth had relocated this pumping station upstream in 1854 at about the same time that a cholera outbreak began in London (Brody et al., 2000). John Snow, a physician in the Soho district of London, was involved in the investigation of this outbreak of cholera (1854-1855). Snow performed door to door interviews and discovered a greater mortality rate among the people drinking the water supplied by
Southwark and Vauxhall than in the people drinking the water supplied by Lambeth (Paneth, Vinten-Johansen, Brody, & Rip, 1998).

Snow is credited with pioneering geographical epidemiology as during his investigations he produced a cholera spot map, marking the location of houses where death occurred in relation to the placement of pumps and their water source (Brody et al., 2000; Newson, 2005, 2006). From this map, Snow formed the hypothesis that water might be the cause of the outbreak. He noticed that the majority of the deaths was located around the Broad Street water pump where residents reported that the water smelt offensive (Brody et al., 2000). Spread of the cholera was attributed by him to the water from the Broad Street water pump (Newson, 2005).

Snow’s methods enabled him to demonstrate the veracity of his hypothesis that the transmission of cholera to humans was from faecally polluted water (Newson, 2005, 2006). He convinced authorities to remove a pump handle to stop the flow of polluted water and thus the transmission of the disease (McLeod, 2000).

Despite the empirical data provided by Snow to support his conclusions, official investigation by the London authorities reached a different conclusion. They attributed the outbreak to stagnant air due to high barometric pressures, high river water temperatures at night and a lack of wind which, it was argued, resulted in the emanation of clouds of vapour laden with impurities. This conclusion was in keeping with the miasma theory of germ transmission current at that time (Paneth et al., 1998), but ignored the geographical outbreak map produced by Snow and its implications.

Aside from the miasma theory of disease transmission, the contagionist theory argued that specific contagia transmission from one individual to another
were responsible for diseases. A third view was essentially a composite of contagia and miasma in that while diseases were acknowledged to be transmitted by contagia, those contagia could not happen without factors such as atmosphere or soil quality (Rosen, 1958). The miasma theory was weakened further by subsequent discoveries and was supplanted by the germ theory of disease transmission, which is discussed next.

**Germ Identification and Antimicrobial Therapies**

Evidence of the existence of microorganisms was uncovered by Jenner (1798, 1800) in one of the first tests of germ theory. He inoculated healthy individuals with cowpox lesions in an attempt to prevent those individuals being infected with smallpox. Although as early as 1674 Anton Van Leeuwenhoek had observed microbes, dirty water, and even red blood cells in the blood using a microscope (Leettwenhoek, 1686 cited in Dobbel, 1923), it was not until 1876 that a protocol establishing the causal relationship between a microorganism and a clinical disease was developed by Henle and his pupil Koch (Evans, 1976). Four postulates are encompassed in the Henle-Koch protocol, also referred to as the Henle-Koch postulates. Koch’s (1890) work, translated by Rivers (1937), outlined these postulates as:

… if it can be proved: first that the parasite occurs in every case of the disease in question, and under circumstances which can account for the pathological changes and clinical course of the disease; secondly, that it occurs in no other disease as a fortuitous and non-pathogenic parasite; and thirdly, that it, after being fully isolated from the body and repeatedly grown in pure culture, can induce the disease anew; then the occurrence of the
parasite in the disease can no longer be accidental, but in this case no other relation between it and the disease except that the parasite is the cause of the disease can be considered (p. 3).

The postulates were difficult to reproduce for a number of diseases and infectious agents. The inability to grow a number of organisms presumed to be human pathogens and the existence of asymptomatic carriers of disease proved to be difficult to understand at the time and limited the value of the postulates. This led Koch to not recommend them as rigid criteria (Evans, 1976). Virological agents, much smaller than bacteria, could not be seen with the microscopes of the time and their consideration in the postulates did not occur until 1937 (Rivers, 1937). The formal identification by Lister, Koch and Pasteur that microorganisms were responsible for the transmission of infections (Best & Neuhauser, 2004; Newson, 2002b), led to the discovery of substances which act on these microorganisms.

Ehrlich, a chemist, studied histological staining in order to visualise microorganisms and to help with the diagnosis of infections (Gensini, Conti, & Lippi, 2007). Applying the concepts of chemical affinity for chemical tissues, Ehrlich used a process which involved testing more than 900 chemicals on mice. He discovered in 1909 what was referred to as a “magic bullet”, that is, a chemical able to specifically destroy tumour cells and microorganisms without killing the patient (Gensini et al., 2007). He coined the term chemotherapy (Blair, 2007; Schwartz, 2004). He also discovered an arsenic compound capable of killing the microorganism *Treponema pallidum*, the spirochete responsible for syphilis (Blair, 2007). While those compounds are now considered toxic, they were the first antibacterial medications available (Gensini et al., 2007).
The second antibiotic of importance was discovered by Domagk in the 1930s. The molecule sulfonamidochrysoidine from the sulphonamide family was originally developed in 1932 as a cell dye but was also found to be effective against some bacterial infections when administered to mice (Jayaraman, 2009). In 1935 Domagk’s daughter was seriously ill with a streptococcal infection and in desperation he administered the drug to her. As the first human to receive the drug, she made a miraculous recovery and the drug was used subsequently to treat puerperal infections and scarlet fever with very good results (Iyer, 2008). It was also found to be effective against other bacterial infections (Stanwell-Smith, 2007) and sulphonamides are still used widely today (Jayaraman, 2009).

The discovery of penicillin constituted a revolution in the fight against infections. While the antibiotic penicillin was discovered in 1928 by Alexander Fleming (Davies & Davies, 2010), its therapeutic value was not realised until 1940, when its use revolutionised the treatment of infections in soldiers wounded during World War II (Hewitt, 1967; G. Lee & Bishop, 2010). Penicillin was described then as a wonder drug and it seemed that there were no limits in sight following the discovery of this antibiotic. Limits to its efficacy were quickly discovered in the form of antimicrobial resistance discussed next.

**Threats to Antimicrobial Therapy: the Emergence of Resistance**

While the discovery of antibiotics allowed for a perception that every infectious condition was curable and that transmission based precautions did not need to be as stringent as before (Zuckerman, Kolin, Price, & Zoob, 1964), the rise of antibiotic resistance paralleled the discovery of antibiotics. Early warnings by Alexander Fleming that inappropriate use of penicillin could lead to the selection of
resistant “mutant forms” of *Staphylococcus aureus*, potentially leading to more serious infections were largely ignored (Alanis, 2005). A year after the use of antibiotics became widespread, it was reported that nearly 50% of the microorganisms targeted were no longer susceptible to penicillin (Alanis, 2005).

Resistance to antibiotics in the first 25 years after their introduction was only seen in hospitals and those resistant bacteria were a threat to hospitalised patients who were often immunosuppressed and vulnerable (Alanis, 2005). Antibiotic resistance is now seen outside healthcare facilities with cases of infections resistant to antibiotics diagnosed in the community (Lowy, 1998). Despite these early warning signs on antibiotic resistance and it spread into the community, in 1969 the US Surgeon General claimed that the book on infectious diseases could be closed (Stanwell-Smith, 2007).

The golden era of antibiotics was to end in the 1980s, with more and more concerns about resistant microorganisms. Since then, a multitude of new antibiotics has been developed alongside good prescribing guidelines and infection control practices in order to try to overcome resistance. These guidelines have been key in managing resistance, nosocomial infections and limiting the transmission of new or re-emerging infections (Neely & Holder, 1999; Tseng, Lee, Lin, Chang, & Chang, 2011). Antibiotic resistance remains a major problem. The main threats posed by antimicrobial resistance are detailed next.

**Antimicrobial Resistance**

Antimicrobial resistance (AMR) was described by the World Health Organization (WHO, 2012) as a major public health concern worldwide. With increasing levels of resistance seen in healthcare facilities and in the community
generally, estimates show that excess mortality due to resistant bacterial infections exceeds 25,000 annually in Europe, which is double the mortality rate following infection with a microorganism susceptible to antibiotics (Gould, 2009). Excess care costs from such cases and productivity loses are estimated to be in excess of 1.5 billion Euros each year, approximately A$1.86 billion (WHO, 2012).

AMR has been described as the “sharp end of the Darwinian natural selection” (Salmond & Welch, 2008, p. S97). Overuse of antibiotics has enabled the selection and dissemination of bacteria with genes that afford them drug resistance. An illustration of the overuse of antibiotics and pathogens’ adaptation to them is the rise of the New Delhi metallo-beta-lactamase-1 producing Enterobacteriaceae (NDM-I), a bacteria genetically selected by incomplete and inadequate antibiotic treatment. Those multi-drug resistant microorganisms are of concern due to their increased incidence worldwide and because there are very few treatment options available to counteract them (Hasan, Drobn, Drobn, Alam, & Olsen, 2012; Matteelli et al., 2007). This overuse would not constitute such a problem if new antibiotics were continually researched, developed and available, but the cost of developing a new antibiotic is around A$800 million or more. This cost is not seen by the pharmaceutical industry as allowing profits to be made from the commercialisation of such drugs in the short-term (Salmond & Welch, 2008). Furthermore, concerns about the safety and lower efficacy than predicted of newly developed antibiotics have also been a deterrent to companies developing new antimicrobial agents (Alanis, 2005). The lack of new antibiotics highlights not just the need for their judicious use but also the need to look at other strategies to enhance infection control.
Alongside overuse of antibiotics, resistant microorganisms can also develop as a result of patients’ poor adherence to treatment regimens (Tseng et al., 2011). Poor adherence is well illustrated by the rise of multi-drug resistant tuberculosis, MDR-TB that is, tuberculosis resistant to isoniazid and rifampicin, and extensively drug resistant tuberculosis XDR-TB that is, tuberculosis with the same characteristics as MDR-TB but also resistant to at least three of the second line anti TB drugs (Jain & Dixit, 2008).

While the incidence of tuberculosis resistance is fairly low in Australia, with 24 cases reported in 2007 out of a 872 confirmed cases of tuberculosis (Simpson, 2011), more than half of those 24 cases originated from the Torres Strait Islands. The geographical location of the cases is a public health concern for Australia as the neighbouring Western Province of Papua New Guinea (PNG) accesses Australian healthcare without the need for their citizens to travel with a visa. The incidence of MDR-TB in the Western Province of PNG is around 26%, a much higher incidence than seen in Australia (Simpson et al., 2011). Of greater concern is that the majority of these cases were acquired as MDR-TB which is resistant to standard treatment (Simpson et al., 2011). XDR-TB, which is resistant to both first and second line treatment started to appear in 2006 (Matteelli et al., 2007) and its reported prevalence in the Asia Pacific region is around 1.5% with the potential to increase if treatment regimens of MDR-TB are not adhered to (Jain & Dixit, 2008).

In the treatment of tuberculosis, one approach to improving adherence, is Directly Observed Therapy (DOT). DOT enables adherence to be monitored by healthcare workers to ensure patients complete their anti-tuberculosis treatment, thus minimising the risk of developing resistance (Jain & Dixit, 2008). The problem of not achieving total adherence among ambulatory patients treated for tuberculosis
was highlighted first by Fox (1958) in a study conducted in Madras, South East India. Fox showed that in the first six months of treatment 4.4% of the patients missed at least one dose a month. Fox suggested that more research on the impact of omitting anti-tuberculosis medication is needed to ascertain the long-term effects.

By the early 1960s, research emerged (Fox, 1958, 1962; Stradling & Poole, 1963) which emphasised the need for DOT for treatments to be efficient (Bayer & Wilkinson, 1995). DOT is now one of the main strategies in the treatment of tuberculosis, both MDR-TB and XDR-TB (Volmink & Garner, 2009). However a systematic review of empirical studies published by Volmink and Garner highlighted the lack of rigorous assurance that DOT improves cure or treatment completion in people with latent tuberculosis from low and middle income countries.

Extending the DOT strategies to all antibiotic use would be unachievable as it would not only increase healthcare costs but would also require a dramatic change in healthcare philosophy accepted by patients. Other strategies to tackle resistance have been described by the World Health Organization (2012) such as surveillance of microbial resistance patterns, antimicrobial use, rational antimicrobial use and regulation, antimicrobial use in animal husbandry, political commitment and infection prevention and control. Infection control practices across the 20th century are described next.

**Aseptic Nursing**

While infection control measures started to be seen as largely redundant after the birth of antibiotics, they were very much paramount before the discovery of antibiotics and alongside the apparition of gloves. Infection control measures such as isolation were common during plague epidemics with patients quarantined in their
homes (Velimirovic & Velimirovic, 1989). After hospitals became more widespread, patients suspected to have the same disease were placed in the same hospital rooms away from other patients (Selwyn, 1991). Alongside these isolation precautions, patients suspected of having an infectious disease were subjected to “fever nursing”. ‘Fever nursing’ (or aseptic nursing) was first described towards the end of the 19th century and was one of the first steps towards standardised infection control guidelines (Richardson, 1915) and contributed to a decrease in the rate of cross transmission of disease (Richardson, 1915).

Richardson (1915) described two efficient methods of aseptic nursing based on the work of Grancher in Paris: the cubicle system, aimed at isolating patients by placing them in single rooms, and the barrier system where patients were isolated from others while in the same room. Cards were placed on individual patient’s beds to highlight the appropriate isolation techniques to be adopted when caring for them (M. Jackson & Lynch, 1985). The cross-infection rate following the implementation of those measures is reported to have been less than 2% (Jackson & Lynch, 1985).

The beginning of the 20th century not only saw a renewed interest in the prevention of infection transmission to staff and between patients but also the opening of a large number of hospitals for the treatment of infectious diseases (Selwyn, 1991). Home care was also advocated in order to reserve hospital beds for the more seriously ill patients (Tucker, 1921). While isolation nursing and personal protection equipment such as gloves and masks use continued to increase over the 20th century (M. Jackson & Lynch, 1985), there was no systematic use either advocated or adopted and very often precautions were used only for patients diagnosed with communicable diseases (I. B. Smith, 1924).
It was not until 1968 that the American Hospital Association (AHA) published the first infection control manual for hospitals (AHA, 1968). This publication detailed precautions for the containment of contagious infectious diseases and emphasised the need for staff to use masks, gloves and gowns (AHA, 1968). Those precautions were reinforced by the publication of isolation guidelines by the United States National Communicable Disease Center (1970), now named the Centers for Disease Control (CDC). These guidelines described several types of isolation and included the use of PPE by healthcare workers (USNCDC, 1970).

These guidelines on PPE were revised in 1975 (CDC, 1975). The need for the systematic use of antimicrobial soap when washing hands was removed and the use of traditional soap advocated, as well as some recommendations for the protective isolation of patients. The 1975 guidelines were updated in 1985 and the need to use PPE in certain circumstances was included mostly when patients were suspected of having an infectious disease or had already been diagnosed with an infectious disease (M. Jackson & Lynch, 1985).

**Glove Use and Infection Control**

As mentioned, a major innovation in infection control was the introduction of latex gloves to reduce risk to both staff and patients. Glove use is now a key element in PPE. Ellis (2008) noted that glove usage in medicine had occurred as early as 1758 when they were made from sheep’s caecum and used as a partial hand covering in obstetric practice (Ellis, 2008). Gloves were used then to protect surgeons’ hands from injuries during operations and autopsies rather than any form of infection control. They were later made from cotton, silk or leather before rubber became available in 1844, although their usage remained sporadic at that time (Ellis, 2008).
Routine glove usage during surgery is reported to have started in 1897 when Jan Mikulicz pioneered the use of gloves and face masks in the operating theatre (Lathan, 2010) to protect surgeons. Surgeons’ use of rubber gloves during surgery became widespread as an alternative to Lister's method of hand decontamination with carbolic acid which was an extreme irritant to the skin (Lister, 1867b; Newson, 2002a). While glove use did serve a dual purpose to protect staff and patients, their use only became widespread to protect healthcare workers’ hands.

Glove use to protect the patient against infections was first advocated by a surgeon, William Halsted, in 1899 (Ellis, 2010) following a report on over 450 hernia operations where those surgeons wearing gloves showed a near 100% decrease in post-surgical infections compared with those who did not wear gloves (Lathan, 2010). It was not until 1957, that glove usage in areas other than operating theatres was advocated in conjunction with hand washing, in circumstances where gross contamination of hands by microorganisms was anticipated (Benson, 1957).

The emergence of the Human Immunodeficiency Virus (HIV) in the 1980s led healthcare professionals and organisations to reconsider their position and behaviours with regard to PPE.

**HIV and the Paradigm Shift**

The threat posed by communicable diseases had lessened quite considerably in industrialised countries over the course of the 20th century. This decrease in communicable disease mortality rates has been attributed to improvements in hygiene, the introduction of antibiotics, widespread immunisation campaigns, the progress of medical knowledge and skills and rising living standards (Zuckerman et al., 1964). The introduction of aseptic nursing, glove use and isolation precautions
also contributed to a lower incidence of communicable diseases. Mortality rates secondary to communicable disease in Australia decreased from 258.9 deaths per 100,000 population in 1907 to 7.2 deaths per 100,000 population in 1987 (Kammerlind, Dahlgaard, & Rutberg, 2004). Similarly, decreased mortality rates were seen in most other industrialised countries with a trend reversal however, in the USA from 1981 for a 15 year period, where death from infectious diseases increased in association with the emergence of Acquired Immunodeficiency Syndrome (AIDS), although that trend reversal was not seen in Australia (Kammerlind et al., 2004).

The first cases of AIDS were described in 1981 in California (Gottlieb et al., 1981), although evidence suggests that the syndrome might have appeared before and was silently spreading between the 1970s and 1981 (Gallo, 2006; Gottlieb et al., 1981; Greenbaum, 1993).

With the emergence of AIDS, the threat of infectious disease reappeared in countries where it had previously lessened dramatically and a complete change in the philosophy of occupational protection for healthcare workers was about to take place. The retrovirus causing AIDS was identified in 1982 by Gallo and Montagnier (2003) and was originally named Human T-Cell Leukaemia Virus III (HTLV III) or Lymphadenopathy Associated Virus (LAV) as it was thought that the AIDS retrovirus was not caused by a new retrovirus but from one of the already known HTLVs (Gallo, 2006). Transmission modes still remained uncertain at that time (Centers for Disease Control, 1982a).

HIV was formally discovered as the cause of AIDS between 1983 and 1984 (Wain-Hobson et al., 1991). As described previously, the CDC (1975, 1983) was
instrumental in devising hospital infection control and isolation guidelines to prevent the spread of infection from patient to patient. Further to the historical developments previously discussed, the onset of AIDS fostered another paradigm shift in infection control. Healthcare workers were faced with the threat of potentially contracting a deadly disease of uncertain transmission mode and new strategies were needed. These strategies started to appear from 1985 following reports of actual transmission of HIV from patients to healthcare workers (Centers for Disease Control, 1985; Garner, 1996).

Semmelweis and the majority of the researchers involved in the early work on infection control focussed on reducing the transmission of pathogens to patients. While they also addressed the cross transmission of pathogens between patients, the anticipated epidemic of AIDS in the 1980s onwards shifted this focus to healthcare workers in attempts to protect them from infection of an uncertain transmission mode (Garner, 1996). The first recommendations for what were to become Universal Precautions (UP) were issued in 1985 by the CDC (1985) in order to protect healthcare workers. These guidelines and subsequent developments will be discussed next.

The Development of Standard Precautions

The onset of a new disease now known as Acquired Immunodeficiency Syndrome (AIDS) caused by the Human Immunodeficiency Virus (HIV) in the early 1980s prompted the development of new infection control guidelines to protect healthcare workers. These guidelines were primarily designed to prevent the transmission of blood borne viruses (BBV) from patients to healthcare workers.
Although not the focus at the time, the guidelines also afforded patient protection by reducing cross-transmission of pathogens from healthcare workers to other patients.

In this section, a comprehensive review of the evolution of the guidelines protecting staff and patients will be considered, the latest guidelines presented, alongside an evaluation of the efficacy of the guidelines in preventing transmission of blood borne pathogens to healthcare workers. It is however, important to first consider the transmission risk of pathogens to healthcare workers from patients, as it was the fear of widespread transmission which sparked the introduction of new guidelines.

**Risks of Pathogen Transmission to Healthcare Workers**

Exposure to a BBV is a serious risk to healthcare workers’ wellbeing. As many as 26 pathogens have been shown to be responsible for the contamination of healthcare workers following OEB and body fluids (Collins & Kennedy, 1987). Three viruses alone: HIV, Hepatitis C Virus and Hepatitis B Virus account for most cases of occupational infection and they also cause the most severe infections (Tarantola, Abiteboul, & Rachline, 2006).

BBVs do not spontaneously penetrate intact skin. Rather, an accidental breach via a needlestick or sharp injury or by a direct inoculation of virus into cutaneous scratches, skin lesions or mucosal surfaces is needed for transmission to occur (Beltrami, Williams, Shapiro, & Chamberland, 2000).

**Human Immunodeficiency Virus.** Infection with HIV in the absence of treatment evolves into AIDS over time (Tenant-Flowers & Mindel, 2012); a range of diseases from primary HIV infection to diseases associated with immunosuppression
can ensue and will result in death. While the first cases of HIV were described in 1981 (Gottlieb et al., 1981), the first transmission of HIV to a healthcare worker was not documented until 1984 (Anonymous, 1984). The transmission occurred post a needlestick injury while the worker was recapping a needle containing fresh blood from an arterial puncture.

Although needlestick and sharp injuries are deemed to be the most common injuries incurred by health workers during the course of their occupation, it has been difficult to ascertain the transmission risk of BBV from those injuries due to widespread underreporting of occupational injuries (Elder & Paterson, 2006). In a review of some percutaneous injuries in healthcare workers caring for HIV patients, Cardo et al. (1997) determined that a deep injury, procedures involving needles in arteries or veins, blood visible on the device, and terminal illness in source patients were all significant risk factors for HIV transmission post occupational exposure. In a case control study, Cardo et al. examined 33 confirmed HIV transmissions and 665 controls. Of these, 23 injuries took place in the United States, five in France, three in the UK and two in Italy. Cardo et al. estimated that the risk of transmission of HIV was higher than the average risk of .3% for exposure involving large quantities of blood.

The risk of acquiring HIV from an occupational exposure is of course linked to HIV seroprevalence in the patient population and those rates are subject to wide variations according to geographical locations (Beltrami et al., 2000). Rates between .15% and 6% have been described in the literature although estimation of seroprevalence rates can be difficult to ascertain due to the lack of systematic testing of patients (Beltrami et al., 2000; Kelen et al., 1988). HIV prevalence rates in Australia have been estimated to be between 39% for homosexual male intravenous
drug users, 9.1% in male homosexuals in the Sydney area, and .05% in heterosexual blood donors, with a total prevalence rate in the Australian population of 115 per 100,000 of the population aged 15 to 49 years (The Kirby Institute, 2013).

As well as being influenced by seroprevalence, risks of occupational transmission are also linked to the source patient viral load (Hewagama, Krishnaswamy, King, Davis, & Baird, 2014). Transmission of HIV from a patient with an undetectable viral load is estimated to be very low (Kuhar et al., 2013). Transmission risks post occupational exposure are now estimated to be between .03% in the case of a needlestick injury to .009% following a mucosal exposure (Kuhar et al., 2013). The use of Post Exposure Prophylaxis with anti-retroviral drugs for these needlestick injuries has been recommended since 1990 (Centers for Disease Control) and has been shown to reduce seroconversion after inoculation injuries where the source patient was HIV positive (Kuhar et al., 2013).

While it is difficult to find up to date numbers of HIV acquisitions post occupational exposure, worldwide 106 seroconversions had been documented as of December 2002 with a further 238 possible cases (Health Protection Agency, 2002; Tarantola et al., 2006). Only one case had been documented in Australia as at the end of 2012 (The Kirby Institute, 2013). Underreporting of injuries and non-completion of post exposure follow up might however, produce an underestimate of occupational exposures (Beltrami et al., 2000). Underreporting as a probable influence on the validity of these statistics is supported by the fact that no seroconversions have been reported from Africa despite the high prevalence of HIV there (Tarantola et al., 2006).
**Hepatitis B Virus.** The first recorded case of serum hepatitis was described in 1833 and it is hypothesised that it was due to the virus now known as Hepatitis B Virus (Robinson, 2000). The first recorded occupational exposure in a healthcare worker was described in 1949 in a blood bank nurse: Hepatitis B Virus being the disease first recognised as posing an occupational risk (Leibowitz, Greenwald, Cohen, & Litwins, 1949).

Several patterns of Hepatitis B Virus infection have been described since then with most primary infection in healthy adults being self-limiting and resolving within six months of onset. Some infections however, fail to be self-limiting and can persist for years, causing chronic hepatitis B, with an increased risks of chronic liver disease and hepatocellular carcinoma (Robinson, 2000). Hepatitis B Virus also has the unique feature of being continuously present in the blood in a viral form in almost all patients during active infections, thus increasing the risk of infection for those coming into contact with infected blood (Robinson, 2000).

The prevalence rate of Hepatitis B Virus in the Australian population is estimated to be .97% (The Kirby Institute, 2013). The risk of transmission varies from 6% to 40% depending of the “e antigen” status of the patient source (Gerberding, 1995). Before vaccination became widespread in Australia, Hepatitis B Virus markers were found to be much higher in the Australian healthcare worker population than in the general population, suggesting that exposures leading to infection were common (Radvan, Allworth, & Hardy, 1984).

Hepatitis B Virus is also the only one of the three most prevalent BBV to have a vaccine available. The vaccine became available in 1982 (Sepkowitz, 2000) and its widespread availability and use in healthcare workers enabled a 90%
decrease in the number of reported infections post occupational exposure between 1982 and 1994 (Sepkowitz, 2000). Some individuals however, remain at risk of infection post occupational exposure due to not responding to vaccination or not reporting the incident if not vaccinated (Gerberding, 1995). Vaccination and post exposure treatment have been shown to be effective in preventing infections in most healthcare workers although non-responders to vaccination require Hepatitis B Virus hyperimmune globulin after each exposure to the virus (Gerberding, 1995).

**Hepatitis C Virus.** Infection with Hepatitis C Virus can lead to hepatic inflammation with the major consequence of a persistent infection being the development of life threatening liver cirrhosis and an increased risk of hepatocellular carcinoma (Thomas & Lemon, 2014). The Hepatitis C Virus prevalence rate in the Australian population is estimated at 1.4% (The Kirby Institute, 2013). Transmission rates of Hepatitis C Virus from a Hepatitis C Virus positive source patient to healthcare workers are estimated to be around 1.8%, ranging from 0 to 7%. Most of the reported exposures have occurred through needlestick and sharp injuries or through patients’ blood or body fluid coming in contact with the workers’ mucosa. No trans-cutaneous infections have been documented (Beltrami et al., 2000). Seroconversion rate for occupational exposure to Hepatitis C Virus is high at around 35%. The seroconversion rate for HIV in the same circumstances is estimated to be around 8% (Health Protection Agency, 2006).

There are currently no vaccines for Hepatitis C Virus or any post-exposure prophylaxis that could reduce the risk for healthcare workers of acquiring a Hepatitis C infection. Furthermore, seroconversion is silent in 85% of the cases (Health Protection Agency [HPA], 2012), making it essential that healthcare workers report any injuries to enable a follow-up. This reporting allows prompt instigation of
treatment post seroconversion with treatment shown to clear 17 of 20 cases in a sample of UK healthcare workers (HPA, 2012).

**Blood-Borne Viruses Transmission from Healthcare Workers to Patients**

As well as BBVs being an occupational risk to healthcare workers, transmissions of BBVs from healthcare workers to patients have also been documented. At least 47 instances of Hepatitis B Virus transmissions were reported worldwide from health workers to patients between 1972 and 1997 (Sepkowitz, 2000). A cardiac surgeon in Spain was responsible for transmitting Hepatitis C Virus to five patients during surgery (Esteban et al., 1996) and at least 217 patients in Spain were suspected of having been infected by an anaesthetist over a five year period (Bosch, 1998). More recently an anaesthetist in Australia infected 55 women with Hepatitis C Virus (Russel, 2013). HIV transmissions from an infected healthcare provider to a patient have been reported in two instances one in the USA and one in France (Sepkowitz, 2000).

Although occupational transmission of Hepatitis B Virus has been described since 1949, it was not until the emergence of HIV that healthcare organisations were forced to react to put workers’ protection in focus (Garner, 1996). Strategies to minimise the risks of transmission of BBVs in healthcare settings, strategies and guidelines were implemented.

**Preventing Exposure to Blood and Body Fluids in Healthcare Settings**

More universal/systematic attempts to enhance infection control and prevent healthcare workers exposure to pathogens from patients were prompted by reports which emanated in the early 1980s. Among these was an unexpected pulmonary
infection (*Pneumocystis carinii*, now reclassified as *Pneumocystis jirovecii*) in five young and otherwise healthy male homosexuals which occurred over a period of seven months, in the USA. These infections resulted in the death of two of these patients and are the first reported cases of what was to become the AIDS epidemic (Centers for Disease Control, 1981b). This report was followed by further accounts, in otherwise young and healthy male homosexuals, of diseases seen almost exclusively in immunosuppressed individuals such as Kaposi’s Sarcoma and unexplained generalised lymphadenopathy (Centers for Disease Control, 1981a, 1981b, 1982b). When further cases of *Pneumocystis carinii* (or *Pneumocystis jirovecii*) were reported among intravenous drug users and haemophiliac patients receiving regular blood transfusions (Centers for Disease Control, 1982c, 1982d, 1982e), transmission by an infectious agent was suspected and the first recommendations for the protection of clinical and laboratory staff were issued by the CDC in the USA (1982a). The same precautions as those used to prevent the spread of Hepatitis B Virus in healthcare settings were advocated given that similar patterns of transmission had been noticed. It was deemed unlikely that the spread of AIDS occurred through airborne or casual contact modes, as there was no evidence of transmission from patient to healthcare worker. The CDC (1982) recommended:

> Specifically, patient-care and laboratory personnel should take precautions to avoid direct contact of skin and mucous membranes with blood, blood products, excretions, secretions, and tissues of persons judged likely to have AIDS (p. 577).

These first recommendations required healthcare workers to display a level of judgement and assess situations before implementing some of the recommendations. Precautions involved the use of PPE such as gloves, gowns, hand washing, needle
safety measures, the use of disposable syringes and the need to label blood and other specimens with prominent special warnings alerting others to the risk of infection.

The CDC altered the recommendations in 1985 (Centers for Disease Control, 1985) based on epidemiological consideration of suspected transmission modes and past experience with hepatitis viruses. The routine implementation of the guidelines by all healthcare workers was recommended alongside the assumption that blood and body fluids should always be regarded as infectious and any individual should always be considered as potentially infectious. These changes removed the patient judgement element present in the original guidelines. The 1985 guidelines outlined: (1) sharp handling principles to minimise risks of injuries, (2) sharp disposal principles, (3) use of gloves and gowns and expanded the use of PPE to include using masks and eye coverings to prevent mucous membrane exposure during certain procedures that could expose healthcare workers to patient’s body fluids, (4) the strategic location of emergency ventilation devices to avoid the need for mouth-to-mouth resuscitation, and (5) calls for greater familiarisation of pregnant healthcare workers with the guidelines as there is an increased risk of perinatal transmission of the virus if a healthcare worker becomes infected during pregnancy. Furthermore, the CDC emphasised that routine serological testing of patients was not recommended. Some recommendations to minimise the transmission risk from healthcare workers to patients were also included in these guidelines. Healthcare workers not performing invasive procedures did not need to be restricted from working in healthcare facilities or be tested for the virus thought to cause AIDS. Some uncertainties remained however, especially in regards to the testing of workers performing invasive procedures, although no definitive answer or recommendations
were made at that time. The guidelines were reviewed again in 1987 (Centers for Disease Control, 1987) and the term Universal Precautions (UP) was formalised.

The UP guidelines (CDC, 1987) outlined the routine use of appropriate barrier precautions by all healthcare workers to prevent skin and mucous membranes becoming exposed to blood and other body fluids during patient contact. Gloves, protective eyewear, or face shields should be worn whenever there is an anticipated risk of contact with body fluids or when the procedure is likely to generate droplets of blood or other body fluids (CDC, 1987). Other fluids implicated in the transmission of HIV, Hepatitis B Virus and other blood borne pathogens that are covered by UP are cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial and amniotic fluid; while faeces, sputum, sweat, tears, urine and vomitus are not covered unless they are visibly tainted with blood (Centers for Disease Control, 1988).

UP were not intended to replace any necessary isolation precautions in place at the time but were to be implemented in addition to isolation precautions (CDC, 1987). At around the same time, Lynch, Jackson, Cummings, and Stamm (1987) were investigating alternative models of isolation precautions to prevent the nosocomial transmission of pathogens from healthcare workers to patients and vice versa that they called Body Substance Isolation (BSI; Lynch et al., 1987).

The BSI approach focuses on the isolation of potentially infectious body substances through the implementation of barrier precautions using PPE (Garner & Hughes, 1987; Lynch et al., 1987). Lynch et al. recommended that gloves be worn for anticipated contact with patients’ blood, secretions, mucous membranes, non-intact skin and most body substances. Hand washing was also advocated and
additional barrier precautions such as gowns, aprons, masks and goggles were to be used when there is a potential for blood or body fluid to soil or splash the skin, and/or the mucosa (Lynch et al., 1987). The BSI guidelines also called for needle management where needles and sharp instruments should be disposed of in “puncture-resistant, rigid containers” (p.245) without being recapped, and the use of single private rooms for patients when they have a disease involving airborne transmission (Lynch et al., 1987).

BSI and UP were very similar and, faced with several sets of infection control guidelines in regard to the protection of patients and staff, healthcare institutions were inconsistent in their adoption of guidelines (Garner, 1996). The CDC saw a need for new isolation guidelines which incorporated the major features of UP and BSI. Accordingly, a new set of guidelines named SP was designed (Garner, 1996; The Hospital Infection Control Practices Advisory Committee, Centers for Disease Control and Prevention, Public Health Service, & U. S. Department of Health and Human Services, 1996). Those guidelines were updated in 2007 (Siegel et al., 2007) to take into account other healthcare settings besides hospitals.

The updated guidelines emphasised the need for SP as a successful foundation for preventing the transmission of infectious agents, they also encompassed the emergence of new pathogens and the continued increase in the incidence of healthcare associated infections caused by multi-drug resistant organisms. Respiratory hygiene/cough etiquette as well as safe injection practices were added to the SP guidelines (Siegel et al., 2007) as a response to the transmission of the coronavirus during the Severe Acute Respiratory Syndrome (SARS) epidemic in 2003-2003, and the continued outbreaks of Hepatitis B Virus
and Hepatitis C Virus. More recently, concern caused by the emergence of more cases of Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) prompted the CDC to issue further guidance to handle confirmed and suspected cases MERS-CoV, with calls for the implementation of SP to be supplemented with contact and airborne precautions (Centers for Disease Control, 2014b). A summary of the current SP guidelines is presented in Table 1.2.

**Table 1.2.**

<table>
<thead>
<tr>
<th>Summary of Standard Precaution Guidelines</th>
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<tr>
<td><strong>Components</strong></td>
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<td>-------------------------------------------</td>
</tr>
<tr>
<td>Hand Hygiene</td>
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<tr>
<td>Procedure gloves</td>
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<tr>
<td>Impermeable gowns</td>
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<tr>
<td>Masks, eye protection and/or facial protection</td>
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<tr>
<td>Safe practices in the handling of piercing and cutting objects</td>
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<tr>
<td>Environmental cleaning and disinfection measures</td>
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<tr>
<td>Safe handling of textiles and laundry</td>
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<tr>
<td>Cardio Pulmonary Resuscitation</td>
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<tr>
<td>Respiratory infection/cough etiquette</td>
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*Note.* Adapted from “Guideline for isolation precaution: preventing transmission of infectious agents in healthcare settings,” by J. D. Siegel, E. Rinehart, M. Jackson and L. Chiarello. 2007. Atlanta: Centers for Disease Control”.

\(^1\)BBF = Blood and Body fluids.
SP guidelines are mandated in all healthcare settings in Australia. They are an integral part of the National Health and Medical Research Council (NHMRC; 2010) guidelines for the prevention and control of infections in healthcare. The NHMRC guidelines highlight that SP are the minimum requirement in any healthcare setting where patients should be considered as potentially infectious. In addition, the guidelines specify that SP should be supplemented early with transmission-based precautions such as contact, droplet or airborne precautions, to reduce transmission opportunities that may arise due to the specific routes of transmission of particular pathogens.

Needle punctures are the most frequent cause of occupational exposure (Doebbeling et al., 2003; Whitby & McLaws, 2002) and the use of safety engineered devices in Australia is recommended by the NHMRC (2010) guidelines. The use of these devices is not mandated as it has been in the USA since 2000 (U.S. Occupational Safety and Health Administration, November 6, 2000) despite having been shown to reduce the number of needlestick injuries in the USA (Jagger, Perry, Gomaa, & Phillips, 2008).

Alongside the NHMRC (2010) guidelines some recommendations for healthcare workers known to be infected by a BBV have also been developed (Department of Health and Ageing, 2012). They recommend that infected healthcare workers do not practice Exposure Prone Procedures (EPP), that is, they should not practice invasive procedures where there is a potential contact between the skin of the healthcare worker and sharp instruments, and that healthcare workers routinely performing EPP should be tested for HIV and other BBVs regularly. The chronological implementation of the different guidelines is presented in Figure 1.1.
While SP are widely advocated and mandated to reduce risks of infection to both healthcare workers and patients, very few studies have investigated their efficiency to do so. Studies looking at evaluating the efficiency of the guidelines will be presented next.

**Efficacy of Standard Precautions**

Attempts to evaluate the efficacy of SP guidelines began soon after their introduction but these early studies are few. Saghafi, Raselli, Francillon, and Francioli (1992) surveyed nurses in a 1000-bed university teaching hospital in the United States to evaluate SP impact on incidents of OEB before and after the implementation of SP guidelines. Failure to wear gloves for any of the procedures examined was reported initially by more than 80% of respondents, post the introduction of SP this figure ranged between 43% and 83% depending on the procedure. Pre SP, 42% of the participants ($n = 210$) reported having been exposed to blood when their skin was unprotected: post the introduction of SP, this figure was reduced to 27%. Reasons participants gave for not wearing gloves post the introduction of SP included perceptions that the patient was not a risk, they felt less skilful when wearing gloves, or they forgot. These results suggest that the
introduction of SP went at least some way towards reducing the incidence of OEB and increasing glove use in their sample.

Around the same time, Beekmann et al. (1994) conducted a retrospective study of computerised occupational injuries data. They found an association between the implementation of SP and a sustained decrease in self-reported needlestick injuries. Specifically, needlestick injuries decreased from 18 injuries per 1,000 discharges prior to the introduction of SP in 1986 to 11.6 needlestick injuries per 1,000 discharges over a seven-year period. The results also showed a decline in risky behaviours such as needle recapping. The data were based on self-reports which may have been inadvertently affected by staff perceptions that having participated in SP training, there was some self-blame attached to an injury. Beekmann et al. (1994) also indicated there was a confirmed case of seroconversion following an OEB in the healthcare facility during the period under study, which may have increased staff adherence to the guidelines.

Ben-David and Gaitini (1996) evaluated the impact of SP and more specifically routine glove wearing on the incidence of percutaneous injuries among anaesthetists over two, four-month periods. The first period did not involve any manipulation but was a continuation of standard procedures. During the second period, the routine use of gloves accessible in practicing areas was mandated. Gloves were readily accessible at all times in practicing areas. The number of anaesthetic acts performed by staff was approximately the same over the two periods. While there was a reduction in the incidence of needlestick injuries during the second phase compared to the first two months, the difference was not significant. This finding is encouraging, as it can be interpreted to suggest that the wearing of gloves did not detract from skills, as is often suggested by participants in past research. It might
also be that the mandated use of gloves made them more aware of risks and this in turn may have had an impact on injury rates.

In order to understand better the impact of the factors that might influence the adoption of SP and adherence to them, it is important to consider theoretical models of health behaviour change. The application of these models to adherence to SP will be discussed in Chapter Two.

**Chapter Summary**

In this chapter the importance of Infection Control for both healthcare workers’ and patient safety was outlined. The introduction of SP to ensure both patients’ and healthcare workers safety was highlighted and the low adherence rates to SP presented as a major issue. An understanding of the factors which contribute to adherence to SP formed the rationale for a series of studies to be conducted in this thesis. An historical overview of infection control was then presented. The early focus of the Greeks, the Egyptians and the Romans on hygiene as a disease avoidance strategy and the relationship between cleanliness and disease was presented. The emergence of hospitals and of early infection control measures to prevent infections and the spread of them, especially those put forward by Lister and Nightingale as well as the findings from Semmelweis that transmission of diseases might be contributed to by staff and Holmes positing that staff can transfer infections between patients were described.

The link between germs and illness was established by Snow in his work during the cholera epidemic in London and further work on the germ theory lead to the development of antimicrobial therapy, thought to be a magic bullet. Infection
Control initiatives over the 20th century as well as the development of Universal Precautions as a reaction to the emergence of HIV were discussed.

The risks of infection with blood borne pathogens such as hepatitis B, hepatitis C and HIV that healthcare workers face after an OEB and body fluids were then described. The risks of transmission of pathogens from healthcare workers to patients were also considered. Strategies put into place, originally to protect healthcare workers such as Universal Precautions and subsequently Standard Precaution, then extended to patient protection were investigated and their efficacy in decreasing exposures considered.
CHAPTER TWO

Health Models

Attempts to predict human behaviours including adherence to treatment have been numerous. Many models have relied on dispositional constructs such as locus of control, sensation seeking, self-consciousness, self-esteem and altruism (Ajzen & Albarracin, 2007) and incorporate elements of normative-decision making (Halpern-Felsher, 2009). In models where their developers have used these constructs there is an implicit assumption that the adoption of health promoting and health compromising behaviours are the result of a deliberate, rational and analytical process (Halpern-Felsher, 2009). Not all behaviours follow from such a rational perspective and, according to Halpern-Felsher (2009), this assumption is a drawback when attempting to predict more irrational, impulsive or socially undesirable behaviours such as smoking or unsafe sexual practices.

Glanz, Rimer, and Viswanath (2008) reviewed 697 research and theory papers published between 1986 and 2005 and identified the five theories/models most used to predict health behaviours. Those five theories/models were: the Health Belief Model (Rosenstock, 1966), the Social Cognitive Theory (Bandura, 1986), the Transtheoretical Model/Stages of Change (Prochaska & DiClemente, 1982), the Theory of Reasoned Action (Ajzen & Fishbein, 1980), and the Theory of Planned Behaviour (Ajzen, 1985). In this chapter, the models that can be applied to understanding the psychosocial variables playing a part in adherence to SP guidelines will be reviewed.
The Health Belief Model

Although not called the Health Belief Model before 1966 early work on this model began with Hochbaum (1958) who was interested in the effectiveness of a programme to promote public participation in X-ray screening to detect tuberculosis. One thousand two hundred and one participants over the age of 25 years were recruited in three cities (Cleveland, Boston and Detroit) where a community wide tuberculosis detection programme was operating. Participants were interviewed about their attitudes, opinions, and feelings concerning the psychological, medical, sociological and administrative aspects of tuberculosis screening. Using content analysis, Hochbaum (1958) identified three sets of factors which influenced participants’ willingness to attend the programme: (1) their psychological state of readiness, (2) situational influences that included changes in bodily functions, social pressures, medical advice or organised campaigns, and (3) environmental conditions.

With a similar aim, Rosenstock, Derryberry, and Carriger (1959) reviewed 13 studies to determine the reasons why some segments of the population were less likely to participate in poliomyelitis vaccination programmes than others. They selected six of the 13 studies to review in depth based on their methodological strengths. Personal readiness factors as well as social and situational factors were identified as influencing people’s decision to participate in a poliomyelitis vaccination programme. Personal readiness factors included individuals’ motives, attitudes and beliefs (perceived susceptibility), while social and situational factors included perceptions of social pressure and convenience. As well as these two sets of factors, Rosenstock et al. found that ignorance or misinformation about vaccination was prevalent among people not vaccinated. They recommended that groups of
people identified as hard to reach be approached and informed personally rather than via “mass means of communication” (p. 101).

Based on Hochbaum (1958) and Rosenstock et al.’s (1959) work it would seem that for people to take a health related action, they need to believe that they are susceptible to the condition, believe that the condition can have serious consequences for them, be aware of the existence of a course of action to reduce susceptibility or severity, and believe that the benefits of taking such an action outweigh the barriers to its implementation. Barriers to taking action include factors such as not feeling psychologically ready to take action, geographical factors such as cost and inconvenience, distance to travel, and even a lack of perceived support from others for their engagement in the behaviour (Rosenstock et al., 1959).

The term Health Belief Model (HBM) was first used by Rosenstock (1966) in a paper titled “Why people use health services” commissioned by the United States Public Health Services. The model was informed by his earlier research (Rosenstock et al., 1959) and that of Hochbaum (1958) and was based on the premise that beliefs that define readiness to engage in a behaviour have both cognitive and emotional elements. Rosenstock (1966) however argued that emotional aspects have a greater valence than the cognitive elements.

While the HBM was originally focussed on predicting individual engagement in preventative health behaviours, it has also been used to predict sick role behaviours, adherence to medical regimens and illness behaviour (Wallston & Wallston, 1984), risky sexual behaviours (Basen-Engquist & Parcel, 1992), dieting and fasting behaviours (Nejad, Wertheim, & Greenwood, 2005) and needlestick reporting behaviours (Tabak, Shiaabana, & ShaSha, 2006) with varied results.
**Constructs of the HBM.** The constructs in the HBM (Figure 2.1) predict that an individual’s readiness to engage in health behaviour is determined by the interplay of four major components: (1) perceptions of susceptibility and seriousness, (2) perceived threat, (3) balancing the pros and cons of the behaviour, (4) internal (demographic variables and structural variables) and (5) external cues to action (Rosenstock, 1974).


While in the HBM it is hypothesised that initiation of a behaviour depends mainly on initial assessment of the desire to avoid illness (via perceived susceptibility, seriousness and perceived threat) and the belief that a specific health action (perceived benefits of preventive action) will prevent or enable the behaviour (Clark & Houle, 2009). Diverse demographical, personal, structural and social factors are also argued to indirectly influence behaviours. These last factors were
added to the model in 1974 by Rosenstock and are referred to as modifying factors in the model. The basic premise of the HBM is that a rational weighing of the pros and cons of the behaviour takes place before an individual instigates any action.

**Construct Validity of the HBM.** Janz and Becker (1984) examined 46 studies which used the HBM in order to assess its overall utility. Studies were both prospective and retrospective in nature, contained at least one behavioural outcome, examined interventions on medical conditions, and were published between 1974 and 1984. Among the outcome variables were participants’ level of engagement in flu vaccination, screening behaviours, sick-role behaviours as well as clinic utilisation. Janz and Becker’s review showed that when used prospectively the HBM yielded a better predictability ratio than when used retrospectively.

Janz and Becker also showed that barriers to engage in health behaviours were consistently the strongest negative predictors regardless of study designs. They noted that attitudes and beliefs also positively explained variance in health related behaviours. Perceived severity of the illness revealed relatively low predictive power except when looking at understanding sick-role behaviours.

Cummings, Jette, and Rosenstock (1987) showed that beliefs about susceptibility to flu, perceived severity of flu, benefits from a flu shot and barriers to obtaining a flu shot explained 60% of the variance in people being vaccinated against the flu. A substantial negative correlation between perceived barriers and benefits was reported ($r = -.65$) with Cummings et al. arguing that perceived benefits and perceived barriers should be combined and not be treated as separate health beliefs. The relationship they found, while strong does not approach singularity and may not exist in all situations, therefore it seems that warranted to use both variables.
Social Cognitive Theory

Bandura (1977), in his Social Learning Theory, posited that self-efficacy plays an integral part in the instigation and maintenance of behavioural change. Thus incorporating self-efficacy into the HBM as an explanatory variable might, according to Rosenstock, Strecher, and Becker (1988), increase the predictability and the specificity of the HBM. Clark et al. (1988) were the first to incorporate self-efficacy in the HBM and they compared three different combinations of factors loosely based on the HBM to test self-management behaviours in children with asthma. The first model included: beliefs, behaviours and self-efficacy, the second model: age, previous hospital stay for asthma, and participation in a health education programme and the third: a combination of the first and second models. Clark et al. found that self-efficacy, in the first model, was a predictor of self-management behaviour in chronically ill children, as was participation in health education and experiencing a hospitalisation in the second model. The variance explained by the factors in the first model was 3%, the variance explained by the factors in the second model was 7%; and the combined factors in the third model explained 10% of the variance. While self-efficacy, participation in health education, and experiencing an hospitalisation predicted self-management behaviour, the amount of variance explained was low. Interestingly, severity did not predict children’s management behaviour and it might be that severity was too abstract a concept for children to understand fully (Clark et al., 1988) or rather the condition of hospitalised patients may have been severe and relatively homogenous thus creating a ceiling effect in the data.

Self-efficacy has not been formally added to the HBM but has been included on an ad hoc basis by many researchers. Its usefulness as a predictor might reside in
the prediction of long term behavioural changes rather than when the HBM is used for preventive health actions. Alternatively, past behaviour might also serve in its stead but this is not typically included in the HBM.

Cues to action are an integral part of the original model and while their utility to increase uptake of preventative actions has been studied, their contribution to the model is difficult to ascertain. There are few studies which have found cues to action make a contribution to the variance explained (Champion & Skinner, 2008). One such study was reported by Larson, Bergman, Heidrich, Alvin, and Schneeweiss (1982), who investigated the use of postcard reminders as cues to action for vaccinations. Three groups received a different postcard design while a control group did not receive a postcard. The three designs were: (1) a neutral design asking the patient to make an appointment to be vaccinated, (2) a personalised version of the design where the patient’s name was added and (3) a postcard utilising information suggested in the HBM to highlight the importance of flu vaccination. Results showed that participants who received the postcard which included information based on the HBM, had the highest rate of flu vaccination compared with the control group who had the lowest rate of flu vaccination. While not directly measuring the impact of cues to action, the results of this study provided some support for cues to action that include what might be considered a justification or reason to act.

A meta-analysis by Harrison, Mullen, and Green (1992) calculated effect sizes of studies using the HBM. They reviewed 147 studies of which 51 measured the four main dimensions of the HBM, thus meeting Harrison et al. (1992)’s inclusion criteria. As reports of the reliability and validity of the measures used in the studies were also an inclusion criteria, the final analysis was reduced to 16 studies. Harrison et al. (1992) found that retrospective studies reported significantly
higher mean effect sizes for benefits and costs of engaging in a behaviour, and a significantly lower mean effect size for severity than concurrent or prospective studies. The variance explained in behaviours ranged from .1% to 9% for any one dimension of the HBM, although these variances explained were not attributed to any one factor. Total mean effect sizes were reported and these ranged from .001 to .30.

Social desirability bias in HBM studies was cited as an issue by Abraham and Sheeran (2005). Although social desirability has received little attention in the literature with respect to health models, it might potentially weaken the results. Abraham and Sheeran suggested asking respondents to answer questions referring to their beliefs in terms of actual and ideal beliefs as an approach to reduce the effect of the bias. They do not then suggest how this might be managed in the model.

Harrison et al. (1992) called for studies to develop weightings and interaction terms to show how the four constructs of the model work together. Wallston and Wallston (1984) also highlighted that major problems with the HBM lie in the lack of consistent operationalisation of its variables and the lack of specification of the relationship among the variables. They stated that different measures are used in different studies, making comparisons across studies difficult. Other models, such as Bandura’s Social Cognitive Theory (1986) might yield better predict health behaviours.

According to Bandura (1986) self-efficacy is:

…people’s judgement of their capabilities to organize [sic] and execute courses of action required to attain designated type of performances. It is concerned not
with the skills one has but with judgements of what one can do with whatever
skills one possesses (p. 391).

In his Social Cognitive Theory (SCT), Bandura (1986) postulated that human
behaviour is motivated and regulated by self-influence, including perceived self-
efficacy and outcome expectancies (people’s belief in the consequences of their
actions). Bandura predicted that behaviours are performed if the outcomes are
perceived as achievable, a sense of control over them is present, there are few
external barriers, and one has confidence in one’s ability to engage with the
behaviour (Bandura, 1986). That is, behavioural change is possible if one has a sense
of control such that people are more inclined to solve a problem if they believe they
can take action. Goals as well as perceived impediments (cons) and opportunities
(pros) are an integral part of the SCT (Figure 2.2).
According to Bandura (2001), a sense of self-efficacy affects how people feel, think and act. A low sense of self-efficacy has been associated with depression (Linde et al., 2004), anxiety and helplessness (Strecher, McEvoy DeVellis, Becker, & Rosenstock, 1986) while a strong sense of self-efficacy has been related to better social integration (Motl, McAuley, Snook, & Gliottoni, 2008), a strong sense of competence and better quality decision making (Stajkovic & Luthans, 1998), and academic achievement (Bandura, 2001). Self-efficacy can therefore enhance or hinder motivation and is directly related to likely accomplishments and personal development (Luszczynska & Schwarzer, 2005). Self-efficacy can also directly affect goal setting as people with higher self-efficacy judge themselves more capable of setting higher goals and more likely to be committed to those goals than those low

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in self-efficacy (Bandura, 1986). Furthermore, socio-structural factors (facilitators or impediments) are argued to be moderated by self-efficacy. For example, optimistic self-beliefs about efficacy will control how opportunities and impediments are perceived (Luszczynska & Schwarzer, 2005).

Outcome expectancies can be defined as situation-outcome expectancies or action-outcome expectancies. Situation-outcome expectancies refer to the perception that some consequences are determined by the physical or social environment and as such are devoid of or removed from personal control, while action-outcome expectancies are self-evaluative and relate to the belief that one’s actions are pivotal to a specific outcome (Bandura, 1986).

Goals serve as self-incentives for the desired behaviour and are formed before engagement in the behaviour. Goal setting is moderated by socio-structural factors such as the need for achievement and satisfaction with one’s achievements, which can act as either barriers or opportunities to implementation of the behaviour (Bandura, 1986).

**Social Cognitive Theory and Health Behaviours.** The SCT has been used to predict a variety of health behaviours and, although not part of the original model, some researchers have also included behavioural intentions. The behaviours predicted by this model range from adherence with medication regimens, rehabilitation (Clark & Dodge, 1999; Murphy, Greenwell, & Hoffman, 2002; Taylor, Bandura, Ewart, Miller, & DeBusk, 1985), sexual health behaviours (Dilorio, Maibach, O'Leary, Sanderson, & Celentano, 1997), adherence to physical exercise (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Dishman et al., 2004; Rovniak, Anderson, Winett, & Stephens, 2002; Strauss, Rodzilsky, Burack, & Colin, 2001),
nutrition and weight control (Resnicow et al., 1997; Van Duyn et al., 2001) and addictive behaviours (Dijkstra, Vries, Kok, & Rouackers, 1999; Shiffman et al., 2000).

Resnicow et al. (1997) utilised the SCT to assess the predictors of fruit and vegetable intake in 1,398 children. The children were asked to complete scales assessing self-efficacy, outcome expectancies of consuming vegetables, as well as to complete a seven-day dietary intake diary including their fruit and vegetable preferences. Results showed that these factors accounted for 10 to 11% of the variance in fruit and vegetable intake respectively but self-efficacy was not a significant predictor. Outcome expectancies and fruit and vegetables preferences were the only significant variables in the model. It might be that the model is not suitable for use with children or that self-efficacy might not be a relevant predictor of children’s diet, which may be largely dependent on parental input and therefore their own sense of efficacy or mastery for their dietary behaviours was not yet developed.

In other studies, self-efficacy appears to be one of best predictors of health behaviour change. For example, Dilorio et al. (1997) demonstrated that people with higher levels of self-efficacy as well as more positive outcome expectancies were more likely to use condoms. Booth et al. (2000) found that high self-efficacy was associated with higher levels of physical activity in older Australians while no other constructs of the SCT played a role in increased physical activity levels. When looking at adherence to anti-HIV medications, low medication adherence in women with HIV or AIDS was predicted by low self-efficacy and low outcome expectancies (Murphy et al., 2002). In addictive behaviours, low self-efficacy has been associated with lapses in smoking abstinence whereas high self-efficacy was a key to coping
with lapses and maintaining non-smoking behaviour in ex-smokers (Shiffman et al., 2000).

Glanz et al. (2008) argued that future studies should combine elements of SCT, such as self-efficacy in conjunction with other theories or models such as the HBM so that they might provide more explanatory power than when used alone.

The Trans-Theoretical Model of Health Behaviour Change

The Trans-Theoretical Model of Change (TTM; Prochaska & DiClemente, 1982; Prochaska & DiClemente, 1983) is one of several health behaviour theories that can be classified as a stage theory alongside the Precaution Adoption Process Model (PAPM; Weinstein, 1988), the Health Action Process Approach (HAPA; Schwarzer, 1999) and the AIDS Risk Reduction Model (Catania, Kegeles, & Coates, 1990). Only the TTM is discussed in this section, as Glanz et al. (2008) identified it as one of the four most frequently used models in empirical investigations looking at health behaviours.

The TTM comprises a series of stages designed to understand the adoption and maintenance of health behaviour change. It was derived from a comparative analysis of leading theories of psychotherapy and behaviour change and was first used to assess the effectiveness of smoking cessation programmes (Prochaska & DiClemente, 1983). From smoking cessation, its use was extended to a wider range of health and mental health behaviours such as alcohol and substance abuse, partner intimate violence, bullying, anxiety and depression, eating disorders and dieting (Prochaska, Johnson, & Lee, 2009).
 Constructs of the Trans-Theoretical Model of Behaviour Change. The core constructs of the model are the five stages of change (sometimes six); 10 processes of change; the pros and cons of changing behaviour (also referred to as decisional balance); self-efficacy (or confidence) and temptation (Prochaska, Johnson, et al., 2009). Its stages provide the organising framework of the model, with people assumed to move through the stages in order but with relapse possible at any stage. People may cycle through the stages multiple times before long-term behaviour change is achieved (Sutton, 2005). The stages are:

(1) Pre-contemplation: where people are not intending to take action, they actively resist being informed about the problem or are naively uninformed about the potential consequences of negative behaviours or the benefits of positive behaviours. They may have tried to change their behaviour a number of times and have become demoralised about their ability to change.

(2) Contemplation: where people are aware of the problem, aware of the pros of changing but also aware of the cons. They may be intending to change their behaviour in the next six months. There is, however, no commitment to change at this stage.

(3) Preparation: where people are intending to take action, usually within the next month. They are aware and accepting of the fact that there might be a price to pay to change their behaviour. People at this stage have a plan of action.

(4) Action: where specific overt modifications to the behaviour or lifestyle have been made and where individuals display considerable time and energy commitments to it. There may be attempts to seek the help of others. People are said
to be in this stage if the behaviour has been altered for a period ranging from one day to six months.

And finally, (5) Maintenance: in this stage, people are working to prevent relapses and are engaged in the new behaviour or have been able to remain free from the old behaviour for a period greater than six months. The maintenance stage is estimated to last from six months to five years (Prochaska, Johnson, et al., 2009). The maintenance stage is sometimes followed by the termination stage, where individuals have no temptation to relapse and will not return to the old unhealthy habit as a way of coping. This stage may be the ideal goal for most individuals (Figure 2.3: Cyclical Stages of Change Model).

![Figure 2.3. The Cyclical Stages of Change Model. Adapted from Prochaska, J. O., Johnson, S., & Lee, P. (2009). The Transtheoretical Model of Behavior change. In S. A. Shumaker, J. K. Ockene & K. A. Riekert (Eds.), The Handbook of Health Behavior Change, 3rd ed.](image-url)
Additional Processes and constructs argued to influence the movement through the stages of change (Prochaska, Redding, & Evers, 2009) are as follows:

Decisional balance: a reflection of individuals’ weighing the pros and cons of changing.

Processes of change: this construct describes overt and covert activities that individuals use to progress through the stages. They can be described as independent variables needing to be applied to move from stage to stage. These 10 cognitive-affective processes have been described (Prochaska & DiClemente, 1983): (1) consciousness raising, (2) dramatic relief, (3) self-reevaluation, (4) environmental reevaluation, (5) self-liberation, (6) social liberation, (7) counterconditioning, (8) stimulus control, (9) contingency management and (10) helping relationships.

Self-efficacy: this construct is based on Bandura’s (1977a) work and refers to individuals’ confidence that they will be able to deal with high risk situations without reverting to their unhealthy behaviour or lapsing from an healthy behaviour (Prochaska, Johnson, et al., 2009).

Temptation: is the opposite of self-efficacy and reflects the intensity of the urge to engage in the unhealthy behaviour or desist from a new healthy behaviour when faced with difficult situations (Prochaska, Redding, et al., 2009).

**Empirical support for the TTM.** Rosen (2000) examined 47 studies using the TTM to assess health behaviour changes in smoking cessation, substance abuse, exercise, diet change, psychiatric disorders or counselling. Rosen found that while the authors of the TTM attempted to operationalise different change strategies within a common paradigm, the studies he examined were not consistent in how the stages
of change were measured, making it difficult to compare them and draw conclusions. Rosen (2000) found however that these 10 cognitive-affective processes explained 11% of the variance in stages, that is, the stage of change in which participants were classified (pre-contemplation to maintenance). The processes that were found to vary the most by stage were self-liberation, counter-conditioning, self-reevaluation, consciousness-raising and stimulus control. Rosen found no sequence of change process common to all health behaviours examined in his review. What can be termed “thinking” processes were used more by participants in studies looking at smoking cessation while “doing” processes were used more by participants in studies investigating abstinence from alcohol.

Riemsma et al. (2003) reviewed 23 randomised control trials of smoking cessation using the TTM. They found that despite some trials showing statistically significant results, there was limited evidence to support the TTM over non-staged based models or no intervention, in smoking cessation behaviours. Similarly, Mastellos, Gunn, Felix, Car, and Majeed (2014) in a Cochrane Group systematic review examined randomised controlled trials using the TTM to look at behaviour changes in the context of weight loss management programmes. Mastellos et al. concluded that the available evidence supporting the TTM in weight loss management programmes was limited by a risk of bias and imprecision, especially in regards to outcome reporting and the extensive use of self-reported outcomes measures rather than objective measures. Spencer, Pagell, Hallion, and Adams (2002) in a systematic review limited to smoking cessation also argued that there was inconclusive evidence for the validity of the TTM because of concerns around the accuracy of determining in which stage participants might best be classified.
Kroll, Keller, and Scholz (2011) tested the two dimensions of decisional balance, where individuals weigh the pros and cons of a behaviour before moving through the stages of change. They surveyed 266 students who were divided into one of the five stage of change based upon their exercise intentions. In their analysis of the dimensions of the decisional balance, Kroll et al. extracted seven factors, rather than the two proposed by Prochaska and DiClemente. Interestingly, Prochaska, Redding, et al. (2009) had originally reported eight dimensions (four pros and four cons), which they subsequently reduced to two factors. It is unclear now whether two, seven or even the original eight dimensions would be the most informative.

One study was identified where the TTM was used to look at adherence to SP (Livshiz-Riven, Nativ, Borer, Kanat-Maymon, & Anson, 2014). Livshiz-Riven et al. asked second-year nursing students to indicate their knowledge and use of SP on a five-point Likert scale. Scores on this scale were then aligned with the five stages of the TTM. Students completed the same scale in years three and four. The authors indicated that students moved through the stages as they advanced in their course. While interesting, these results are not really surprising and do not indicate that the TTM stages as used here are any more than descriptive of level of training.

While the TTM has been influential in the design of interventions (Sutton, 2005), the stages are descriptive and as such are subject to interpretation.

**Theory of Reasoned Action**

The Theory of Reasoned Action (TRA; Figure 2.4; Ajzen & Fishbein, 1980) was designed to predict intentions to perform a behaviour which, in turn, was used to predict actual behaviour. Ajzen and Fishbein (1980) argued that behaviour “follows
quite logically and systematically from whatever information he [the person] happened to have available” (p. 244).

**Figure 2.4.** Basics of the Theory of Reasoned Action. – Adapted from “Understanding Attitudes and Predicting Social Behavior” by I. Ajzen and M. Fishbein, 1980, p. 100.

**Constructs of the Theory of Reasoned Action.** The focus of the TRA is on the intention to either engage or disengage with a behaviour which is predicted in turn by attitudes towards the behaviour and the subjective norms connected to the behaviour. Ajzen and Fishbein (1980) suggested that the proximal cause of volitional behaviour is one’s intention to engage in that behaviour, with intention representing a person’s motivation. Attitude, Subjective Norm and Intention constructs are described below.

Attitude refers to behavioural beliefs and outcome evaluations which either positively or negatively predict people’s attitude towards the behaviour. Attitude towards the behaviour will indirectly predict the behaviour via intention.
Subjective norm refers to the perceived social pressure to perform or not to perform the behaviour. Subjective Norm is a reflection of positive or negative social pressure.

The TRA conceptual framework assumes that: “the best single predictor of an individual’s behaviour will be a measure of his intention to perform that behaviour” (Fishbein & Ajzen, 1975, p. 369) however it does not consider the provision of failing to adopt an intended behaviour. The model considers the intention of performing the behaviour at a given point in time, it does not consider the fact that intention in the future might not transform into action. Fishbein and Ajzen (1975) stated that “only when the intention is measured at the same level of specificity as the behavior [sic] and [it] has not changed between time of measurement and observation of the behavior [sic], will it be highly predictive of the behavior [sic] in question” (Fishbein & Ajzen, 1975, p. 372). Many cross-sectional studies using the TRA do not however, have a temporal separation between measuring intention and measuring behaviour. A drawback to the TRA highlighted by Wallston and Wallston (1983) is that it does not give any weight to factors facilitating or hindering engagement in behaviours. Sarver (1983) further argued that Fishbein and Ajzen have failed to consider context of opportunity in the TRA, such that the causal sequence of the behaviour is blocked if an opportunity to act in a consistent manner with the behaviour under study is not forthcoming.

Although the TRA has been successfully used to predict health related behaviours (Burak, Rosenthal, & Richardson, 2013; Sidani, Shensa, Barnett, Cook, & Primack, 2013) criticisms of it led to the development of the Theory of Planned Behaviour (TPB; Ajzen, 1991) in an effort to address these issues and increase its predictive utility.
The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB, Ajzen, 1991) includes a Perceived (behavioural) Control construct which was not in the earlier TRA. Perceived Control was added to take into account situations where individuals might not have total volitional control over a behaviour but they may have a perception of control. Perceived Control was argued to have both a direct effect on intention and on behaviour. Ajzen (1991) argued that “perceived behavioural control can often be used as a substitute for a measure of actual control” (p. 184), and can therefore be used to predict the probability of behavioural engagement (Figure 2.5).

Perceived Behavioural Control is an independent determinant of behavioural intention, as are attitudes toward the behaviour and subjective norms. Perceived Behavioural Control encompasses two aspects: the belief that an individual possesses
the necessary resources and opportunities to successfully perform the behaviour (control beliefs), and the power the individual attributes to these beliefs (Ajzen, 1985, 1991, 2005). According to Ajzen, Perceived Behavioural Control is similar to Bandura’s (1977a) concept of perceived self-efficacy, where individuals’ behaviours are influenced by their confidence in performing the behaviour (Ajzen, 1991). Control beliefs include external factors such as opportunities and internal factors such as information, personal deficiencies, skills, abilities or emotions. Individuals who perceive they have access to resources and perceive a lack of obstacles to engage in a behaviour are likely to perceive they have a high degree of behavioural control (Ajzen, 1991, 2005).

Other factors such as demographic variables, personality traits or environmental characteristics can also have an impact on the model but they are not specifically included. Ajzen (2005) stated that they would operate through other constructs in the model and not have an independent contributing effect on the likelihood of performing a behaviour.

**Empirical Support for the Theory of Planned Behaviour.** Ajzen and Madden (1986) compared the TPB and the TRA models in a study of 169 undergraduate university students to ascertain the reasons why students attended or failed to attend classes. The addition of perceived behavioural control to the TRA significantly increased the variance explained from 55% to 68%. In a second experiment with 90 undergraduate students, Ajzen and Madden (1986) also showed that the TPB was superior to the TRA in its ability to account for variance in intentions to attend classes, with an increase from 49% to 64% of the variance explained. The regression coefficient for behavioural control was described as high ($\beta = .40$).
Several other comparisons of the TRA and TPB are available (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Anderson & Lavallee, 2008; Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008; Madden, Ellen, & Ajzen, 1992; Sideridis, Kaissidis, & Padeliadu, 1998) with some (Anderson & Lavallee, 2008; Godin et al., 2008) supporting the addition of Perceived Behavioural Control (PBC) to increase the variance explained in the outcome variable (Madden et al., 1992) while others (e.g., Sideridis et al., 1998) demonstrated that the addition of PBC failed to increase the variance explained over that explained by the components of the original TRA.

A meta-analytic comparison of the TRA and TPB in the context of condom use (Albarracin et al., 2001) demonstrated little difference of the TPB over the TRA. The components of the TPB and of the TRA predicted 50% and 49% respectively of the variance in intention to use condoms, and the predicted variance for future behaviour was 28% for the TPB and 30% for the TRA. The direct impact of perceived control on future behaviour was small (β = .05) but perceived control on intention was larger (β = .20). These results suggest a relationship between perceptions of control and perceived intentions, both cognitive processes, rather than on the outcome variable which is an actual behaviour.

Anderson and Lavallee (2008) showed that the TPB was superior to the TRA when looking at athletes’ adherence to training, with the TPB accounting for 24% of the variance in adherence to training while the TRA only accounted for 6.4% of the variance. Past behaviour was not investigated in their study and this might be a limitation. Certainly Norman, Conner, and Bell (2000) showed that past behaviour had a direct effect on future exercise behaviour and moderated the effect of Perceived Behavioural Control when they used the TPB to predict exercise
intentions. The factors of the TPB in Anderson and Lavallee’s study explained 53% of the variance in exercise intention and 15% of the variance in exercise behaviour. PBC was the sole independent predictor in their study and although moderated by past behaviour, past behaviour itself did not increase the variance explained in exercise intention or behaviour. Similar findings were described by Albarracin et al. (2001), where a model which included past behaviour as a predictor of condom use revealed a small effect for past behaviour but did not explain more variance overall than the model which did not include past behaviour.

Godin et al. (2008) reviewed 72 studies where the authors aimed to predict various healthcare professionals’ intentions and behaviours via the use of social cognitive theories. They found that the TRA and the TPB were the most used theoretical frameworks and the TPB components accounted for between 25.6% and 34% of explained variance in behaviours and predicted 59% of the variance in intentions. The only model to explain more variance was the Theory of Interpersonal Behaviour (Triandis, 1980) which includes several other unique factors besides past behaviour, for example, affect, habits and roles. The review also highlighted that the prediction of behaviour was much lower when an objective measure of behaviour was obtained than when self-reports were used. This discrepancy suggests that a social desirability bias may be present in self-reports.

Looking at SP and determinants of adherence, Godin, Naccache, Morel, and Ebacher (2000) showed that the TPB explained up to 28% of the variance in nurses’ adherence behaviour, PBC accounted for 3% of the variance, and intentions accounted for 25%. Similarly, Watson and Myers (2001) showed that the TRA variables explained 39% of the variance in intentions to use gloves among nurses, and after adding PBC to the model a further 3.5% of the variance was explained.
Perceived barriers, such as time to access and don gloves, amount of anticipated contact with blood, or knowing that a patient was HIV positive, were added as an extension of the TPB and the variables in the model then explained 45% of the variance in intentions to use SP. Watson and Myers (2001) showed higher explained variance in behaviour than Godin et al. (2000) which can, in part, be attributed to the variables in the extended TPB.

The comparisons presented here between the TRA and the TPB show that the addition of perceived behavioural control to the TRA has improved the utility of the model to predict the variance explained in the behaviours under consideration. Reviews of the use of the TPB and its potential limitations are presented next.

Armitage and Conner (2001) looked at 185 independent studies using the TPB published up to 1987 and showed that overall the TPB accounted for 39% and 27% of the variance in intention and behaviour, respectively. The PBC construct was shown to account for an extra 2% of explained variance in behaviour over and above intention. This low overall contribution might be explained by Ajzen’s (1991) argument that the PBC does not contribute to behaviour when there are no problems of volitional control. Armitage and Conner compared the utilisation of the TPB for self-reported and for observed behaviour. They noted that prediction of behaviour using participants’ self-reports was better than when observed behaviour was used as the outcome variable. In fact, some 20% of the variance was typically explained by the TPB using observed behaviour, and 31% of the variance was explained when self-reports were used.

Among the components of the TPB which Armitage and Conner found significant were intention and perceived behavioural control on self-reported
behaviours, but these variables were not significant predictors of observed behaviours. This anomaly could potentially lead to skewed results when self-reports are used as it is suggestive of a possible reporting bias.

Hardeman et al. (2002) identified 30 studies describing 24 distinct interventions for behaviour change which utilised the TPB as their theoretical framework. They showed that half of the interventions used were effective in changing intentions and two-thirds were reported to be effective in changing behaviour. Effect sizes were reported as small and they were only able to be calculated for 33% of the intervention studies, 38% of studies looking at behaviour change. Hardeman et al. concluded that better designed studies are needed which provide more details on how the effectiveness of interventions or behaviour change was determined.

In a more recent meta-analysis of primary studies, McEachan, Conner, Taylor, and Lawton (2011) reviewed 237 prospective tests of the TPB from 206 papers. One of the foci was to ascertain the impact of the TPB constructs on intention and behaviours while controlling for past behaviour as this had not been addressed by other meta-analyses or systematic reviews. The meta-analysis showed that, on average, behavioural intention and PBC accounted for 19.3% of the predicted variance in behaviour, with intention being the main predictor of behaviour, contributing three times more than PBC.

When just intention was predicted, attitude, subjective norm and perceived behavioural control accounted for 44.3% of the variance explained on average regardless of the behaviour being studied. Dietary and safer sex intentions (50.3% and 51.3%) were predicted better than abstinence intentions (36.6%). As in the
Armitage and Conner (2001) review, McEachan et al. (2011) also found that attitude was the strongest predictor of intentions, but when past behaviour was added, an additional 25.3% of variance was explained in the prediction of risk behaviours, 11.4% was added for abstinence behaviours, 10.3% of variance explained for physical activity behaviours, and 3.4% for dietary behaviours. When looking at behaviours, the TPB was more effective in predicting physical activity and dietary behaviours (23.9% and 21.2% respectively) and least effective in preventing risk, safe sex behaviours, and abstinence (between 13.8% to 15.3%). Again, behaviours assessed with self-report yielded higher levels of explained variance than behaviours assessed using objective measures.

The TPB was not developed specifically as a model of health behaviour and this is considered a major weaknesses if used in these areas (Maddux, 1993). In order to overcome this limitation it would be important to include variables relevant to the behaviour being considered.

The TPB posits that intention is the most important determinant of behaviour, yet Sheeran (2002) found that the median percentage of people intending to engage in a behaviour but who subsequently failed to engage in it was high at 47%. Somewhat ironically, he also found that of those people not intending to engage in the behaviour, 7% of them subsequently did so. It might be that, for some, assessing intention is a consciousness raising exercise. Sheeran (2002) emphasised that some control factors were needed in order to lessen the intention-behaviour gap, for example in the case of condom use, the individual’s knowledge of, and ability to use a condom, as well as the cooperation of one’s partner are important. Using measures of behavioural expectation rather than behavioural intention or both together was suggested by Pomery, Gibbons, Reis-Bergan, and Gerrard (2009) as a way of
improving predictive strength. Others have suggested intention should be measured now (for the future), then behaviour measured later (in the future) for a more accurate prediction. Conversely Sutton (1998) argued that measuring intention at Time one to predict a behaviour measured at Time two is open to changes in intention and thus affecting the variance explained.

Past behaviour and habit are areas not considered by the TPB as Ajzen (2011) argued that neither constitutes a causal antecedent of intention. Yet past behaviour has contributed to the prediction of future behaviour in several but not all studies (Armitage & Conner, 2001; Hardeman et al., 2002; McEachan et al., 2011) and the addition of this construct to the TPB might increase the variance explained especially when looking at repeated behaviours that do not require an ongoing decision process (Nilsen, Roback, Brostrom, & Ellstrom, 2012). Habit has been shown to be positively associated with adherence to guidelines in general medical practice (Weingarten et al., 1995). The addition of other background factors such as personality traits or demographic variables to the TPB might also increase its utility (Ajzen, 2011).

The static nature of the model with an exclusive focus on rational reasoning and the exclusion of unconscious influences on behaviour, such as the role of emotions and the effect of behaviour on cognition and future behaviour, have also been cited as criticisms of the TPB (Sniehotta, Presseau, & Araújo-Soares, 2013). Sniehotta et al. expressed overall concern about the validity and the utility of the TPB arguing that beliefs predict behaviours over and above intentions and that observing correlations between measures over time has not been an acceptable test of the TPB. Armitage and Conner (2001) called for additional normative variables such
as moral or descriptive norms to be added to increase the predictive power of the TPB.

Despite criticisms, the TPB remains widely used to explain health behaviours, however, the addition of other variables which may potentially have an impact on the particular outcome behaviour to be investigated need to be considered. Among these might be knowledge concerning the behaviour and/or its benefits, and personality traits that might influence the specific behaviour. Any additions need to be theoretically relevant to the domain under consideration and limited in number in order to maintain the parsimony of the model as emphasised by Ajzen (2011). Furthermore, it would seem that the TPB explains different amount of variance based on the behaviour examined and whether or not past behaviour is taken into account. These variations may also be a function of the different measures albeit of the same construct, across studies.

**Chapter Summary**

Attempts to predict human health behaviours have been numerous. In this chapter the most widely used models to predict health behaviour were discussed: the Health Belief Model, the Social Cognitive Theory, the Transtheoretical Model of Change, the Theory of Reasoned Action and the Theory of Planned Behaviour. Reviews and criticisms of each of these models were presented together with the suggestion that the Theory of Planned Behaviour might benefit from the inclusion of behaviour specific factors.
CHAPTER THREE

Factors Influencing Adherence to Standard Precautions

Healthcare workers adherence to SP has been studied extensively and results indicate a widespread lack of adherence (Madan, Rentz, Wahle, & Flint, 2001; Tait et al., 2000). The studies have been mostly based on cross-sectional surveys (Ferguson, Waitzkin, Beekmann, & Doebbeling, 2004; Tait et al., 2000) or using direct observation techniques (Gammon, Morgan-Samuel, & Gould, 2008). A wide variety of factors affecting adherence are identified in the literature and in this chapter a review of studies exploring adherence and the factors affecting it are presented. While Universal Precautions (UP) guidelines evolved to SP in 1996 and there are some minor differences between UP and SP, the term SP will be used throughout this chapter to prevent confusion, regardless of the publication dates of the studies examined.

From Compliance to Adherence

The terminology used to refer to the application of SP guidelines has recently undergone a change. When the guidelines were introduced their adoption was referred to as compliance (Baraff & Talan, 1989). More recently, the term adherence has been favoured (Kaur, Kaur, & Lal, 2010), which mirrors the change describing patients’ patterns of medication taking. Bissonnette (2008) used concept analysis to examine the shift from compliance to adherence and the sometimes used term concordance. She found that while the terms adherence and compliance were used interchangeably in the literature, compliance was criticised for its paternalistic undertones. Although Bissonnette looked at patients and their use of medications rather than healthcare workers and their adoption of SP, this change in terminology
needs to be considered when reviewing the literature in order to retrieve all relevant studies.


After the CDC mandate in 1987 for healthcare workers to adopt SP guidelines, studies on the adoption of SP and the required PPE, and on staff adherence to the guidelines began to be reported in the literature (Baraff & Talan, 1989; Huff & Basala, 1989; Loewen, Dhillon, Willy, Wesley, & Henderson, 1989). Baraff and Talan (1989) used an observational study of adherence while Huff and Basala (1989) and Loewen et al. (1989) utilised cross-sectional surveys. All three studies showed varying levels of adherence to SP, ranging from 16% to 88%. In Loewen et al.’s (1989) study, while 65% of the midwives sampled reported having been at some point “soaked to the skin” with blood or amniotic fluid, only 55% of that group reported using SP. The most frequent reason given for non-adherence was that following the guidelines interfered with the midwife-client relationship.

In Baraff and Talan’s (1989) small observational study, gloves were used by 52% of healthcare workers during the routine placement of intravenous lines, which increased to 72% in an emergency situation. Baraff and Talan reported that staff attributed their low adherence to SP guidelines to the unavailability of the PPE needed, a lack of comfort afforded by wearing gloves, and an underestimation by staff of the risks of transmission of a BBV.

Huff and Basala’s (1989) survey was also of small scale. Chief Residents of 75 medical education training programmes were invited to participate in their study, of whom 45 (63%) agreed. The results showed that despite PPE being available at 82% of the programmes sites, PPE were consistently used in only 16% of cases for
minor procedures and 22% of cases involving major resuscitations. These low adherence rates are especially concerning in a training facility.

In an observational study of 129 emergency department personnel, Kelen et al. (1990) looked at 1,274 interventions performed on critically ill patients over a 31-day period. Healthcare workers were covertly observed, with observations limited to the first 15 minutes of the evaluation and treatment of patients. Although SP guidelines had only been introduced recently to the facility, all staff had been exposed to seminars/teaching sessions on how to use SP and information posters were on prominent display. Furthermore, necessary PPE were available at the entrance to all rooms where critical patients were treated. Adherence to guidelines was defined as wearing all the recommended barrier precautions for a defined procedure. Kelen et al. (1990) showed that overall SP were adhered to 44% of the time, with glove usage being adopted the most. In situations where profuse bleeding was present, overall adherence rates were only 19.5%. Interestingly, fewer precautions were taken for paediatric patients while the rate of usage of precautions increased to 50% for patients with identified HIV risk factors.

Reasons staff gave for not following the guidelines included lack of time, interference with skill-based procedures and describing PPE as uncomfortable to wear (Kelen et al., 1990). Although a small percentage (2.7%) of the participants stated that they believed SP did not work and therefore they did not use them. This figure is concerning in terms of patients, staff and fellow workers. The authors also observed that nursing staff adhered to guidelines slightly more than medical consultants but less than resident doctors. Kelen et al. highlighted the fact that SP were only guidelines and not policy in that facility at the time of their study. This, and the fact that guidelines were only formulated three years before the study took
place, could explain why observed adherence rates were low. It is also important to note that some healthcare workers identified some of the covert observers during the course of the study. This could have introduced a Hawthorne effect as while adherence rates remained low they were observed to increase slightly after the first ten days of the study despite no further educational intervention taking place.

Using covert observers has some ethical implications, and Pedersen, Keithly, and Brady (1986) were able to demonstrate the impact they have on people’s behaviour in their study. Handwashing behaviour was positively affected by the presence of observers; 18 participants out of 20 washed their hands after visiting the toilet when an observer was overtly present and only three out of 19 when the observer was covert. Whether these people continued to wash their hands when no observer was present is unknown.

**Incidences in Emergency Care Areas.** Emergency Departments (ED) are distinct environments from general wards or community settings. It can be assumed that patients are mostly unknown in the emergency department setting. This lack of knowledge might lead healthcare workers to take more precautions as it is not known whether or not the patient has a BBV. Studies in Central America (e.g., Kato-Maeda et al., 2000) have shown a high prevalence rate of 19% for BBV in ED, but this figure includes HIV, Hepatitis B and C. Of these patients who were HIV positive, 34% of them were unaware that they carried HIV (Kato-Meda et al., 2000).

HIV has a prevalence of between 4% and 7% in emergency departments in the United States and it is important to note that the patients’ race, age, sex, risk factors, and presenting complaint were not predictors of serological status (Kelen et al., 1988; Kelen et al., 1989). No Australian study was identified in the extant
literature which examined the incidence of BBV in ED patients: the latest incidence data showed that in the general population estimates of HIV between 130 to 158 cases per 100,000, Hepatitis B are .97% and Hepatitis C 1.4% (The Kirby Institute, 2013).

The incidence and prevalence of HIV and BBV vary from country to country but all emergency care areas can include conditions and practices likely to increase the frequency and duration of healthcare workers exposure to blood. This increased exposure increases the risk of an OEB especially when precautions are not adopted (Williams, Campbell, Henry, & Collier, 1994).

**Paediatric Emergency Departments.** Ros and Cabrera-Ros (1990) examined adherence to SP, in particular glove use, via a cross-sectional survey of faculty members, residents, and medical students in a paediatric emergency department setting soon after the implementation of SP in their facility. Seventy-four participants (23 faculty members, 29 residents, and 22 medical students) completed a questionnaire. Reported adherence rates of glove usage for venepuncture and cannulation was 13% among faculty members, 7% among residents, and 18% among medical students. Ros and Cabrera-Ros suggested that medical students were more likely to have instruction on SP use as part of their ongoing training compared with residents or faculty members yet their rate of adherence was not high. These results might also suggest some form of modelling or cultural influences were in effect for the students. Interestingly though, Ros and Cabrera-Ros (1990) reported that most physicians stated they adhered to SP when judging the patient to be a high risk of carrying a BBV, although it is not clear how the physicians were able to reach this conclusion. Ros and Cabrera-Ros also reported that participants in each of the three groups studied (faculty, residents and students) had a perception that SP interfered
with performing skilled procedures. This alleged interference was cited as the main explanation for non-adherence. These results support other early studies showing low adherence to SP. Yet the small sample size, as well as the specialised paediatric ED workforce, makes generalisability of these and other results of the time difficult.

**Trauma Room and Adherence.** Hammond, Eckes, Gomez, and Cunningham (1990) covertly observed 81 trauma room resuscitations involving 18 house officers (interns) over a two-month period. They reported that all SP were adhered to in only 16% of cases by the house officers. Although they described glove usage as “nearly universal” (p.556) gloves were not used in 18% of cases. Masks were not used 37% of required cases and aprons in 18% of such cases. Visible blood or inclusion of the patient in a high-risk category did not affect adherence rates. These house officers were interviewed subsequently to elicit their reasons for non-adherence. In 45 of the 81 cases observed, 22% of the respondents claimed they were not aware of the guidelines, 20% stated that they forgot, 20% claimed they were too busy or the patient was too unwell and they had no time to utilise the required PPE, 18% felt the patient was not at high-risk of having a BBV and 13% felt that SP were not necessary. It is not clear to what the remaining 7% attributed their lack of adherence.

In order to address the lack of application and knowledge revealed at interview, the hospital prepared information packs containing all the materials needed for SP and made these available to these staff. The use of SP was also promoted by the trauma nurse coordinator at the beginning of each shift. A further two-month observation phase was undertaken in parallel with this promotion. Eighty-four trauma situations were covertly observed and the adherence rate increased to 62%. The most common reason given by staff for not adhering during
this second observation period was forgetfulness. Although steps were taken by the researchers to minimise any Hawthorne effect by using covert observers as well as the trauma nurse coordinator who was routinely present in the observed situations, it is difficult to be sure that the effect was entirely controlled. This caveat is especially relevant in the second phase of the study where the observer was also the person educating and reminding staff of SP at the beginning of each shift. Staff awareness that they were being observed might have contributed to the increase in adherence although it is difficult to determine this in any observational study. Whatever the influences, it is encouraging that adherence rates did improve but it would be of greater interest to know if they were sustained.

**Hospital-Wide Glove Usage Adherence.** Stringer, Smith, Scharf, Valentine, and Walker (1991) investigated glove usage in a large tertiary teaching hospital also using observational methods. The team of observers were members of the hospital infection control team using a questionnaire developed by the researchers, to record the appropriateness of observed glove use. Glove usage was observed in the ward areas and in diagnostic laboratories where analyses of body fluids were performed. The results showed that staff members did not wear gloves in only three instances out of 336 observations where it was deemed gloves were required. This result is in sharp contrast to results from Ros and Cabrera-Ros (1990) and Kellen et al. (1990) which revealed low adherence rates, specifically in regards to venepuncture. In Stringer et al.’s study, they found an observed glove usage adherence rate of 100% with respect to venepuncture. While this result is highly promising, it is important to note that the criterion used by the observers: “use of gloves when the risk of contamination was absent or minimal” (p. 234) is not in keeping with SP guidelines. In fact, their criterion required a judgement on the part of the observer as well as the
healthcare worker when clearly, the guidelines state that gloves should be worn whenever there is a potential for exposure to body fluids. The guidelines do not specify that gloves should not be worn when the contamination risk is minimal for such requires a judgement by staff which may not be valid.

In another hospital-wide survey conducted in Denmark, Kristensen, Wernberg, and Anker-Moller (1992) investigated the perceived impact of blood exposure risk on adherence to SP via a self-report questionnaire. An overall response rate of 69% was reported, with physicians, nurses, laboratory staff, nurses’ aides, porters, allied health staff and nursing students being surveyed. Results highlighted that in all groups surveyed, blood contact was more frequent among personnel who did not know of, or who did not adhere to SP guidelines. Overall adherence to SP was 41% with physicians having the lowest uptake. Of interest in this study was their investigation of the effect that knowledge of the guidelines had on instances of blood exposure. People with knowledge of SP reported lower rates of exposure thus implying the importance of training in SP and their use. Again, this was an early study.

**Value of Educational Interventions.** Educational interventions and making SP guidelines a policy mandated by the organisation seems to have an impact on uptake. Kelen et al. (1991) in a follow up study to Kelen et al. (1990) seven months after SP were made hospital policy investigated the uptake of guidelines in critical care areas. The study took place in the same ED as their previous study. Kelen et al. (1991) observed 127 healthcare workers performing 1861 interventions on 155 critically ill patients over a 10-day period. The observed interventions were classified as major, minor, or examination only depending on whether the intervention was likely to produce profuse bleeding or blood spray or were minimal
to no risk of this occurring. The use of PPE was expected for interventions classified as major or minor, with personnel involved in major interventions expected to wear gown, mask, eye protection and gloves: while individuals performing or assisting in minor interventions were expected to at least wear gloves, in-keeping with the SP guidelines and mandated by the organisation. The researchers excluded from analysis 440 examinations (such as blood pressure taking or chest auscultation) not requiring the use of SP. Kelen et al. (1991) showed that overall adherence was 72.7%, an increase from 44% reported earlier by Kelen et al. (1990) in the same hospital. In situations where profuse bleeding occurred the rate increased from 19.5% to 55.7%. The significant improvement in adherence shown in this study was attributed to several factors. The adoption of the SP guidelines as hospital policy is thought to have been the most influential factor, as practitioners could be held accountable through performance reviews when policy violations were observed, with repeated violations leading to possible termination of employment.

Interestingly, Kelen et al. (1991) noted that nurses were often the driving force behind adherence to SP, with nurses blocking entrance to the critical care rooms to providers not wearing PPE for less critical cases and insisting that PPE were worn as soon as possible for urgent cases. As with other observational studies, the results might have been influenced by inter-rater reliability of the observers or the possibility of a Hawthorne effect. These results do however, suggest the importance of the organisational culture and staff proactivity in enhancing staff adherence to SP guidelines.

**Testing as an Occupational Risk Reduction Strategy.** From the inception of SP, debates have taken place on the value of the guidelines with some people arguing that both patients and healthcare staff should be systematically tested for
HIV antibodies and other BBV as a better means of protection (Elford & Cockcroft, 1991). Elford and Cockcroft surveyed 515 undergraduate medical students at the Royal Free Hospital Medical School and the 141 consultants from the Royal Free Hospital in London to gather data on perceived risk of HIV infections, adherence to SP guidelines and attitudes towards compulsory HIV antibody testing. Both medical students and consultants saw themselves more at risk of HIV transmission in their professional life rather than in their personal life. Despite considering that they were more at risk of catching HIV from their professional practices, only 10% of the students in the study wore gloves in situations where there might be some contact with patients’ blood. Ninety-four per cent of them however, stated that they would change their clinical practice if they knew that a patient was carrying HIV. Between 40% and 84% of the consultants were also more likely to change their clinical practice in the same known situation, with anaesthetists and surgeons more likely to adopt SP in these circumstances than those working in other specialties. Changes in practice were said to include wearing gloves and being more careful when handling sharps. Elford and Cockcroft also showed that more than 25% of the consultants and more than 50% of the students were in favour of compulsory HIV testing of hospital inpatients with medical students also expressing support for compulsory testing of at risk groups in the general population. Students were also more likely to change their behaviour than consultants when faced with a patient known to be HIV positive.

These early findings might reflect the heightened anxiety healthcare workers experienced at the beginning of the HIV/AIDS epidemic when faced with possibility of acquiring a fatal disease via their employment. Certainly Bernstein, Rabkin, and Wolland (1990) and Feldmann, Bell, Stephenson, and Purifoy (1990) reported high levels of anxiety in students when they were faced with patients considered to have...
some risk factors for HIV, such as intravenous drug use or homosexual practices, to
the point that some students stated they would elect not to work with high risk
patients or in areas where the prevalence of HIV was high. How students would
avoid such patients or work areas was not discussed. Elford and Cockcroft suggested
that medical students who see consultants not applying SP might feel that they
should replicate that behaviour in order to fit in.

**General Practitioners and SP Guidelines.** While most studies described so
far have taken place in hospital settings, Krol, Losh, and Miller (1992) surveyed
3568 general practitioner (GP) members of the American Academy of Family
Physicians working in community settings. Although the response rate for this postal
survey was only 39%, having implications for the generalisibility of the results, they
found that 80% of the respondents always or almost always wore gloves when “they
felt it was appropriate”. Whether participants’ self-reported knowledge of guidelines
was adequate to determine “appropriateness” was not ascertained in the research and
the highly subjective nature of these judgements brings not only the responses but
also the validity of the results into question.

Krol et al. (1992) also aimed to determine the extent of GP exposure to
blood borne pathogens and to known HIV-positive patients. Thirty six percent of the
respondents reported at least one exposure via a hollow-bore needle, unprotected
eyes, suture needle or mucous membrane, with 26% of these participants stating that
the exposure occurred with a known HIV-positive patient. Only 35% of the
respondents almost never or never recapped used needles prior to disposal and
seldom wore eye protection. While factors influencing adherence were not a focus of
their study, the authors did find that GPs working in areas of higher HIV prevalence
were more likely to adopt SP. Such situation specific behaviours seem to support the
tendency for GPs to engage in risk assessments of patients, which then influence their use of SP.

**Nurses and SP Guidelines.** Schillo and Reischl (1993) surveyed a random sample of nurses listed on the Michigan Nursing Register to determine their level of HIV related knowledge and their precautionary behaviours with respect to HIV positive patients. Questionnaires were mailed to 3468 of the 80,289 nurses on the register, with a response rate of 58% (1530 nurses). Knowledge of HIV was assessed by four items, occupational risk exposure by a further four-items, and two items were devised to ascertain the use of SP. While the results showed that the participants were knowledgeable about HIV transmission routes, 25% of participants indicated that they did not consistently use gloves when handling these patients’ blood or body fluids. Furthermore, while participants reported always or nearly always using puncture-resistant containers for the disposal of sharps, more than 50% of the respondents stated that they recapped needles prior to disposal which is in contradiction to the guidelines. Participants identified awkwardness associated with wearing gloves and other PPE, and a lack of availability of correct sized gloves, as some of the reasons behind their non-adherence to SP.

**A Systematic Review of the Early Years.** Levin (1995) published the first systematic literature review on improving adherence to SP. She reviewed 13 studies but reported that only one study utilised a conceptual framework to look at adherence behaviour. Non-experimental pre- and post-test designs were used in 85% of the studies, with sample sizes ranging from 4 to 283 healthcare workers. Levin noted that none of the studies she reviewed included a power analysis to determine whether the sample size was large enough to reach meaningful conclusions. Levin also noted that the definition of adherence was not consistent across the studies with
one study labelling healthcare workers as adhering if they demonstrated that they observed even one aspect of the guidelines. Other authors have considered that adherence was present only when all aspects of the guidelines were observed. Levin’s review revealed that adherence varied according to the type of barrier precautions examined and also varied according to what professional group was being examined. Accessibility of PPE, sizing issues, and lack of time to put on PPE were identified as factors affecting adherence in the studies reviewed. Levin classified these reasons as perceived control, risk, behavioural beliefs and protection effectiveness in an attempt to align the results in terms of theoretical models used to predict behaviour. That said, she made no attempt to determine the variance explained in adherence by these constructs.

While all the studies presented so far were conducted in the early years of SP implementation and are of different designs, they share common elements: the identification of the frequency of SP use in varying circumstances and the identification of factors influencing non-adherence. These early results were affected by staff’s lack of knowledge of the guidelines and the low but rising incidence of HIV in the community. The low incidence of HIV/AIDS in the community could have led some healthcare workers to perceive that they were unlikely to care for HIV/AIDS patients while others may have been overly concerned. SP guidelines had only recently been developed at the time, the organisational culture of hospitals and other healthcare settings needed to embrace the guidelines, and management had yet to ensure staff adherence to them.

Furthermore, the many studies reported so far whether of an observational, qualitative or quantitative design, have mostly been atheoretical. The following
sections of this chapter will present a review of studies grouped by design and theoretical framework.

**Fourteen Years Post SP and Forward**

The majority of the studies investigating factors affecting adherence to SP published since 2000 have generally been quantitative, cross-sectional, and have used specifically designed questionnaires. A wide variety of settings have been studied however results are of a similar nature. In the following section, findings from studies published within the last decade are discussed. The factors uncovered in this literature can be broadly classified as individual, psychosocial and organisational factors and to a large extent, reflect many findings or interpretations from the early studies. Although many studies report adherence rates for SP, it is important to note that some disparities exist between studies, with many reporting adherence to specific aspects of SP such as handwashing or glove wearing rather than reporting adherence to all aspects of SP.

**Individual and Psychosocial Factors.** Gender was shown to influence adherence to some aspects of SP by van de Mortel, Bourke, McLoughlin, Nonu, and Reis (2001) with female staff washing their hands significantly more often after patient contact than male staff. Profession was also shown to influence hand washing rates with van de Mortel et al. (2000) and Pittet et al. (2000) showing that hand washing rates were consistently higher among nurses than medical doctors.

As in the earlier studies, the perception that wearing PPE is cumbersome has been cited as hindering the use of PPE and hence adherence to SP (Madan et al., 2002). One respondent in Tait et al.’s (2000) study reported not using a face shield because of a fear of being perceived as “paranoid” by her co-workers. Other
individual factors such as the perception that wearing gloves might reduce dexterity and thus interfere with or delay care by making healthcare workers repeat procedures were reported by Madan et al. (2002) and Cutter and Jordan (2012).

Tait et al. (2000) found that not anticipating any blood contact was the most frequent reason for not adhering to SP and the same finding was reported by Hills and Wilkes (2003) and Ferguson et al. (2004). This same finding has been reported in settings ranging from acute hospital wards such as intensive care to community settings. Although not anticipating exposure to blood is a valid reason to not implement SP (for example when measuring a blood pressure), faced with the circumstances described in Tait et al.’s study (e.g., having to take blood), healthcare workers should have implemented SP. The fact that they did not highlights that these staff undertook a risk assessment process before deciding whether or not to follow SP. Ad-hoc risk assessment of patients was also reported by Ferguson et al. (2004) and Cutter and Jordan (2012) as reasons for not following SP, with surgeons being more likely than nurses to not follow SP if patients were not deemed “high risk”.

Younger age has also been shown to be associated with less SP adherence (Rabaud et al., 2000). That Henrotin, Pocheron, Smolik, and Latour (2003) found that years of experience in the profession was related to the risk of OEB seems to support this association, although they did not specifically assess adherence in their study. Henrotin et al. found that nurses qualified for less than two years had a significantly higher risk of OEB than nurses with more professional experience. They also showed that staff who had sustained an OEB in the previous two years were at significant increased risk of sustaining another OEB.
In one of the few studies to look at self-efficacy, Luo et al. (2010) found that it was positively correlated with adherence ($r = .21$). Few other studies have examined psychosocial factors relevant to adherence to SP and it may be important to address this gap.

**Organisational Factors.** Excess workload and lack of time to don PPE are often cited as the reasons for non-adherence to SP, whether this is during routine practice or an emergency situation (Cutter & Jordan, 2012; Ferguson et al., 2004; Madan et al., 2002; Tait et al., 2000). Despite the implementation of SP guidelines 15 years ago, staff in several studies still cite the lack of availability of PPE as a factor limiting their adherence (Cutter & Jordan, 2012; Hills & Wilkes, 2003; Reda et al., 2010; Tait et al., 2000). If this is so, it is clearly a fault of the organisation, and an issue for staff and patient safety as well as a breach of NHMRC guidelines (2010).

Reda et al. (2010) highlighted that a lack of equipment in Ethiopia resulted in high rates of needle recapping (46.6%), as well as the reuse of syringes and/or needles (5.9%). Healthcare workers who stated that needles and/or syringes were recapped for reuse also indicated that they believed that patients may have acquired HIV infection as a result of this practice. While there is no evidence to support these Ethiopian participants’ claims, they are nonetheless very concerning especially as the HIV prevalence rate in Ethiopia is 1.3% (UNAIDS, 2012b) as opposed to 0.1% in Australia (UNAIDS, 2012a). While this apparent lack of equipment may be attributed to poor organisational management and supply, it might also be a reflection of an economy which is unable to support these costs. It is not expected that the same fiscal restraints apply in Australia or other developed countries.
Lack of management support for SP guidelines and an unsupportive organisational climate were highlighted by Cutter and Jordan (2012) as important factors influencing healthcare workers non-adherence to SP. They also cited the normalisation of OEB as a risk of the job and the lack of senior staff acting as role models as negative influence on junior staff and which could affect their adherence to SP.

Although lack of training and insufficient knowledge of policies and guidelines can be classified as an individual factor, it is also the remit of the organisation to facilitate professional development and further learning. Luo, He, Zhou, and Luo (2010) and Atif et al. (2013) reported educational factors influenced adherence to SP. Atif et al. (2013) found that 39.3% \((n = 1745)\) of participants in their study had a good knowledge of SP. Female participants were more likely to display good knowledge of SP than male participants and individuals who had participated in training sessions on SP in the previous five years also displayed better knowledge. Neither age nor years of professional experience were associated with better knowledge but nurses were found to have better knowledge of the guidelines than physicians.

**Studying Adherence to SP: The Use of Theoretical Models**

**Health Belief Model and Adherence to SP.** O'Boyle Williams, Campbell, Henry, and Collier (1994) used a questionnaire based on the components of the Health Belief Model (HBM; Rosenstock, 1966) to determine adherence among emergency department healthcare workers and the factors influencing adherence. Questions used in the study were formulated in terms of perceived obstacles to adherence, beliefs regarding the efficacy of the recommended precautions, self-
reported adherence and knowledge of the possible and perceived negative consequences of an infection following an OEB. The biggest obstacle to the use of SP stated by 74% of the respondents was the perceived lack of time to adopt the necessary PPE. The second most common reason not to use SP was perceiving the patient to be at low risk to be Hepatitis B Virus/HIV positive (57%), followed by the statement that PPE interfere with their skills (55%). Other factors which affected adherence included unavailability of equipment and lack of knowledge of SP. The authors emphasised the fact that healthcare workers reported that they would not routinely use SP unless patients are known to have a BBV or are perceived at risk of BBVs. Although O'Boyle Williams et al. (1994) used the HBM to frame their study, they did not analyse the data to calculate the variance explained in adherence, neither did they assess perceived susceptibility to diseases or perceived seriousness of acquiring a disease integral components of the HBM.

Osborne (2003a, 2003b) specifically looked at perceptions that influenced reporting of OEBs and adherence to SP using the HBM in a population of Australian peri-operative nurses. The incidence of OEB was reported as 27%, which is much lower than that reported by Hills and Wilkes (2003). Osborne only asked about percutaneous exposure while Hills and Wilkes (2003) asked about all OEB. Intention to report exposure in Osborne’s study was high at 92% while actual reporting was only 23%. The reporting statistics are lower than in Hills and Wilkes’s (2003) study despite the samples being drawn from similar populations. It is difficult to ascertain the reasons for such discrepancies but they might be related to the wording of the questions used in each of the studies. Osborne also looked at correlations between adherence to SP and the constructs of the HBM. She found significant correlation between perception of risk of acquiring a BBV and adherence to SP. A low
significant correlation was also found between staff observations that reporting an OEB was time consuming and not reporting an OEB. These results, although the effect sizes are not large, provide valuable insight into perceived barriers to reporting OEB. The authors also identified barriers to adherence to SP as lack of fit of PPE, unavailability of PPE, lack of time to put on PPE and the perception that PPE interfered with the performance of some clinical procedures. Osborne did not give any details on the amount of variance explained in adherence while using the components of the HBM. It seems rather that the data were collected using questions simply classified into constructs approximately aligned with those of the HBM.

Efstathiou, Papastavrou, Raftopoulos, and Merkouris (2011b) used a qualitative design with focus groups to study factors influencing a group of Cypriot nurses adherence to SP with the HBM as the underpinning theoretical framework. Thirty-two nurses from the two biggest hospitals in Cyprus were canvassed via four focus groups. Factors negatively influencing adherence were emergency situations, lack of available equipment, perception that PPE reduced nurses’ skills, perception that PPE would increase patients’ discomfort and cause anxiety and/or distress, lack of time to implement SP, provision of care to children, the negative impact of the PPE on nurses’ physical appearance, and seeing other nurses/medical doctors not following SP. Factors positively influencing adherence included providing nursing care to adult patients; having previously sustained an OEB; being reminded to implement SP via educational updates; leaflets or posters; patients’ appearance and more specifically whether or not a patient had tattoos, low personal hygiene, low educational level or was dressed carelessly; and foreign patients coming from less developed countries. Incentive for the respondents to adopt SP included seeing colleagues use SP, fear of being infected by a disease, and fear of dying as a result of
the infection. Efstathiou et al. ranked the themes uncovered in the data from the least influential in making nurses adopt SP to the most influential; dealing with children was ranked the least influential while fear of death was the most influential.

The constructs of the HBM were used to design the questionnaires used in the studies reported above yet none of these researchers used statistical methods to determine the amount of variance explained in adherence to SP. It is difficult therefore, to ascertain what benefits using the HBM to design questionnaires brought to these studies.

**The PRECEDE Model.** Two studies were found which used the PRECEDE model of health education as their theoretical framework to assess adherence (DeJoy et al., 1995; DeJoy et al., 2000). Although this model was not presented in Chapter Four as it is not widely used, it is of interest to review these two studies as they give valuable insight into factors influencing adherence to SP.

Originally designed as a five-step model to plan and evaluate health promotion interventions, PRECEDE stands for: predisposing, reinforcing, and enabling constructs in educational diagnosis and evaluation. DeJoy et al. (1995) used the model to develop a questionnaire examining individual, job/task and organisational factors having an impact on nurses’ adherence to SP. Results showed that job hindrances such as the perception than duties interfered with adherence to SP and high workload were the strongest negative predictors of adherence to SP, and an unsupportive safety climate was a positive predictor of job hindrances. Personal risk taking tendencies were measured in the study using six items from the Sensation Seeking Scale-V (Zuckerman, Eysenck, & Eysenck, 1978) and this summated scale was found to contribute positively to job hindrances.
In a later study DeJoy et al. (2000) used the same model to examine individual, job/task and environmental/organisational factors influencing adherence to SP among nurses. DeJoy et al. (2000) hypothesised that adherence to SP is influenced by reinforcing factors, enabling factors and predisposing factors. Those reinforcing factors also potentially have an impact on enabling factors which in turn might have an impact on predisposing factors. They administered a questionnaire administered to a sample of nurses ($N = 902$) to measure individual, psychosocial, job-task and organisational factors. Surprisingly, the factors in the model predicted general adherence ($R^2 = .41$) better than adherence to specific PPE ($R^2 = .18$) and this difference may be related to how ‘general’ adherence was defined. A positive safety climate in the organisation was shown to increase the likelihood that the working environment enabled workers to adhere to SP. DeJoy et al. concluded that a safety climate influenced adherence by facilitating a work environment which fostered or enabled adherence. In sum, the organisational climate played an important role in staff adherence to SP (DeJoy et al., 1995).

Theory of Planned Behaviour. Watson and Myers (2001) evaluated cognitive factors predicting clinical glove use among nurses, including perceived barriers to adherence, using the TPB. Intention to wear gloves, attitudes towards glove usage, subjective norm, perceived behavioural control, adherence, demographic variables and perceived barriers to adherence were measured using a questionnaire designed for the study. Perceived behavioural control and positive attitudes towards glove usage contributed significantly to explaining glove usage intention and intention was a strong predictor of glove use behaviour. Despite numerous reports to the contrary, barriers to adherence and perceived loss of dexterity did not predict participants’ adherence. Watson and Myers (2001) found that the variables in the extended model
predicted 45% of the variance in intention to wear gloves and 61% of the variance in self-reported glove usage. Time pressure was a significant negative predictor of wearing gloves. Nurses made the decision not to wear gloves based on whether or not they were in an emergency situation but not on whether or not the patient was known to have a BBV. While the variables in Watson and Myers’s study predicted intention and behaviour they made so suggestions on what factors might contribute to the unexplained variance.

**Blood Exposure, Personality and Behaviour**

Rabaud et al. (2000) took a different approach to investigating adherence among a sample of nurses. They explored links between Zuckerman’s Sensation Seeking Scale V (SSS-V; Zuckerman et al., 1978), practices in regards to adherence to SP, OEB, and OEB reporting. The sample comprised nursing students (n = 459) and employed registered nurses (n = 505). Only 17% of the participants reported routinely using gloves during all procedures that involved potential exposure to blood. Nurses who had reported an OEB were less likely to wear gloves than nurses who had not sustained an OEB. Rabaud et al. found that being employed as a Registered Nurse (RN), rather than being a student, and having a higher degree of disinhibition were significant predictors of sustaining an OEB. When the number of OEB reported was taken into account, being employed as a RN, having a higher degree of disinhibition, being more susceptible to boredom and having fewer years’ professional experience were significant predictors of sustaining an OEB. Staff reporting of OEBs was linked to having had at least one percutaneous injury, being younger, and being less susceptible to boredom. While this study is important, as it is one of the very few which have examined relationships between personality dimensions, in this case sensation seeking, level of disinhibition, and OEB most of
the items in the measure used (SSS-V) are not specific to healthcare situations. Rather these items describe leisure activities, sexual and drinking behaviours. A further study around the same time (DeJoy et al., 2000) also considered risk-taking tendencies among healthcare workers, again using the SSS-V and found that risk-taking tendencies were negative predictors of adherence to SP. Brevidelli and Cianciarullo (2009) and da Silva Felix, Toffano Malagutti, and Gir (2013) utilised the same items as DeJoy et al. (2000) to assess risk-taking but neither of these studies revealed a relationship between risk-taking and adherence. These few studies looking at risk-taking have produced equivocal results suggesting a need to explore the impact of risk-taking using a questionnaire specific to the healthcare context.

No further studies evaluating the role of personality traits on adherence to SP were sourced although some personality traits such as conscientiousness have been shown to predict safety related behaviours in other occupational settings as well as in leisure activities such as risky driving (Bogg & Roberts, 2004; Hogan & Foster, 2013). Christian, Bradley, Wallace, and Burke (2009) showed that the safety climate of an organisation was positively related to staff’s safety knowledge and safety motivation and to lower levels of workplace injuries. Conscientiousness was also associated with safety motivation which in turn was related to safety knowledge. It might be that levels of conscientiousness would also influence people to adhere to SP.

**The Concept of Disgust and its Potential Influence on Adherence to SP**

Etymologically, disgust originates from the French via the Latin “disgustus” meaning distaste or unpleasant to taste (W. I. Miller, 1997). One of the first descriptions of the disgust emotion was given by Darwin (1872). He used both a
written description and pictures, and he emphasised that the facial expression reflective of disgust is mostly concentrated around the mouth: “As the sensation of disgust primarily arises with the act of eating or tasting, it is natural that its expression should consist chiefly in movements around the mouth” (p.257).

The modern use of the word disgust has evolved from distaste. S. B. Miller (2004) argued that disgust is now also associated with a powerful anxiety described as “contagious disgustingness” (p.178). In this concept, the principle of contagion (referred to as “psychological principle of contagion by S. B. Miller), suggests there is danger in touching the aged or the sick which is expressed via disgust which, in turn, is argued to be a protective mechanism against diseases. Rozin, Haidt, and McCauley (2008) pointed out that the association between contagion and disgust might have become more obvious with the emergence of the germ theory when a link between filth and germs was confirmed.

While the word disgust has evolved linguistically, a biological evolution has also occurred with disgust originally characterising a revulsion of potentially spoilt food to now also being used to refer to behaviours of which one does not approve (Rozin & Fallon, 1987). Curtis and Biran (2001) argued that disgust can also be explained from an evolutionary perspective as it may have evolved from an aversion to potential sources of disease whether known or instinctively inferred which posed, at the time, a threat of mortality and further, of genetic extinction.

Curtis, Aunger, and Rabie (2004) investigated the possibility that disgust evolved to protect people from a risk of disease. They presented participants with either a plate of blue slime or one of bodily fluids. The participants presented with the body fluids scored it as more disgusting than did those presented with the plate of
blue slime. Similar reactions were observed when the researchers presented pictures of the same face twice to each participants: once the face appeared healthy looking; the second time external signs of fever were apparent. A third element of that study involved the presentation of a towel with yellow and red stains to mimic blood and bodily secretions, which was rated as more disgusting than a similar towel presented covered only with a blue stain.

In an investigation of the effect of disgust on oral immune function by Stevenson, Hodgson, Oaten, Barouei, and Case (2011) they found that disgust triggers an oral inflammatory response as well as a decreased secretion of salivary immunoglobulin A which is associated with a local immune response (Marcotte & Lavoie, 1998). A decrease in salivary Immunoglobulin A secretion has been shown to be the body’s response to deal with pathogen threats by redirecting the secretion to the gastric tract to counteract the ingestion of potentially spoilt food. This process is designed to prevent disease from ingested substances (Stevenson et al., 2011).

In a further test of reactions to disgust, Porzig-Drummond, Stevenson, Case, and Oaten (2009) elicited a disgust reaction in participants by showing them videos. The videos included images of people sneezing, then touching a door handle, followed by another person touching that handle then eating food from the hand that had been in contact with the handle. The idea was to demonstrate the chain of events from one behaviour to another resulting in possible infection or disease. Part of the reaction to this video was argued to be a feeling of disgust which would prompt a remedial behaviour. They found that people watching this video significantly increased their hand-hygiene behaviour when compared to a control group who had not been exposed to the same video.
C. Jackson and Griffiths (2014) found that, while SP guidelines were originally designed as an infection control strategy, nurses used them as a form of self-protection from patients they found “dirty”. Interestingly, nurses’ familiarity with the same “dirty” patients over time would often result in a reduction in the use of protective behaviours and SP suggesting that the perception that a patient is dirty reduces over time and can elicit behaviour change.

Consedine, Tzu-Chieh, and Windsor (2013) showed that disgust sensitivity was lower among medical and nursing students than among pharmacy students. This finding could imply a self-selection into professions where there is, or conversely is not, a higher probability of being subjected to substances or practices that some might find disgusting. While this in itself does not imply that every member of the nursing or medical profession will have a lower sensitivity to disgust, it is possible to wonder whether, as disgust has been shown to be a disease avoidance behaviour (Curtis, de Barra, & Aunger, 2011), healthcare professionals displaying lower levels of disgust sensitivity would be less likely to adhere to SP. To date, there is no evidence that this potential relationship has been investigated among nursing and medical professionals, although Loveday, Lynam, Singleton, and Wilson (2014) showed that nurses used gloves more if patients elicited feelings of disgust in them because they considered the patient to be unclean. Similarly, C. Jackson and Griffiths (2014) showed that fear of contact with dirt was one of the main motivations for nurses to adopt protective behaviours and wear PPE, while familiarity with the patient would elicit less protection even if those nurses were performing clinical procedures where infection control guidelines were required to be followed.
Some suggestions that disgust evolved as a protection mechanism from disease have been presented as well as suggestions that disgust propensity might be different by profession. It is not likely nurse and medical professionals would experience more disgust than the general population, in fact they may well demonstrate a greater tolerance for what many lay people might find abhorrent. These differences aside, an up-to-date investigation of the role of disgust and other factors with respect to adherence to SP is warranted. In this thesis, these factors will be investigated in a series of studies to be outlined next.

**Chapter Summary**

In this chapter a comprehensive review of empirical data assessing the factors affecting adherence to SP was presented. The first studies looking at adherence to UP (SP) were published from 1989 onwards. Despite healthcare workers education and SP being mandated by healthcare organisation, uptake has consistently been shown to remain less than satisfactory, putting patients and healthcare workers alike at risk of contracting infections. Few studies reviewed were underpinned by a theoretical framework using a health behaviour model, but the vast majority have been atheoretical. A range of factors affecting adherence have been identified and can be subdivided in organisational factors, psychosocial factors and individual factors.
CHAPTER FOUR

Aims of this Thesis

The aims in this thesis were to ascertain the factors which influence healthcare worker adherence to SP. In order to do this, a series of four studies were proposed: (1) a qualitative study would be conducted to elicit the factors that affect healthcare workers, in particular nurses and medical doctors, adherence to SP guidelines; (2) from Study One data, to develop and test the psychometric properties of a scale to measure these factors (3) the third study will involve a confirmatory factor analysis of the structure of the new scale and a test of its temporal stability; (4) and in Study Four a model of adherence to SP among healthcare workers using the new scale and other factors derived from the literature will be tested.

It is anticipated that the outcomes of these studies will provide a reliable and valid scale to assess the factors influencing adherence to SP; an understanding of the psychosocial variables which predict healthcare workers adherence, as well as suggestions to improve adherence rates and hence enhance infection control. Details of Study One are presented next.
CHAPTER FIVE

Study One

Aims

There is currently no comprehensive instrument to assess factors influencing adherence to SP. While past studies have explored these factors, the studies have been mostly observational in nature and, of the few scales that have been used, the authors have addressed a limited range of factors and reported little in terms of psychometric testing.

The aim of Study One was to interview healthcare workers, more precisely nurses and medical doctors, in order to ascertain their knowledge of SP guidelines, and healthcare workers’ behaviours and attitudes towards SP, and the factors which influence their use of SP. The themes identified from these data will inform the development of a scale which will be used in the subsequent studies in this thesis.

Method

Design

A cross-sectional design was employed to obtain qualitative data to ascertain nursing and medical staff’s knowledge of, attitudes towards, and behaviours regarding their use of SP.

Participants

A sample of 31 adults from the nursing, and medical workforce of the Northern Territory Department of Health participated in the study. There were six males (M age = 36.83 years; SD = 8.93); and 25 females (M age = 41.36 years; SD =...
The male participants had been practicing for an average of 11.88 years ($SD = 7.92$); the female participants had been practising for an average of 16.70 years ($SD = 9.89$). While all six male participants were nurses, two of the female participants were medical doctors.

**Procedure**

Ethical approval for the conduct of this study was obtained from the Northern Territory Department of Health and the Menzies School of Health Research Human Research Ethics Committee (Project No. HREC -2011-1601, Appendix A), support from the Northern Territory Department of Health (Appendix B) and from Charles Darwin University Human Ethics Committee (Project No. H11111, Appendix C). Participants were recruited by several means: (1) A notice advertising the study was posted on noticeboards in wards at the Royal Darwin Hospital (RDH; Appendix D); (2) an email was distributed to all Northern Territory medical and nursing staff by the Northern Territory Department of Health Principal Nurse Adviser, the same email was also distributed by senior nurses and nurse unit managers at the RDH to their staff (Appendix E); and (3) nurse unit managers at RDH known to the researcher were contacted directly to outline the aims of the study and to ascertain whether they would be willing to support the study individually and by promoting it among their staff.

The various emails contained a brief outline of the study, an invitation to participate in either a focus group or an individual interview and an advice, if interested in participating, to contact the researcher by telephone or email to arrange a meeting (Appendix E). A plain language statement outlining the aims of the study, what was expected of participants, any potential risks and the voluntary, anonymous
and confidential nature of their participation was also attached to the emails
(Appendix F).

A witnessed signed consent form was collected prior to the commencement
of the interviews and focus groups (Appendix G). Interviews and focus groups lasted
between 35 minutes and 48 minutes. Participants were asked for permission for the
researcher to record the interviews and to take notes. These notes were used to
present a summary of the discussions to participants towards the end of the session
in order to confirm their veracity. All participants were requested to avoid using
people’s names when referring to any incident, behaviour or attitude and, for those
meeting in groups, when conversing among themselves.

Materials

All participants were required to provide demographic data on their gender,
age, profession, and continuous years of practice since graduation and these data
were recorded anonymously on a data sheet.

The following open-ended questions were used as prompts during each
session:

- Are you aware of Universal Precaution (UP)/Standard Precaution (SP)
guidelines?
- What do you think is the most important aspect of the guidelines?
- Do you think people always follow these guidelines when required?
- How do staff decide whether or not to use SP in circumstances where SP are
  required to be followed?
- What would prompt you to follow or not follow the UP/SP guidelines?
- Do you think people are selective with regards to what aspects of UP/SP they decide to follow?
- How do you feel when seeing some people wearing personal protection equipment such as goggles or masks when others do not?

Follow up questions and prompts were used to explore issues that arose during the discussions. Participants were encouraged to discuss any issues they considered relevant and to provide examples.

**Results**

The audio recordings of the interviews and focus groups were transcribed verbatim into a Word document and checked to ensure accuracy of the transcriptions. Thematic analysis which allows the identification and reporting of emergent patterns or themes from the corpus of the data (Braun & Clarke, 2006) was then employed. Seven primary themes emerged which were categorised as: Knowledge, Justification for Use/Non-Use, Organisational Factors, Education, Consequences, Leadership/Role Modelling and Judgement/Risk Assessment (Table 5.1).
### Table 5.1

**Summary of Themes Identified Among Nurses and Medical Doctors**

<table>
<thead>
<tr>
<th>Primary Theme</th>
<th>Sub-Themes and Participants’ Comments</th>
</tr>
</thead>
</table>
| Knowledge           | Participants were aware of several sets of different guidelines, including  
|                     |   - Standard Precautions/Universal Precautions (SP/UP)  
|                     |   - Additional precautions (transmission based precautions)  
|                     |   - WHO guidelines  
|                     |   - Code of conduct  
|                     |   - Local policies and protocols  
|                     |   - Hospital risk management policies  
|                     |   - Workplace architecture  
|                     |   - Workflow principles  
|                     |   - Hospital manuals  
|                     | Participants stated that guidelines are often not read  
|                     | Stated that Hand hygiene is the most important aspect of SP/UP  
|                     |   - But it is not done well  
|                     |   - Hand rub can be an alternative to hand washing  
|                     | UP is the standard that everyone should practice  
|                     | SP/UP are part of initial university training  
|                     | There are too many interpretations of the same guidelines  
| Justification for Non-Use | Gloves are seen as an impediment  
|                     |   - They decrease dexterity and make it difficult to palpate veins and decrease sensation  
|                     |   - Perception of decrease in skills when wearing gloves, important to have a good fit  
|                     |   - It makes it easier for the patient and myself not to wear gloves when I take blood as I am less likely to miss the vein and I won’t hurt them or have to do the procedure twice  
|                     | Media influence: Heroes of TV shows save lives but are often without SP and influence us  
|                     | Complacency  
|                     |   - Developed when pathologies requiring protection are seen very often  
|                     | People become tired of protecting themselves  

Table 5.1 (Continued)

*Summary of Themes Identified Among Nurses and Medical Doctors*

<table>
<thead>
<tr>
<th>Justification for Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provide protection to patient (client), public and healthcare workers against splashes, body fluids and contamination</td>
</tr>
<tr>
<td>• Are to treat everybody the same</td>
</tr>
<tr>
<td>o Treat everybody as potentially infected</td>
</tr>
<tr>
<td>• Their use reduces infections, prevents cross contamination and minimises environmental contamination</td>
</tr>
<tr>
<td>• Is a patient expectation</td>
</tr>
<tr>
<td>o Expectations different in different venues i.e. Emergency Department vs. Birthing centre</td>
</tr>
<tr>
<td>• Need to be used when anticipating potential contact with body fluid</td>
</tr>
<tr>
<td>• Wearing gloves is not a conscious decision</td>
</tr>
<tr>
<td>o It is common sense</td>
</tr>
<tr>
<td>o There is awareness and habituation involved</td>
</tr>
<tr>
<td>o It is an automatic behaviour</td>
</tr>
<tr>
<td>o There is a lack of thinking sometimes when people don’t wear gloves</td>
</tr>
<tr>
<td>o Task at hand enables the use of Personal Protective Equipment or not</td>
</tr>
<tr>
<td>• Gloves are used for self-protection</td>
</tr>
<tr>
<td>o Sad as it is self and not patient</td>
</tr>
<tr>
<td>o Self and also protect family of staff</td>
</tr>
<tr>
<td>o Even if putting patient at risk</td>
</tr>
<tr>
<td>o Gloves are seen only as a self-protection device</td>
</tr>
<tr>
<td>o By using gloves I look after myself but not the patient</td>
</tr>
<tr>
<td>o No hand washing between patients, no hand washing before or after putting gloves on when people are wearing gloves</td>
</tr>
<tr>
<td>o People worry about getting infected by patients’ pathogens and wear gloves</td>
</tr>
<tr>
<td>• Wearing gloves is a false perception of safety</td>
</tr>
</tbody>
</table>
Table 5.1 (Continued)

**Summary of Themes Identified Among Nurses and Medical Doctors**

- **Organisational Factors**
  - **Culture**
    - It all comes down to organisational culture
    - Organisational culture is an enabler of compliance
      - Accreditation is seen as a motivator to improve adherence to SP
      - Audit of injuries can make areas change practice
    - Organisational culture is an enabler of non-compliance
      - People see what is usual practice and replicate it
      - Culture of the organisation allows for slips
      - In some places it is standard not to follow guidelines
      - Decreased supervision leads to a decreased accountability
      - Weak executive support for guidelines leads to low adherence
    - Accreditation can be a driver for education
    - Practicing audits with naming and shaming force staff to pick up their game
  - **Workload perception**
    - People are too busy to use PPE or forget the guidelines
    - They are in a hurry to get a task done and therefore do not use gloves
    - Lack of time is used as an excuse as it is part of the role to follow SP
    - As it is too time onerous to wear PPE people do not use protection if they consider that the situation has a low risk of transmission
    - In an emergency situation
      - People think about it afterward
      - In some facilities, people not able to enter trauma rooms if they are not wearing the appropriate PPE
  - **Availability of PPE**
    - There is a lack of availability/visibility of PPE or hand washing equipment
    - Visual cues can act as reminders for use
    - Decreased stocks due to financial constraints and have to go to another ward, therefore easier not to use
    - Lack of certain sizes of gloves therefore people don’t wear them
    - Goggles are not used as often because they are scratched or missing
Table 5.1 (Continued)

*Summary of Themes Identified Among Nurses and Medical Doctors*

- **Initial Training**
  - SP are more likely to be followed if healthcare workers are taught to use them before starting in the profession
  - Every assignment at university should contain aspects of SP
  - Training anchors the behaviour and gives the basics
  - Is not enough as practical experience is also needed
  - If people are taught without gloves less likely to wear them
  - People are not taught to wear goggles
  - Younger people are more likely to comply as gloves were around when they were taught
  - Older nurses comply less as gloves were not available [*sic*] when they trained

- **Perception of differences between nurses and doctors training**
  - UP/SP training is not mandated for some professions like medical doctors [*sic*]
  - Nurses are assessed yearly on infection control but not doctors
  - UP guidelines knowledge is picked up in clinical practice rather than initial training for doctors [*sic*]

- **Education opportunity**
  - Audits can lead to increased adherence
  - Nurses can educate doctors when adherence decreases
  - Testing and assessment by educators increases compliance
  - Education can be used to address organisational culture and improve adherence

- **A lack of education can lead to inappropriate use of PPE**
- **People do not use SP because they do not know about the guidelines**
- **Training as an enabler**
  - People are educated and need to weigh up the risk benefits of using/not using SP for themselves
  - Expectations that university trained nurses understand the consequences of not complying with guidelines

- **Ritual**
  - Everything was ritualised 30 years ago and not evidence-based
  - Venepuncture and cannulation used to be taught without gloves on
### Table 5.1 (Continued)

**Summary of Themes Identified Among Nurses and Medical Doctors**

<table>
<thead>
<tr>
<th>Consequences</th>
<th>Leadership</th>
<th>Role Modelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Not following guidelines can lead to injury</td>
<td>• Leadership</td>
<td>• Modelling can be used to change behaviour and address non-compliance</td>
</tr>
<tr>
<td>• Not using SP leads to patient being disempowered</td>
<td>o Can drive SP culture and compliance</td>
<td>o Individuals contributing to the culture is seen as positive</td>
</tr>
<tr>
<td>• Some people take more care when using sharps or instruments to avoid injury</td>
<td>o A good leader will say something if gloves are not being used</td>
<td>o Offer gloves to people not wearing them</td>
</tr>
<tr>
<td>• The effect of non-compliance are not immediately seen: it is not connected to practice and people do not feel any accountability</td>
<td>o Allows for discussions before adoption of new equipment/guidelines</td>
<td>o If I see somebody wear PPE/gloves it prompts me to follow guidelines</td>
</tr>
<tr>
<td>• Microorganisms are not visible so are not there – They are therefore not seen when passed on or acquired</td>
<td>• Non-compliance seen as an opportunity to educate those staff</td>
<td>o Modelling the behaviour might influence adoption in other people</td>
</tr>
<tr>
<td></td>
<td>• Some people challenge other healthcare workers seen as not using guidelines</td>
<td>o People that taught me did not wear gloves therefore I do not use them</td>
</tr>
<tr>
<td></td>
<td>• Non-compliance can be addressed by giving non-confrontational feedback</td>
<td>o Role modelling increases adherence to SP</td>
</tr>
<tr>
<td></td>
<td>• Peer leading by example can increase adherence</td>
<td>• Prompting when staff are seen not following i.e. do not forget your gloves, can make them change their behaviour</td>
</tr>
<tr>
<td></td>
<td>• People are rote learning rather than understanding</td>
<td>• Challenging other staff members when not adhering make them realise what they are doing wrong</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Often no intervention if more senior staff member is not adhering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• We all have a responsibility to encourage people to protect themselves</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It is more difficult for junior staff to challenge senior staff</td>
</tr>
</tbody>
</table>
Table 5.1 (Continued)

**Summary of Themes Identified Among Nurses and Medical Doctors**

<table>
<thead>
<tr>
<th>Judgement/Risk Assessment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff judge the procedure or the environment before deciding whether or not to adopt guidelines</td>
<td></td>
</tr>
<tr>
<td>o Judgement of when hand washing is required</td>
<td></td>
</tr>
<tr>
<td>o A potential exposition to contaminants will trigger SP use</td>
<td></td>
</tr>
<tr>
<td>o Judgement call when to use SP (use for cannulation but not for changing a child’s nappy)</td>
<td></td>
</tr>
<tr>
<td>Staff judge the patient</td>
<td></td>
</tr>
<tr>
<td>o Judgement of infection status is a deciding factor</td>
<td></td>
</tr>
<tr>
<td>o People change their behaviour if they know a patient’s status (in regards to BBV infection)</td>
<td></td>
</tr>
<tr>
<td>o Judgement based on how the patient looks and their background without real knowledge</td>
<td></td>
</tr>
<tr>
<td>o People assess what is wrong with the patient before deciding on SP (infectious or not)</td>
<td></td>
</tr>
<tr>
<td>Staff judge themselves and professionals working alongside</td>
<td></td>
</tr>
<tr>
<td>o I am very skilled at the procedure and I am not going to injure myself therefore gloves aren’t needed (in regards to cannulation)</td>
<td></td>
</tr>
<tr>
<td>o I am confident and skilled and gloves are not needed when cannulating even if the patient is known to have a BBV</td>
<td></td>
</tr>
<tr>
<td>Overall risk assessment is influenced by experience</td>
<td></td>
</tr>
<tr>
<td>Can modify the adoption of SP</td>
<td></td>
</tr>
<tr>
<td>o Some people warn other staff about patient status</td>
<td></td>
</tr>
<tr>
<td>o Patients are assessed according to types with paediatric patients being considered less a risk than an adult patient</td>
<td></td>
</tr>
<tr>
<td>o People with BBVs were routinely flagged at the beginning of the HIV epidemic but now everybody should be treated the same as possibly infectious</td>
<td></td>
</tr>
<tr>
<td>Being able to recognise when contamination happens</td>
<td></td>
</tr>
<tr>
<td>Perception of personality differences: some people think they are not going to stab themselves and refuse to wear gloves.</td>
<td></td>
</tr>
<tr>
<td>Using a non-touch technique instead of wearing gloves but situation can change</td>
<td></td>
</tr>
<tr>
<td>Assessment of own health for example not having any cuts on hands and therefore there is no need for</td>
<td></td>
</tr>
<tr>
<td>No anticipated patient contact</td>
<td></td>
</tr>
<tr>
<td>Previous experience of a situation or act where they didn’t use gloves and didn’t have a problem</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.1 (Continued)

**Summary of Themes Identified Among Nurses and Medical Doctors**

<table>
<thead>
<tr>
<th>Judgement/Risk Assessment (continued)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low anticipated patient contact time</td>
<td></td>
</tr>
<tr>
<td>Depends what the clinical procedure to be carried out is going to be Person experience of a situation: if a staff member is senior enough they can make the decision not to comply, not so if more junior</td>
<td></td>
</tr>
<tr>
<td>It is a personal preference: when taking blood/cannulating as only the healthcare worker is put at risk</td>
<td></td>
</tr>
<tr>
<td>Perception of personality differences: some people think that they are not going to stab themselves and refuse to wear gloves</td>
<td></td>
</tr>
</tbody>
</table>
**Knowledge of Guidelines**

All participants were aware of the existence of the SP guidelines as well as of several other guidelines and codes relevant to their working environment. They discussed where the guidelines were available to them such as in hospital manuals and on internal websites.

Some participants expressed concern that there were several different sets of guidelines and they suggested that this could give rise to confusion. Concerns were also voiced that staff often did not read hospital infection control manuals and that neither these manuals nor SP guidelines were clear enough. They stated that this lack of clarity could result in different interpretations of the requirements.

In our hospital we always had a manual that is very bulky and I don’t think that out of 3,500 staff anybody has read it. So what we are now is changing [the manual] to individual procedures so it will be easier to review and staff will hopefully have been more inclined to go and read (Participant 7).

Participants reported knowledge of guidelines was a key enabler to their use of the SP guidelines. The component from the SP guidelines with which they were the most familiar was hand washing, but less so the need to use gloves and other PPE. Even so, the majority of participants emphasised that hand hygiene, notably hand washing, was not performed consistently especially when people were putting on and removing gloves.

… and I can remember working in a neonatal intensive care nursery and when they started wearing gloves for every time you touched a baby and I
watched people as they peeled off the gloves from one baby and just put another glove on never wash their hands in between (Participant 9).

… the first basic [of SP] is washing hands, the second basic is that you treat everybody the same (Participant 4).

**Justification**

The comments coded as justification reflected participants’ justification for use of SP as well as their justifications for not using SP. Justification for using SP was reflected in statements such as the consistent adoption of SP standardises behaviour towards patients as well as affording protection to both staff and patients. Participants also stated that the use of SP is now an expectation of most patients, although some participants stated that wearing PPE might frighten some patients and/or remove some of the touch aspect of care, especially in the midwifery context:

… but they do get frightened if someone just starts gloving up and nobody says what they are doing and why they are doing it for [sic]. Then it does take away from the ambiance of a natural birth I suppose (Participant 4).

Or

But it’s the same with any procedures you are doing with a patient, even when you are gloving up to put a cannula in; you say to the patient, I am getting ready. Patients feel better if they think, they like to see, you know, clean hands and gloves too (Participant 9).

Protection of the patient and family but more commonly protection of self were also cited as justifications for using SP. Some participants saw protection of self as
“sad” as it was taking the focus away from the patient and only concentrated on staff welfare.

…staff actually only think of doing SP as a protection for themselves and their families, they don’t do it as oh this is what I should be doing to protect my patients … it is sad but that’s the way they think (Participant 1).

Some participants justified wearing gloves as a non-conscious decision, they justified their use of PPE as an automatic behaviour, which involved an awareness of the situation as well as habituation.

…[wearing PPE] is because it is just good sense, it is good for me and it is good for the patient and this is the standard of care that we are striving for (Participant 3).

Or

…personally I think it is common sense if you are a clinician (Participant 12).

And again

It is an automatic behaviour you know, you attend to a patient, you put on the required gear [PPE] you’re safe in your practice and protect yourself (Participant 14).

Some participants justified not using SP, such as gloves because they stated their use impeded their psychomotor skills. They further observed that as a result of wearing gloves, they would not be able to feel patients’ veins and potentially they might have to repeat the procedure thus causing more discomfort to patients.
…when taking blood samples I won’t wear gloves and that’s because in my previous experience, when I wear gloves, for blood taking, I can’t feel the vein properly and sometimes I miss which is obviously not good for the client who will need to be re-stabbed so I have learnt over the years to take blood without wearing gloves. I am more than aware that this is against policy and I take that on myself should anything happen… (Participant 17).

Media influence was also mentioned by some participants as a justification for the adoption or otherwise of SP. They mentioned that the heroes of television shows are often seen saving lives without following any SP guidelines and participants argued that such modelling was highly influential particularly on junior members of staff.

I think, because they see [nurses], and that’s doctors as well, they seemed to be, in the media, it is just… yep we are the heroes of the day and yes we’ll just do this without gloves. We go in, we save a life quickly stabilise, bang! Bang! (Participant 12).

Further justification for not using SP included a sense of complacency, that is becoming blasé about adopting SP, especially when dealing with pathologies seen on a regular basis.

I think people get tired of having to gown up and glove up and they used to always have flu patients so people get tired of putting a mask on but when they hear something new is out there and, you know, we don’t see scabies, we don’t see head lice so everyone panics so it is new to them and they sort of don’t know the risk when they sort of get a bit I don’t know complacent with gastro and things like that (Participant 28).
Although being blasé was described by some as justification for non-adherence to SP, feelings of frustration were also expressed by one participant:

I get frustrated with staff who don’t [follow SP] because they are just so blasé and they just don’t get safety (Participant 18).

**Organisational factors**

Comments related to the organisational culture, workload perceptions and availability of PPE were coded under the theme Organisational factors.

**Organisational culture.** The organisation was described as both fostering the use of SP but also as not promoting their use by lack of enforcement and/or lack of equipment. Some participants commented about ‘slips’ in practice, for example omitting to use gloves. While these ‘slips’ were not necessarily directly condoned, they were often ignored by others, including senior staff, thus contributing to a workplace culture that was lax in terms of adherence to guidelines.

I think culture in the workplace, if you are just new, you are more likely to do what other people do rather than what you know is the right thing (Participant 16)

This comment suggests that the workplace culture can be an important determinant of adherence to SP.

…the culture slips hum and if the culture slips, then… if there are people that are more vulnerable and taking some behaviours, taking those short cuts, and if you can set the standards, this is the standard that is expected (Participant 12).

On a more positive note, one participant indicated that:
… and SP were part of the culture of that hospital. Like it was on everybody’s lips you know, everybody knew what it was about, everybody talked about it (Participant 4).

A positive cultural influence on the adoption of SP was seen to occur leading up to hospital re-accreditations. At these times, participants stated that they were encouraged to follow all procedures. Participants observed however that changes wrought at such times might only lead to short-term change rather than to sustained practice.

**Workload Perception.** Some participants stated that high workloads in some organisations were not conducive to adherence to SP as staff are in a hurry to get tasks done and feel that they will be slowed down by having to put on the required PPE. Others commented that high workloads were just an excuse for non-use rather than being an objective rationale.

…and I think that’s when omissions are made [on SP guidelines] as they think they are really busy and maybe tempted to take short cuts (Participant 8).

Emergency situations were also described as occasions when SP guidelines were not adhered to, as there was a belief that taking the time to put on PPE might have a negative impact on the patient.

…but in that emergency situation, where you may go from one patient to the next, in a rush timeframe because they have collapsed or they are seizing or whatever, well we don’t necessarily consider…the cross contamination and not sticking on a pair of gloves necessarily (Participant 21).
**Availability.** While lack of availability of PPE was used by participants to justify non-adherence to guidelines it is coded under culture as it is the organisation’s responsibility to provide these resources. Participants stated that the lack of PPE related sometimes to no availability, inappropriately sized items such as gloves, and the lack of proximity of sinks in clinical areas, among factors which limit staff adoption of SP. Furthermore, some other equipment provided by the organisation was often said to be unserviceable and therefore not usable, such as scratched goggles.

I think having, the equipment readily available, so you can grab it as you walk past it so it is evident (Participant 16)

While another participant saw lack of availability as both a justification and an excuse:

[washing hands] it is not like in India, where I actually had to look for a sink and spent 10 minutes looking for a sink to wash my hands (Participant 12).

**Education**

Participants discussed a wide range of supervisory standards experienced during their training, as well as in their workplace. Participants stated that there is a need for better initial training in the use of SP as well as ongoing monitoring and peer modelling as further forms of education. There was also a perception that there are differences between medical training and nursing training around knowledge and the application of SP. Nurses argued that they were taught about SP in more depth than medical doctors. One nurse commented:
...I don’t think this is something that is covered a lot in the medical training, it is something they pick up usually from the nursing staff (Participant 8).

Education was also seen as facilitating risk assessments performed by healthcare providers. Some participants stated that as educated professionals they are able to understand the ramifications of non-adherence and so weigh up the risk/benefits of not following the guidelines. Participants rationalised their non-use of the SP guidelines, even though a situation required their use, by stating that it was the best decision made at the time with full knowledge of the consequences.

Whether or not SP guidelines and their use were covered during initial training was also cited as a factor that would influence behaviour towards implementation of the guidelines such as:

I assisted somebody in the resus [resuscitation] bay and I didn’t wear gloves cause I had forgotten again. So I had to rewire my brain to put gloves on for bleeding people because it wasn’t something we were taught years ago. You just had to wash your hands [then] (Participant 9).

Consequences

What can be termed a proximal/distal effect of the possible consequences of not using SP was also cited as a factor in the decision to use or not use SP. That is, any negative effects of non-adherence are not typically seen immediately and therefore seem disconnected to practice. Such a distal effect may reduce or remove any fear or accountability feelings from not following the guidelines.

I would certainly be expecting somebody that is a tertiary trained healthcare worker of any stripe, to be able to sort of understand the sequelae of their
actions [when not adhering to SP] and they don’t go beyond predicting the next 5-10 minutes you know when there might actually be [consequences] much further down the track (Participant 26).

And

I think not only can you not see it but the effects aren’t immediate. If I give you the wrong drug, something could happen and we could make a connection but if you give somebody a staph. aureus bacteraemia, that happens [is evident] 10 days later and they are being transferred, there is no connection to my practice (Participant 10).

Microorganisms were described by some participants as the “invisible killer”. Some participants commented that staff took shortcuts in implementing SP because they did not realise the possible future consequences of saving a few seconds in the here and now.

One example given of possible patient disempowerment was when the patient knew PPE were required for the procedure being undertaken, the staff member failed to use such PPE, but the patient felt unable to speak up about it.

Participants perceived that dealing with sharps and needles would elicit more caution among some staff, as the consequence of not following SP in those instances appeared more “visible” than when, say, not using goggles for a suction procedure. Some participants also stated that they themselves were more likely to adhere to SP when dealing with instruments rather than when there was a potential for exposure to body fluid but where no instruments were required:
In my experience people are very cautious around instruments and I think because they are separate entities people treat them differently and people are more aware of the danger they [the instruments] pose (Participant 18).

Other examples of differential use were alluded to, such as the manipulation of a needle would likely involve use of SP but if the procedure involved endotracheal suction, the person would not necessarily use goggles.

**Judgement/Risk Assessment**

Most participants stated that staff frequently used their judgement of a situation and of the patient, as well as an evaluation of the risks associated with the procedure, before deciding whether or not to use SP.

Comments where the staff can be seen to “evaluate” the patient and/or the situation and where the use of SP is dependent on this judgement include:

Sometimes depending on the patient, if it is a normal patient I don’t wear gloves but if it is a patient that has very flaky skin, does not look very well kept and looked after then I would put gloves on to protect myself. You kind of eyeball the patient and decide (Participant 15);

Or

I think also that we tend to use [PPE] more when our patients are like of an unkempt appearance… hum… or they may have been incontinent of faeces or urine (Participant 30)

Not all participants operated this way, with one stating that:
Making assumptions on whether a patient is a regular Typhoid Mary or not, that doesn’t enter into it” (Participant 8).

One participant commented that SP use should be universal and there is a need for a shift in mentality so that everyone [is viewed] as infectious (Participant 12).

Participants generally observed that level of experience influenced staff’s judgement of patients’ status, with more junior staff considered unable to make a valid judgement.

… if they were experienced I would expect them to make their own judgment on that. I suppose if you are experienced you are going to think oh ok whether if you are junior, you need to nurture your junior staff and make sure they learn the right way then if they do it the wrong way then it is up to them as they know what the right way is (Participant 5).

Patient judgement was also used as a justification for not reporting injuries, for example:

I can give examples of nurses getting needlestick injuries with a patient and not reporting it saying that she [the patient] doesn’t look like she has HIV or anything…so I guess as well as risk assessment some of it you could classify as prejudice assessment as well (Participant 24).

Some participants stated that they were informed by, or informed, their colleagues of the status of a patient and would be guided by this information in deciding whether or not to adopt SP:
But I have noticed that other staff member will be like [sic] before they do something with a patient they will say, this patient is Hep. C positive but to me it’s like, it is good to know but at the same time it is not needed if we have SP (Participant 11).

Judgement of patients was said to occur differentially when working with paediatric or adult patients. SP adoption was often more stringent when dealing with aged care patients than when dealing with babies. For example, some participants were under the impression that adopting guidelines when dealing with faeces was mostly universal as it is seen as dirty (thus judging the situation) while guideline adherence was not universal when dealing with blood. The exception was when dealing with children where the concept of clean/dirty was not seen to be relevant and guidelines were not adhered to. That is, children were seen as clean individuals while older adults were seen as dirty.

Yet technically you should wear gloves when changing nappies cause [sic] they are wet and dirty nappies. I reckon [sic] the decision would be different with older people as they are dirty and babies aren’t (Participant 4).

Different patients would make me act differently, I think baby poo or wee doesn’t really bother me but to get adult ones is disgusting. [silence] babies are clean (Participant 12).

Or again:

For example I used to work in an environment where we did procedures and for an adult we were absolutely doing everything [PPE] whereas if it was a tiny
person [child/baby], we did not necessarily wear gloves. Babies are clean (Participant 23).

Judgement of self and other professionals also featured in the discussions. Some participants saw their job experience as a safety net against injuries, particularly when practicing acts such as venepuncture or cannulation. Those participants stated that adhering to SP in those circumstances was not necessary as they felt they were skilled enough and the likelihood of injury was perceived as extremely low.

I weigh up the risks and if I feel I am going to be successful and I am pretty damn sure I am going to get it in and I am the best person for the job in the room then I will do it and I won’t wear the gloves and usually I am ok. And if I do get blood on my hands, stop what I am doing you know within reason (Participant 13).

Or again:

I feel like if I have to put a cannula in and I am going to go ahead without a glove on I feel pretty confident that I am gonna [sic] get it in and I am probably not going to put blood everywhere. I feel confident with my skills (Participant 22).

Staff seen not wearing PPE when practicing the same procedures where others were adhering to SP were described as arrogant if they refused to comply with a request to wear PPE when prompted. These staff were said to put themselves at risk by refusing to wear PPE. Arrogance was ascribed specifically to the more senior
members of the medical or nursing teams as they frequently refused gloves even when offered to them.

**Leadership/Role Modelling**

Positive comments were also made about how to deal with non-adherence by others and foster adherence. Some participants stated that they felt they had a responsibility to encourage people to protect themselves and that they would address non-adherence by a junior staff member. Somewhat ironically, an observed lack of adherence by senior staff members in the same situations was not seen as needing attention and was not questioned, but to some extent this behaviour was justified.

I guess if I thought the practitioner was experienced, then I didn’t feel so much concerned as with junior staff, senior staff like myself are able to make decisions about the level of risk as [*sic*] if it were junior staff, then maybe I could stop them and I have done that or talk to them and tell them about gloves, eye protection and all that kind of stuff (Participant 28).

Some participants stated that their adherence to SP was a positive demonstration of adherence behaviour to others, and that observing them implementing the guidelines was a positive incentive for others to do so.

The only way to actually change the system is by role-modelling and when you see people not doing the right thing, you don’t kick them, you make it easy for them to comply with what acceptable practice is, the appropriate practice is (Participant 22).

Or:
I go and get a pair [of gloves] and say to them [junior staff] you need to be wearing these. That is all I need to say and usually people just don them (Participant 24).

The same was stated in reverse, that is where staff do not follow guidelines in either practicing or demonstrating clinical procedures, participants said this acted as a negative influence on the observer’s adoption of SP.

In interviews and extracting these themes from the data, aside from the majority of nurses commenting that medical doctors lacked SP training or seemed to receive less training than nurses, there was commonality in their views.

**Discussion**

The aim in Study One was to ascertain nurses and medical doctors’ knowledge of and behaviours around the adoption of, Standard Precaution (SP) guidelines, and their opinions why colleagues might or might not follow the guidelines. Seven themes were drawn from the data.

Of the 31 participants recruited for the study, only two were medical doctors, the remainder were nurses. The proportion of male nurses who participated in the study (20.70%) was higher than the proportion of males in the nursing workforce generally (9.9% nationally and 13.4% in the Northern Territory; Australian Institute of Health and Welfare, 2012), and hence the proportion of female nurses in the study was lower than these national and Territory figures. The mean age of the nurses was 40.48 years while the national average age for nurses is 44.5 years and, more specifically, 43.3 years in the Northern Territory. Thus the current sample was slightly younger than the average nurse in the Australian workforce (Australian
Institute of Health and Welfare, 2012) and more skewed towards males. Clearly these current data are drawn from a sample which is divergent in age and gender from the population of nurses. Both medical doctors were female aged 31 and 52 years. As they are few in number and both female, they are not at all representative of medical doctors.

The average length of practice for nurses was 15.77 years and 24.21 years for the doctors. This information is not part of the data collected by the Australian Institute of Health and Welfare on the Australian nursing workforce. It was therefore, not possible to compare the sample data with national data in regards to this criterion.

**Themes Derived from the Data**

While all participants acknowledged that they were aware of the SP guidelines, they also knew of several other codes and protocols and suggested that these diverse guidelines could give rise to confusion over which one to use. Certainly, before UP evolved and were renamed SP, they coexisted for a short while with a subset of guidelines called Body Substance Isolation (BSI; Lynch et al., 1987) and this co-existence has potentially led to some confusion especially among those who trained in those years. The major features of UP and BSI were incorporated when SP superseded these two sets of guidelines (Garner, 1996; The Hospital Infection Control Practices Advisory Committee et al., 1996), so the confusion described by the participants might reflect a lack of understanding of the difference between SP and isolation precautions as described previously by Prieto and Clark (1999). SP represent the minimum requirement when dealing with a patient when there is a potential risk of exposure to body fluid and those guidelines need to be
supplemented with isolation precautions if a patient has been diagnosed with contagious pathogens or is suspected of carrying a contagious pathogen (Siegel et al., 2007). Stein, Makarawo, and Ahmad (2003) reported that 80% of nurses they surveyed had attended infection control training, but this information was not collected in the current sample. It would have been interesting to ascertain whether or not attendance at professional development sessions was lower in the current sample and if not, this might explain in part the confusion described by participants.

Participants cited hand hygiene as one of the most important aspects of SP guidelines. While hand hygiene was not the most important element when the guidelines were originally designed, an increasing focus on nosocomial transmission prevention does reinforce the importance of hand hygiene (Pittet, Allegranzi, & Boyce, 2009). The average years of practice of nurse participants was 16 years (between 3 months and 27 years), which can be interpreted to suggest they would have undertaken at least part of their training since the introduction of UP in 1987. It is unclear whether this training was not of sufficient depth or whether other factors, perhaps even modelling and organisational culture mentioned later, may have influenced both their behaviours and knowledge of SP.

The theme labelled Justification provides an insight into participants’ perceptions on the usefulness of the guidelines and how they justified using them or not. Participants stated that SP guidelines should be adopted as they afford staff and patients’ protection as well as being a consistent approach towards patient care. Staff use of SP was also argued to be a patient expectation and therefore justified. There was a perception though that staff’s use of SP might be frightening for some patients, especially in the delivery room context, if no prior explanation had been given to the patient. These comments support Woloski-Wruble, DeKeyser, Levi, and Margalith
(2000) who found that the majority of patients they surveyed were in favour of and expected nurses to be wearing gloves, especially when there was a risk of exposure to body fluid. Patients did not however, voice this expectation for situations where the healthcare worker was not at risk, such as when taking blood pressure. Although not mentioned by the current participants, See et al. (2014) reported that patients in their study who challenged healthcare workers not adhering to hand hygiene were advocating for their own safety. These two studies highlight that the guidelines were viewed, at least by the patients in their studies, as enabling their protection as well as enabling the protection of healthcare workers.

Some participants justified the non-use of PPE in settings such as the delivery ward. They argued that the use of PPE might be seen as unnecessary, threatening or offensive by these women especially if no explanation was offered by staff. These observations reflect those from Kobert (1989) who also reported that nurses perceived that wearing gloves and masks during deliveries could be ‘offensive’ to patients. Yet when these patients were interviewed, Kobert noted that they indicated they did not take offense. As reported in the current data and by the nurses in Kobert’s study, Butts and Janes (1995) argued that the wearing of gloves removes the positive impact of a comforting touch in the nurse-patient relationship.

The perception that a healthcare worker wearing PPE could frighten patients can be seen as an expression of the paternalistic legacy still present in some aspects of healthcare. Anticipating patients’ feelings to justify not using PPE suggests a lack of communication between staff and patients which could potentially endanger not just the relationship between healthcare workers and patients but also the care delivered. Clearly these are among situations where better staff-patient communication is required as suggested by Cohen (2004).
Self-protection was also cited as a justification for SP use. Some participants however, observed that use of SP primarily for self-protection was ‘sad’ as it did not take into account the protection of patients. For some this was seen as a focus on self rather than the patient or both patient and healthcare worker.

The original focus of SP was indeed staff protection when faced with an epidemic of an uncertain transmission mode (Garner, 1996). Although the guidelines have evolved to now encompass patient protection and the reduction of cross contamination risks, staff protection needs to be kept on an equal footing with patient protection. Examples of the importance of this need come from recent outbreaks where healthcare workers were affected. In Hong Kong in 2003, around a quarter of the patients with Severe Acute Respiratory Syndrome (SARS) were healthcare workers, 65% of the diagnosed cases of SARS in Canada involved health workers while the only deaths reported in Vietnam from SARS were among healthcare workers (Donnelly et al., 2003; Emanuel, 2003).

Erasmus et al. (2009) showed that one of healthcare workers’ main justification for practicing hand hygiene was self-protection. Participants in their study mentioned that they felt a need to perform hand hygiene when they felt their hands were dirty, before eating or at the end of a shift. This cleansing occurred despite participants reporting that their hands were visibly clean. Such comments would suggest that the incentive for staff to perform hand hygiene is more geared towards self-protection than towards patient protection.

Some comments were also made, in the current study, about a lack of hand hygiene before putting on and removing gloves with the implied justification that gloves alone provided protection. This inaction could be construed as healthcare
workers not considering patient safety as not performing hand hygiene before putting on or removing gloves can facilitate cross-transmission of pathogens. Poor hand hygiene adherence in these circumstances was also highlighted by Girou et al. (2004) and Whitby and McLaws (2004).

Habit and complacency were also justifications for the use or non-use of SP. Participants emphasised that the use of PPE was an automatic behaviour not requiring thought, while on the other hand they highlighted that complacency might develop when dealing with pathologies seen often. Habituation was shown by Nilsen et al. (2012) to potentially explain engagement in behaviours that do not require an ongoing decision process. While adherence to SP could be classified as an habitual behaviour not needing an ongoing decision process, this aspect is debatable. Healthcare workers do need to decide whether or not the procedure to be performed is one that involves exposure to a patient’s body fluid (Siegel et al., 2007). Where adoption of SP is required, it might be that some contextual cues are required in these circumstances to prompt staff to use the relevant PPE (Nilsen et al., 2012).

Glove use was also stated by participants to be an impediment to care and this was stated to be a justification for non-use of PPE. Participants commented that wearing gloves decreased their dexterity, especially when practicing venepuncture or cannulation, and thus made the healthcare worker more likely to have to repeat the procedure and cause discomfort to the patient. This perception of impaired dexterity has been described often in the literature (Cutter & Jordan, 2012; Reda et al., 2010; Tait et al., 2000) and in fact, Phillips, Birch, and Ribbens (1997) showed that wearing latex gloves did affect the performance of fine motor skills in surgeons. On the other hand, Zhang, Lee, and Knott (2014), when looking specifically at cannulation failure rates, found no difference in whether participants wore gloves or
not. They also found that participants who did not wear gloves reported more incidents related to significant blood spillage than among those who wore gloves.

Media influence, especially television series set in hospitals were also cited as a justification for the non-use of the guidelines, especially among younger staff. There is some evidence that inaccurate television and/or media portrayals of doctors and nurses have a negative influence on the general public’s view of these professions (Chory-Assad & Tamborini, 2001; Quick, 2009). There is no literature to date that has explored the influence of media portrayal on medical and/or nurse professionals. Clearly though, participants in the current study are of the view that the behaviours of the characters in these series are role models for junior staff, at least regarding the use of PPE.

Several aspects were incorporated in the theme labelled organisation: culture, workload perceptions, and the provision of PPE supplies. The organisational culture was discussed as both an enabler of non-adherence and of adherence to SP. Participants suggested that staff who witnessed departures from the use of SP might then deem this “usual practice” within the organisation and replicate these behaviours in order to fit in. While this is a form of modelling, participants also saw this as related to the culture of the organisation where “slips” were normalised. This perception led to discussion about the safety climate of organisations as an enabler of adherence, by ensuring staff training and PPE resources were appropriate. Safety culture in the organisation has been described as being pivotal in increasing adherence to SP (Lymer, Richt, & Isaksson, 2003, 2004), and peer behaviour was shown by Neves et al. (2011) to positively influence participants’ adherence to SP. The impact of organisational culture in normalising non-adherence has been described previously by Gershon et al. (1995) and Kermode et al. (2005). The
comments that the organisational culture is an enabler of adherence support Vaughn et al.’s (2004) findings where greater levels of management support were associated with more consistent adherence to safe needle precautions.

Perceptions of a heavy workload, being too busy to adopt PPE or being involved in an emergency situation, as well as a lack of availability/visibility of PPE or hand washing equipment were cited as reasons for non-adherence. Clearly these issues and resources are the responsibility of the organisation. These factors were described previously in the literature as limiting adherence (Baraff & Talan, 1989; Cutter & Jordan, 2012; Kelen et al., 1990; Kristensen et al., 1992; Madan et al., 2002; Reda et al., 2010; Schillo & Reischl, 1993; Tait et al., 2000; Williams et al., 1994). Despite these criticisms of the organisation and the implication by participants that a lack of facilities contributes to non-adherence, it is interesting to note the findings from Whitby and McLaws (2004). They found that even in a purpose built hospital with sinks located never further than five metres from areas where clinical activity took place healthcare workers adherence to handwashing did not improve over a nine month period of observation. Also of concern, was their observation that glove use diminished adherence to handwashing protocols by 25%.

The education theme was characterised by comments relating to initial training with participants suggesting they were taught “different” things. Participants perceived differences between nurses and doctors’ training in SP and suggested that doctors were less well trained in SP than nurses. The need for subsequent professional development activities to increase adherence to SP was also mooted. Empirical evidence has shown that poor knowledge is linked with low adherence (M. F. Chan, Ho, & Day, 2008; Knight & Bodsworth, 1998; Luo et al., 2010; Reynolds,
Dulhunty, Tower, Taraporewalla, & Rickard, 2013) thus emphasising the importance of education to the promotion of adherence.

Some comments were made in regards to the time elapsed since initial training and there was a perception that nurses who were not taught to wear PPE during their initial training were less likely to adhere to SP guidelines. These comments do not appear highly valid, as female participants in this study had been practicing for an average of 16.70 years and male an average of 11.88 years so it is likely most if not all were taught SP guidelines during their training. Calabro, Bright, and Kouzekanani (2000) showed that medical students had poor long term retention of infection control knowledge taught during initial clinical training and the same may be true for the current sample albeit mostly of nurses. This finding highlights the importance of including refresher courses on the SP guidelines in ongoing professional development for healthcare workers.

While there was a perception among the participants that being older would decrease those staff’s adherence to SP because they trained before SP were introduced, this contradicts findings from Zhang et al. (2014). They showed that older healthcare professionals (nurses and doctors) were more likely to wear gloves than younger ones, especially when performing cannulation. It seems that there is no consensus in regards to age, time elapsed since initial training and whether or not the timing of education has a positive or negative influence on adherence to SP.

As mentioned, there was a perception of differences between nurses’ and doctors’ education of SP. The imbalance in the sample between doctors and nurses may have exacerbated the number of comments made on the content of the medical training. Despite this imbalance, the nurses generally perceived that medical training
did not give doctors knowledge of SP and that their knowledge and skills were “picked up” during clinical placements. Apart from working alongside doctors, it is unlikely that nurses would have a comprehensive knowledge of the medical curriculum to be able to make such a judgement. In contradiction of the statements, Brevidelli and Cianciarullo (2009) showed that 73.9% of the medical doctors they surveyed acknowledged that they had been taught SP at university while only 39.4% of the nurses surveyed acknowledged they were taught about SP at university or during their initial training. Certainly, in the Australian context there is no information that would suggest that the SP guidelines have not been part of nurses and medical training since the guidelines were adopted.

Profession has been shown to be a factor that can affect adherence to SP with medical doctors displaying lower adherence rates than nurses (Cutter & Gammon, 2007; Stein et al., 2003). Manias and Street (2000) found that doctors relied on knowledge from past medical placements and knowledge derived from medical textbooks to make decisions, while nurses relied more on policies and procedures. This finding appears to be reflected in the current results where the majority of participants were nurses who perceived that doctors did not adhere to policies and procedures.

As the consequences, if any, of non-adherence are often not seen for some time participants emphasised it was often difficult for staff to realise that non-adherence could have dramatic results for themselves and their patients. Negative effects, the acquisition of a blood born virus such as HIV or Hepatitis, or even death through sepsis were said to be distal and not related to ‘an incident’ where SP were not followed. These comments support the findings of Eiamsitrakoon, Apisarnthanarak, Nuallaong, Khawcharoenporn, and Mundy (2013) who showed
that not realising the potential consequences of non-adherence contributed to staff implementing SP less often.

Non-adherence to SP also expose staff to the risk of injury and some participants described a differential adoption of SP when using sharp instruments and needles as opposed to gloves or goggles. This suggestion contradicts Zhang et al. (2014) who showed low adherence rates in the context of cannulation (performed with sharp instruments) where only 54% of the participants wore gloves for that procedure. One of the options to reduce risks to healthcare workers from needlestick injuries for cannulation or venepuncture, would be the introduction of safety engineered devices or needleless systems. Certainly, Vaughn et al. (2004) showed that one positive predictor of adherence to SP was working in a facility using needleless systems.

Participants reported making judgements of the procedure, the patient, and their skills before deciding whether to use SP or not. Yet based on SP guidelines, any judgement should be limited to whether or not the clinical procedures or interaction with the patient is likely to expose the healthcare provider to body fluid. If it is, then SP should be implemented. Participants’ description of the judgements they or others used was qualitatively different. Some participants indicated that they implemented SP based on whether or not the procedure to be performed was seen as clean or dirty. For example, a potential exposure to urine or faeces was a trigger to glove use while gloves were not used for taking blood or inserting a cannula. Staff practice was also often different when changing babies’ nappies as compared to handling older incontinent patients: babies were seen as clean while older adults were seen as dirty.
Some participants also stated that they judged patient status, that is whether or not they could have a BBV, before deciding to use PPE or not. Others stated that they relied on colleagues informing them of the patient’s status or, that others informed them of the patient’s status whether this information was sought or not. Vaughn et al. (2004) reported that patients could be categorised as “blood and body fluid precautions needed” and this labelling reduced the overall use of SP as healthcare workers would only implement SP for patients so flagged. It must be noted however, that the data reported by Vaughn et al. was collected in 1996 and such formal categorisation of patients should not be seen any more in healthcare facilities as it is against SP guidelines (Siegel et al., 2007). No participant in the current study mentioned if the institution for which they worked still flagged HIV or Hepatitis positive patients formally, however they remarked that this used to be the practice when HIV first appeared. Nevertheless, it would seem that some informal assessments still occur among the staff.

Judgement or knowledge of patients’ status seems to influence some participants behaviours and this observation reflects the earlier results from Tait et al. (2000). They showed that knowledge of patient status increased adherence, with 81.3% of the nurses in an operating theatre setting wearing goggles if they knew the patient was HIV-positive. This finding seems clearly related to the judgement of the patient’s status as wearing goggles is one aspect of SP typically less adhered to (R. Chan et al., 2002; Cutter & Gammon, 2007; Cutter & Jordan, 2004, 2012).

Judgement of the patient status was also described as influencing whether or not healthcare workers’ occupational exposures to blood and body fluids were reported. This statement is in accord with Hills and Wilkes (2003) and Osborne (2003) who found that the reporting of occupational exposures to blood and of
percutaneous injuries increased with a belief in the risk of contracting a BBV infection. It remains worrisome that judgement of the patient still plays a part in the decision to report an injury, as reporting and the subsequent post-exposure prophylaxis have been shown to decrease the risk of occupational acquisition of HIV. Likewise Hepatitis B acquisition risks in unvaccinated individuals are lessened if post exposure treatment and vaccinations are instigated (Young, Arens, Kennedy, Laurie, & Rutherford, 2007).

The last aspect described by participants in regards to judgement was in relation to their own skills. Some participants stated that their level of skill and experience ensured that they would not sustain an OEB during procedures such as venepuncture or cannulation. These comments can be interpreted to suggest feelings of invincibility.

Invincibility has been shown to be a phase in the social-cognitive development of adolescents (Wickman & Koniak-Griffin, 2013). It has been linked to risk-taking behaviours in adolescents, especially in relation to unsafe sexual behaviours and the increased risk of sexually transmitted diseases as a result of perceptions of invincibility (Roberts & Kennedy, 2006; Wickman & Koniak-Griffin, 2013). Beyth-Marom, Austin, Fischhoff, Palmgren, and Jacobs-Quadrel (1993) showed no difference between teenagers and adults’ perceptions of outcomes from risk-taking behaviours. This finding might suggest that a sense of invincibility and risk propensity in the context of leisure, drug taking, and sexual activities might translate into later risk-taking in adulthood in occupational settings. The behaviours associated with risky decisions have been shown to be influenced by characteristics of the situation, characteristics of the decision maker, and interactions between the two (Figner & Weber, 2011). Neves et al. (2011) showed that a lack of fear of the
consequences of a behaviour, in terms of acquiring a disease or being exposed to a pathogen reinforced healthcare workers feelings of self-confidence and increased non-protection.

Self-confidence can lead the person to neglecting to use of PPE and the healthcare worker might be reinforced by the belief that use of PPE interferes with one’s ability to perform a procedure. Thus by overstating their ability and/or underestimating their vulnerability healthcare workers might choose not to use PPE (Neves et al., 2011).

Brevidelli and Cianciarullo (2009) measured risk-taking personality along with other individual, work related, and organisational factors using five items from the Impulsive Sensation Seeking Scale (ImpSS; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). Although they established that overall the model tested explained 38.5% of the overall rate of adherence to SP, they did not detail how much variance the sensation seeking factors contributed. It may be beneficial to explore further the roles of risk-taking and invincibility with respect to adherence to SP.

It was interesting to observe that although the current participants made an assessment of their own skills and of abilities, they failed to notice that other staff were applying similar judgements. Not only did they not notice this similarity but in one instance, recounted by Participant 17, of an anaesthetist refusing to accept the gloves handed to him by the nurse, the anaesthetist’s behaviour was described as arrogant. Ironically, this participant had earlier recounted that she had cannulated a patient without gloves as she was skilled enough to do so and did not risk injury. She failed to note that this could be an example of the same “arrogance” she attributed to the anaesthetist. Participants failing to see that their own non-adherence behaviours
were similar to other members of the healthcare team supports reports from C. Jackson, Lowton, and Griffiths (2014) in their study on infection prevention behaviours.

Some participants also stated that by not using SP they would only put themselves at risk. They were happy to take that risk based on their own judgement or a risk-assessment of the patient that has no place in the application of the guidelines. Such an approach goes against the dual protection principle of SP.

The leadership of senior staff and role modelling by other staff members were also said to influence adherence. These comments ranged from senior members directly challenging other staff members who were not complying, feeling responsible for encouraging people to protect themselves, prompting staff to use PPE, or role-modelling appropriate behaviours. Some participants stated that not intervening at all was a negative leadership, that is, when the person seen as not complying with SP guidelines was a more senior member of staff they would not correct that person. Some participants saw leadership as driving the organisational culture in relation to SP and their adherence to SP. These observations support past findings from Lymer et al. (2004) who showed that a lack of supervision and leadership led to nurses being demotivated and adhering less to SP. Similarly, Efstathiou et al. (2011b) found that nurses were also less likely to follow SP if medical doctors working alongside them were not adherent.

The current findings also support Beatty and Beatty (2004) who found that the strongest influence leading the anaesthetists in their study to adhere to the guidelines was their normative beliefs about any violation. That is, they expressed concern about the opinions of their peers and significant others in the organisation
would have of them if they violated procedure. Such a belief can be related to the organisational culture, modelling of behaviours and may well be termed the safety climate of the organisation (Cooper, 2000).

Clearly the interviews and focus groups have yielded a rich array of data much of which supports previous literature. The aggregation of these data produced seven themes which can be seen to cover a range of requirements to promote adherence to SP from education, to individual and organisational factors. The themes derived from this study will be used to inform the development of an instrument to assess the factors affecting adherence to SP in Study Two.

Chapter Summary

The data from the interviews and focus groups revealed factors which can be seen to influence adherence to SP. The main themes extracted from the data were Knowledge, Justification, Organisational Factors, Education, Consequences, Judgement/Risk Assessment and Leadership/Role Modelling. The themes derived from the data collected during Study One reflect different factors which have an impact on staff adherence to SP. The issues identified can be broadly construed as educational, individual, organisational and professional factors. These factors were discussed in terms of their support for past research. These themes will form the basis to develop a scale to assess factors influencing adherence in the following study.
CHAPTER SIX

Study Two

Aims

The aims of Study Two were to develop and evaluate the psychometric properties of a new scale to assess the factors influencing healthcare workers’ knowledge, attitudes, behaviours and organisational factors in regards to adherence to SP based upon the themes identified in Study One.

This research will provide a standardised scale to measure healthcare workers’ adherence to occupational guidelines and it will enable better understanding of the impact of the different factors on adherence to SP.

Method

Design

A repeated measure design was employed to determine (1) the factor structure and the internal reliability of the Factors Influencing Adherence to Standard Precautions Scale (FIASPS) developed in this study, (2) its convergent validity with the Impulsive Sensation Seeking scale (ImpSS; Zuckerman & Kuhlman, 2000), and (3) its temporal stability over a four week interval.

Scale Development

One hundred and sixteen items were generated from the themes extracted from the qualitative data collected in Study One. A five-point Likert scale rated from
0 = not at all like me to 5 = A lot like me was used as the response format (Appendix H).

The items generated were evaluated by 10 experts, academics and infection control nurses, in order to assess their face validity. These 10 experts were also asked to answer each question to ensure further the readability of the questions, relevance and ease of response.

A Spearman’s correlation matrix was conducted using data from these ten experts. The correlations indicated that 24 items did not correlate ≥ .3 with any other item and were removed from the scale. Although the sample size was small, it was unlikely that these items would contribute to any subsequent factor. No suggestion of multicollinearity or singularity was present in the correlation matrix. After these items were deleted, the scale comprised 92 items (Appendix I).

Participants

Time One. Three hundred and ninety-six participants were recruited and started the questionnaire with complete data submitted by 363 participants. These 363 participants’ age ranged from 23 years to 64 years (M age = 44.03 years; SD = 9.78). There were 49 males (13.5%; M age = 41.94 years; SD = 10.36) and 314 females (86.5%; M age = 44.36 years; SD = 9.66). An independent samples t test revealed no gender difference in the mean age of participants t(361) = 1.61, p = .362 (two-tailed). Participants at Time One (T1) provided demographic data and completed both the 92-item FIASPS and the ImpSS described below. They were also asked to provide a six-letter code consisting of the first three letters of their mother’s first name and the first three letters of their father’s first name. This code was to be used to match the responses from time one and time two.
**Time Two.** Two hundred and sixty-two participants agreed to participate in the test-retest phase four weeks later, but only 100 participants (88 females) completed the questionnaire. Their age ranged from 27 to 64 years ($M = 45.18$ years; $SD = 8.81$). There was no difference in age between females ($M_{age} = 45.37$; $SD = 8.74$) and 12 males ($M = 43.64$, $SD = 9.66$) using an independent $t$-test ($t(98) = .70$, $p = .484$ (two-tailed).

At Time Two (T2), participants completed only the 92-item FIASPS as well as providing demographic data and the same code from T1 based on parent’s names for matching.

**Measures**

At Time One, Participants were asked to indicate their age, gender, area of work, how long they had been working since qualifying as a nurse or a medical doctor and whether they worked full, part-time or on a casual basis. They also provided the code described above.

The Factors Influencing Adherence to SP Scale (FIASPS) is a 92-item scale specifically developed for this study using the themes from Study One. Examples of items for each theme are: Knowledge (I am familiar with the content of the Standard Precautions guidelines); Justification for use/non-use (I use SP whenever there is a potential for me to be exposed to body fluids; Wearing gloves makes it more difficult to palpate veins when practicing venepuncture or cannulation); Organisational factors (In some workplaces it is standard practice not to follow guidelines; I am more likely to wear protective equipment if it is located nearby patients); Education (I don’t wear goggles very often as it wasn’t part of my initial training; I typically follow SP as taught during my training); Consequences (The
consequences of not adhering to SP are not very clear; The fact that microorganisms are not visible has a lot to do with the way people fail to follow the guidelines; Judgement/Risk-Assessment (I decide whether I need to use SP based on the likelihood of becoming infected; The more experienced I become at my job, the more likely I am able to decide when I need to use SP); and Leadership/Role-Modelling (I feel the need to confront people I see not adhering to SP; I have a responsibility to encourage people to protect themselves). Questions were answered on a five-point Likert scale ranging from 0 = not at all like me to 5 = very much like me.

In order to assess the convergent validity of the new scale, participants also completed the ImpSS (Zuckerman & Kuhlman, 2000; Zuckerman et al., 1993) which has been used in previous studies related to OEB or adherence (e.g., Rabaud et al., 2000; DeJoy et al., 2000). While the ImpSS scale was not designed specifically to assess reasons for non-adherence to SP, an earlier version of the ImpSS: the Sensation Seeking Scale, Version V (Zuckerman et al., 1978; Zuckerman et al., 1964) has been used as a predictor of OEB by Rabaud et al. (2000).

The ImpSS is a 19 item subscale from the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) which was developed as an alternative to McCrae and Costa’s (1987) Five Factor Model (Zuckerman et al., 1993). The ImpSS scale was derived from factor analyses of other scales including the subscales of the Sensation Seeking Scale Version V (SSS-V) and other impulsivity scales (see Zuckerman, 2007). The ImpSS consists of two subscales: an Impulsivity subscale (Imp) of eight items (e.g., I tend to begin a new job without much planning on how I will do it, I very seldom spend much time on the details of planning ahead) and a Sensation Seeking subscale (SS) of 11 items (e.g., I enjoy getting into new situations where
you can’t predict how things will turn out; I tend to change interests frequently). Zuckerman et al. (1993) reported internal reliability for the summated items of the ImpSS as Cronbach’s $\alpha = .86$. In order to increase the variance in the current data, the True/False answer format was changed to a five point Likert scale $0 = $ not at all like me to $5 = $ very much like me.

While items in the original SSS-V were related to specific activities (e.g., I often wish I could be a mountain climber; I would like to try parachute jumping) the items in the ImpSS as seen above are more general in nature. Both have been used in health research but they do not relate specifically to health or health workers’ behaviours, but neither was any other scale so identified in the literature.

**Procedure**

Ethical approval for the conduct of this study was obtained from the Northern Territory Department of Health and the Menzies School of Health Research Human Research Ethics Committee (Project No. HREC -2011-1601, Appendix A) and from the Charles Darwin University Human Research Ethics Committee (Project No. H11111, Appendix B). The Northern Territory Department of Health Principal Nurse Advisor sent an email to all Northern Territory Senior Nurses inviting them to participate in the study. The email contained a brief outline of the study requirements and a link to the actual online survey (Appendix J). The Senior Medical Officer sent a similar email to the Northern Territory Medical Staff (Appendix J) and an invitation to participate in the study was also distributed via a similar email to members of the Australian College of Critical Care Nurses (ACCCN) by their administration (Appendix K). The Northern Territory General Practitioners Education Network placed an advertisement in their newsletter inviting members to
participate in the study. An announcement containing similar information was also placed on the social media site Facebook to disseminate information about the study and provide the link to the online survey. Interested parties were asked to refer the invitation to friends and colleagues in the nursing and medical professions.

The link to the website on which the questionnaire resided: (http://cduhes.asia.qualtrics.com/SE/?SID=SV_08Iq2Y1QnGUPh9q) first presented viewers with a printable Plain Language Statement (PLS; Appendix L) which provided further details on the study, that participation was voluntary, and their data anonymous. The PLS also advised readers that submission of the completed questionnaire would constitute their informed consent. Participants were also advised that they could exit the study at any time by simply closing their web browser.

At the completion of the survey, participants were asked to indicate if they would be willing to complete the questionnaire a second time four weeks later. They were given options to “Submit Time One/Agree” or “Submit Time One/ Do not Agree”. Those who indicated “Agree” were then directed to a second independent survey form where they were asked to enter the date and their email address twice, to overcome any typographical mistakes. It was not possible to link participants’ original responses to their email addresses. For those who elected not to participate at Time Two, they were advised that their T1 responses had been submitted and they were thanked for their participation.

After four weeks, a link to the retest survey was emailed to participants who had provided their email address. A reminder was sent to each of these participants seven days later. This process occurred over several months as the four-week
interval had to be matched to the original submission date of each respondents. At no time was it possible to identify any participant’s data or link data from T2 to email addresses. Due to the means of distribution it was not possible to calculate a response rate for T1, but 27.55% of T1 respondents also contributed at T2.

Results

Data screening and normality checks

The development and testing of a scale to assess the factors influencing adherence to SP in medical and nursing staff is reported here. The data were exported directly from the online survey tool, Qualtrics, into SPSS files for analyses. Prior to data analyses, the data were checked for accuracy of transposition, missing values and normality. Three hundred and seventy-eight participants started the questionnaire, but 15 cases reflected a large component of missing data. These cases were excluded from analyse. A final sample of 363 participants remained.

Demographic data

Occupation. Twenty-one medical doctors (3 males) and 342 nurses (46 males) were recruited for this study.

Work area. The majority of participants reported that they worked in a critical care area (46.9% of the male participants, 51.6% of the female participants), which encompassed intensive care, coronary care areas and high dependency units, followed by emergency departments and medical care for both male and female participants. There was no association of participant’s work areas by gender ($\chi^2 = 19.81, p = .09$; Table 6.1).
Table 6.1

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Care Areas</td>
<td>46.9</td>
<td>51.6</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>10.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Medical Care</td>
<td>14.3</td>
<td>8.2</td>
</tr>
<tr>
<td>Surgical Care</td>
<td>2.0</td>
<td>4.4</td>
</tr>
<tr>
<td>Community</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>Gerontology/Rehabilitation/Long Term Care</td>
<td>2.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Mental Health</td>
<td>4.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Admission Ward</td>
<td>4.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Other</td>
<td>14.3</td>
<td>16.6</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. “Other” encompassed areas such as: (1) education, (2) clinical management, (3) Nurse Unit Managers, (4) Medical Imaging, (5) others specified areas related to a specific disease or it was not possible to identify their classification.

**Time in the Profession.** Participants’ reports of the time they had been working in their profession since qualifying ranged from 2 months to 45 years ($M = 19.60$ years; $SD = 10.96$). The male participants (both nurses and medical doctors) had been working in their profession from 18 months to 35 years ($M = 16.42$ years; $SD = 9.20$) while female participants had been working in their profession from 2 months to 45 years ($M = 20.10$ years; $SD = 11.14$).

When considered by profession, male medical doctors had been working in their profession from seven to 12 years ($M = 8.66$ years; $SD = 2.89$) and female medical doctors from three to 30 years ($M = 9.05$ years; $SD = 6.28$). Female nurses had been working in their profession from two months to 45 years ($M = 20.76$ years; $SD = 11.02$) and male nurses from 18 months to 35 years ($M = 16.92$ years; $SD = 9.25$).

A factorial between groups Analysis of Variance (ANOVA) was used to compare the average time working in their profession (years) by gender (male,
female) by profession (nurse, medical doctors) and it revealed no effect for gender on years in the profession, $F(1, 359) = .38, p = .54$, partial $\eta^2 = .001$; a main effect for profession on time working in profession was present, $F(1, 359) = 8.56, p = .004$, partial $\eta^2 = .02$ with nurses reporting more years of work in their profession than medical doctors. There was no interaction between gender and profession on years of work $F(1, 359) = .25, p = .61$, partial $\eta^2 = .001$.

**Employment Status.** Most participants (62.6%) worked full time, 31.4% worked part-time, and the remaining 6% worked either on a casual basis or were in other circumstances (e.g., maternity leave). The majority of the male participants (37 participants, 75.6%) worked full time, six (12.2%) worked part-time, and six (12.2%) were employed on a casual basis. A greater proportion of female participants than male participants worked part-time (108 participants; 34.4%), but like males, the majority of female participants (190 participants; 60.5%) worked full time. Eleven female participants, (3.5%), worked on a casual basis and five reported that they were on maternity leave from their job (1.6%).

**Construct Validity and Reliability of the Factors Influencing Adherence to Standard Precautions Scale**

Initial screening of the data revealed no missing data across the 92 items for the final sample of 363 participants. The data were subjected to a Principal Components Analysis (PCA) with oblique rotation to determine the underlying factor structure of the scale. Inspection of box plots, skewness, kurtosis, and Shapiro-Wilk statistics revealed approximate normality for all items. The Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO .816) and Bartlett’s Test of
Sphericity ($\chi^2 (1431) = 6215.40, p < .001$) both indicated the factorability of the correlation matrix.

The initial PCA revealed 28 factors with eigenvalues greater than one, two factors explained 5% or more of the variance, while Cattel’s Scree Plot suggested the presence of four or five factors. After successive extractions and the removal of 43 items which either failed to contribute to a factor $\geq .4$ or which loaded onto two or more factors, simple independent structure was produced with a five-factor solution. These five factors explained 39% of the variance and were labelled: (1) Leadership (17 items); (2) Justification (12 items); (3) Contextual Cues (9 items); (4) Culture/Practice (6 items) and (5) Judgement (5 items). Internal reliability analyses using Cronbach’s Alpha ranged from $\alpha = .67$ to .86. The factor structure, factor loadings, reliability coefficients, inter-correlations, eigenvalues, per cent of the variance explained, and descriptive statistics for each factor are presented in Appendix M.

In order to address the imbalance in the number of items loading onto each factor and to improve the parsimony of the scale for subsequent administrations, the number of items was reduced to the five items in each factor with the highest loadings. A further PCA confirmed that this reduced number of items yielded a similar, stable structure, which explained approximately 50% of the variance. Internal reliabilities remained adequate ($\alpha \geq .60$). The factor structure, factor loadings, reliability coefficients, inter-correlations, eigenvalues, per cent of the variance explained and descriptive statistics for each of the final factors are presented in Table 6.2.
Table 6.2

*Five Factor Principal Component Analysis of Factors Influencing Adherence to Standard Precautions Scale*

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am able to decide whether or not to use Personal Protective Equipment based on the clinical risks to me</td>
<td>.70</td>
</tr>
<tr>
<td>The more experienced I become at my job, the more likely I am to be able to decide when I need to use standard precaution</td>
<td>.63</td>
</tr>
<tr>
<td>I am educated and able to weigh up risks/benefits of not using standard precautions when needed</td>
<td>.62</td>
</tr>
<tr>
<td>I assess what is wrong with a patient before deciding whether or not to implement standard precautions</td>
<td>.60</td>
</tr>
<tr>
<td>My assessment of a patient's status will indicate if I need to follow standard precautions guidelines</td>
<td>.59</td>
</tr>
<tr>
<td>I feel the need to confront people I see not adhering to standard precautions</td>
<td>.88</td>
</tr>
<tr>
<td>When I witness others non-adherence with standard precautions, I use that as an education opportunity</td>
<td>.85</td>
</tr>
<tr>
<td>I feel comfortable challenging nurses or doctors when I see them not adhering to standard precautions</td>
<td>.78</td>
</tr>
<tr>
<td>I use role-modelling to increase use of standard precautions by others</td>
<td>.77</td>
</tr>
<tr>
<td>I have a responsibility to encourage people to protect themselves</td>
<td>.66</td>
</tr>
<tr>
<td>The culture of my organisation allows for people not to follow standard precaution guidelines (R)</td>
<td>.71</td>
</tr>
<tr>
<td>In some workplaces it is standard practice not to follow guidelines (R)</td>
<td>.68</td>
</tr>
<tr>
<td>Most nurses typically adhere to standard precautions</td>
<td>.60</td>
</tr>
<tr>
<td>People interpret standard precaution guidelines differently (R)</td>
<td>.55</td>
</tr>
<tr>
<td>Most doctors typically adhere to standard precautions</td>
<td>.49</td>
</tr>
<tr>
<td>Item</td>
<td>Factor</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>If I know that my workplace has a culture of adhering to standard precautions, I am more likely to adhere</td>
<td>.78</td>
</tr>
<tr>
<td>I am more likely to wear Personal Protective Equipment if I see my colleagues wearing them</td>
<td>.70</td>
</tr>
<tr>
<td>I am more likely to wear Personal Protective Equipment if they are located nearby patients</td>
<td>.70</td>
</tr>
<tr>
<td>I am more careful if I know that a patient has a blood borne pathogen</td>
<td>.54</td>
</tr>
<tr>
<td>I am more likely to follow standard precautions if I am dealing with needles</td>
<td>.38</td>
</tr>
<tr>
<td>I don't wear gloves as I cannot feel veins</td>
<td>.73</td>
</tr>
<tr>
<td>I am less likely to wear gloves as I was taught procedures without them</td>
<td>.68</td>
</tr>
<tr>
<td>I am clumsier when I wear gloves and risk having to repeat the procedure</td>
<td>.67</td>
</tr>
<tr>
<td>I don’t need to wear gloves when taking blood/cannulating as I am skilled at what I do</td>
<td>.66</td>
</tr>
<tr>
<td>It is my choice to not wear gloves when taking blood/cannulating as I am only putting myself at risk</td>
<td>.66</td>
</tr>
</tbody>
</table>

Eigenvalue | 4.14 | 2.88 | 2.04 | 1.88 | 1.55 |
%variance explained | 16.58 | 11.52 | 8.15 | 7.51 | 6.18 |
Correlation matrix (weighted scores)

<table>
<thead>
<tr>
<th>Judgement</th>
<th>Leadership</th>
<th>Culture/Practice</th>
<th>Contextual Cues</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.03</td>
<td>.03</td>
<td>.14</td>
<td>.24</td>
</tr>
<tr>
<td>Leadership</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Culture/Practice</td>
<td>.06</td>
<td>.01</td>
<td>.09</td>
<td>.13</td>
</tr>
<tr>
<td>Contextual Cues</td>
<td>.19</td>
<td>.09</td>
<td>.13</td>
<td>1</td>
</tr>
<tr>
<td>Justification</td>
<td>.24</td>
<td>.08</td>
<td>.01</td>
<td>1</td>
</tr>
</tbody>
</table>

M (Range 0-20) | 6.58 | 14.44 | 12.00 | 11.31 | 2.78 |
SD              | 4.61 | 4.51  | 3.35  | 4.92  | 3.40 |
Cronbach’s alpha (α) | .67 | .86   | .60   | .67   | .72  |
Convergent Validity of the Factors Influencing Adherence to Standard Precautions Scale

The ImpSS was used as an indicator of the convergent validity of the five factors of the FIASPS. Before doing so, Confirmatory Factor Analysis (CFA; AMOS Version 7) was conducted to confirm the factor structure of the ImpSS in the current sample. The independent Chi Square ($\chi^2_{136} = 2169.18$, $p < .001$) indicated an association among the items and their suitability for a CFA. The goodness of fit indices indicated that the data failed to fit the two factor model: $\chi^2_{118} = 376.81$, $p < .001$, C/Min 3.14, Goodness of Fit Index (GFI) .885, Adjusted Goodness of Fit Index (AGFI) .850, NFI .829, CFI .876, RMSEA .077, and $p_{\text{close}} < .001$. Examination of the factor loadings revealed that although all items loaded significantly onto their appropriate factors, numerous items also loaded on both factors. Exploratory factor analysis of the scale using a Principal Component Analysis with oblique rotation to allow for intercorrelations among the factors (Tabachnick & Fidell, 2007) was then conducted.

The Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO .915) and Bartlett’s Test of Sphericity ($\chi^2_{171} = 2619.89$, $p < .001$) both indicated the factorability of the correlation matrix for the 19 items. Initial PCA revealed three factors with eigenvalues greater than one, two factors explained 5% or more of the variance, while Cattel’s Scree Plot suggested the presence of two to three factors. After successive iterations and the removal of two items that contributed to more than one factor (I am an impulsive person; I often do things on impulse), simple independent structure was extracted with a two-factor solution. These two factors explained 45.81% of the variance. It was still possible to label them as per the original scale: Sensation Seeking (SS: 12 items) and Impulsivity (Imp: 5 items).
Internal reliabilities for these factors were Imp $\alpha = .72$ and SS $\alpha = .88$. The factor structure, factor loadings, reliability coefficients, inter-correlations, eigenvalues, percent of the variance explained and descriptive statistics for each factor are presented in Table 6.3.

Table 6.3

*Factor Structure, Loadings, Eigenvalues, Per Cent of the Variance Explained, Descriptive Statistics for the ImpSS Scale*

<table>
<thead>
<tr>
<th>Item</th>
<th>Sensation Seeking</th>
<th>Impulsivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to have new and exciting experiences and sensations even if they are a little frightening</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>I sometimes like to do things that are a little frightening</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>I like doing things just for the thrill of it</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>I would like the kind of life where one is on the move and traveling a lot, with lots of change and excitement</td>
<td>.71</td>
<td></td>
</tr>
<tr>
<td>I enjoy getting into new situations where you can’t predict how things will turn out</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>I’ll try anything once</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>I sometimes do “crazy” things just for fun</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>I like to explore a strange city or section of town by myself, even if it means getting lost</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>I prefer friends who are excitingly unpredictable</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>I would like to take off on a trip with no pre-planned or definite routes or timetables</td>
<td>.58</td>
<td></td>
</tr>
<tr>
<td>I like “wild” uninhibited parties</td>
<td>.47</td>
<td></td>
</tr>
<tr>
<td>I tend to change interests frequently</td>
<td>.40</td>
<td></td>
</tr>
<tr>
<td>Before I begin a complicated job, I make careful plans (R)</td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>I usually think about what I am going to do before doing it (R)</td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>I tend to begin a new job without much planning on how I will do it</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td>I very seldom spend much time on the details of planning ahead</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>I often get so carried away by new and exciting things and ideas that I never think of possible complications</td>
<td>.51</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>6.05</th>
<th>1.74</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Variance explained</td>
<td>35.57</td>
<td>10.25</td>
</tr>
<tr>
<td>Correlation matrix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.37</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$M$</th>
<th>16.23</th>
<th>4.37</th>
</tr>
</thead>
<tbody>
<tr>
<td>$SD$</td>
<td>8.63</td>
<td>3.21</td>
</tr>
<tr>
<td>Cronbach’s $\alpha$</td>
<td>.88</td>
<td>.72</td>
</tr>
</tbody>
</table>

Intercorrelations between the Impulsivity and Sensation Seeking factors with the five factors (Leadership, Justification, Contextual Cues, Culture/Practice and Judgement) of the new scale are presented in Table 6.4.
Table 6.4

*Correlations between the Five Factors of the FIASPS and the Factors of the ImpSS Scale*

<table>
<thead>
<tr>
<th></th>
<th>Leadership</th>
<th>Justification</th>
<th>Contextual Cues</th>
<th>Culture/Practice</th>
<th>Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulsivity</td>
<td>-.11*</td>
<td>.14**</td>
<td>.04</td>
<td>-.19**</td>
<td>.01</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>.02</td>
<td>.15**</td>
<td>.05</td>
<td>-.19**</td>
<td>.03</td>
</tr>
</tbody>
</table>

** **p < .01.
* * p < .05.

The Impulsivity subscale correlated positively with Justification for not using SP (e.g., no time, unable to feel veins; skilled enough), and negatively with Leadership (e.g., confront others; use role-modelling to increase uptake of guidelines) and negatively with Culture/Practice (e.g., aware of the organisational culture), although none of these correlations were substantial. Sensation Seeking correlated positively with Justification for not using SP and negatively with Culture/Practice but again these correlations were weak. There were no significant correlations between Contextual Cues and Judgement with either Imp or SS, nor did SS correlate significantly with Leadership.

**Comparison of Factors by Gender and by Profession**

A factorial between groups Multivariate Analysis of Variance (MANOVA) was used to compare the five subscales of the FIASPS (Leadership, Justification, Contextual Cues, Culture/Practice and Judgement) by gender by profession. Box’s $M = 40.98$ ($F = 1.26$, $p = .15$) revealed multivariate homogeneity and Levene’s Test indicated homogeneity of error variances for each dependent variable. Pillai’s trace revealed a global difference by profession, $F (5, 355) = 3.44$, $p = .005$ partial $\eta^2 = .05$, but no global difference by gender, $F (5, 355) = .65$, $p = .66$, partial $\eta^2 = .01$. 
There was no interaction between gender and profession $F(5, 355) = .75, p = .59$, partial $\eta^2 = .01$. Table 6.5 contains the means, standard deviations, F-Statistics and effect sizes for all subscales of the FIASPS by profession only as there was no gender difference.

Table 6.5

<table>
<thead>
<tr>
<th>Sub-scale</th>
<th>Nurses M</th>
<th>Nurses SD</th>
<th>Medical Doctors M</th>
<th>Medical Doctors SD</th>
<th>$F_{1,359}$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>14.71</td>
<td>4.32</td>
<td>10.05</td>
<td>5.30</td>
<td>9.35</td>
<td>.002</td>
<td>.025</td>
</tr>
<tr>
<td>Justification</td>
<td>2.66</td>
<td>3.31</td>
<td>4.81</td>
<td>4.24</td>
<td>9.54</td>
<td>.002</td>
<td>.026</td>
</tr>
<tr>
<td>Contextual Cues</td>
<td>9.91</td>
<td>4.34</td>
<td>11.95</td>
<td>4.05</td>
<td>5.33</td>
<td>.021</td>
<td>.015</td>
</tr>
<tr>
<td>Culture/Practice</td>
<td>12.04</td>
<td>3.37</td>
<td>11.42</td>
<td>3.07</td>
<td>.18</td>
<td>.670</td>
<td>.001</td>
</tr>
<tr>
<td>Judgement</td>
<td>6.53</td>
<td>4.64</td>
<td>7.48</td>
<td>4.12</td>
<td>1.11</td>
<td>.292</td>
<td>.003</td>
</tr>
</tbody>
</table>

Post hoc univariate tests of between-subject effects revealed no difference between the professions on the subscales Culture/Practice and Judgement. Nurses scored higher on the Leadership subscale than medical doctors, but lower on Justification and Contextual Cues, although no effect size ($\eta^2$) was large.

**Retest of the Factors Influencing Adherence to Standard Precautions Scale**

Of the 363 participants in Study Two, 262 volunteered to take part in the retest phase of the study four weeks later but of these only 100 participants completed the Time Two (T2) survey. Stability over time on the factors of the FIASPS was
determined by assessing the correlations between these 100 participants’ scores at Time One (T1) and T2 (Table 6.6).

Table 6.6

*Descriptive Statistics and Correlations between the Five Factors of the FIASPS at T1 and T2*

<table>
<thead>
<tr>
<th>Factors</th>
<th>Means (SD)</th>
<th>Test-Retest Reliability Coefficients (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time One</td>
<td>Time Two</td>
</tr>
<tr>
<td>Leadership</td>
<td>14.45 (4.62)</td>
<td>14.75 (4.30)</td>
</tr>
<tr>
<td>Justification</td>
<td>2.64 (3.42)</td>
<td>2.94 (4.33)</td>
</tr>
<tr>
<td>Contextual Cues</td>
<td>9.92 (4.53)</td>
<td>9.54 (4.33)</td>
</tr>
<tr>
<td>Culture/Practice</td>
<td>11.60 (3.54)</td>
<td>11.97 (3.25)</td>
</tr>
<tr>
<td>Judgement</td>
<td>6.52 (4.41)</td>
<td>5.80 (3.89)</td>
</tr>
</tbody>
</table>

*Note.*** = p < .001, n = 100.*

Although all correlations were statistically significant, they ranged from strong (Leadership; Justification; Culture/Practice and Judgement) to weak (Contextual Cues).

In order to determine if there was any systematic effect between participants who participated in the Retest phase (n = 100) and those participants who did not (n = 263), a Multivariate Analysis of Variance (MANOVA) was conducted on their T1 factor scores.

All underlying assumptions for a MANOVA were met. Pillai’s trace (F (5, 251) = 2.11, p = .065, partial \( \eta^2 = .04 \)) revealed no significant difference in T1 scores for the five factors between those participants who completed the questionnaire at T2 and those who did not.
Discussion

The aims of Study Two were to develop and psychometrically evaluate a new scale to assess factors impacting on healthcare workers’ adherence to SP (Factors Influencing Adherence to SP Scale; FIASPS). The results provide support for the reliability and the validity of this scale.

Construct Validity of the Factors Influencing Adherence to Standard Precautions Scale

An initial Principal Component Analysis (PCA) produced five independent factors which were labelled: Leadership; Contextual Cues; Justification; Culture/Practice and Judgement which together explained 39% of the variance and demonstrated good internal reliability. As there was an unequal number of items across the factors, and to ensure a more parsimonious scale for future administrations, these factors were reduced to five items each using the highest loading items per factor. A further PCA yielded the same structure which explained 50% of the variance. Internal reliability of these factors was adequate ($\alpha \geq .60$). The factors extracted in this study reflect several of the themes identified from participants’ responses in Study One.

The factor labelled Judgement relates to healthcare workers’ making judgements on their skills and knowledge with respect to whether or not they would use PPE. Higher scores suggest a perception that their skills and knowledge are such that they are able to decide whether or not to utilise SP, and in what situations they judge themselves to be at risk or not of OEB. This judgement was reflected in the statements that “The more experienced I become at my job, the more likely I am to be able to decide when I need to use SP”. These judgements not only ignore patient
safety but also suggest a level of perceived invincibility by some participants. A sense of invincibility has been linked with risk-taking behaviour in the leisure context (Roberts & Kennedy, 2006; Wickman & Koniak-Griffin, 2013) and it may be that some of this personality trait is also exhibited in other domains, including the workplace. That staff make judgements also supports Efstathiou et al.’s (2011b) findings that some guidelines were not followed when nurses were very confident about their capabilities and stated that they had enough experience to make a judgement. Clearly there is a need to account for people’s perception that they can accurately judge when to use or not use SP when looking at factors influencing adherence to them.

The second component relates to healthcare workers demonstrating Leadership to others with respect to SP use. It includes confronting others seen not to be adhering to SP, as well as the use of modelling to prompt SP use by others. This proactivity can be likened to a type of informed leadership. The emergence of this factor supports Neves et al. (2011) who showed that Leadership and supervision influenced adherence to SP. Both of these dimensions are in accord with Lymer et al. (2004) who reported that leadership and supervision have an impact on adherence by increasing the safety culture in the workplace. Leadership was also a component of Efstathiou et al.’s (2011a) findings where senior nurses were seen to influence more junior members of the nursing staff by their behaviours, while junior nurses were less likely to adopt SP guidelines if witnessing one of their supervisor not following guidelines.

The third component described aspects of the organisational culture and practice which promote or hinder the use of SP. Certainly, Lymer et al. (2004) found the role of organisational culture in promoting adherence to guidelines to be very
important. While the Leadership subscale measured the impact of leadership and supervision, the Culture/Practice subscale looks at perceptions of the organisational climate as a reinforcer of SP use (or non-use). The factor also addresses the interpretation of SP guidelines and adherence to them within the organisation. Workplaces prioritising safety are, according to DeJoy et al. (2000), more likely to encourage and facilitate a self-protective behaviour and thus the uptake of SP should be higher than in organisations where safety is less of a visible priority. It is important for the organisational culture to set expectations for staff and furthermore, to ensure that these expectations are met.

The fourth factor, Contextual Cues encompasses physical, cultural and risk elements which prompt healthcare workers to implement SP. Such cues include the proximity of PPE, knowledge that the organisational culture supports SP use, and knowledge that a patient has a BBV. While there are some elements of knowledge and occupational culture in this factor, it is the environmental context that appears to influence the person to act. These cues act as influences on individuals’ behaviour and either promote or hinder adoption of SP so that the behaviours become habitual. Habit can be described as a behaviour that has been repeated until it has become more or less automatic (Nilsen et al., 2012) and clearly that is desirable in terms of following the guidelines. Such a proposition supports Neal, Wood, Wu, and Kurlander (2011) who showed that habits are activated directly by contextual cues outside of awareness, rather than being activated automatically by goals, as some researchers (e.g., Kruglanski et al., 2002) have hypothesised. Furthermore, positive or negative cues, such as lack of PPE availability, knowledge of a patient’s BBV status, have been described previously as factors influencing adherence to SP (Cutter & Jordan, 2012; Madan et al., 2002; Tait et al., 2000; Wu et al., 2008).
The fifth factor labelled Justification relates to reasons cited by participants to justify their non-adherence to SP. Healthcare workers justified not using gloves due to the clumsiness they said their use causes, that they had trained without gloves, and lacked tactile feelings when wearing gloves. These comments are in line with those by Cutter and Jordan (2012), Gammon et al. (2008) and Tait et al. (2000) who also found that staff had perceptions that PPE interfered with their skilled delivery of clinical procedures or increased workload due to a need to repeat procedures and so staff omitted to use these devices.

The convergent validity of the FIASPS was assessed via its relationship with the ImpSS. No extant scale specifically assesses predictors of SP however past studies have used Zuckerman’s Sensation Seeking Scale and the ImpSS (Brevidelli & Cianciarullo, 2009; DeJoy et al., 1995; DeJoy et al., 2000; Rabaud et al., 2000; Zuckerman et al., 1978; Zuckerman et al., 1964) which evolved into the ImpSS. The ImpSS (Zuckerman et al., 1993) was considered more suitable for use than the Sensation Seeking Scale as most items are stated in general terms rather than referring to leisure activities. In the current study, factor analysis of the ImpSS revealed two factors which, while able to be labelled similarly to the original scales, had a spread of items that differed slightly from the original.

The convergent validity of the five factors of the FIASPS with the two ImpSS factors was minimal. Leadership and Culture/Practice correlated negatively with Impulsivity while Justification for non-use of SP correlated positively with Impulsivity. Justification for non-use of SP also correlated positively with Sensation Seeking while Culture/Practice, perceived as conducive to SP use was negatively correlated with Sensation Seeking.
The correlation between Impulsivity and Justification for non-use of can be seen to support past research where higher levels of impulsivity were associated with risky sexual behaviours (Kahn, Kaplowitz, Goodman, & Emans, 2002) and risky driving behaviours (Lajunen, 2001) as well as higher levels of occupational injuries (Clarke & Robertson, 2005). Eysenck and Eysenck (1977) described impulsivity as being characterised by individuals acting on the spur of the moment without thinking and without being aware of the risks involved in the behaviour. It seems feasible that individuals displaying higher levels of impulsivity would also justify not using SP more and therefore score higher on the Justification factor.

Impulsivity correlated negatively with the Leadership factor which suggests that leaders may be more thoughtful or timely in their approach to issues. To some extent, this supports House and Howell (1992) who reported that leaders have a transforming effect on the organisation they are leading in that they foster a culture of change. Individuals displaying leadership will typically engage in proactive behaviour in the organisational context, will initiate situations, create favourable conditions. They will also take initiatives to improve the current circumstances such as by role-modelling or prompting appropriate behaviour in others rather than adapting to current conditions or acting on impulse (Crant, 2000). The items in this factor also support Crant and Bateman’s (2000) suggestions that leaders, and especially charismatic leaders, are more likely to be followed and viewed as high performers, setting examples with their own behaviour, and setting high expectations for followers’ performance. The items in the leadership factor are relevant to these conditions and it is not unexpected that this factor would be negatively correlated with Impulsivity.
Organisational Culture/Practice factor assesses whether the culture of the organisation allows for guidelines to be followed and whether it is standard practice for individuals to follow them. That this factor was negatively correlated with Impulsivity suggests that people higher on impulsivity may not be adopting the culture of the organisation. Organisational culture typically refers to employees’ subjective perception of their working environment and this perception can be influenced by individual job satisfaction, involvement in the organisation and performance (Lawler, Hall, & Oldham, 1974). Individuals prone to boredom, which may contribute to impulsivity, have been shown to display higher level of impulsivity and also less job satisfaction (Stebbins & Dent, 2011; Watt & Vodanovich, 1992). This negative correlation supports findings from Henle (2005) who showed that higher levels of workplace deviance were associated with high levels of impulsivity in employees. It can also be suggested that individuals scoring lower on impulsivity might be more conservative and want to conform to norms and thus follow SP guidelines.

Sensation Seeking correlated positively with Justification for non-use of SP but negatively with Culture/Practice. To some extent, these relationships can be seen to support Rabaud et al. (2000) who reported that nurses displaying higher levels of susceptibility to boredom and a higher degree of disinhibition were more likely to have sustained an OEB as they failed to use SP. Susceptibility to boredom and a higher degree of disinhibition are aspects of sensation seeking as measured by the ImpSS scale and it seems congruent that individuals reporting higher levels of Sensation Seeking would justify not using the guidelines more, thus explaining the positive correlation seen in this study between Sensation Seeking and Justification.
Stein et al. (2003) also showed that some healthcare professionals de-emphasised the importance of following infection control guidelines, arguing that they were dealing with an emergency situation or that needle disposal containers were not located nearby when asked about their reasons for not adhering to SP guidelines. Their results suggest that healthcare workers who do not follow guidelines felt a need to justify why they decided not to adhere.

In the current study, participants' higher levels of Sensation Seeking were negatively related to their perception of the organisational Culture and Practice. This result is congruent with that of Pidgeon (1991) who found that in organisations which promote a culture of safety, this is associated with increased employees’ positive attitudes towards safety, their ability to reflect on safety practices, and decreases in acting on impulse.

Overall, the correlations between the factors of the ImpSS and FIASPS were low or not significant. This result is not entirely unexpected as the ImpSS was not designed to measure health behaviours while the FIASPS is designed to assess health behaviours which are highly prescribed.

**Profession and Gender Differences**

Scores on Leadership, Culture/Practice, Justification, Contextual Cues and Judgement revealed no gender differences suggesting that there is no systematic difference between males and females on their scores for the FIASPS. This null result also confirms that the FIASPS can be used across genders and data from the entire sample used in subsequent analyses.
A comparison by profession (medical doctor and nurse) revealed that doctors scored higher levels on Justification than nurses. The Justification subscale includes reasons one uses to justify non-adherence to SP, including the perception that they interfere with care delivered to the patients (e.g., I don’t wear gloves as I cannot feel veins). Ferguson et al. (2004) also found that medical doctors justified their lack of glove use when they believed it interfered with patients, and interestingly adherence rates in their study were higher for nurses than for doctors.

Doctors also scored higher on Contextual Cues than nurses. Doctors were more likely to make use of these cues to adopt SP (e.g., I am more careful if I know the patient has a blood borne virus). This finding supports Ferguson et al. (2004) who reported that physicians failed to follow infection control guidelines significantly more than nurses when they believed the patient to be a low risk of carrying a BBV.

Nurses scored higher on Leadership than the medical doctors. Nurses who witnessed staff not using SP were more likely than medical doctors to confront them (e.g., I feel the need to confront people I see not adhering to Standard Precautions). The Leadership factor also explores role-modelling as a strategy to promote and increase adherence in others (e.g., I use role-modelling to increase use of SP by others). This finding supports Erasmus et al. (2009) who found, when looking at reasons for non-adherence to hand hygiene, that doctors were less likely to comply with hand washing than nurses, and that medical students felt that this negative role modelling from their senior peers made them less likely to adhere to hand washing guidelines. Martinez et al. (2014) examined the association between medical trainees’ exposure to positive and negative role modelling on their attitudes and behaviours regarding medical error disclosure. They found that exposure to negative
role-modelling was associated with an increased likelihood of what they termed non-transparent behaviour (i.e. concealing an error) when medical errors were made. While Martinez et al. (2014) did not investigate professional differences in their study, their findings confirmed the effect of negative role-modelling on the behaviour of other professionals and peers. Whether negative role-modelling has a higher incidence in the medical profession than in the nursing profession would need to be investigated in subsequent studies in order to fully explain the difference seen in the current study.

There were no differences by profession on Judgement (e.g., I am able to decide whether or not to use Personal Protective Equipment based on the clinical risks to me) or on Culture/Practice (e.g., The culture of my organisation allows for people not to follow Standard Precautions guidelines). That each profession demonstrated similar levels of judgement before deciding whether or not to use SP speaks to the commonality among participants, rather than any systematic difference by profession. In fact, it seems that both groups engaged in little judgement of patients or situations ($\bar{x}_{\text{Nurses}} = 6.68; \bar{y}_{\text{Medical Doctors}} = 8.25; \text{Range} 0 – 20$). These low scores tend to reject the findings of Ros and Cabrera Ros (1990), Hills and Wilkes (2003), Osborne (2003a) and Cutter and Jordan (2012) who all found that judgement of patient status influence the adoption of SP.

It is encouraging that there was no difference by profession in their perception of the organisational culture however, this does not necessarily mean the culture was supportive. A review of the mean scores for Culture/Practice ($\bar{x}_{\text{Nurses}} = 11.76; \bar{y}_{\text{Medical Doctors}} = 11.25; \text{Range} 0 – 20$) suggests, however, that each group had a perception that their organisation’s culture support of SP was limited.
Despite the differences highlighted between the two professional groups, it is important to note that the effect sizes for the profession differences were low, suggesting that the scale is applicable for general use across professions and genders.

**Temporal Stability**

The test-retest reliability of the FIASPS over a four-week interval was satisfactory. Leadership showed the greatest stability ($r = .72$) suggesting that participants remained constant in their proactivity and role-modelling towards the application of SP guidelines. Contextual Cues was the factor with the lowest re-test correlation ($r = .44$) and this might be attributed to the fact that participants benefitted from participating in the study at Time One. They may have reflected on their approach to SP and made changes to align their behaviour to the content of the guidelines, or it might simply be that these cues were in fact different at T2.

While it would be expected that the same participants sampled at different time points would answer questions similarly, this assumption does not take into account recall bias, true changes or learning that might have occurred from the first administration of the questionnaire. Maturation of participants over time can also influence test-retest reliability (Gillespie & Chaboyer, 2013). Polit and Beck (2014) emphasised that many traits change over time regardless of the instrument, with attitudes being easily modified by experiences between the two measurements, thus potentially weakening the value of a test-retest when looking at questionnaires measuring attitudes. While this effect is possible regardless of the timing between the re-administration of a questionnaire and while there are no standards dictating the ideal time to re-administer a questionnaire, Polit and Beck (2014) suggested that test-retest reliability tends to decline as the amount of time between the two
questionnaire administration increases. This suggestion of decline was supported by Paiva et al. (2014). In a systematic review of studies using test-retest in the context of palliative care they found that studies reporting higher correlations ($r \geq .70$) were readministered to the same sample within a two week maximum period, earlier than when the correlation coefficient was lower ($r \leq .70$), although this difference was not statistically significant. This factor could explain why most of the correlations measured in the current study were lower than optimal (Anastasi & Urbina, 1997) although statistically significant.

It is also not possible to rule out whether respondents might have attended some infection control or SP training between responding the first time and taking the questionnaire a second time, as this was not part of the information collected during the survey. The retest questionnaire was administrated four weeks after the initial administration, whether this contributed to a recall bias responsible for the differences seen between the test and the retest questionnaires is also difficult to rule out, although such an effect could have produced higher correlations or lower correlations if participants had developed a sense of what might be termed desired responses. The impact of social desirability therefore needs to be considered when looking at both sets of test results. The impact of social desirability was not assessed in this study either at T1 or T2 and while it may be important to consider it is potentially an issue with all studies.

A comparison of T1 data for participants who responded at T2 and those who did not respond, revealed no differences on any of the five factors. This null finding suggests there was no systematic bias at least in their baseline scores, for those participants who responded at T2 versus those who did not. It will be important to
confirm the structure and the psychometric properties of the FIASPS in a future study.

Chapter Summary

In this chapter, Study Two was presented. The results of the FIASPS were also discussed. The five factors Leadership, Justification, Contextual Cues, Culture/Practice and Judgement demonstrated independence, good internal reliability, and adequate test-retest reliability. The construct validity with the ImpSS, used in past research, was minimal and reasons for this were discussed. There were no gender differences on the five subscales of the FIASPS, but nurses scored higher than medical doctors on Leadership and medical doctors scored higher than nurses on Contextual Cues and on Justification, but they did not differ on Culture/Practice and Judgement. These findings were related to past research, and the need to confirm the scale’s psychometric properties in a future study was highlighted.
CHAPTER SEVEN

Study Three

Aims

The aim of Study Three was confirm the factor structure of the Factors Influencing Adherence to SP Scale designed to assess the factors influencing healthcare workers’ behaviours in regards to adherence to SP.

Method

Design

A cross-sectional study was used to confirm the factor structure of the Factors Influencing Adherence to SP Scale (FIASPS) developed in Study Two.

Participants

Four hundred and twenty two participants were recruited. Completed data were available from 384 participants whose age ranged from 23 years to 66 years (median age = 43.75 years; SD = 9.74). There were 53 males (13.8%; median age = 42.19 years; SD = 10.21) and 331 females (86.2%; median age = 44.00 years; SD = 9.65). An independent samples t test revealed no gender difference in the age of participants, t(382) = 1.25, p = .209, (two-tailed).

Procedure

Ethical approval for the conduct of this study was obtained from the Northern Territory Department of Health and Menzies School of Health Research Human Research Ethics Committee (Appendix A) and Charles Darwin University Human
Research Ethics Committee (Appendix B). Invitations to participate in an online questionnaire were distributed via several channels: 1) an email was sent by the Northern Territory Department of Health Principal Nurse Advisor to all Northern Territory Senior Nurses, 2) senior nurses employed in the Northern Territory Department of Health were invited to participate and disseminate the questionnaire to their networks, 3) an email was sent to the Northern Territory Medical Staff via the Senior Medical Officer, 4) invitations were also distributed via the Northern Territory General Practitioners Education Network newsletter and, 5) an invitation to participate was distributed via an email to the members of the Australian Association of Critical Care Nurses who had elected to belong to a research distribution list. A snowball sample was also used via Social media sites to disseminate an invitation to participate in the study, with participants asked to refer the invitation to friends and colleagues who were qualified nurses or medical doctors.

Interested persons followed the web link found in the various invitations which opened with a printable Plain Language Statement (Appendix N) in which they were advised of the requirements of the study, the anonymity of their data, that they could withdraw from the study at any time by closing their web browser, but that submission of the completed questionnaire would constitute their informed consent. Due to the method of recruitment it was not possible to calculate a response rate.

**Materials**

All participants were required to provide demographic information that included their gender, age, profession, number of years in the profession since
qualifying, employment status (full time, part-time, casual or other) and area of practice in which they currently worked.

Participants were asked to complete the 25-item FIASPS from Study Two. The scale has five factors: Judgement, Leadership, Culture/Practice, Contextual Cues and Justification, with items rated on a five-point Likert scale from 0 = not at all like me to 5 = A lot like me.

Results

The data were subjected to a CFA using AMOS (version 7) with Maximum Likelihood estimation.

Inspection of histograms, box plots, skewness, kurtosis and Shapiro-Wilk statistics revealed approximate normality across all items. The independent Chi-square ($\chi^2_{\text{indep}} (300) = 2294.06, p < .001$) indicated the presence of associations among the variables and hence the suitability of the data for CFA. The Chi-square ($\chi^2 (265) = 434.99, p < .001$) and the goodness-of-fit indices supported the fit of the data to the model and the five factor structure: $\chi^2/df = 1.64$, Goodness of Fit Index (GFI) = .915, Adjusted GFI (AGFI) = .896, Incremental Fit Index (IFI) = .918, Tucker-Lewis Index (TLI) = .906, Comparative Fit Index (CFI) = .917, Root Mean Square Error of Approximation (RMSEA) = .041, Probability of Close Fit ($p/\text{close}$) = .987 and Standardised Root Mean Square Residual (SRMR) = .056.

Each variable loaded onto its relevant factor and the inter-correlations among factors were low ($r = .04$ to $.44$). Figure 7.1 contains the standardised factor loadings and inter-factor correlations.
Figure 7.1. Confirmatory factor structure of the Factors Influencing Adherence to Standard Precautions Scale.
Cronbach’s Alpha revealed moderate to strong internal reliabilities for the
five subscales of the FIASPS (Table 7.1).

<table>
<thead>
<tr>
<th>Factor</th>
<th>Judgement</th>
<th>Leadership</th>
<th>Culture/Practice</th>
<th>Contextual Cues</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronbach’s Alpha</td>
<td>.70</td>
<td>.85</td>
<td>.60</td>
<td>.67</td>
<td>.72</td>
</tr>
</tbody>
</table>

**Discussion**

Confirmatory Factor Analysis confirmed the five-factor structure of the
FIASPS in the current sample. Each item loaded onto its relevant factor, with no
cross loadings, and the inter-correlations among the factors were minimal indicating
their independence.

Rabaud et al. (2000) and DeJoy et al. (2000) are among the few who have
empirically examined the psychosocial variables that influence adherence to SP and
the characteristics of individuals reporting OEB. They used the Zuckerman
Sensation Seeking Scale (SSS-V; Zuckerman et al., 1978) which assess boredom
susceptibility and thrill and adventure seeking which are not specifically targeted to
the healthcare setting but to leisure activities. Other researchers (e.g., Chiang et al.,
2008; Cutter & Jordan, 2004, 2012; Hosoglu, Akalin, Sunbul, Otkun, & Ozturk,
2011; Stein et al., 2003) have previously assessed the factors influencing healthcare
workers adherence to SP with scales developed specifically for their studies but none
reported any rigorous psychometric testing of those instruments or include the range
of factors extracted by the FIASPS.
The results of the rigorous testing of the current scale: Principal Component Analysis and four-week retest (Study Two), and Confirmatory Factor Analysis (Study Three) attest to its psychometric properties and its potential for use in future research, training and education.

A comprehensive model of healthcare workers’ adherence to SP based on an extension of the Theory of Planned Behaviour will be tested in the next Study, including the FIASPS among the predictors.
CHAPTER EIGHT

Study Four

Aims and Hypotheses

The aims in Study Four were to test a model of healthcare workers’ adherence to SP based on the Theory of Planned Behaviour (TPB), the factors previously identified in the literature (see Chapter Two and Chapter Three) as well as the five factors of the FIASPS developed in Studies Two and Three.

The model to be tested is depicted in Figure 8.1; the signs on the paths are the hypothesised directions of influence.

Method

Design

A cross-sectional design was used to test a theoretical model of the factors involved in predicting the adherence to Standard Precaution guidelines. The model is based on the Theory of Planned Behaviour. It incorporates the factors of the FIASPS, and the personality variables of disgust, sensation seeking, and conscientiousness identified in the literature, knowledge of the guidelines and previous OEB.

Participants

Two hundred and fifty-four participants were recruited for this study. Four cases were removed from the dataset as those respondents had not answered the majority of scale items. Data from 250 participants ranging in age from 25 years to 66 years ($M$ age = 44.40 years; $SD = 9.60$) were included in the analyses.
Figure 8.1. Hypothesised Extension of the Theory of Planned Behaviour applied to adherence to SP. The model includes personality variables (Disgust, Sensation Seeking traits and Conscientiousness) as well as other factors identified in the literature and the five factor scale developed in Study Two. Arrows indicate the specific hypotheses to be tested with + indicating a positive predictive pathway and – indicating a negative predictive pathway. Dotted boxes indicate the original TPB factors, solid boxes are from the literature review and the FIASPS (See Chapters Four, Five, 13 and 17).
There were 31 males (12.4%; $M$ age = 43.67 years; $SD$ = 9.84) and 219 females (87.6%; $M$ age = 44.55 years; $SD$ = 9.58). An independent samples $t$-test revealed no gender difference on the age of participants $t(248) = .47, p = .64$, two-tailed.

**Procedure**

Ethical approval for the conduct of this study was obtained from the Northern Territory Department of Health and the Menzies School of Health Research Human Research Ethics Committee (Project No. HREC-2011-1601, Appendix A) and from the Charles Darwin University Human Research Ethics Committee (Project No. H11111, Appendix B) The Northern Territory Department of Health Principal Nurse Advisor sent an email to all Northern Territory Senior Nurses who in turn were asked to disseminate the invitation to their networks. The Senior Medical Officer sent an email with information on the study to the Northern Territory Medical Staff. The Northern Territory General Practitioners Education Network placed an advertisement in the Northern Territory General Practitioners Education Network newsletter with a link inviting readers to participate in the study. An invitation to participate in the study was also distributed via an email to members of the Australian Association of Critical Care Nurses (AACCN). A snowball sample was also used, via Social media sites, such as Facebook, to disseminate information about the study and potential participants who were nurses or medical doctors were invited to follow an online link to a printable participant Information Statement and a link to the online survey. Participants were also asked to forward the invitation to friends and colleagues who were nurses or medical doctors.
The link to the survey was located at: (http://cduhes.asia.qualtrics.com/SE/?SID=SV_08Iq2Y1QbeGUPh9q). Participants were advised in the Plain Language Statement (Appendix O) that their participation was voluntary, their data anonymous and that submission of the completed questionnaire would constitute their informed consent. Due to the method of recruitment it was not possible to calculate a response rate.

**Measures**

Participants were asked to provide demographic information on their gender, age, profession, number of years in the profession since qualifying, employment status (full time, part-time, casual or other), work area in which they were currently employed, whether or not they had sustained an OEB over the course of their career and, if yes, whether or not they had reported the exposure.

In addition, they completed the following questionnaires:

The Factors Influencing Adherence to SP Scale, developed in Studies Two and Three, has 25 items over five factors: Culture/Practice, Contextual Cues, Judgement, Justification and Leadership. Items are rated on a five-point Likert scale from 0 = not at all like me to 5 = very much like me (see Chapters Six and Seven).

The Conscientiousness factor of the HEXACO Personality Inventory (K. Lee & Ashton, 2004) comprises four facets: diligence (e.g., When working, I often set ambitious goals for myself), organisation (e.g., I clean my office or home quite frequently), perfectionism (e.g., I often check my work over repeatedly to find any mistakes) and prudence (e.g., I make decisions based on the feeling of the moment rather than on careful thought). Questions are answered on a five-point Likert scale
from 0 = not at all like me to 5 = very much like me. K. Lee and Ashton, reported an internal reliability for the conscientiousness factor of the HEXACO of $\alpha = .89$ and that the HEXACO conscientiousness dimension is highly correlated with conscientiousness in the Big Five.

The Disgust Propensity and Sensitivity Scale (DPSS; Cavanagh & Davey, 2000) consists of 32 items concerning the experience of bodily symptoms and their emotional impact. The scale was subsequently reduced by van Overveld, de Jong, Peters, Cavanagh, and Davey (2006) to 16 items comprising two factors: disgust propensity (e.g., Disgusting things make my stomach turn) and disgust sensitivity (e.g., I think disgusting items could cause me illness/infection). van Overveld et al. reported good internal validity of the overall scale (Cronbach’s $\alpha = .71$ with Cronbach’s $\alpha = .78$ for the propensity subscale and Cronbach’s $\alpha = .77$ for the sensitivity subscale). In the current study, four items from the DPSS that were the most relevant to the context of clinical care and healthcare workers were utilised (e.g., Seeing disgusting things makes my stomach turn). An additional three items were written by the researcher (e.g., Dealing with blood and other bodily fluids is revolting). All items are answered on a five-point Likert Scale ranging from 0 = not at all to 5 = very much.

Adherence to SP was assessed using four items written for this study (e.g., I use SP whenever there is a potential for me to be exposed to body fluids). These items were answered on a five-point Likert Scale ranging from 0 = not at all to 5 = very much.

Subjective norm was evaluated using the item: It is the norm in my hospital for staff to adhere to SP.
Perceived control or perceived confidence in one’s ability to plan ahead was assessed with four items written for the current study (e.g., I always start a task with a plan) rated on a five-point Likert scale ranging from 0 = not at all like me to 5 = very much like me.

Knowledge of guidelines was evaluated with a single item: I am familiar with the content of the SP guidelines, rated on a five-point Likert scale ranging from 0 = not at all to 5 = very much.

Attitude towards SP was assessed negatively using five items written for the current study (e.g., Sometimes I am too busy to worry about using Personal Protective Equipment). Items are rated on a five-point Likert scale ranging from 0 = not at all to 5 = very much.

The Impulsive and Sensation Seeking Scale (ImpSS; Zuckerman et al., 1993) has two factors: Sensation Seeking (SS) and Impulsivity as described in Study Two (see Chapter 12). Only the SS scale was used in Study Four as it demonstrated better internal reliability and the pattern of intercorrelations with the FIASPS was approximately similar. Furthermore, Rabaud et al. (2000) found that sensation seeking had an effect on adherence to SP. The subscale consists of 12 items (e.g., I enjoy getting into new situations where you can’t predict how things will turn out) answered on a five-point Likert scale 0 = not at all like me to 5 = very much like me. The negative items were reversed scored so that a higher score reflects a higher risk-taking propensity. Zuckerman et al. (1993) reported good internal reliability for the summated items of the ImpSS scale (Cronbach’s $\alpha = .86$). A copy of all scales administered to participants is included in Appendix P.
Results

The data were exported directly from the online survey tool, Qualtrics, into a Statistical Package for Social Sciences (SPSS; Version 22) file.

The statistical analyses were conducted in three phases: (1) descriptive statistics of participants’ demographic data, (2) factor analyses and internal reliability of each scale, and (3) a path analysis of the hypothesised Model of Adherence to SP (Figure 8) using AMOS (Version 7). Descriptive statistics related to participants’ demographic data are presented next.

Demographic Data

Occupation and Gender. Two hundred and fifty participants (219 females) participated in this study. Of the six medical doctors, three were male and three were female; of the 244 nurses, 28 were male and 216 female. A Mann-Whitney U test indicated that the medical doctor participants ($M = 34.00$ years; $SD = 3.16$; $Mean Rank = 44.92, n = 6$) were significantly younger than the nurse participants ($M = 44.70$ years; $SD = 9.56$; $Mean Rank = 127.48, n = 244$), $U = 248.50, z = 2.76$ (corrected for ties), $p = .006$, two-tailed.

Work area. The majority of participants reported that they worked in a critical care area (61.3% of the male participants, 71.2% of the female participants), which encompassed intensive care, coronary care areas and high dependency units. Other major work areas were the Emergency Department (ED) and medical care (Table 8.1).
Table 8.1

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Male (%)</th>
<th>Female (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Care Areas</td>
<td>61.3</td>
<td>71.2</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>6.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Medical Care</td>
<td>6.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Surgical Care</td>
<td>3.2</td>
<td>1.8</td>
</tr>
<tr>
<td>Community</td>
<td></td>
<td>.5</td>
</tr>
<tr>
<td>Gerontology/Rehabilitation/Long Term Care</td>
<td></td>
<td>.9</td>
</tr>
<tr>
<td>Mental Health</td>
<td>3.2</td>
<td>.5</td>
</tr>
<tr>
<td>Admission Ward</td>
<td>3.2</td>
<td>-</td>
</tr>
<tr>
<td>Theatre/Operating Room/Anaesthesia</td>
<td></td>
<td>1.4</td>
</tr>
<tr>
<td>Other</td>
<td>16.1</td>
<td>11.4</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note. “Other” encompassed three areas: (1) education, (2) clinical management, (3) Nurse Unit Managers, (4) Medical Imaging, (5) others specified areas related to a specific disease or it was not possible to identify their classification.

**Time in the profession.** Overall, participants’ reports of the time they had been working in their profession since qualifying ranged from 6 months to 45 years ($M = 19.80$ years; $SD = 10.91$). Male participants (nurses and medical doctors) had been working in their profession from two years to 35 years ($M = 17.06$ years; $SD = 9.15$) while female participants had been working in their professions from six months to 45 years ($M = 20.18$ years; $SD = 11.10$). An independent samples $t$-test revealed no gender difference in mean years in profession $t(248) = 1.49, p = .13$, two-tailed.

Male medical doctors had been working in their profession from seven to 12 years ($n = 3; M = 8.66$ years; $SD = 2.89$) and female medical doctors from five and a half years to seven years ($n = 3; M = 6.50$ years; $SD = .86$). No statistical comparison was made due to the small sample sizes.

Female nurses had been working in their profession from six months to 45 years ($M = 20.37$ years; $SD = 11.06$) and male nurses from 2 years to 35 years ($M =$
17.96 years; $SD = 9.15$). An independent samples $t$-test revealed no gender difference in mean years in profession $t(242) = 1.10, p = .27$, two-tailed.

**Employment Status.** A breakdown of participants’ employment status revealed that 145 of the participants worked full time, 92 worked part-time and the remaining 13 participants worked either on a casual basis or were on maternity leave. Table 8.2 shows the number and percentages of males and females across their employment status. A Pearson’s Chi-Square revealed no association between gender and work status ($\chi^2 \sim (N = 250) = 7.37, p = .06$).

Table 8.2

<table>
<thead>
<tr>
<th>Employment Status</th>
<th>Male N (%)</th>
<th>Female N (%)</th>
<th>$\chi^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-Time</td>
<td>24 (77.4)</td>
<td>121 (55.3)</td>
<td>7.37</td>
<td>.061</td>
</tr>
<tr>
<td>Part-Time</td>
<td>5 (16.1)</td>
<td>87 (39.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casual</td>
<td>2 (6.5)</td>
<td>8 (3.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternity Leave</td>
<td>-</td>
<td>3 (1.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31 (100)</td>
<td>(219)100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Occupational Exposure to Blood and Body Fluids.** The majority of the participants (70.5%; $n = 176$) reported having sustained at least one OEB during the course of their career. Nurses reported a greater number of exposures (72.5%; $n = 172$) than medical doctors (66.7%; $n = 4$) although there is an imbalance overall in numbers in these professions both in this sample and in hospital employment generally. Nurses who reported having sustained an OEB reported between one and six exposures ($M = 1.91; SD = 1.26$) while medical doctors reported a maximum of two OEBs ($M = 1.75; SD = .5$; Table 8.3).
Table 8.3

*Number of Occupational Exposure to Blood and Body Fluids per Profession*

<table>
<thead>
<tr>
<th>Profession</th>
<th>Number of Exposure</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>1</td>
<td>85 (49.4)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>53 (30.8)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>16 (9.3)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10 (5.8)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>4 (2.3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>172 (100)</td>
</tr>
<tr>
<td>Medical Doctors</td>
<td>1</td>
<td>1 (25.0)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3 (75.0)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4 (100)</td>
</tr>
</tbody>
</table>

Both the medical doctors who experienced an OEB reported it while only 85.5% of the nurses (n = 147) did so.

**Factor Analyses and Internal Reliabilities**

Prior to use of the various scales in the model, a series of Factor Analyses were conducted to ensure the suitability of the instruments for use in the current sample.

Confirmatory Factor Analyses with Maximum Likelihood Estimations were conducted to confirm the factor structure of the Conscientiousness and the Sensation Seeking scales as determined in Study Two. Inspection of histograms, box plots, skewness, kurtosis and Shapiro-Wilk statistics revealed approximate normality by item by scale.

For Conscientiousness, the independent Chi-Square ($\chi^2_{\text{indep}} (45) = 603.16, p < .001$) indicated there were significant relationships among the variables in the model thus indicating its suitability for CFA. The Chi-Square ($\chi^2_{32} = 147.22, p <$
and the goodness of fit indices indicated that the data provided only a borderline fit to the model: $\chi^2/df = 4.601$, GFI = .884, AGFI = .800, NFI = .756, CFI = .794, RMSEA = .120, and $p_{close} = .000$. While modifications were suggested, these would have involved intercorrelations among the items or the errors resulting in a complex structure. An exploratory factor analysis of the scale using a PCA with oblique rotation to allow for intercorrelations among the factors (Tabachnick & Fidell, 2007) was conducted. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.77) and Bartlett’s Test of Sphericity ($\chi^2 (45) = 593.07, p < .001$) indicated the factorability of the correlation matrix for these initial 10 items. The initial PCA revealed three factors with an eigenvalue greater than one, but Cattel’s Scree Plot suggested the presence of three to four factors. A series of iterations revealed support for a one-factor solution which explained 33.79% of the variance. The factor structure, loadings, reliability coefficients, inter-correlations, eigenvalues, per cent of the variance explained, and descriptive statistics are presented in Table 8.4.
Table 8.4

**Descriptive Statistics for Conscientiousness Factor of the HEXACO**

<table>
<thead>
<tr>
<th>Item</th>
<th>Conscientiousness</th>
</tr>
</thead>
<tbody>
<tr>
<td>I plan ahead and organise things to avoid scrambling at the last minute</td>
<td>.71</td>
</tr>
<tr>
<td>Often when I set a goal I end up quitting without having reached it (R)</td>
<td>.61</td>
</tr>
<tr>
<td>People often joke with me about the messiness of my room or desk (R)</td>
<td>.60</td>
</tr>
<tr>
<td>I clean my office or home quite frequently</td>
<td>.59</td>
</tr>
<tr>
<td>I often push myself very hard when trying to achieve a goal</td>
<td>.58</td>
</tr>
<tr>
<td>When working on something I don’t pay much attention to small details (R)</td>
<td>.58</td>
</tr>
<tr>
<td>I make a lot of mistakes because I don’t think before I act (R)</td>
<td>.58</td>
</tr>
<tr>
<td>When working I often set ambitious goals for myself</td>
<td>.54</td>
</tr>
<tr>
<td>I make decisions based on the feeling of the moment rather than on careful thought (R)</td>
<td>.52</td>
</tr>
<tr>
<td>I often check my work over repeatedly to find any mistakes</td>
<td>.46</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>33.79</td>
</tr>
<tr>
<td>%Variance explained</td>
<td></td>
</tr>
</tbody>
</table>

| M                      | 30.39             |
| SD                     | 5.10              |
| \( \alpha \)           | .77               |

*Note.* R = reverse coded item.

A CFA with Maximum Likelihood Estimations was conducted on the 12 items of the SS scale from Study Two. Inspection of histograms, box plots, skewness, kurtosis and Shapiro-Wilk statistics revealed approximate normality by item. The independent Chi-Square \( \chi^2_{\text{indep}} (66) = 984.41, p < .001 \) indicated there were significant associations between the variables in the model. The Chi-Square was significant \( \chi^2_{54} = 142.65, p < .001 \), but all other fit indices supported the fit of the data to the model (Figure 9): \( \chi^2/df = 2.64 \), GFI = .910, AGFI = .870, NFI = .855, CFI = .903, RMSEA = .081, \( p \text{close} = .001 \) and SRMR = .057. This solution was accepted as \( \chi^2 \) is sensitive to sample size (House & Howell, 1992). Internal reliability of the SS was strong (Cronbach’s \( \alpha = .86 \); Figure 8.2).
In order to determine whether the four items of the Disgust Propensity and Sensitivity Scale (DPSS) together with the three items written for this study cohesed to form a homogenous scale of Disgust, a PCA with oblique rotation was conducted. One item written for this study (I always use protection if I have to deal with disgusting things) failed to correlate at least .30 with any other item and was
excluded from further analysis. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.71) and Bartlett’s Test of Sphericity ($\chi^2 (15) = 216.21, p < .001$) indicated the factorability of the correlation matrix for the remaining six items.

The PCA revealed one factor with an eigenvalue of 2.32 while Cattel’s Scree Plot suggested the presence of either one to two factors. A unifactorial solution that explained 38.76% of the variance was accepted. Reliability analysis indicated adequate internal reliability, Cronbach’s $\alpha = .65$. Factor loadings and descriptive statistics are shown in Table 8.5.

Table 8.5

*Factor Loadings and Descriptive Statistics for the Disgust Propensity and Sensitivity Scale*

<table>
<thead>
<tr>
<th>Item</th>
<th>Disgust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeing disgusting thinks makes my stomach turn</td>
<td>.71</td>
</tr>
<tr>
<td>Dealing with blood and other bodily fluids is revolting</td>
<td>.70</td>
</tr>
<tr>
<td>I am comfortable dealing with things others find disgusting (R)</td>
<td>.64</td>
</tr>
<tr>
<td>I avoid dealing with disgusting things</td>
<td>.59</td>
</tr>
<tr>
<td>Seeing open wounds make me feel sick</td>
<td>.58</td>
</tr>
<tr>
<td>I think disgusting items could cause me illness/infection</td>
<td>.48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>% Variance Explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.32</td>
<td>38.76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M</th>
<th>4.86</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>3.37</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>.65</td>
</tr>
</tbody>
</table>

*Note.* R = reverse coded item.

In order to determine whether the four items for Perceived Control cohesed to form a homogenous scale of Perceived Control, a PCA with oblique rotation was conducted. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.73) and Bartlett’s Test of Sphericity ($\chi^2 (6) = 167.41, p < .001$) indicated the factorability of the correlation matrix for these four items.
The PCA revealed one factor with an eigenvalue of 2.12 with Cattel’s Scree Plot also suggested the presence one factor, this unifactorial solution explained 53.03% of the variance. Reliability analysis indicated adequate internal reliability, Cronbach’s $\alpha = .70$. Factor loadings and descriptive statistics are shown in Table 8.6.

Table 8.6

<table>
<thead>
<tr>
<th>Item</th>
<th>Perceived Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>I always start a task with a plan</td>
<td>.75</td>
</tr>
<tr>
<td>I think before I embark on a task</td>
<td>.72</td>
</tr>
<tr>
<td>I make careful plans</td>
<td>.73</td>
</tr>
<tr>
<td>I focus on details of the task ahead</td>
<td>.70</td>
</tr>
</tbody>
</table>

Eigenvalue 2.12
% Variance Explained 53.03

$M$ 12.58
$SD$ 2.69
$\alpha$ .70

A PCA with oblique rotation was used to determine if the four items written to assess Adherence were unifactorial. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.65) and Bartlett’s Test of Sphericity ($\chi^2 (6) = 116.69, p < .001$) both indicated the factorability of the correlation matrix for these four items. A unifactorial solution was extracted and it explained 46.57% of the variance. Internal reliability was adequate, Cronbach’s $\alpha = .60$. Factor loadings and descriptive statistics are shown in Table 8.7.
Table 8.7

<table>
<thead>
<tr>
<th>Item</th>
<th>Adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>I always wash my hands before putting on gloves</td>
<td>.77</td>
</tr>
<tr>
<td>I always wash my hands after removing gloves</td>
<td>.75</td>
</tr>
<tr>
<td>I use standard precautions whenever there is a potential</td>
<td>.61</td>
</tr>
<tr>
<td>for me to be exposed to body fluids</td>
<td></td>
</tr>
<tr>
<td>I always wear goggles when required</td>
<td>.55</td>
</tr>
</tbody>
</table>

Eigenvalue 1.86
% Variance Explained 46.57

The mean level of Adherence was 12.89 out of a possible 16 (SD = 2.85).

This mean suggests that a high proportion of the sample scored above the mid-point of the scale (8) and were, therefore moderately adherent.

A PCA with oblique rotation was used to determine if the four items written to assess attitude towards adherence were unifactorial. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (.74) and Bartlett’s Test of Sphericity ($\chi^2$ (10) = 162.00, $p < .001$) indicated the factorability of the correlation matrix for these five items. A unifactorial solution was extracted and it explained 43.15% of the variance. Cronbach’s, $\alpha = .65$, was satisfactory. Factor loadings and descriptive statistics are shown in Table 8.8.
Table 8.8

*Factor Loadings and Descriptive Statistics for the Negative Attitude towards Adherence to SP*

<table>
<thead>
<tr>
<th>Item</th>
<th>Negative Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Putting on the Personal Protective Equipment takes too long</td>
<td>.75</td>
</tr>
<tr>
<td>Sometimes I am too busy to worry about Personal Protective Equipment</td>
<td>.72</td>
</tr>
<tr>
<td>In an emergency situation, I only worry about infection afterwards</td>
<td>.61</td>
</tr>
<tr>
<td>I am tired of having to use Personal Protective Equipment when</td>
<td>.60</td>
</tr>
<tr>
<td>delivering patient care</td>
<td></td>
</tr>
<tr>
<td>Previous experience of a situation will influence whether or not</td>
<td>.59</td>
</tr>
<tr>
<td>I implement standard precautions even if required</td>
<td></td>
</tr>
</tbody>
</table>

Eigenvalue 2.16
% Variance Explained 43.15

Path Analysis: Factors Predicting Adherence to Standard Precautions

A power calculation confirmed that the hypothesised model (Figure 8.1), a sample of 250, and a probability level of .05 had an observed statistical power of 1.

In order to test the hypothesised model of Adherence to SP (Figure 8.1) a path analysis was conducted using AMOS (Version 7). The independent Chi-Square ($\chi^2_{\text{indep}}(91) = 676.675, p < .001$) indicated there were significant associations among the variables in the model, making it suitable for analysis. The Chi-Square and other fit indices failed to support the fit of the data to the model, $\chi^2_{\text{model}} = 461.43, p < .001$, $\chi^2/df = 6.236$, GFI = .773, AGFI = .678, NFI = .318, CFI = .338, RMSEA = .145, $p_{\text{close}} < .001$, and SRMR = .151.

The modification indices suggested several changes that would improve the fit of the data to the model. These modifications were considered for their theoretical
relevance (Keith, 2006) and paths added as deemed appropriate, one at a time (Table 19). The added paths were Conscientiousness to Perceived Control, Attitude to Justification, Attitude to Risk Assessment, Sensation Seeking to Perceived Control, Disgust to Perceived Control, Justification to Judgement, Attitude to Leadership, Knowledge to Subjective Norm, Subjective Norm to Contextual Cues, Attitude to Culture/Practice, Knowledge to Attitude, Contextual Cues to Judgement, Culture/Practice to OEB and Perceived Control to OEB. Following these modifications, the data provided a good fit to the model (Table 8.9). In order to present a more parsimonious model, the non-significant paths in the model were removed, one at a time, and the fit of the data to the model remained stable (Appendix Q). The penultimate model of Adherence to SP is shown in Figure 8.3 and the Table of Total Effects for this model is included as Appendix R.

As some interrelationships exist among the variables which have no direct or indirect effect upon adherence, it was decided to test a more parsimonious model with these variables removed. Disgust, OEB, Perceived Control, Sensation Seeking, Judgement and Contextual Cues were removed. This analysis provided a good fit of the data to the revised model ($\chi^2_{16} = 32.29, p = .009, \chi^2/df = 2.018$, GFI = .969, AGFI = .930, NFI = .911, CFI = .951, RMSEA = .064, $p_{close} = .214$, and SRMR = .063) as presented in Figure 8.4.
### Table 8.9

**Goodness of Fit Statistics for the Model of Adherence to SP**

<table>
<thead>
<tr>
<th></th>
<th>χ²</th>
<th>df</th>
<th>p</th>
<th>χ²/df</th>
<th>GFI</th>
<th>AGFI</th>
<th>NFI</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>p/closē</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hypothesised Model</strong></td>
<td>461.43</td>
<td>74</td>
<td>&lt; .001</td>
<td>6.24</td>
<td>.77</td>
<td>.68</td>
<td>.32</td>
<td>.19</td>
<td>.34</td>
<td>.14</td>
<td>&lt; .001</td>
<td>.15</td>
</tr>
<tr>
<td><strong>Paths Added</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscientiousness → Perceived Control</td>
<td>404.02</td>
<td>73</td>
<td>&lt; .001</td>
<td>5.53</td>
<td>.800</td>
<td>.71</td>
<td>.40</td>
<td>.29</td>
<td>.43</td>
<td>.13</td>
<td>&lt; .001</td>
<td>.14</td>
</tr>
<tr>
<td>Attitude → Justification</td>
<td>351.63</td>
<td>72</td>
<td>&lt; .001</td>
<td>4.88</td>
<td>.83</td>
<td>.76</td>
<td>.48</td>
<td>.40</td>
<td>.52</td>
<td>.12</td>
<td>&lt; .001</td>
<td>.13</td>
</tr>
<tr>
<td>Attitude → Contextual Cues</td>
<td>311.56</td>
<td>71</td>
<td>&lt; .001</td>
<td>4.39</td>
<td>.85</td>
<td>.78</td>
<td>.54</td>
<td>.47</td>
<td>.60</td>
<td>.12</td>
<td>&lt; .001</td>
<td>.13</td>
</tr>
<tr>
<td>Sensation Seeking → Perceived Control</td>
<td>276.13</td>
<td>70</td>
<td>&lt; .001</td>
<td>3.95</td>
<td>.87</td>
<td>.80</td>
<td>.59</td>
<td>.54</td>
<td>.65</td>
<td>.11</td>
<td>&lt; .001</td>
<td>.12</td>
</tr>
<tr>
<td>Disgust → Perceived Control</td>
<td>241.69</td>
<td>69</td>
<td>&lt; .001</td>
<td>3.50</td>
<td>.88</td>
<td>.82</td>
<td>.64</td>
<td>.61</td>
<td>.70</td>
<td>.10</td>
<td>&lt; .001</td>
<td>.12</td>
</tr>
<tr>
<td>Justification → Judgement</td>
<td>216.73</td>
<td>68</td>
<td>&lt; .001</td>
<td>3.19</td>
<td>.89</td>
<td>.83</td>
<td>.68</td>
<td>.66</td>
<td>.75</td>
<td>.09</td>
<td>&lt; .001</td>
<td>.11</td>
</tr>
<tr>
<td>Attitude → Leadership</td>
<td>192.34</td>
<td>67</td>
<td>&lt; .001</td>
<td>2.87</td>
<td>.90</td>
<td>.84</td>
<td>.72</td>
<td>.71</td>
<td>.79</td>
<td>.09</td>
<td>&lt; .001</td>
<td>.10</td>
</tr>
<tr>
<td>Knowledge → Subjective Norm</td>
<td>174.11</td>
<td>66</td>
<td>&lt; .001</td>
<td>2.64</td>
<td>.91</td>
<td>.85</td>
<td>.74</td>
<td>.74</td>
<td>.81</td>
<td>.08</td>
<td>&lt; .001</td>
<td>.09</td>
</tr>
<tr>
<td>Subjective Norm → Contextual Cues</td>
<td>161.57</td>
<td>65</td>
<td>&lt; .001</td>
<td>2.49</td>
<td>.92</td>
<td>.86</td>
<td>.76</td>
<td>.77</td>
<td>.83</td>
<td>.08</td>
<td>.002</td>
<td>.09</td>
</tr>
<tr>
<td>Attitude → Culture/Practice</td>
<td>144.02</td>
<td>64</td>
<td>&lt; .001</td>
<td>2.25</td>
<td>.93</td>
<td>.88</td>
<td>.79</td>
<td>.81</td>
<td>.86</td>
<td>.07</td>
<td>.01</td>
<td>.09</td>
</tr>
<tr>
<td>Knowledge → Attitude</td>
<td>131.61</td>
<td>63</td>
<td>&lt; .001</td>
<td>2.09</td>
<td>.93</td>
<td>.88</td>
<td>.81</td>
<td>.83</td>
<td>.88</td>
<td>.07</td>
<td>.05</td>
<td>.08</td>
</tr>
<tr>
<td>Contextual Cues → Judgement</td>
<td>120.39</td>
<td>62</td>
<td>&lt; .001</td>
<td>1.94</td>
<td>.93</td>
<td>.89</td>
<td>.82</td>
<td>.85</td>
<td>.90</td>
<td>.06</td>
<td>.12</td>
<td>.07</td>
</tr>
<tr>
<td>Culture/Practice → OEB</td>
<td>111.36</td>
<td>61</td>
<td>&lt; .001</td>
<td>1.83</td>
<td>.94</td>
<td>.89</td>
<td>.83</td>
<td>.87</td>
<td>.91</td>
<td>.06</td>
<td>.22</td>
<td>.07</td>
</tr>
<tr>
<td><strong>Final Model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Non-Significant Paths Removed</td>
<td>122.29</td>
<td>71</td>
<td>&lt; .001</td>
<td>1.72</td>
<td>.93</td>
<td>.90</td>
<td>.82</td>
<td>.89</td>
<td>.91</td>
<td>.05</td>
<td>.33</td>
<td>.07</td>
</tr>
</tbody>
</table>

*Note.* GFI = Goodness of Fit Index; AGFI = Adjusted GFI; NFI = Normed Fit Index; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; p/closē = Probability of Close Fit; SRMR = Standardised Root Mean Square Residual.
Figure 8.3. Revised model of Adherence to SP after non-significant paths were removed. All standardised predicted pathways (β) shown are significant at $p < .05$. 
Figure 8.4. Parsimonious model of Adherence to SP. All standardised predicted pathways ($\beta$) shown are significant at $p < .05$. 
The variables in the final model explained 35% of the variance in Adherence to SP, 28% of the variance in Leadership, 19% in Justification, 13% in Culture/Practice, and 7% in Knowledge.

**Direct Effects.** Leadership ($\beta = .36$), Knowledge ($\beta = .23$) and Culture/Practice ($\beta = .18$) had direct positive effects on Adherence to SP, while Justification (for non-use; $\beta = -.11$) had a direct negative effect on Adherence to SP. No other variables in the model exerted direct effects on levels of adherence but several exerted indirect effects.

**Indirect and Total Effects.** Negative Attitude had a total negative effect on Adherence to SP ($\beta = -.19$) through Culture/Practice, Justification and Leadership. Subjective Norm had a positive and indirect effect ($\beta = .04$) on Adherence to SP through Culture/Practice. Conscientiousness has indirect effects on Adherence through Knowledge and through Leadership for a total effect of $\beta = .12$.

Knowledge also had indirect effects through Subjective Norm, Negative Attitude, Culture/Practice, justification and Leadership and combined with its direct effect on SP, exerted a total effect of $\beta = .43$. The standardised total effects in the data (Table 8.10) represent the summated standardised direct and indirect effects of the variables (Tabachnick & Fidell, 2007).
Table 8.10

<table>
<thead>
<tr>
<th></th>
<th>Conscientiousness</th>
<th>Knowledge</th>
<th>Negative Attitude</th>
<th>Subjective Norm</th>
<th>Leadership</th>
<th>Justification</th>
<th>Culture/Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adherence</td>
<td>.12</td>
<td>.43</td>
<td>-.19</td>
<td>.04</td>
<td>.36</td>
<td>-.11</td>
<td>.18</td>
</tr>
<tr>
<td>Culture</td>
<td>.03</td>
<td>.12</td>
<td>-.25</td>
<td>.24</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Justification</td>
<td>-.03</td>
<td>-.10</td>
<td>.44</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Leadership</td>
<td>.12</td>
<td>.45</td>
<td>-.28</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>.07</td>
<td>.27</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Negative Attitude</td>
<td>-.60</td>
<td>-.22</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Knowledge</td>
<td>.27</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

Discussion

The aim of Study Four was to explore a model of psychosocial influences as predictors of Adherence to SP. The model was based on an extension of the Theory of Planned Behaviour (TPB) and included factors from the literature and from the FIASPS developed in Studies Two and Three.

It was hypothesised that the three constructs of the TPB (Ajzen, 1991): Perceived Control, Subjective Norm and Negative Attitude would have a direct effect on adherence. It was also hypothesised that Disgust, previous OEB, Sensation Seeking, Conscientiousness, and Knowledge of the guidelines would have direct effects on adherence to SP. Furthermore, it was hypothesised that the five factors of the FIASPS developed in Studies Two and Three: Culture/Practice, Justification, Judgement, Contextual Cues and Leadership, would have a direct effect on Adherence to SP. As well as some direct effects on Adherence, the indirect effect of Conscientiousness and Subjective Norm via Culture/Practice, Conscientiousness via
Knowledge and Knowledge via Leadership were also hypothesised. The final model (Figure 8.4) provides partial support for these hypotheses.

The scales to measure Disgust, Conscientiousness, Adherence, Perceived Control and Sensation Seeking were all subjected to factor analysis prior to their use in the proposed model with the current sample. Each scale yielded the hypothesised factor structure and acceptable levels of internal reliability and therefore were deemed suitable for use in the model.

The data provided a good fit to the proposed model after a series of suggested modifications, considered theoretically relevant, were added. The factors in that model explained 35% of the variance in Adherence. In this revised model, there were several paths among the variables that did not contribute either directly or indirectly to Adherence. In order to provide a more parsimonious model, the factors which had no direct or indirect bearing on Adherence were removed and the model recalculated. The variables in the final model still explained 35% of the variance in adherence to SP. Twenty eight per cent of the variance in Leadership, 19% in Justification, 13% in Culture/Practice, and seven per cent in Knowledge were also explained by the factors in the model.

Before discussing the components of the TPB, which was the theoretical framework on which the model of adherence in this study was based, it is important to look at adherence to SP. Adherence to SP was measured via self-report and overall, moderately high levels of adherence to SP were reported by participants. The mean level of adherence reported by participants was 12.89 ($SD = 2.85$) from a range of 0 – 16. This compares higher than levels of adherence reported in Li et al.’s (2011) study where the mean level of adherence reported by participants was 32.70
(SD = 4.90) from a range of 0 – 52. Levels of adherence reported in most previous studies have been reported in percentage terms and these vary widely from 19% to 72% (Askarian, McLaw, & Meylan, 2007; R. Chan et al., 2002; Kagan, Ovadia, & Kaneti, 2009; Kelen et al., 1990; Kermode et al., 2005; Li et al., 2011; Schillo & Reischl, 1993; Tait et al., 2000). Adherence is usually measured by looking at different aspects of SP, with hand hygiene being the aspect to which most adhere. While specific behaviours related to PPE were not assessed in the current study, the items on the Adherence Scale are somewhat indicative, with one item being the main criterion that should be used to implement SP (e.g., I use SP whenever there is a potential for me to be exposed to body fluids). Two of the other items assessed hand hygiene before and after glove usage and one item measures the use of goggles. Goggle use has consistently been described as low in the literature (Efstathiou, Papastavrou, Raftopoulos, & Merkouris, 2011a). As adherence was measured using self-reports, it is not possible to rule out that an element of social desirability might have influenced participants’ responses and therefore their levels of adherence might be higher than if observational measures had been used.

In regards to the components of the TPB, none of these demonstrated any direct effects on Adherence. It was hypothesised that Perceived Control and Subjective Norm would have a positive effect on adherence while Negative Attitude would have a negative effect. In the final model, Subjective Norm and Negative Attitude exerted only indirect effects on Adherence through the factors of the FIASPS, while Perceived Control was removed.

Perceived Control was measured using items that related to planning and thinking about the task before engaging in it, aspects one would expect to be associated with adherence but this was not the case. As the vast majority of the
sample was employed in critical care and emergency areas, responses to the Perceived Control items might reflect the fact that many tasks are deemed urgent and there is less time for planning. However, it would seem that people working in these high pressure areas might need to be more systematic than not. While time and urgency have been shown to reduce adherence in past studies (Kelen et al., 1991; Michalsen et al., 1997), they are not acceptable reasons for non-adherence.

The finding that no constructs of the TPB had any direct effect on Adherence rejects Watson and Myers (2001) findings that Perceived Control and Attitudes towards glove usage contributed significantly to adherence to glove use. Similarly, McGaw et al. (2012) showed that “an unfavourable attitude towards infection control guidelines correlated with non-compliance” (p.7). The current results also fail to support E. A. Jenner, Watson, Miller, Jones, and Scott (2002) who demonstrated that Perceived Control was a significant predictor of adherence to hand-washing guidelines. Interestingly, E. A. Jenner et al. (2002) found that Attitude predicted Intention to implement the behaviour but not the behaviour itself. Intention was not measured in the study as the design was cross-sectional and adherence was measured in the present time.

While neither Subjective Norm nor Negative Attitude had a direct effect on Adherence to SP, Subjective Norm did have an indirect effect on Adherence via the Culture/Practice factor of the FIASPS as hypothesised, and Negative Attitude had a negative indirect effect on adherence via the Culture/Practice, Justification and Leadership factors of the FIASPS.

Subjective Norm as defined by Ajzen and Fishbein (1980) and assessed in this study reflects perceived social pressure to engage in the behaviour. While in the
current study there was no direct effect on the behaviour (adherence), it is perhaps not surprising that it had an effect on the Culture/Practice of the workplace, and thus indirectly on Adherence, as this factor looks at perceptions of the organisational climate.

The finding that subjective norm had no direct effect on Adherence does not support the findings from Godin et al. (2000) who showed that subjective norm increased adherence to SP in their sample of nurses. Similar findings with respect to the effect of Subjective Norm were reported by Sax, Uçkay, Richet, Allegranzi, and Pittet (2007). The healthcare workers surveyed by Sax et al. however, had extensive exposure to hand hygiene campaigns, and such exposure was not measured in the current study.

A negative Attitude towards adherence to SP could be reflected via the organisational culture and this modification was made to the hypothesised model. McGaw et al. (2012) showed that a favourable attitude towards infection control policies correlated with adherence to those policies, while an unfavourable attitude correlated with non-adherence. It is likely that individuals displaying a negative attitude towards adherence would also have a negative view of the organisational culture in their workplace which is the case in the final model. Ostroff (1992) also highlighted a direct relationship between attitude and performance at an organisational level, with employees’ attitude influencing organisational effectiveness.

The negative effect of Negative Attitude on Leadership seen in the final model could be expected as the leadership factor of the FIASPS measures proactivity in relation to SP. A negative attitude towards leadership can be argued to
have an indirect effect on Adherence as seen in the final model. Healthcare workers’
attitudes are important and may also be a key to leadership behaviours and in turn,
an important part of the environment or organisational culture as measured by the
Culture/Practice factor of the FIASPS. The finding that attitude influences the
leadership of organisations supports results from Sinuff, Cook, Giacomini, Heyland,
and Dodek (2007) who found that positive attitudes towards guidelines created a
culture which enabled the application of guidelines and encouraged adherence.

The literature review on factors affecting adherence to SP presented in
Chapter Five identified Sensation Seeking, Conscientiousness, Disgust, previous
OEB, and Knowledge of the guidelines as possible predictors of Adherence and
these were included in the hypothesised model (Figure 8). Despite evidence in the
literature of their effects on adherence to SP, Knowledge was the only one of these
predictors to have a direct effect on adherence (β = .23) but knowledge also exerted
indirect effects through Negative Attitude and Leadership for a total effect of β =
.43. Sensation Seeking, Disgust, and OEB did not make any contribution to the
model and were deleted from the final version, thus rejecting the hypothesis
concerning these factors. That Disgust did not contribute to the model fails to
support C. Jackson and Griffiths’s (2014) findings where disgust towards patients
was associated with the implementation of SP in their sample of nurses. The items
used to evaluate disgust in the current study referred to disgust towards situations
and not patients as it would not be expected that someone working in healthcare
would feel disgust towards their patients. This difference could explain why these
results fail to support earlier studies.

With regard to OEB, the majority of the participants (70.5%) reported having
experienced an OEB. Nurses reported a greater number of exposures than medical
doctors, although there were only six medical doctors in the sample. Mehrdad, Atkins, Sharifian, and Pouryaghoub (2014) reported similar exposure rates in nurses, and also showed that injuries and exposure were widely underreported to the healthcare facility administration. While this data was collected in the current study, it is not possible to make a differentiation between the types of exposures that can take place in the workplace. The item used to assess OEB in this study was not specific and encompassed needlestick and sharp injuries as well as mucous membrane exposures. Although it was assumed that respondents would be able to characterise their exposure and only answer the question to take into account exposure with a potential risk of acquisition of a BBV, it is not possible to discount that some participants might have reported exposures that did not pose a transmission risk. This limitation might explain why the data in the current study does not support previous findings showing that a previous OEB increased adherence to SP as shown by Rabaud et al. (2000) and was therefore removed from the model.

As predicted Knowledge had a direct effect on adherence which supports past research by Kristensen et al. (1992), Berhe, Edmond, and Bearman (2005), Luo et al. (2010) and Atif et al. (2013). Clearly, knowledge alone is not an incentive to engage in behaviour as it is known from public lack of engagement in many health behaviours, such as exercise and non-smoking, but it is certainly a prerequisite and might be inferred as such here.

Conscientiousness exerted an indirect effect on Adherence via Knowledge. Individuals scoring higher levels of conscientiousness are said to be more rule abiding (Mehrdad et al., 2014) and it might be that conscientious individuals familiarise themselves more with rules and guidelines, thus explaining the direct
effect of Conscientiousness on Knowledge. Furthermore, this finding supports findings from Barrick and Mount (1991) who argued that conscientious individuals were careful, thorough, and committed less policy violations.

Of the five factors of the FIASPS, Judgement and Contextual Cues failed to predict adherence. The rejection of those two hypotheses does not support findings from past research such as Tait et al. (2000) and Reda et al. (2010) who showed that healthcare workers would cite lack of available equipment to explain non-adherence, and would make a judgement about the situation before deciding whether or not to implement SP guidelines. Furthermore, Efstathiou et al. (2011b) found that participants in their study made a judgement of their skills and would not follow guidelines if they felt confident about their capabilities.

It is however important to also consider C. Jackson et al.’s (2014) findings, in the context of studies using self-reports. They showed that that the majority of their participants were keen to give a good impression and present themselves as knowledgeable in regards to equipment, policies and procedures while also evidently displaying lack of adherence to those. This finding is important to consider as this phenomenon can be likened to social desirability, where participants have a tendency to choose responses believed to be more socially acceptable than true thoughts or feelings (Grimm, 2010). It is not possible to ascertain whether or not the finding that Judgement and Contextual Cues do not have an impact on Adherence in the current study might be due to the effect of a social desirability bias, as it was not measured in this study.

Culture/Practice and Leadership had direct positive effects on adherence while Justification (for not using SP) had a direct negative effect as hypothesised.
Justifications for not using SP, such as the perception that wearing gloves might reduce dexterity and hinder the practice of procedures such as cannulation support findings of previous researchers. For example Tait et al. (2000) and Cutter and Jordan (2012) reported that decreased adherence to SP was associated with staff justification of their ability to practice procedures and this was also reported by Mylon, Lewis, Carré, Martin, and Brown (2014), although Zhang et al. (2014) showed that cannulation success rates were identical whether or not staff were wearing gloves. Poor leadership and negative role-models have been shown to increase non-adherence to hand hygiene guidelines by Erasmus et al. (2009) and this finding is supported albeit in the reverse directions. The finding that leadership has a positive effect on adherence to guidelines also supports the findings from Sinuff et al. (2007) who showed that leadership influenced change and adherence to guidelines through support and modelling rather than through an authoritative approach. Furthermore, Sinuff et al. showed that the best leadership, in the context of guideline implementation and adherence, is provided by a team of “dynamic, motivated and highly capable individuals” (p. 2085). This suggests that an environment or a culture supportive of leadership also contributes to adherence. This findings is reflected in the current study, where Culture/Practice had a positive effect on adherence thus also supporting DeJoy et al. (2000) findings that an occupational environment fostering adherence to SP increases adherence to SP. Findings from Erasmus et al. (2009) showing that a hospital culture where it is accepted that medical doctors who deviate from guidelines influenced study participants into not adhering to hand hygiene and SP guidelines was also inversely supported by the current results.
The final model clearly shows that three main areas appear to be of importance when trying to understand and explain adherence to SP: (1) education, (2) the individual, and (3) the organisation. Clearly individuals need to have knowledge of guidelines to enable their adherence to SP, the culture of the organisation needs to be such that staff are also encouraged to adhere to SP guidelines and the individual must have a positive, conscious attitude. Individual’s knowledge and understanding of the rationale for SP can contribute to their leadership in these behaviours. Knowledge of guidelines is a basic educational requirement, for without knowledge of these infection control principles, the individual cannot be expected to implement SP.

Initial training is nowadays devolved to Higher Education Institutions where knowledge of the guidelines is imparted to novice and returning healthcare workers. This training affords medical doctors and registered nurses with their basic knowledge of the guidelines in order to meet the registration requirements for both professions. It is also a requirement to maintain and build upon this knowledge via professional development activities (Medical Board of Australia, 2014; Nursing and Midwifery Board of Australia, 2008). While professional development activities will enable “refreshers” and updates of the guidelines, organisations also need to be supportive of staff participation in these programmes. Knowledge and training involves more than the mechanics of PPE. It should also address relevance to infection control overall, for both patients and staff, and thus decrease staff justification for not using PPE. Furthermore, the organisation needs to foster a proactive environment where leadership in the application of the guidelines is an underlying value in the culture of the organisation.
Clearly, for SP guidelines to be applied effectively in the workplace the organisational culture needs both to promote and support this among individuals at all levels, from the implementation of policies and procedures, initial training to expert level. Levett-Jones and Lathlean (2009) showed that an environment not embracing guidelines can have a detrimental effect on students’ adherence to SP. They found that students choose to adopt the facility clinical practices even when they were aware these were not best practice rather than speak up. This finding was also reported by Erasmus et al. (2009) who showed that junior staff’s conformity to guideline violations was seen as a way for them to feel a sense of belonging to the team, and they did not want to put this precarious sense of belonging at risk. Based on these findings, it is likely that in organisations where it is standard practice to deviate from guidelines the majority of newcomers would not challenge the status quo in order to fit in and the culture of the organisation would remain one that does not embrace best practice guidelines. Personal development activities can lead to empowerment of employees and can enable changes in the culture to take place as described by Levett-Jones and Lathlean (2009) but again, the culture needs to be open to this or staff may become disenchanted.

**Sample Representativeness**

According to the Australian Institute of Health and Welfare (AIHW; 2012), the total number of nurses employed in Australia in 2011 was 268,018, 90% were female and 49% worked part-time. In the current study, 58% of respondents worked full-time, 37% part-time, 4% on a casual basis and 1% were on maternity leave. Furthermore, according to the AIHW the Aged Care sector employed 40,443 nurses (approximately 15%) while 27,344 nurses were employed in Critical Care and Emergency areas (approximately 10%). In the current study, with regards to area of

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work, the sample was skewed to critical care areas and emergency departments (74%). This bias may have resulted from a preponderance of participants responding via the Australian College of Critical Care Nurses advertisement of the study. Clearly, this imbalance may affect the generalisability of the results to the wider nursing workforce.

The average age of nurses in the workforce as determined by the AIHW was 44.3 years which compares with the average age of 44 years in the current sample. In this study, the number of male nurses was slightly higher than in the general nursing population at 11.48% compared with 10%.

It should be noted however, that due to the methods of distribution of the questionnaire, it is not possible to determine clearly whether the participants were in fact all from Australia as one method of recruitment was via Facebook which could have been accessed by healthcare workers in other countries. Overall, it seems that by gender these results can be generalised to the population of nurses.

Limitations

While the current model has provided valuable insights into predictors of adherence and utilised a psychometrically valid new scale, it was cross-sectional in design. A longitudinal study is required to test the model of Adherence and the FIASPS further with another sample of nurses and in particular, medical doctors.

It is also important to note that there was an overrepresentation of healthcare workers from critical care and emergency care areas when compared to the general nursing workforce. Area of work has been shown to be a factor affecting adherence to SP with Erasmus et al. (2010) showing lower hand-washing adherence among
staff working in Intensive Care Units than in any other hospital setting. Furthermore, the sample was heavily skewed to nurses and the six medical doctors in the sample are not representative of the population of medical doctors in Australia. Difficulties in the recruitment of medical doctors as study participants has been described previously by Firth-Cozens (2001) and E. A. Jenner et al. (2002). Due to the few doctors in the study, it was not considered meaningful to compare their scores to those of nurses.

Both confirmatory and exploratory factor analyses were used to support the structure of the scales used in the model, yet for some scales the internal reliabilities were only adequate. Future studies might determine if these reliabilities are stable or if they can be improved.

**Conclusions**

The model of adherence tested in this study partially supports the hypothesised model of adherence. The significant factors in the model explained 35% of the variance in adherence to SP. Four factors had a direct effect on adherence to SP: Leadership, Knowledge, Culture/Practice and Justification, In addition, some constructs of the Theory of Planned Behaviours, Subjective Norm and Negative Attitude, had indirect effects on Adherence via Culture/Practice, Leadership and Justification. Conscientiousness was also found to have an indirect effect on Adherence via Knowledge. Knowledge as well as having a direct effect on Adherence also had an indirect effect via Leadership.

Three of the four variables which have a direct effect on adherence were assessed with the new Factors Influencing Adherence to SP Scale developed in
Studies Two and Three, suggesting its suitability for use as indicators of the factors that influence adherence to SP in future research, and in education and training.

In addition, the model clearly identified that there was three major influences on adherence to SP: (1) the individual, (2) the organisation and (3) education. It appears that any attempts to improve adherence to Standards Precaution needs to have a three pronged approach where equal attention is given to address each of these three factors if any sustained behaviour change to address poor adherence to SP is to be successful.
CHAPTER NINE

Conclusion

Infection control is a major healthcare aim. Initiatives to reduce infection include hygiene, antibiotics and more recently the introduction of infection control guidelines. These guidelines are designed to protect both patients and healthcare workers.

In this thesis important theoretical and practical concerns with respect to healthcare workers adherence to SP were addressed. This work has addressed a gap in the literature as, while previous attempts to establish factors affecting Adherence to SP have been made, no psychometrically validated scale has resulted, and no model utilising these factors has been tested.

This thesis was conducted over four related studies. Study One \( (N = 31) \) a qualitative study of nurses and medical doctors to ascertain their views of factors affecting adherence to SP and behaviours around SP. Seven themes emerged from the qualitative data: Knowledge, Justification, Organisational Factors, Education, Consequences, Leadership/Role Modelling and Judgement/Risk-Assessment. These themes were used to develop items for a questionnaire which was distributed widely in Study Two.

Study Two \( (N = 363) \) involved the psychometric testing of this questionnaire and results revealed five independent factors with acceptable internal reliability. These factors were reduced to five items each for comparability of scores and to yield a more parsimonious and quick to administer scale. A comparison with the Impulsive and Sensation Seeking Scale (ImpSS) used in some previous studies to predict adherence, revealed some level of construct validity, although it is clear that
the ImpSS is not applicable to occupational settings. A retest of the 25-item questionnaire with 100 of the original participants four weeks later revealed scores from Time One and Time Two correlated $r = .44$ to .72, attesting to the temporal stability of the factors.

Study Three was conducted to confirm the factor structure of the Factors Influencing Adherence to SP Scale (FIASPS) with a further sample of 384 participants. The five-factor structure of the scale was confirmed using Confirmatory Factor Analysis. These factors were then used in the final study with a further independent sample of 250 participants to test a hypothesised model of factors influencing adherence.

The Theory of Planned Behaviour (Ajzen, 1991) formed the basis of the model to be tested in Study Four. Factors identified from past research as having an influence on healthcare workers’ adherence to SP: Sensation Seeking, previous Occupational Exposure to Blood, Disgust, Conscientiousness and Knowledge of guidelines were added to the Theory of Planned Behaviour model, as were the five factors of the FIASPS: Judgement, Leadership, Contextual Cues, Practice/Culture and Justification.

The hypothesised model was partially supported by the data. A final model was developed by removing factors that did not have a direct or indirect effect on Adherence. The final model explained 35% of the variance in adherence to SP, with direct effects on adherence from three of the five factors of the new FIASPS: Leadership, Justification and Culture/Practice. Knowledge also contributed directly to Adherence. Conscientiousness contributed to Adherence indirectly via Knowledge, Subjective Norm also exerted an indirect effect on Adherence via
Culture/Practice, while Negative Attitude had an indirect effect via Justification, Leadership and Culture/Practice. As well as having a direct effect on Adherence, Knowledge also had an indirect effect on Adherence via Leadership.

Contrary to the hypotheses in this thesis, none of the variables form the original TPB directly predicted adherence to SP. A Negative Attitude and Subjective Norms did exert indirect effects on Adherence but only through subscales of the FIASPS. This finding might reflect the fact that actual behaviour with respect to Adherence was measured in this thesis while the predominant outcome variable in the TPB is Intention. Past studies (e.g., Sheeran, 2002) have shown that Behaviour is not well predicted by Intention and the only variable in the TPB to directly have an impact on Behaviour is Perceived Control.

It is important to note that the predictors of Adherence to SP in this study can be seen to represent three main dimensions: (1) the education/training (Knowledge), (2) the individual (Conscientiousness, Justification and Negative Attitude) and (3) the organisation (Culture/Practice and Leadership). Clearly it is imperative to address each of these areas in promoting healthcare workers’ adherence to SP as a focus on one factor alone will not be sufficient.

The initial training of healthcare workers takes place in universities and this training might benefit from fostering a knowledge of the guidelines both in preclinical simulated clinical environment and during clinical placement so that a sense of infection control is seen as an integral part of the nursing and medical cultures and behaviour. The development of such an ethos needs to begin with University training but must be supported and encouraged by preceptors and the organisation during clinical placements and subsequent employment.
Developing this culture needs to take place at the university level but a sense of supportive and SP embracing culture also need to be integral part of the students’ placement experience. The role of the educator, preceptor and the role-models to whom students are exposed on clinical placements as well as the feedback obtained from their preceptors has the potential to make a major impact on students’ behaviours not only during their training but also post qualification. It is paramount that the professionals acting as mentors and/or preceptors to students have a positive and engaged attitude towards adopting Standard Precaution guidelines as it could have a long lasting impact on students’ behaviour in regards to adherence to SP. This suggestion is in accord with Gray and Smith (2000) who showed that mentors had a lasting effect on students learning and that students saw professionals with skills, knowledge and attitude as worthwhile mentors. Furthermore, Erasmus et al. (2009) highlighted that students would copy other professionals’ behaviour in the workplace to conform to the culture. This idea of modelling was also reported by Levett-Jones and Lathlean (2009) who showed that a sense of belonging was paramount among nursing students when attending clinical placement, and that in order to feel this sense of belonging, students would replicate policy violations witnessed on placement rather than speaking up against those violations and adopting evidence-based practice.

Clinical placements are a source of great anxiety for students and Levett-Jones and Lathlean (2008) explained the need to fit in as a way of offsetting this anxiety, with students who felt accepted reporting that their learning experience was vastly improved. This need to fit in and having a sense of belonging has also been described by Melia (1987). The relationship between social exclusion and cognitive processes has been investigated by Baumeister, Twenge, and Nuss (2002) with
findings showing that not having a sense of belonging to a group reduced people’s capacity for intelligent thoughts. The implications of not belonging to a group appear to be more complex than just replicating policy violations, it seems to have an actual impact on the learning process as highlighted by Baumeister et al. (2002). Past research described here highlight that the educational, individual and organisational dimensions, also highlighted by the model of adherence to SP tested in Study Four (see Chapter Eight) are clearly interrelated.

In order to foster an organisational culture embracing adherence to SP, personal development activities also need take place at the organisation level, to reinforce and update knowledge of guidelines. These educational activities need to be responsive to novel disease threats such as the recent Middle East Respiratory Syndrome Coronavirus (MERS-CoV) cases, a virus very similar to the virus that caused the Severe Acute Respiratory Syndrome (SARS) epidemic in 2002-2003. In some countries, the majority of the SARS diagnoses were healthcare workers who had looked after patients with SARS (Donnelly et al., 2003) thus highlighting the risks of occupational transmission to healthcare staff. More recently the increasing number of cases of Ebola Virus Disease (EBV) has prompted the CDC in the United States of America to issue some further guidance for environmental infection control in hospitals, emphasising that SP are the minimum standard to adopt for patients confirmed or suspected to have EBV (Centers for Disease Control, 2014c). While there are some concerns among the general public about EBV transmission, its transmission mode highlights that healthcare workers caring for patients affected with EBV, people in healthcare settings and people in close contact with EBV patients are the most at risk (Centers for Disease Control, 2014a).
Not only do the educational activities need to be reactive and up to date, but the organisational culture needs to support them as promoting a safety climate, where guidelines protecting patients and healthcare workers alike are embedded in the values of the organisation and in the organisational culture. The organisational culture as well as embracing professional development needs to foster a sense of empowerment to enable individuals to display leadership and be proactive in the use of SP guidelines. This was highlighted in Study One, with comments from participants emphasising the need for empowerment with regards to SP guidelines. Clearly empowerment is not possible without knowledge of guidelines and without an organisational culture that fosters leadership.

Gray and Smith (2000) showed that medical students found mentors to be excellent role-models when they demonstrated leadership qualities as well as clinical skills and teaching abilities. Leadership is an area measured by the FIASPS in regards to Adherence to SP and it clearly has an impact on healthcare professionals practice but also the practice of those they mentor.

While the developed instrument was valid and reliable with good psychometric properties and the modified model was supported, future research is needed to evaluate the stability of this predictive model over time. The FIASPS has been shown to be valid regardless of gender and across nurses and medical doctors, but further testing of this scale and the model is warranted. Recruiting more medical doctors to ascertain the stability of the predictive model is also needed although Firth-Cozens (2001) highlighted the difficulties in recruiting medical doctors for such research.
It would also be beneficial to test the FIASPS and the model among nurses working in a wide variety of settings, as the sample was skewed towards participants working in critical care and emergency areas.

Future research monitoring students’ education and practice in the use of SP is also important, using the FIASPS. Early adoption and reinforcement of appropriate behaviour is essential to later practice. It is also important for future research to determine the SP knowledge and adherence levels of unit managers who are both role models for other staff and who may influence corrective behaviour in others seen not to implement SP.

Despite those limitations, the studies reported in this thesis make a novel and important contribution to the literature. The results have provided a new instrument that is psychometrically sound, to assess factors affecting healthcare workers’ adherence to SP. A model of psychosocial influences on Adherence to SP was also examined and provided worthwhile findings to target adherence to SP and enable interventions to be specific and effective at addressing adherence shortfalls. Not only will this provide safer environments for healthcare workers, but it will also enable the delivery of care to patients with reduced risks of cross-infections caused by healthcare workers behaviours.

The findings of the studies presented here and the literature examined clearly highlight that a holistic and multidimensional approach is needed when implementing programmes to improve adherence to SP. It has been demonstrated that three main areas have an impact on adherence to SP, the individual, the organisation and education, and policy and practice clearly need to address each of
these to ensure the highest possible levels of healthcare workers adherence to SP in order to improve infection control.
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APPENDIX A

Northern Territory Department of Health and the Menzies School of Health
Research Human Research Ethics Committee (Project No. HREC – 2011-1601)

Ethics Approval
10 October 2011

Mr. Stephane Bouchoucha,
Lecturer,
Charles Darwin University,
School of Health Sciences,
Casuarina Campus,
Casuarina NT 0909.

Dear Mr. Bouchoucha,

Re: HREC-2011-1601: Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

The Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research thanks you for taking the time to respond to the issues of concern identified by the Committee at the meeting held 15 June 2011.

The Chair has reviewed and approved the following document:

- Letter of support from the Chief Executive Officer of the Department of Health, dated 30 September 2011.

Full approval is now granted. The Committee is satisfied that the research proposal meets the requirements of the NH&MRC National Statement on Ethical Conduct in Human Research, 2nd ed, 2007.

This approval will be ratified at the next meeting of the Human Research Ethics Committee to be held 19 October 2011. Please note that HREC approval applies only to research conducted after the date of this letter.

Approved Project timeline: 10/10/2011 – 31/12/2011. This approval is for a period of three (3) months. A final project report is required on or before 31/12/2011.

Please note the terms under which ethical approval is granted:

1. The safe and ethical conduct of this project is entirely the responsibility of the investigators and their institution(s).
2. Researchers should report immediately anything which might affect continuing ethical acceptance of the project, including:
   a) adverse effects of the project on subjects and the steps taken to deal with these,
   b) other unforeseen events,
   c) new information that may invalidate the ethical integrity of the study.
   d) Proposed Changes in the project
3. Approval for a further twelve months will be granted if the HREC is satisfied that the conduct of the project has been consistent with the original protocol.
4. Confidentiality of research participants should be maintained at all times as required by law.
5. The Patient Information Sheet and the Consent Form shall be printed on the relevant site letterhead with full contact details.

6. The Patient Information Sheet must provide a brief outline of the research activity including, risks and benefits, withdrawal options, contact details of the researchers and must also state that the Human Research Ethics Secretary can be contacted (telephone and email) for information concerning policies, rights of participants, concerns or complaints regarding the ethical conduct of the study.

7. The Committee must also be notified at the completion of the project.

If you have any queries or if I can be of further assistance, please do not hesitate to contact me on (08) 89228795.

Yours sincerely,

[Signature]

Dr Michael Nixon
Chair
Human Research Ethics Committee
of Northern Territory Department of Health
and Menzies School of Health Research
Northern Territory Department of Health Study Approval
Mr Stephane Bouchoucha  
Lecturer  
Charles Darwin University  
Ellengowan Drive  
DARWIN NT 0909  

Dear Mr Bouchoucha  

RE: PHD STUDY: ASSESSING ADHERENCE TO STANDARD PRECAUTIONS AND RISK TAKING BEHAVIOURS AMONGST HEALTHCARE PROFESSIONALS  

Thank you for your letter of 8 August 2011 seeking my support for your PhD study of ‘Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals’.  

I am pleased to approve you seeking voluntary participation of the Department of Health workforce in your study; and for you to use this letter as evidence of my support of your study to gain ethics approval from the Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research.  

I wish you every success with your study and would like to receive regular updates, as well as the final report, once completed. If you have any further queries please contact Ms Angela Brannenly, AJPrincipal Nursing and Midwifery Advisor on 892 27161.  

Yours sincerely  

Jeffrey Moffett  
August 2011
APPENDIX C

Charles Darwin University (Project No. H11111) Ethics Approval
HUMAN RESEARCH ETHICS COMMITTEE CLEARANCE
NEW PROPOSAL

HREC REFERENCE: H11111

PROJECT TITLE: Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

CHIEF INVESTIGATOR(S): Mr Stephane Bouchoucha

The Charles Darwin University Human Research Ethics Committee has considered your project.

The Committee is satisfied that the research proposed in this project conforms with the general principles set out in the current National Health and Medical Research Council regulations, and with the policy of the Charles Darwin University.

It should be noted that data must be stored securely on campus. Storage in a central facility (with limited access if necessary) is available. Researchers should address any queries concerning data storage to their relevant Faculty.

Expiry date: 31 December 2011

Please Note: A Final Report is due on completion of this project, or if the project extends beyond the expiry date a progress report is due before the date of expiry.

APPROVED

[Signature]

Chair

CDU Human Research Ethics Committee

[Signature]

Dated

20 (2), 2011

C.c. Menzies HREC : Jennifer.Wong@Menzies.edu.au
14 September 2011

Mr Stephane Bouchoucha
School of Health Sciences
Charles Darwin University
DARWIN NT 0909

Dear Mr Bouchoucha

RE: H11111 - Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals
Human Research Ethics Committee Project Application Approval

The Charles Darwin University Human Research Ethics Committee considered your application for reciprocal ethics clearance for the abovementioned project at meeting 7/11, held on 11/29/2011.

The Committee provided reciprocal approval for this research project, noting the ethics clearance granted by the Menzies School of Health Research HREC (HREC-2011-1601) on 10th October 2011.

Please note: In order to extend the approval please provide the HREC with notification of Menzies’s ethics approval extension.

Please find attached a notice of clearance.

The expiry date of ethics approval for your project is 31 December 2011. It is the responsibility of the researcher to ensure that ethics approval is renewed prior to the expiry date. If renewal is necessary, you will need to submit a progress report including a statement of compliance with ethical requirements, and detailing any proposed or actual changes to the project, which may affect its ethical acceptability. Renewal/Final Report forms are available from the Web at: http://www.cdu.edu.au/research/officerenew_final_04.rtf or from the Office of Research & Innovation.

If any significant alterations to your project are contemplated, or if any matters arise which may conceivably affect the continued ethical acceptability of the project, you are required to immediately notify the Human Research Ethics Committee by letter.

Our best wishes for the success of your project.

Yours sincerely,

Professor Sharon Bell
Chair, Human Research Ethics Committee
APPENDIX D

Notice advertising the study posted on noticeboards at the Royal Darwin Hospital (RDH)
Research on healthcare workers and Standard/Universal Precautions

My name is Stephane Bouchoucha and I am seeking volunteers who are nurses or medical practitioners routinely having contact with patients as part of their employment, to participate in a research project that I am undertaking as part of my doctoral studies.

This project will explore your attitude towards Universal/Standard precautions in the workplace through group discussion and interviews.

Interviews and group discussions are planned on 9th, 10th and 11th November 2011.

If you are interested in participating or would like more information, please contact me on the following phone number or by email.

PHONE: 04203 76834
EMAIL: stephane.bouchoucha@edu.edu.au

Thank you

Stephan Bouchoucha
APPENDIX E

Email distributed to all Territory medical and nursing staff by the Northern Territory Department of Health Principal Nurse Adviser and distributed by senior nurses and nurse unit managers at the RDH to their staff.
Dear Colleagues,

Please see below request for participation in a research project. If any of you are interested, please reply directly to the researcher.

Kind regards,

Research on healthcare workers and Standard/Universal Precautions

My name is Stephane Bouchoucha and I am seeking volunteers who are nurses or medical practitioners routinely having contact with patients as part of their employment, to participate in a research project that I am undertaking as part of my doctoral studies. This project will explore your attitude towards Universal/Standard precautions in the workplace through group discussion and interviews.

Interviews and group discussions are planned on 9th, 10th and 11th November 2011.

If you are interested in participating or would like more information, please contact me on the following phone number or by email.

PHONE: 04203 XXXX
EMAIL: stephane.bouchoucha@cdu.edu.au

Thank you
APPENDIX F

Invitation to participate in focus group and/or interview and Plain Language Statement
Plain language statement
Interview or focus group
This is for you to keep

You are invited to participate in the research study titled: Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

Chief researcher
Stephane Bouchoucha – PhD candidate, Charles Darwin University

Supervisor
Professor Kate Moore – Psychology Theme Leader, School of Health, Charles Darwin University.

Purpose of the study
Healthcare workers are required to follow certain guidelines when undertaking procedures that potentially could expose them to pathogens and more specifically blood borne viruses. These guidelines are called Standard Precautions but are sometimes also referred to as Universal Precautions. Previous research has established that many healthcare workers do not follow those guidelines or at all times and are potentially putting themselves at risk of being infected by blood borne viruses. Using semi-structured interviews or focus groups, the aim in this study is to understand factors (e.g. work pressure) which might influence adherence or not to these Standard Precautions.

Benefits of the study
This study will help inform agencies and healthcare workers of the factors affecting compliance to standard precautions guidelines. It will also assist in creating ways to support healthcare workers to develop strategies to adopt standard precaution guidelines.

What would be expected of you?
You are invited to attend a 30-45 minute interview or focus group. In the interview and focus group, you would be asked a series of questions around your experience
of the use of Standard Precautions guidelines. You will be asked if the interview can be audio recorded to help the researcher in gathering the maximum amount of information, you may, however, decline this request.

At the beginning of the interview/focus group, you will be reminded of what will be involved and the purpose of the research. You will also be requested to avoid the use of any fellow participants names as far as possible. Taking part in the study is completely voluntary and you are able to withdraw from the study at any point. All of your responses from the interview/focus group will be treated in the strictest confidence, kept anonymous, and only group data will be reported.

**Risks**
There are no specific risks associated with this study. Participants in focus groups will be asked to maintain confidentiality.

The questions in the interview are not intended to be too sensitive. If during the interview you experience any discomfort, then you are free to refrain from answering that question, or withdraw from the study completely.

**Confidentiality**
The researcher will keep full confidentiality of your interview. The interview audiotapes, transcripts, and questionnaires will be kept confidential and anonymous and used only for the purpose of informing the research study. Your name and those of any other people possibly mentioned during the interview will not appear in the transcription of the tapes or on questionnaires and the audio tapes will be erased. The researcher will summarise the content prior to concluding the session for clarifications or corrections.

While adherence to SPs is not a legal matter, you will be asked to speak in general terms and not necessarily in reference to your own practices as should the disclosure of any illegal practices occur this disclosure might carry legal implications.

**Your participation**
You have been invited to participate in the study because you are a healthcare worker working in clinical practice. We would be grateful if you are able to participate in this study and would only ask about 30 to 45 minutes of your time, but you are free to refuse to participate. Even if you decide to participate, you may withdraw from the research at any time, without any influence on your future work.
Results of the study
A copy of the final report will be available for you if you wish. There will also be a seminar on the results of the study held by the researcher at Charles Darwin University, which you are welcome to attend. Dates and times of this seminar will be made available close to the end of the study.

Person to contact
If you would like to take part, or have any questions about the project, please contact the researcher, Stephane Bouchoucha on 04203 76 834 or email stephane.bouchoucha@cdu.edu.au

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, please contact the Ethics Secretariat, phone 08 89227922 or email ethics@menzies.edu.au.

If you decide to participate, please fill in the consent forms attached to this letter. You may still withdraw from the study at anytime, without penalty of any kind.

Whatever your decisions on this matter, thank you for devoting some time to reading this statement, and considering its contents.

Ethical guidelines
This project will be carried out according to the Australian Code for the Responsible Conduct of Research, as defined by the National Health and Medical Research Council of Australia.

Thank you for devoting some time to reading this statement, and considering its contents.
APPENDIX G

Consent Form for Study One
Consent form: interview and/or focus group
This means you can say NO

Research project title: Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

I, __________________________

Hereby consent to participate in the study undertaken by Stephane Bouchoucha – PhD candidate at Charles Darwin University. I understand that the purpose of the research is:

To ascertain the factors that contribute to adherence to the Standard Precautions Guidelines amongst healthcare workers.

I acknowledge that:

- The aims, methods, and anticipated benefits, and possible risks of the study, have been explained to me by the principal investigator Stéphane Bouchoucha.
- I voluntarily and freely give my consent to my participation in such study.
- I understand that only aggregated results will be used for research purposes and may be reported in scientific journals and academic journals.
- Individual results will not be released to any person except at my request and on my authorisation.
- I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease, and any information obtained will be returned to me or destroyed at my request.

Signature: __________________________ Date: __________________________

Independent witness signature: __________________________ Date: __________________________
APPENDIX H

Preliminary 116-item questionnaire generated from Study One themes
<table>
<thead>
<tr>
<th></th>
<th>Not at all (0)</th>
<th>A little (1)</th>
<th>Somewhat (2)</th>
<th>Quite a bit (3)</th>
<th>Very much (4)</th>
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<tbody>
<tr>
<td>I am familiar with the content of the standard precautions guidelines (1)</td>
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<td>My hospital has a strict policy for staff to adhere to SPs (2)</td>
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<td>I am familiar with my hospital/clinical setting manual on safety precautions (3)</td>
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<td>I am able to recognise when contamination happen during a clinical procedure (4)</td>
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<td>Hand hygiene is the most important aspect of SPs (5)</td>
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<td>The use of gloves is needed with all patients (6)</td>
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<td>The importance of adherence to SPs was an integral part of any university training (7)</td>
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<td>I think audits are an essential way to ensure adherence to SPs (8)</td>
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<td>Most doctors typically adhere to SPs (9)</td>
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<td>Most nurses typically adhere to SPs (10)</td>
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<td>The use of personal protective equipment is essential when following SPs</td>
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<td>(11)</td>
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<td>Alcohol hand rub is an alternative to hand washing</td>
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<td>SPs guideline are a standard that everybody should use</td>
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<td>(13)</td>
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<td>SPs are only important to protect staff</td>
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<td>(14)</td>
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<td>SPs are only important to protect patients</td>
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<td>(15)</td>
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<td>Nowadays, patients expect healthcare workers to be implementing SPs</td>
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<td>(16)</td>
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<td>The way patients look will influence whether or not I follow SP guidelines</td>
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<td>(17)</td>
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<td>My assessment of a patient status will indicate if I need to follow SP</td>
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<td>There is no need to implement SPs unless I identify contamination during a</td>
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<td>I use SP whenever there is a potential for me</td>
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<td>to be exposed to body fluids (20)</td>
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<td>I expect SP to be used in any settings (21)</td>
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<td>I expect all staff to use SPs (22)</td>
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<td>I consider all patients to be potentially infectious irrespective of their diagnosis status (23)</td>
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<td>I wear gloves because I am worried I could catch an infection from a patient (24)</td>
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<td>Gloves afford me more protection than they protect my patients (25)</td>
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<td>I always wash my hands before putting on gloves (26)</td>
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<td>I always wash my hands after removing gloves (27)</td>
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<td>Wearing gloves gives me a sense of safety when I practice clinical procedures (28)</td>
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<td>Adhering to SP is automatic for me whenever there is a risk of exposure to bodily fluid (29)</td>
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<td>Wearing gloves when needed is common sense (30)</td>
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<td>Sometimes I am too busy to be worrying about Personal Protective Equipment (31)</td>
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<td>I am able to decide whether or not to use PPE based on the risks I am exposing myself to when practicing clinical procedures (32)</td>
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<td>It takes too long to put on the PPEs required by SPs when attending to patients (33)</td>
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<td>Wearing gloves makes it more difficult to palpate veins when practicing venepuncture or cannulation (34)</td>
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<td>Not wearing gloves is better for patients (35)</td>
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<td>When I wear gloves I cannot feel the veins (36)</td>
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<td>I am clumsier when I wear gloves and risk having to repeat the procedure (37)</td>
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<td>I am more likely to wear PPEs if I see my colleagues wearing them (38)</td>
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<td>I am more likely</td>
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<td>to wear PPEs if they are located nearby patients</td>
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<td>(39) When I cannot find the correct PPEs needed for SPs, I proceed without rather than looking for them in another place</td>
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<td>(40) If there is a clinical emergency, there is no time to worry about PPEs</td>
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<td>(41) I don’t know enough about SPs to be consistent in applying them</td>
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<td>(42) There is not always the correct size gloves available for me to wear</td>
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<td>(43) In an emergency situation, I only worry about infection afterward</td>
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<td>(44) I have learned some procedures without wearing PPEs and do those procedures without using any PPEs</td>
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<td>(45) I am tired of having to use PPEs when delivering patient care</td>
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<td>(46) When I don’t</td>
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<td>Statement</td>
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<td>Anticipate staying very long with a patient there is no need for SP (47)</td>
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<td>Previous experience of a situation will influence whether or not I implement SP even if I should (48)</td>
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<td>I find it hard to interpret the SP guidelines (49)</td>
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<td>There are different interpretations of the SP guidelines (50)</td>
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<td>It is my choice to not wear gloves when taking blood/cannulating as I am only putting myself at risk (51)</td>
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<td>My level of seniority in the organisation allows me to decide when I should follow SP guidelines (52)</td>
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<td>I expect more junior members of the staff to follow SPs thoroughly (53)</td>
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<td>If I am not going to be very long with the patient, I do not need to follow SPs (54)</td>
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<td>I see some of the conditions patient have very often</td>
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and do not need to use SPs in those instances (55)
I always wear goggles when required to (56)
I don’t need to use SP if I am going to be using a non-touch technique (57)
Wearing gloves is not needed if I have not got any cuts on my hands (58)
Doctors don’t use SPs as much as nurses (59)
Nurses use SPs less consistently than doctors (60)
My initial training gave me only the basics on SP (61)
University training anchored the behaviour regarding SP I am now following (62)
I am more likely to follow SP as it was taught when I was at university/during my training (63)
Younger professionals seem to follow SPs more (64)
Older professionals seem to follow SPs less (65)
<table>
<thead>
<tr>
<th>I don’t wear goggles very often as it wasn't something I was taught to do (66)</th>
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<tr>
<td>I believe SP would be followed more if every assignment at university/during training encompassed SPs (67)</td>
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<td>I am less likely to wear gloves if I was taught procedures without them (68)</td>
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<td>When I witness people non-adhering with SPs, I use that as an education opportunity (69)</td>
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<td>I use role-modeling to increase use of SPs (70)</td>
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<td>I am happy to challenge people when I see them not using PPEs when needed (71)</td>
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<td>I feel comfortable challenging nurses or doctors when I see them non adhering to SPs (72)</td>
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<td>I am educated and able to weigh up risks/benefits on not using SPs when needed (73)</td>
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<td>I think that a lack of education can</td>
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<td>lead to an inappropriate use of PPEs (74)</td>
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<td>I think that the way SPs are taught at university has a lot to do with adherence in practice (75)</td>
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<td>I think the consequences of not adhering to SPs are not very clear (76)</td>
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<td>Annual training and assessment of SPs knowledge and practice increase adherence (77)</td>
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<td>Doctors should be trained in adherence to SPs (78)</td>
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<td>Nurses training in SPs should be strictly evaluated (79)</td>
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<td>In some workplaces it is standard practice not to follow guidelines (80)</td>
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<td>If I know that my workplace has a culture of adhering to SPs, I am more likely to adhere too (81)</td>
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<td>The culture of the organisation allows for people to not follow SP guideline (82)</td>
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<td>I think that when an organisation is</td>
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about to undergo accreditation, there is a more pronounced emphasis on following SP guidelines (83)

I think that the leadership of the ward I work on has a lot to do with how SP guidelines are followed (84)

In my practice, a potential exposure to contaminants will trigger the use of SP (85)

I assess what is wrong with a patient before deciding whether or not to implement SPs (86)

I am more likely to wear gloves if I have to deal with urine rather than when taking blood (87)

I am able to decide whether I need to use SP based on the patient appearance (88)

I am able to decide whether I need to use SP based on the likelihood of becoming infected (89)

I think that the more experienced
<p>| I become at my job, the more likely I am to be able to decide when I need to use SPs (90) |   |   |   |   |
| I think that not seeing the effect of using SP can have an impact on adherence (91) |   |   |   |   |
| I think that because I can’t see what will happened if I don’t use SP, I am less likely to adopt SP guidelines (92) |   |   |   |   |
| I think that the fact that microorganisms are not visible has a lot to do with the way people decide to follow the guidelines (93) |   |   |   |   |
| When I see people doing my job in TV shows and not wearing PPEs, I am more likely to follow their example and not follow SP guidelines (94) |   |   |   |   |
| I think it is more difficult for junior member of the staff to encourage their peers to follow SPs when they witness non-adherence (95) |   |   |   |   |
| I think that senior staff members do |   |   |   |   |</p>
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<td>not need to be reminded to use PPEs are they are able to make the decision themselves (96)</td>
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<td>I have a responsibility to encourage people to protect themselves (97)</td>
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<tr>
<td>I think audit exposing areas not adhering to SPs allow those areas to correct their shortfalls (98)</td>
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<td>I feel concerned when I witness people not adhering to SPs (99)</td>
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<td>I feel anxious when I witness people not adhering to SP (100)</td>
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<td>I feel the need to confront people that I see not adhering to SP (101)</td>
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<td>Knowing the patient serological status in regards to HIV and hepatitis will affect the way I implement SP (102)</td>
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<tr>
<td>I am able to tell if a patient has HIV or hepatitis by looking at them (103)</td>
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<td>I think that it is</td>
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<td>less risky not to use SP when dealing with a paediatric patient than when dealing with an adult patient (104)</td>
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<td>I think that implementing SPs was easier when people were flagged as having an infection (105)</td>
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<td>I warn staff that I see interacting with patient with an infection that they need to use SP (106)</td>
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<td>I need to treat everybody as if they were infectious (107)</td>
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<td>People should be treated the same regardless of their BBV infection status (108)</td>
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<td>I will be more careful if I know that a patient is Hepatitis positive or HIV+ (109)</td>
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<td>I think that if people see me practicing SP, they will do the same (110)</td>
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<td>I am very skilled at some procedures and do not need to follow SPs (111)</td>
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<td>I don’t need to wear gloves as I</td>
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<tr>
<td>am skilled at what I do (112)</td>
<td>I am confident when dealing with patients and don’t need to use SPs (113)</td>
<td>I am confident of not using SPs, even if a patient is infectious as I know what I am doing (114)</td>
<td>I am more likely to follow SPs if I am dealing with sharp instruments (115)</td>
<td>I am more likely to follow SPs if I am dealing with needles (116)</td>
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APPENDIX I

92-Item Scale administered in Study Two
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<tr>
<th></th>
<th>Not at all (0)</th>
<th>A little (1)</th>
<th>Somewhat (2)</th>
<th>Quite a bit (3)</th>
<th>Very much (4)</th>
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<tbody>
<tr>
<td>I am familiar with the content of the standard precautions guidelines (1)</td>
<td>○</td>
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<tr>
<td>My hospital has a strict policy for staff to adhere to standard precautions (2)</td>
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<td>I am able to recognise when contamination happen during a clinical procedure (3)</td>
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<td>Hand hygiene is the most important aspect of standard precautions (4)</td>
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<td>The use of gloves is needed with all patients (5)</td>
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<td>The importance of adherence to SPs was an integral part of my training (6)</td>
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<td>I think audits are an essential way to ensure adherence to standard precautions (7)</td>
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<td>Most doctors typically adhere to standard precautions (8)</td>
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<td>Most nurses typically adhere to standard precautions (9)</td>
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<td>Alcohol hand rub is an alternative</td>
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<td>to hand washing (10)</td>
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<td>Standard precautions are only important to protect staff (11)</td>
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<td>Nowadays, patients expect healthcare workers to implement standard precautions (12)</td>
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<td>My assessment of a patient's status will indicate if I need to follow standard precautions guidelines (13)</td>
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<td>There is no need to implement standard precautions unless I identify contamination during a procedure (14)</td>
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<td>I use standard precautions whenever there is a potential for me to be exposed to body fluids (15)</td>
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<td>I consider all patients to be potentially infectious irrespective of their diagnosis status (16)</td>
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<td>I wear gloves because I am worried I could catch an infection from a patient (17)</td>
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<td>Gloves afford me more protection than they protect my patients</td>
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<td>(18)</td>
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<td>I always wash my hands before putting on gloves</td>
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<td>(19)</td>
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<td>I always wash my hands after removing gloves</td>
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<td>(20)</td>
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<tr>
<td>Wearing gloves gives me a sense of safety when I practice clinical</td>
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<td>procedures</td>
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<td>(21)</td>
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<td>Wearing gloves when needed is common sense</td>
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<td>(22)</td>
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<tr>
<td>Sometimes I am too busy to worry about Personal Protective Equipment</td>
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<td>(23)</td>
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<td>I am able to decide whether or not to use Personal Protective Equipment</td>
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<td>based on the clinical risks to me</td>
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<td>(24)</td>
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<td>It takes too long to put on the Personal Protective Equipment required</td>
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<td>when attending to patients</td>
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<td>(25)</td>
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<td>Wearing gloves makes it more difficult to</td>
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<td>palpate veins when practicing venepuncture or cannulation (26)</td>
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<td>Not wearing gloves is better for patients (27)</td>
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<td>I don't wear gloves as I cannot feel veins (28)</td>
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<td>I am clumsier when I wear gloves and risk having to repeat the procedure (29)</td>
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<td>I am more likely to wear Personal Protective Equipment if I see my colleagues wearing them (30)</td>
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<td>I am more likely to wear personal protective equipment if they are located nearby patients (31)</td>
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<td>When no correct Personal Protective Equipment are immediately available, I proceed without looking for them in another place (32)</td>
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<tr>
<td>If there is a clinical emergency, there is no time to worry about personal protective</td>
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If the correct size glove is not available I proceed without (34)

In an emergency situation, I only worry about infection afterwards (35)

Some procedures I learnt without personal protective equipment and I continue to perform these without personal protective equipment (36)

I am tired of having to use personal protective equipment when delivering patient care (37)

Previous experience of a situation will influence whether or not I implement standard precautions even if required (38)

People interpret standard precaution guidelines differently (39)

It is my choice to not wear gloves when taking blood/cannulating as I am only putting myself at
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<td><strong>risk (40)</strong></td>
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<td>I expect more junior members of the staff to follow standard precautions thoroughly (41)</td>
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<td>I see some patient conditions very often and do not need to use standard precautions in those instances (42)</td>
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<td>I always wear goggles when required (43)</td>
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<td>I don’t need to use standard precautions if I am going to be using a non-touch technique (44)</td>
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<td>Doctors don’t use standard precautions as much as nurses (45)</td>
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<td>Nurses use standard precautions less consistently than doctors (46)</td>
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<td>My initial training was only the basics of standard precautions (47)</td>
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<td>University/initial training anchored my current behaviours regarding standard precautions (48)</td>
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<tr>
<td>I typically follow</td>
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standard precautions as taught during my training (49)
Younger professionals seem to follow standard precautions more (50)
Older professionals seem to follow standard precautions less (51)
I don’t wear goggles very often as it wasn't part of my initial training (52)
I believe standard precautions would be followed more if every assignment at university/during training encompassed them (53)
I am less likely to wear gloves as I was taught procedures without them (54)
When I witness others non-adherence with standard precautions, I use that as an education opportunity (55)
I use role-modelling to increase use of

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<td>standard precautions as taught during my training</td>
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<td>Younger professionals seem to follow standard precautions more</td>
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<td>When I witness others non-adherence with standard precautions, I use that as an education opportunity</td>
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<td>I use role-modelling to increase use of</td>
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<td>standard precautions</td>
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<td>I feel comfortable challenging nurses or doctors when I see them non adhering to standard precautions</td>
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<td>I am educated and able to weigh up risks/benefits of not using standard precautions when needed</td>
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<td>A lack of education can lead to an inappropriate use of personal protective equipment</td>
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<td>The way standard precautions are taught at university has a lot to do with practice</td>
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<td>The consequences of not adhering to standard precautions are not very clear</td>
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<td>Annual training and assessment of standard precautions knowledge and practice increase adherence</td>
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<td>Doctors should be trained in adherence to standard precautions</td>
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<td>Nurses training in standard precautions should be strictly evaluated (64)</td>
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<td>In some workplaces it is standard practice not to follow guidelines (65)</td>
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<td>If I know that my workplace has a culture of adhering to standard precautions, I am more likely to adhere too (66)</td>
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<td>The culture of my organisation allows for people to not follow standard precaution guidelines (67)</td>
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<tr>
<td>I think that when an organisation is about to undergo accreditation, there is a more pronounced emphasis on following standard precaution guidelines (68)</td>
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<tr>
<td>A potential exposure to contaminants will trigger my use of standard precautions (69)</td>
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<tr>
<td>I assess what is wrong with a patient before deciding whether or not to implement</td>
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<tr>
<td>Standard precautions (70)</td>
<td>I am more likely to wear gloves if I have to deal with urine rather than when taking blood (71)</td>
<td>I decide whether I need to use standard precaution based on the likelihood of becoming infected (72)</td>
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<td></td>
<td>The more experienced I become at my job, the more likely I am to be able to decide when I need to use standard precaution (73)</td>
<td>The fact that microorganisms are not visible has a lot to do with the way people fail to follow the guidelines (74)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>It is more difficult for junior members of the staff to encourage their peers to follow standard precautions when they witness non-adherence (75)</td>
<td>Senior staff members do not need to be reminded to use personal protective</td>
<td></td>
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</tbody>
</table>
equipment as they are able to make decisions themselves (76)

I have a responsibility to encourage people to protect themselves (77)

Audit which expose areas not adhering to standard precautions allow those areas to correct their shortfalls (78)

I feel concerned when I witness people not adhering to standard precautions (79)

I feel anxious when I witness people not adhering to standard precautions (80)

I feel the need to confront people I see not adhering to standard precautions (81)

Knowing the patient's serological status in regards to blood borne pathogens will affect the way I implement standard precautions (82)

I am able to tell if a patient has a blood borne pathogen by
<p>| | | | | |</p>
<table>
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<tbody>
<tr>
<td>looking at them</td>
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<tr>
<td>It is less risky not to use standard precautions when dealing with a paediatric</td>
<td></td>
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<tr>
<td>patient than when dealing with an adult patient (84)</td>
<td></td>
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<tr>
<td>Implementing standard precautions was easier when people were flagged as having</td>
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<tr>
<td>an infection (85)</td>
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<tr>
<td>I warn staff interacting with patients with an infection that they need to use</td>
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<tr>
<td>standard precautions (86)</td>
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<tr>
<td>I need to treat everybody as if they were infectious (87)</td>
<td></td>
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</tr>
<tr>
<td>I am more careful if I know that a patient has a blood borne pathogen (88)</td>
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<tr>
<td>If people see me practicing standard precautions, they will do the same (89)</td>
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<tr>
<td>I don’t need to wear gloves when taking blood/cannulating as I am skilled at what</td>
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<tr>
<td>I am more likely to follow</td>
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</tbody>
</table>
I am more likely to follow standard precautions if I am dealing with needles (92)

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<table>
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</table>
APPENDIX J

Email to participants from The Northern Territory department of Health
Principal Nurse Advisor and the Northern Territory Senior Medical Officer
Dear Colleagues,

Stephane Bouchoucha is a PhD candidate from Charles Darwin University. His research is looking at the factors affecting adherence to Standard Precautions Guidelines in nurses and medical practitioners. This research project is very relevant and has received ethical clearance from the NT government and Menzies school of health research HREC. The study is supported by the NT Department of Health.

Participation in the study is online, via an online survey. Completion of the survey should take no more than 20 minutes. The plain language statement is attached to this email. The link below enables direct access to the survey.

http://cduhes.asia.qualtrics.com/SE/?SID=SK_bwlC7JtvTcxRoU

Thank you very much for considering participating in the study.
APPENDIX K

Email to members of the Australian College of Critical Care Nurses

(ACCCN)
Dear ACCCN Member,

My name is Stephane Bouchoucha and I am a Critical Care Registered Nurse. After many years of working in ICU in different countries, I am now enrolled in a PhD at Charles Darwin University.

I invite you to participate in an online survey to explore the factors influencing adherence to Standard Precautions in healthcare workers.

If you are working a registered nurse, you are eligible to participate in this study and can take part.

The survey will take approximately 15-20 minutes to complete, no remuneration will be provided. A Participant Information sheet describing the nature of the study and your rights as a participant is attached to this email.

Please click on this link to start the survey:
http://cduhes.asia.qualtrics.com/SE/?SID=SV_bwlC7JtvTcxTRoU

Thank you for your cooperation,

Stephane Bouchoucha

Please contact the principal investigator Stephane Bouchoucha if you have any questions, at stephane.bouchoucha@cdu.edu.au or at 03 9496 4456.
APPENDIX I

Study Two Plain Language Statement
Plain language statement - Questionnaire survey

This is for you to keep

Research project
Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

Chief researcher
Stephane Bouchoucha – PhD candidate, Charles Darwin University

Supervisor
Professor Kate Moore – Psychology Theme Leader, School of Health, Charles Darwin University.

Purpose of the study
The purpose of this study is to understand the factors affecting compliance to standard precautions guidelines.

Benefits of the study
This study will help in informing agencies and healthcare workers of the factors affecting compliance to standard precautions guidelines. It will also assist in creating ways to support healthcare workers with developing strategies to adopt standard precaution guidelines.

What would be expected of you
If you decide to take part in this research, you would be asked to complete an online questionnaire, which will take about 20 to 25 minutes of your time. As well as providing information on your age, gender, current/recent work, and marital status, examples of other questions or statements to rate include:

Risks
There are no specific risks associated with this study.

Confidentiality
Complete confidentiality is assured as you are not requested to provide any identifying information at any stage. Only group data will be used in the analyses and in any publications.
Your participation
Participation is completely voluntary and you are free to decline to participate. Further, you may withdraw from the research at any time prior to submitting the online questionnaire by exiting the webpage. As we have no identifying information, it will not be possible to remove your data once submitted. **Completion and submission of the questionnaire will be deemed to be your informed consent to participate in this study.**

Results of the study
A copy of the final report will be available for you if you wish. There will also be a seminar on the results of the study held by the researcher at Charles Darwin University, for which you are welcome to attend. Dates and times of this seminar will be made available close to the end of the study. An article will also be submitted for publication to further disseminate the results.

Person to contact
If you would like to take part, or have any questions about the project, please contact the researcher, Stephane Bouchoucha on (08) 8946 7734 or email stephane.bouchoucha@cdu.edu.au

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, please contact Ethics Secretariat, phone 08 69227922 or email: ethics@menzies.edu.au.

If you decide to participate, please fill in the consent forms attached to this letter. You may still withdraw from the study at anytime, without penalty of any kind.

Whatever your decisions on this matter, thank you for devoting some time to reading this statement, and considering its contents.
APPENDIX M

Factor structure, factor loadings, reliability coefficients, inter-correlations, eigenvalues, per cent of the variance explained and descriptive statistics for each factor of the non-parsimonious scale for Study Two.
<table>
<thead>
<tr>
<th>Item</th>
<th>Leadership</th>
<th>Justification</th>
<th>Contextual Cues</th>
<th>Culture/Practice</th>
<th>Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I witness others non-adherence with standard precautions, I use that as an education opportunity</td>
<td>.87</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I feel the need to confront people I see not adhering to standard precautions</td>
<td>.81</td>
<td></td>
<td></td>
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<tr>
<td>I use role-modelling to increase use of standard precautions</td>
<td>.73</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I feel comfortable challenging nurses or doctors when I see them non adhering to standard precautions</td>
<td>.72</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I feel concerned when I witness people not adhering to standard precautions</td>
<td>.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have a responsibility to encourage people to protect themselves</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel anxious when I witness people not adhering to standard precautions</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses training in standard precautions should be strictly evaluated</td>
<td>.53</td>
<td></td>
<td></td>
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<tr>
<td>If people see me practicing standard precautions, they will do the same</td>
<td>.53</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I am familiar with the content of the standard precautions guidelines</td>
<td>.52</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Doctors should be trained in adherence to standard precautions</td>
<td>.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I always wash my hands after removing gloves</td>
<td>.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I always wash my hands before putting on gloves</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual training and assessment of standard precautions knowledge and practice increase adherence</td>
<td>.45</td>
<td></td>
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</tr>
<tr>
<td>I warn staff interacting with patients with an infection that they need to use standard precautions</td>
<td>.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I always wear goggles when required</td>
<td>.42</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I use standard precautions whenever there is a potential for me to be exposed to body fluids</td>
<td>.41</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Item</td>
<td>Leadership</td>
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<td>Culture/Practice</td>
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<tr>
<td>I don't wear gloves as I cannot feel veins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.75</td>
</tr>
<tr>
<td>I am clumsier when I wear gloves and risk having to repeat the procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.64</td>
</tr>
<tr>
<td>I am less likely to wear gloves as I was taught procedures without them</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.62</td>
</tr>
<tr>
<td>I don’t need to wear gloves when taking blood/cannulating as I am skilled at what I do</td>
<td></td>
<td></td>
<td></td>
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<td>.60</td>
</tr>
<tr>
<td>It is my choice to not wear gloves when taking blood/cannulating as I am only putting myself at risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.58</td>
</tr>
<tr>
<td>Wearing gloves makes it more difficult to palpate veins when practicing venepuncture or cannulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.57</td>
</tr>
<tr>
<td>Some procedures I learnt without personal protective equipment and I continue to perform these without personal protective equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.55</td>
</tr>
<tr>
<td>In an emergency situation, I only worry about infection afterwards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.55</td>
</tr>
<tr>
<td>If there is a clinical emergency, there is no time to worry about personal protective equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.50</td>
</tr>
<tr>
<td>If the correct size glove is not available I proceed without</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.49</td>
</tr>
<tr>
<td>I am more likely to wear gloves if I have to deal with urine rather than when taking blood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.49</td>
</tr>
<tr>
<td>When no correct Personal Protective Equipment are immediately available, I proceed without looking for them in another place</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.40</td>
</tr>
<tr>
<td>I am more likely to wear Personal Protective Equipment if I see my colleagues wearing them</td>
<td></td>
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<td>-.62</td>
</tr>
<tr>
<td>If I know that my workplace has a culture of adhering to standard precautions, I am more likely to adhere too</td>
<td></td>
<td></td>
<td></td>
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<td>-.61</td>
</tr>
<tr>
<td>I am more careful if I know that a patient has a blood borne pathogen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.61</td>
</tr>
<tr>
<td>Item</td>
<td>Leadership</td>
<td>Justification</td>
<td>Contextual Cues</td>
<td>Culture/Practice</td>
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<tr>
<td>I am more likely to wear personal protective equipment if they are located nearby patients</td>
<td>.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am more likely to follow standard precautions if I am dealing with needles</td>
<td>.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am more likely to follow standard precautions if I am dealing with sharp instruments</td>
<td>.51</td>
<td></td>
<td></td>
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<tr>
<td>Wearing gloves gives me a sense of safety when I practice clinical procedures</td>
<td>.50</td>
<td></td>
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<tr>
<td>A potential exposure to contaminants will trigger my use of standard precautions</td>
<td>.50</td>
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<tr>
<td>I wear gloves because I am worried I could catch an infection from a patient</td>
<td>.40</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>The culture of my organisation allows for people to not follow standard precaution guidelines R</td>
<td>.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In some workplaces it is standard practice not to follow guidelines R</td>
<td>.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most doctors typically adhere to standard precautions</td>
<td></td>
<td>.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People interpret standard precaution guidelines differently R</td>
<td></td>
<td>.52</td>
<td></td>
<td></td>
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<tr>
<td>Most nurses typically adhere to standard precautions</td>
<td></td>
<td>.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctors don’t use standard precautions as much as nurses R</td>
<td></td>
<td>.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am able to decide whether or not to use Personal Protective Equipment based on the clinical risks to me</td>
<td>.59</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I am educated and able to weigh up risks/benefits of not using standard precautions when needed</td>
<td>.59</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I assess what is wrong with a patient before deciding whether or not to implement standard precautions</td>
<td>.56</td>
<td></td>
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<tr>
<td>The more experienced I become at my job, the more likely I am to be</td>
<td>.54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Leadership</td>
<td>Justification</td>
<td>Contextual Cues</td>
<td>Culture/Practice</td>
<td>Judgement</td>
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<tr>
<td>able to decide when I need to use standard precaution</td>
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<td></td>
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<td>.53</td>
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<tr>
<td>My assessment of a patient's status will indicate if I need to follow</td>
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<tr>
<td>standard precautions guidelines</td>
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<tr>
<td>Eigenvalue</td>
<td>7.57</td>
<td>4.71</td>
<td>2.71</td>
<td>2.19</td>
<td>1.89</td>
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<td>%variance explained</td>
<td>15.45</td>
<td>9.61</td>
<td>5.52</td>
<td>4.47</td>
<td>3.86</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Justification</td>
<td>-.09</td>
<td>-.14</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contextual Cues</td>
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<td>-.17</td>
<td>.04</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Culture/Practice</td>
<td>.01</td>
<td>-.12</td>
<td>.11</td>
<td>.01</td>
<td>1</td>
</tr>
<tr>
<td>Judgement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>51.39</td>
<td>7.88</td>
<td>20.37</td>
<td>13.20</td>
<td>6.58</td>
</tr>
<tr>
<td>SD</td>
<td>10.69</td>
<td>7.09</td>
<td>7.56</td>
<td>3.82</td>
<td>4.61</td>
</tr>
<tr>
<td>Cronbach’s Alpha (α)</td>
<td>.88</td>
<td>.83</td>
<td>.73</td>
<td>.61</td>
<td>.67</td>
</tr>
</tbody>
</table>
APPENDIX N

Plain Language Statement Study Three
Plain language statement - Questionnaire survey
This is for you to keep

Research project
Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

Chief researcher
Stephane Bouchoucha – PhD candidate, Charles Darwin University

Supervisor
Professor Kate Moore – Psychology Theme Leader, School of Health, Charles Darwin University.

Purpose of the study
The purpose of this study is to understand the factors affecting compliance to standard precautions guidelines.

Benefits of the study
This study will help in informing agencies and healthcare workers of the factors affecting compliance to standard precautions guidelines. It will also assist in creating ways to support healthcare workers with developing strategies to adopt standard precaution guidelines.

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Risks
There are no specific risks associated with this study.

Confidentiality
Complete confidentiality is assured as you are not requested to provide any identifying information at any stage. Only group data will be used in the analyses and in any publications.
Your participation

Participation is completely voluntary and you are free to decline to participate. Further, you may withdraw from the research at any time prior to submitting the online questionnaire by exiting the webpage. As we have no identifying information, it will not be possible to remove your data once submitted. Completion and submission of the questionnaire will be deemed to be your informed consent to participate in this study.

Results of the study

A copy of the final report will be available for you if you wish. There will also be a seminar on the results of the study held by the researcher at Charles Darwin University, for which you are welcome to attend. Dates and times of this seminar will be made available close to the end of the study. An article will also be submitted for publication to further disseminate the results.

Person to contact

If you would like to take part, or have any questions about the project, please contact the researcher, Stephane Bouchoucha on (08) 8946 7734 or email stephane.bouchoucha@cdlu.edu.au

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, please contact Ethics Secretariat, phone 08 89227922 or email: ethics@menzies.edu.au.

If you decide to participate, please fill in the consent forms attached to this letter. You may still withdraw from the study at anytime, without penalty of any kind.

Whatever your decisions on this matter, thank you for devoting some time to reading this statement, and considering its contents.
APPENDIX O

Study Four Plain Language Statement
Plain language statement - Questionnaire survey
This is for you to keep

Research project
Assessing adherence to standard precautions and risk taking behaviours amongst healthcare professionals

Chief researcher
Stephane Bouchoucha – PhD candidate, Charles Darwin University

Supervisor
Professor Kate Moore – Psychology Theme Leader, School of Health, Charles Darwin University.

Purpose of the study
The purpose of this study is to understand the factors affecting compliance to standard precautions guidelines.

Benefits of the study
This study will help in informing agencies and healthcare workers of the factors affecting compliance to standard precautions guidelines. It will also assist in creating ways to support healthcare workers with developing strategies to adopt standard precaution guidelines.

What would be expected of you
If you decide to take part in this research, you would be asked to complete an online questionnaire, which will take about 20 to 25 minutes of your time. As well as providing information on your age, gender, current/recent work, and marital status, examples of other questions or statements to rate include:

Risks
There are no specific risks associated with this study.

Confidentiality
Complete confidentiality is assured as you are not requested to provide any identifying information at any stage. Only group data will be used in the analyses and in any publications.
Your participation
Participation is completely voluntary and you are free to decline to participate. Further, you may withdraw from the research at any time prior to submitting the online questionnaire by exiting the webpage. As we have no identifying information, it will not be possible to remove your data once submitted. Completion and submission of the questionnaire will be deemed to be your informed consent to participate in this study.

Results of the study
A copy of the final report will be available for you if you wish. There will also be a seminar on the results of the study held by the researcher at Charles Darwin University, for which you are welcome to attend. Dates and times of this seminar will be made available close to the end of the study. An article will also be submitted for publication to further disseminate the results.

Person to contact
If you would like to take part, or have any questions about the project, please contact the researcher, Stephane Bouchoucha on (08) 8946 7734 or email stephane.bouchoucha@cdlu.edu.au

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, please contact Ethics Secretariat, phone 08 69227922 or email: ethics@menzies.edu.au.

If you decide to participate, please fill in the consent forms attached to this letter. You may still withdraw from the study at anytime, without penalty of any kind.

Whatever your decisions on this matter, thank you for devoting some time to reading this statement, and considering its contents.
APPENDIX P

Scales administered in Study Four
Are you a nurse or a medical practitioner?
- Yes
- No

What is your gender?
- Male
- Female

What is your age (in years)?

What is your occupation?

How long have you been working in your profession since qualifying?

Please select whether you are:
- Full time
- Part time
- Casual
- Other ________________

Please select the type of area you predominantly work in:
- Intensive Care/CCU/HDU
- Emergency Department
- Medical care
- Surgical care
- Theatre/Operating room/Apnaesthesia
- Community
- Gerontology/Rehabilitation/Long Term Care
- Mental Health
- Admission Ward (medical or surgical)
- Other ________________

Have you ever experienced a needle-stick injury or exposure to patient’s body fluid in the course of your employment?
- Yes
- No

How many times have you suffered a needle-stick injury or body fluid exposure?

In what year did you experience this injury or exposure? (Specify the different years if you experienced more than one injury)
Did you report your injury or exposure?
- Yes
- No
Please select the answer that best describe you. Please answer all the questions

<table>
<thead>
<tr>
<th></th>
<th>Not at all like me (0)</th>
<th>A little bit like me(1)</th>
<th>Somewhat like me(2)</th>
<th>Quite a bit like me(3)</th>
<th>Very much like me(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to have new and exciting experiences and sensations even if they are a little frightening</td>
<td></td>
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<tr>
<td>I would like to take off on a trip with no pre planned or definite routes or timetables</td>
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<tr>
<td>I enjoy getting into new situations where you can't predict how things will turn out</td>
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<td>I like doing things just for the thrill of it</td>
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<tr>
<td>I tend to change interests frequently</td>
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<tr>
<td>I sometimes like to do things that are a little frightening</td>
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<tr>
<td>I'll try anything once</td>
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<tr>
<td>I would like the kind of life where one is on the move and traveling a lot, with lots of change and</td>
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</tr>
</tbody>
</table>
I sometimes do “crazy” things just for fun
I like to explore a strange city or section of town by myself, even if it means getting lost
I prefer friends who are excitingly unpredictable
I like “wild” uninhibited parties

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little</th>
<th>Somewhat</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am familiar with the content of the standard precautions guidelines</td>
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<tr>
<td>It is the norm in my hospital for staff to adhere to Standard Precautions</td>
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<tr>
<td>Seeing open wounds make me feel sick</td>
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<tr>
<td>Dealing with blood and other bodily fluids is revolting</td>
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<td>I am comfortable dealing with things other find disgusting.</td>
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<tr>
<td>Seeing disgusting thinks makes my stomach turn</td>
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<tr>
<td>I avoid dealing with disgusting things</td>
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<tr>
<td>I think disgusting items could cause me illness/infection</td>
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<tr>
<td>Most doctors typically adhere to standard precautions</td>
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<tr>
<td>Most nurses typically adhere to standard precautions</td>
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<tr>
<td>My assessment of a patient's status will indicate if I need to follow standard precautions guidelines</td>
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<tr>
<td>I am able to decide whether or not to use Personal Protective Equipment based on the clinical risks to me</td>
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<tr>
<td>I don't wear gloves as I cannot feel veins</td>
<td>Not at all like me</td>
<td>A little like me</td>
<td>Somewhat like me</td>
<td>Quite a bit like me</td>
<td>Very much like me</td>
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<tr>
<td>I am clumsier when I wear gloves and risk having to repeat the procedure</td>
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<tr>
<td>I am more likely to wear Personal Protective Equipment if I see my colleagues wearing them</td>
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<tr>
<td>I am more likely to wear personal protective equipment if they are located nearby patients</td>
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<tr>
<td>People interpret standard precaution guidelines differently</td>
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<tr>
<td>It is my choice to not wear gloves when taking blood/cannulating as I am only putting myself at risk</td>
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<tr>
<td>I am less likely to wear gloves as I was taught procedures without them</td>
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<tr>
<td>When I witness others non-adherence with standard precautions, I use that as an education opportunity</td>
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<tr>
<td>I use role-modelling to increase use of standard precautions</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
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<td>![ ]</td>
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<tr>
<td>I feel comfortable challenging nurses or doctors when I see them non adhering to standard precautions</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
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<tr>
<td>I am educated and able to weigh up risks/benefits of not using standard precautions when needed</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
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<td>![ ]</td>
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<tr>
<td>In some workplaces it is standard practice not to follow guidelines</td>
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<tr>
<td>If I know that my workplace has a culture of adhering to standard precautions, I am more likely to adhere too</td>
<td>![ ]</td>
<td>![ ]</td>
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<tr>
<td>The culture of my organisation allows for people to not follow standard precaution guidelines</td>
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<tr>
<td>I assess what is wrong with a patient before deciding whether or not to implement standard precautions</td>
<td>![ ]</td>
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<tr>
<td>The more experienced I become at my job, the more likely I am to be able to decide when I need to use standard precaution</td>
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<tr>
<td>I have a responsibility to encourage people to protect themselves</td>
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<tr>
<td>I feel the need to confront people I see not adhering to standard precautions</td>
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<tr>
<td>I am more careful if I know that a patient has a blood borne pathogen</td>
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<tr>
<td>I don’t need to wear gloves when taking blood/cannulating as I am skilled at what I do</td>
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<tr>
<td>I am more likely to follow standard precautions if I am dealing with needles</td>
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<tr>
<td>I always wear goggles when required</td>
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<tr>
<td>I use standard precautions whenever there is a potential for me to be exposed to body fluids</td>
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<tr>
<td>I always wash my hands before</td>
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<tr>
<td>Activity/knowledge</td>
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<td>putting on gloves</td>
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<td>I always wash my</td>
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<td>hands after</td>
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<td>removing gloves</td>
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<td>Sometimes I am</td>
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<td>too busy to worry</td>
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<td>about Personal</td>
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<td>Protective</td>
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<td>Equipment</td>
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<td>worry about</td>
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<td>protective</td>
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<td>equipment when</td>
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<td>delivering patient</td>
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<td>influence whether</td>
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<td>or not I implement</td>
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<td>standard</td>
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<td>if required</td>
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<td>I always use</td>
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<td>protection if I</td>
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<td>have to deal with</td>
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<tr>
<td>disgusting things</td>
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<td>I always start a</td>
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<td>task with a plan</td>
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<td>I make careful</td>
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<tr>
<td>of the task ahead</td>
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</tbody>
</table>
Please select how much each statement is like you

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not at all like me</th>
<th>Not much like me</th>
<th>Somewhat like me</th>
<th>Like me</th>
<th>Very much like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>I clean my office or home quite frequently</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I plan ahead and organise things, to avoid scrambling at the last minute.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>When working, I often set ambitious goals for myself</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>I often push myself very hard when trying to achieve a goal</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I often check my work over repeatedly to find any mistakes</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>When working on something, I don't pay much attention to small details</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>People often joke with me about the messiness of my room or desk</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
I make decisions based on the feeling of the moment rather than on careful thought. I make a lot of mistakes because I don't think before I act. Often when I set a goal, I end up quitting without having reached it.
APPENDIX Q

Path Analysis of the full hypothesised model for Study Four
Appendix P. Revised model of Adherence to Standard Precautions. Standardised predicted pathways (β) significant at $p < .05$ are shown with continuous arrows and non-significant pathways are shown with dotted arrows. Squared-multiple correlations are shown as a percentage on top right hand corner of the relevant variable.
APPENDIX R

Table of Standardised Total Effects for Full Hypothesised Model (Study Four)
### Appendix Q.

#### Standardised Total Effects ($\beta$) for the Full Model

<table>
<thead>
<tr>
<th></th>
<th>Conscientiousness</th>
<th>Knowledge</th>
<th>Sensation Seeking</th>
<th>Disgust</th>
<th>Negative Attitude</th>
<th>Subjective Norm</th>
<th>Leadership</th>
<th>Contextual Cues</th>
<th>Justification</th>
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<th>Perceived Control</th>
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PUBLICATIONS AND CONFERENCE PRESENTATIONS ARISING FROM THIS THESIS

PUBLICATIONS


CONFERENCE PRESENTATIONS

