Understanding the contribution of situation awareness to decision making by medical/surgical nurses for pressure injury prevention in nursing practice

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Abstract

Situation awareness (SA) has been developed in occupations other than nursing to improve decision making (DM) for optimal performance and outcomes. There are some studies exploring the use of situation awareness by nurses in simulated settings but few have examined SA in clinical practice. Because of this paucity of evidence nurses’ use of situation awareness in practice is not fully understood.

Studies examining decision making by nurses have indicated that clinical decisions arising from a lack of awareness of patient needs in busy, complex clinical environments can compromise care. In ward environments, compromised care often results in the omission of ‘basic’ nursing interventions which may include pressure injury prevention. This thesis explored the use of situation awareness by nurses in medical/surgical wards as the precursor to decision making and the influences on situation awareness whilst making pressure injury prevention decisions in practice.

To develop in-depth knowledge and understanding of the use of situation awareness in clinical nursing practice an exploratory, descriptive, two phase study was conducted. The setting was an outer metropolitan, general hospital in Queensland. The first phase explored the use of situation awareness for decision making by nurses in medical and surgical wards. Twenty-five registered nurses who cared for ward patients with pressure injury prevention needs were interviewed about their decision making practices and the resulting transcripts were thematically analysed. Three themes relating to participant experiences and perceptions of influences on decision making
emerged from the data. These themes were: (1) deciding priorities; (2) gaining new knowledge and skills; (3) becoming confident through decision making.

The second phase of the study explored how nurses used situation awareness whilst making pressure injury prevention decisions and examined the influences on the use of situation awareness for pressure injury prevention decision making in practice. Seven nurses were observed while ‘thinking aloud’ during a typical shift in their practice setting and the transcript content was deductively analysed using content analysis. A number of findings emerged. All nurses used perception, demonstrating Level 1 situation awareness, to gather data that was highly visual in nature to assess and prioritise patient needs. Comprehension, demonstrating Level 2 situation awareness, occurred when nurses analysed data cues and understood the significance of their findings related to pressure injury (PI) risk. Anticipatory decision making, that indicated level 3 situation awareness, was evident in some, but not all nurses. Nurses who used Level 3 situation awareness consistently anticipated what might happen in the future and determined what interventions were required for pressure injury prevention. Using Level 3 situation awareness they tailored holistic care to the patient, particularly in those with more complex pressure injury prevention needs.

The findings revealed that there were many influences in the ward environment that affected the development and use of situation awareness for pressure injury prevention decision making. These influences stemmed from interruptions, inadequate documentation, multilevel skill mix and delegation issues. In addition, individual characteristics, interpersonal aspects and communication appeared to have an impact on the ability of nurses to develop and use situation awareness.
Overall, the findings show that situation awareness development and use by nurses is not pervasive in clinical practice. This potentially exposes patients at risk of pressure injuries to suboptimal care arising from decision making that is not fully informed, consequently increasing the risk of pressure injuries as adverse events. The findings indicate the need for education related to situation awareness for decision making, support for nurses to develop situation awareness and for effective decision making in the clinical setting, and ongoing research of situation awareness in practice. Based on the study findings, a number of recommendations for how these deficits in situation awareness can be proactively addressed by researchers, educationalists and practitioners are presented in the thesis.
Statement of originality

This work has not previously been submitted for a degree or diploma in any university.

To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Elizabeth Stubbings
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# Abbreviations

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<th>Description</th>
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<tbody>
<tr>
<td>ACSQHC</td>
<td>Australian Commission on Safety and Quality in Health Care</td>
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<tr>
<td>AIN</td>
<td>Assistant in nursing</td>
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<tr>
<td>CC</td>
<td>Critical Care</td>
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<td>DM</td>
<td>Decision making</td>
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<td>ED</td>
<td>Emergency Department</td>
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<td>EN</td>
<td>Enrolled nurse</td>
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<td>HREC</td>
<td>Human Research Ethics Committee</td>
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<td>ICU</td>
<td>Intensive Care Unit</td>
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<td>MDT</td>
<td>Multidisciplinary team</td>
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<tr>
<td>NICE</td>
<td>National Institute for Clinical Effectiveness</td>
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<td>NTS</td>
<td>Non-Technical Skills</td>
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<td>NUM</td>
<td>Nurse Unit Manager</td>
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<td>RN</td>
<td>Registered nurse</td>
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<td>SA</td>
<td>Situation awareness</td>
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<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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Dissemination of study findings

Refereed publications


Conference presentations


Acknowledgements

The decision to embark on a PhD was not an easy one. With trepidation, and heels dragging, I eventually completed the enrolment process and was accepted as a doctoral scholar. From that moment on I have enjoyed every minute of the journey.

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To my husband, Trevor, and children, Tom and Harry – thank you. The last few years have been challenging enough without the added pressures arising from my studies. You have been a constant source of motivation, encouragement and support. Thanks also to my dear friend Dr Janet Scott, you may not realise it, but your motivation for me to succeed has kept me going.

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Chapter 1

Introduction

This study investigated medical/surgical nurses’ situation awareness (SA) as the precursor to decision making (DM) related to pressure injury prevention (PIP). Situation awareness informs decision making. It reflects an individual’s awareness of a situation in a complex environment and his/her dynamic insight into ‘what is going on’ (Salmon, Stanton, Walker, & Jenkins, 2009). Endsley (1995) conducted seminal work on situation awareness, culminating in the most widely cited, generic definition that situation awareness is “the perception of the elements in the environment in a volume of time and space, the comprehension of their meaning and the projection of their status in the near future” (Endsley 1995, p. 36).

However, this generic definition remained to be operationalised for individual occupational groups. Sitterding, Broome, Everett, and Ebright (2012) subsequently provided a working definition for nursing as follows:

“The nurse’s perception of relevant clinical cues related to the patient and his or her environment; the comprehension of the meaning and sense of salience about those cues; and the anticipated projection of required intervention based on those cues.” (Sitterding, et al., 2012, p. 83)

All individuals are predisposed to situation awareness, with some ability to understand their environment and sense danger, challenges or opportunities, while maintaining the capacity to conduct normal activities. However, situation awareness is variable, depending on an
individual’s level of attention and awareness to a given situation. Attentiveness can fluctuate considerably. People can make a deliberate choice to modify attention and awareness (Norman, Heywood, & Kentridge, 2013). When paying attention, the Reticular Activating System (RAS), the part of the brain that influences cognition and awareness, is enabled to filter and process external stimuli subconsciously and supply integrated responses (Lawrence, 2013). Heightened attention can process stimuli that otherwise would remain unseen, increasing situation awareness and its use as a precursor to decision making (Norman et al., 2013).

Situation awareness as the precursor to effective decision making has been most frequently studied in the aviation industry, where it was found that when based on incomplete situation awareness, pilots’ decisions were increasingly likely to cause adverse events (Singh, Petersen, & Thomas, 2006). As a strategy to improve decision making, and ultimately minimise adverse events, situation awareness development was incorporated into aircraft cockpit crews’ training to enhance attentiveness to stimuli and communication (Flin, Crichton, & O’Conner, 2008).

Situation awareness has subsequently been explored in healthcare, predominantly by surgeons and anaesthetists, with situation awareness development strategies used to improve clinicians’ decision making, performance and patient safety (Schulz, Endsley, Kochs, Gelb, & Wagner, 2013). Such strategies heighten attention with the aim of increasing situation awareness in increasingly complex, clinical environments. The expectation is that situation awareness will become a background activity over time, requiring little conscious thought. where this occurs, the outcome is perceived to be enhanced decision making efficacy for personnel in any complex occupational setting (Parasuraman, Sheridan, & Wickens, 2008).
In the workplace, the situation awareness required for effective decision making is becoming more challenging for personnel, given the reliance on technology, increasingly complex work environments and often a reduced number of skilled operators (Salmon et al., 2009). Individuals in busy, complex environments are exposed to many factors that can influence situation awareness and the skills required to make effective decisions. Situation awareness is considered a non-technical skill along with decision making, communication, teamwork, leadership, managing stress and coping with fatigue (Flin et al., 2008). Non-technical skills (NTS) are the cognitive, social and personal resources that complement technical skills and contribute to safe, efficient task performance (Yule et al., 2008). They can be influenced by environmental, organisational or individual characteristics, interpersonal behaviours, team dynamics and the personality, leadership or management styles of people in authority (Mitchell & Flin, 2008). Situation awareness may also be influenced by technical aspects, such as task expertise, system complexity, automated machinery and workload that can be compromised by distractions, demands on concentration, secondary tasks, time pressure and poor information quality (Gawron, 2008).

When technical and NTS are compromised, personnel often experience diminished alertness and impaired performance. As a result, situation awareness can be obscured as personnel forget, ignore checks and procedures, revert to habit and inaccurately recall operational events (Salmon et al., 2008). In healthcare settings, the effects of sub-optimal situation awareness affect decision making and subsequent actions as individuals become less vigilant, automated, overlook sequential tasks, focus on single or minor tasks and fail to anticipate events (Dekker, 2011).
The Study Context

Increasingly busy and complex clinical settings have resulted in work intensification for nurses, impacting on decision making as nurses are required to make more rapid and a greater number of difficult clinical decisions (Higgins, 2009). Work intensification for nurses has arisen because of a blurring of professional role boundaries, increasing scope of job tasks, dilution of nurse to patient ratios, reliance on technology and increased patient acuity (Milton-Wildey & O'Brien, 2010; Woodward, 2010). In stressful, complex clinical environments, compromised decision making frequently results in the omission of ‘basic’ patient care aspects such as feeding, toileting and pressure injury prevention (Milton-Wildey & O'Brien, 2010). Cumulatively, these changes occurring in the workplace challenge practitioner decision making and ultimately the quality of patient care and safety that can precipitate adverse events (Higgins, 2009; Woodward, 2010).

Inquiries into clinical adverse events involving nurses have highlighted poor practitioner awareness and inadequate decision making as the most common cause of clinical error or sub-optimal clinical performance (National Patient Safety Agency, 2007). As a result there is a growing global agenda to improve decision making, reduce sub-optimal care and adverse events for hospital patients (Thompson, Aitken, Doran, & Dowding, 2013). The causes of sub-optimal decision making are multifarious but include aspects such as fatigue, high workloads, inaccuracies in patient data and misunderstanding of the patient’s needs (Woodward, 2010). The accumulation of pertinent data to develop situation awareness to inform decision making was also found to be negated by a lack of practitioner anticipatory insight, unsupportive or overly assertive behaviour of people in authority and poor team dynamics (NHS Education for Scotland & University of Aberdeen, 2010).
The Problem

Despite a general consensus that pressure injuries (PIs) are preventable adverse events, they continue to remain a problem in clinical settings (Australian Wound Management Association, 2012). For patients, Pressure injuries interfere with functional recovery (Bales & Duvendack, 2011), and may be complicated by pain or infection (Sullivan & Schoelles, 2013), resulting in an increased hospital stay (Padula, Mishra, Makic, & Sullivan, 2011).

International statistics indicate a wide range in pressure injury prevalence and incidence rates. Although prevalence rates may be considered a more crude measure, they are more easily collated internationally and widely used for comparison (Lahmann, Kottner, Dassen, & Tannen, 2012). In 2006, international pressure injury prevalence rates in acute care ranged from 8.3 – 23% (average 18.1%) (Vanderwee, Clark, Dealey, Gunningberg, & Defloor, 2007). A more recent estimate of acute care Pressure injuries suggests that prevalence rates are between 10-20% internationally (Banks, Graves, Bauer, & Ash, 2013) and from 4.5% to 27% in Australia (Australian Wound Management Association, 2012). A review of statistics from the USA, found Pressure injuries escalating at an alarming rate in acute care facilities, with obese, diabetic and elderly patients experiencing an increased incidence of up to 80%, which was predicted to rise as these patient groups continue to expand (Sullivan & Schoelles, 2013).

Pressure injuries are a costly global issue for both patients and health care providers. In addition to the adverse health outcomes for patients, there is the substantial financial impact of treating Pressure injuries. In some European countries pressure injury associated spending was the third highest health expenditure after cancer and cardiovascular diseases (Reddy, Gill, & Rochon, 2006). The annual cost in 2012 of treating Pressure injuries in the United Kingdom was estimated as GB£3.1 billion, equivalent to approximately 4% of the total health budget, US$25
billion in the USA and US$1.6 billion in Australia (Graves & Zheng, 2014a). In Australia, public health researchers identified over 345,000 occurrences of patients being admitted with, or acquiring, pressure injuries in public and private hospital facilities in 2012, with 69,000 cases occurring in Queensland (Graves & Zheng, 2014b). The costs associated with the care of these patients was equivalent to US$3.5 million in Queensland and US$1.6 billion across Australia (Graves & Zheng, 2014a).

Pressure injury rates are now frequently used as a safety and quality performance indicator for healthcare facilities (Center for Medicare and Medicaid Services, 2007; Rich et al., 2011). In Australia, Pressure injuries have become a focus of national standards (Australian Commission on Safety and Quality in Health Care, 2010) and these have been integrated into pressure injury prevention guidelines in public hospitals across Queensland. The breadth and impact of the problem therefore created the impetus for the researcher to investigate Pressure injuries further, with a desire to advance knowledge for pressure injury prevention in practice and, ultimately, reduce patient suffering by improving the care provided to those at risk.

The introduction of performance indicators and national standards for pressure injury prevention has highlighted that pressure injuries are considered an important indicator of efficient nursing practice (Benbow & Bateman, 2012) as pressure injury prevention is defined as a nursing sensitive patient outcome (American Nurses Association, 2012). Nursing sensitive patient outcomes are used as indicators to reflect the structure, process and outcomes of nursing care. Patient outcomes that are identified as being nursing sensitive are those that improve if there is a greater quantity and/or quality of nursing care, for instance Pressure injuries and falls. Hence, pressure injury prevention is the unique domain of the nurse in terms of decision making and
subsequent patient care interventions by nurses are considered a fundamental, vital practice for pressure injury prevention (Defloor, De Bacquer, & Grypdonck, 2005; Lahmann et al., 2012). Although the impact on patient care from work intensification and staffing levels has been identified, there remains a consensus that pressure injury incidence is more significantly affected by other factors (Australian Wound Management Association, 2012). These include nurses providing non-evidence based, inappropriate or untimely care (Australian Wound Management Association, 2012), negative attitudes associated with pressure injury prevention (Beeckman, Defloor, Schoonhoven, & Vanderwee, 2011) and non-adherence to best practice guidelines (Vanderwee, Clark, et al., 2007). In an attempt to ensure that pressure injury prevention care follows appropriate guidelines, international projects have created or updated clinical practice recommendations to promote preventative action and optimise the care of patients at risk of, or with, Pressure injuries (Australian Wound Management Association, 2012).

Pressure injury prevention practice recommendations now include: risk assessment; preventative actions such as repositioning, skin protection, good nutrition and appropriate pressure redistribution surfaces; assessment and monitoring; and appropriate treatment of pressure injury wounds (Australian Wound Management Association, 2012). These practices are consistently recommended globally and form a major part of the guidelines shared by European countries and the USA (European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009) and in the Pacific Rim countries, including Australia, the Pan Pacific region guidelines (Australian Wound Management Association, 2012). In Queensland, these are now incorporated into local guidelines, skin integrity assessment tools, patient safety frameworks and decision making algorithms (Queensland Health Patient Safety Unit, 2012a). These pressure injury prevention strategies are an attempt to overcome pressure injury causal factors and improve
patient care outcomes by requiring nurses to first assess and then make a decision regarding what interventions should be used for which patients and when.

Although adherence to guidelines may progress some technical aspects of care, decision making may still be affected by situation awareness (Mitchell, 2008; NHS Education for Scotland & University of Aberdeen, 2010). Despite increasing policy awareness for patient safety, it has been reported that 80% of clinical errors made by nurses can be attributed to compromised situation awareness, arising from inattention, technical aspects and NTS factors in the practice setting (Sitterding et al., 2012). The same study indicated that compromised situation awareness resulted in sub-optimal decision making and practice, yet situation awareness was the least explored aspect in adverse patient events (Sitterding et al., 2012). The importance of situation awareness in pressure injury prevention led the researcher to investigate what influenced situation awareness for pressure injury prevention decision making in practice in Queensland.

**Purpose Statement**

The purpose of this study was to assess the use of situation awareness and explore the situational influences when nurses make decisions related to pressure injury prevention for medical/surgical patients.

The research aims were to:

1. Investigate the use of situation awareness by nurses in medical and surgical wards;
2. Describe nurses’ level of situation awareness whilst making pressure injury prevention decisions for medical/surgical patients; and
3. Explore the influences on medical/surgical nurses’ use of situation awareness whilst making pressure injury prevention decisions.

**Significance of the Study**

This interpretive study elicited perspectives, behaviours, beliefs and values to produce an understanding of nurses’ experiences and their subsequent actions related to the use of situation awareness for pressure injury prevention decision making in practice. Evidence from the study can be used to advance knowledge and practice. This research study is significant for three reasons.

First, this study produced an account of nurses’ use of situation awareness and established the extent to which levels of situation awareness are applied by a group of nurses in the clinical setting. Ultimately, this understanding can provide the foundation for quality improvement activities, education and further research. For example, this study provides a focus for targeting future initiatives to improve nurses’ situation awareness for enhanced pressure injury prevention decision making and care actions.

Second, the study provided unprecedented insight into situation awareness which is beneficial to individual practitioners and those who manage nurses in clinical settings to reduce the incidence of Pressure injuries. The study explored the situation awareness factors influencing pressure injury prevention decision making and the subsequent intervention actions of nurses. Previously, this has been an unexplored area of clinical practice and, to date, there is no published evidence investigating situation awareness in the context of pressure injury prevention decision making. The contribution of this body of knowledge can potentially improve nurses’ use of situation awareness. Presenting clinical practitioners with this information can provide an opportunity to
reflect on current decision making practices. This information can inform those that lead nurses to develop management strategies to facilitate the cue gathering, interpretation and actioning of decisions made by nurses in practice. The study also offered insights into the environmental and organisational aspects of practice that, if addressed, could result in increased situation awareness use by nurses.

Third, this study provided evidence that can inform practice changes focused on preventative care, which mitigates Pressure injuries. Potentially, this preventative focus could lessen pressure injury occurrence or prevent deterioration in patients admitted with Pressure injuries and ultimately improve outcomes for patients by alleviating suffering, improving quality of life and reducing recovery time. A more preventative focus could lead to cost savings for healthcare providers. It has been suggested that spending on Pressure injuries could decline by 95% if Pressure injuries were avoided with appropriate preventative care and if existing Pressure injuries were treated more effectively to prevent further deterioration (Banks et al., 2013).
**Key Terms and Definitions**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Decision making (DM)</td>
<td>‘The cognitive processes resulting in the selection of a course of action among several alternative scenarios’ (Fonteyn &amp; Ritter, 2008).</td>
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<tr>
<td>Medical/surgical patients</td>
<td>‘Hospital in-patients receiving acute care treatment on medical and surgical wards.’</td>
</tr>
<tr>
<td>Non-technical skills (NTS)</td>
<td>‘Social and personal resource skills that complement technical skills and contribute to safe and efficient task performance’ (NHS Education for Scotland &amp; University of Aberdeen, 2010).</td>
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<tr>
<td>Pressure Injury (PI)</td>
<td>‘A localised injury to the skin and/or underlying tissue usually over a bony prominence. Also known as a pressure or decubitus ulcer or bed sore’ (Australian Wound Management Association, 2012).</td>
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<tr>
<td>Situation Awareness (SA)</td>
<td>‘The nurse’s perception of relevant clinical cues related to the patient and his or her environment; the comprehension of the meaning and sense of salience about those cues; and the anticipated projection of required intervention based on those cues’ (Sitterding et al., 2012).</td>
</tr>
<tr>
<td>Situational Awareness (SA)</td>
<td>‘Term used interchangeably for situation awareness by some authors. Definition is the same as that for situation awareness.’</td>
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Thesis Structure

This chapter has introduced the study and provided an overview of the research. It presents the significance of the study and describes its purpose. The terms used in the thesis are also clarified.

Chapter 2 critically reviews the literature relating to situation awareness and pressure injury prevention. Chapter 3 focusses on the methodology used for this qualitative research. The methods used to design and guide this study are explained. Chapter 4 reveals the findings from the study. Chapter 5 provides a discussion of the findings from both phases of the study. Comparison and significance are made in light of previous research findings and the implications for nursing arising from this study are revealed. Limitations of the study and recommendations for future research and practice are also identified in the chapter. Finally, conclusions are made as to how and why the use of situation awareness is critical to decision making by nurses for pressure injury prevention.
Chapter 2

Literature Review

Introduction

This chapter describes situation awareness, its significance and relevance to clinical decisions made by nurses for pressure injury prevention. To achieve this, the chapter presents a critical appraisal of the literature identifying situation awareness from a theoretical perspective. Subsequently, a critique of situation awareness studies related to contemporary nursing practice is presented. This is followed by a critical appraisal of the literature related to the role of nurses in the provision of pressure injury prevention.

Search Strategy

The origin of situation awareness as a concept arises from the military and can be traced back to tactical decision making from World War I (Carol, 1992). However, the term ‘Situation Awareness’ and the theoretical literature emerged during the late 1980’s as a result of aviation and human factors (psychology and ergonomic) research (Flin et al., 2008). situation awareness has been incorporated into healthcare research, mainly by surgeons and anaesthetists, from the 1990’s onwards (Singh et al., 2006). Consequently, psychology and healthcare related databases i.e. PROQUEST (Health including psychology), CINAHL, PUBMED and other internet search engines were accessed for this literature review using the dates 1985 to March 2014 as parameters. The Griffith University book catalogue was also searched and interfaced with catalogues externally using the same date range.
To source literature relating to situation awareness, search terms included situation awareness; cognitive awareness; cognitive task analysis. The literature retrieved predominantly related to the theoretical perspectives of situation awareness and was most often applied to aviation and military occupational settings. An advanced search incorporating clinical terminology elicited a limited number of healthcare related sources. The literature relating to pressure injury prevention was sourced using search terms including pressure injury prevention; pressure ulcer; pressure sore; and additional combinations of terminology related to prevention.

The selection of publications for review was refined by reviewing article abstracts or summaries of text books, elimination of duplicates and the application of the exclusion criteria. The exclusion criteria for the literature review, by subject, were:

General

- Non-English language publications.
- Papers without an abstract or presenting an opinion too far removed from occupational practice (e.g. personal commentary).
- Literature discussing commercial aspects (e.g. healthcare or education initiatives from private providers, specific wound care products or equipment).

SITUATION AWARENESS

- Literature associated with ergonomics related to equipment or automated machinery (e.g. technical operation).
- Papers discussing personal security or non-professional associations (e.g. self-defence organisations).
• Literature with a technical informatics focus (e.g. computer assisted DECISION MAKING program design).

PRESSURE INJURY PREVENTION

• Papers outlining the use of obsolete, prohibited or restricted pressure relieving equipment.
• Citations discussing patient self-management of PRESSURE INJURY PREVENTION (e.g. patient participation or experiences).
• Literature discussing non-clinical care related to PRESSURE INJURY PREVENTION (e.g. physiology of wound healing).
• Papers with a focus on risk assessment scales (e.g. Waterlow Scale evaluations).
• Studies of local PRESSURE INJURY PREVENTION initiatives where reports were anecdotal and not supported by research evidence.

The final selection was comprised of:

SITUATION AWARENESS

• 7 books
• 30 theoretical publications (2 nursing)
• 9 clinical studies related to other healthcare professionals
• 5 empirical nursing clinical studies
PRESSURE INJURY PREVENTION

- 2 nursing books
- 30 theoretical publications
- 3 systematic reviews
- 2 international guidelines
- 14 empirical clinical nursing studies

The scope of the search revealed many sources of theoretical literature that did not arise from empirical, clinical studies but was related to situation awareness and pressure injury prevention. These were used to build a theoretical foundation to inform the research and establish the relevance of the clinical studies retrieved. The empirical clinical studies provided the researcher with insight into the clinical application of situation awareness for pressure injury prevention decision making in contemporary nursing. The review of the literature provided clinical relevance to the study and identified gaps in knowledge related to situation awareness for pressure injury prevention decision making.

Theoretical Perspectives of Situation Awareness

A number of scholars have defined situation awareness and developed conceptual models and measurement strategies. Disparate definitions of situation awareness have presented challenges to researchers in terms of identifying situation awareness and how it is used by individuals for decision making. Situation awareness has been identified as: knowledge from working memory (Bell & Lyon, 2000); a cognitive product of information processing (Endsley, 1995); or externally driven consciousness (Smith & Hancock, 1995).
The definitional ambiguities are further complicated by the different discipline bases from which situation awareness has been theorised. Endsley (1995) considered situation awareness a product of awareness and applied an information processing approached derived from cognitive theory. Smith and Hancock (1995) adopted an ecological approach, modelled on a perpetual cycle, and identified situation awareness as both a process and product of awareness. However, it is the work by Dr Mica Endsley that is considered seminal (Salmon et al., 2009). The theory and model of situation awareness purported by Endsley (1995) has been criticised for being generalised and not specifying the exact cognitive processes involved or to what extent these are involved in applying the concept of situation awareness (Banbury & Tremblay, 2004). However, despite these criticisms, the Endsley model is accepted globally as the ‘industry gold standard’ (Wickens, 2008).

Endsley (1995) identified that prior to decision making individuals have to be cognisant of pertinent environmental data. Individuals in the work setting continuously extract environmental information to make sense of their situation – this is known as situation awareness. Situation awareness may be integrated with previous knowledge to form a coherent mental picture, which is then used to direct future perception of environmental cues, understanding and anticipation of events as a precursor to decision making. Thus, situation awareness was identified as having distinct, incremental levels: Level 1 – perception of current situation (gathering data); Level 2 – comprehension of current situation (interpretation of data); Level 3 – ability to project what can happen in the future (anticipation of future states) (Endsley, 1995). In addition to perceiving, interpreting and anticipating a situation, it is widely recognised that individuals in occupational settings require sufficient knowledge and technical ability to undertake work tasks.
The situation awareness levels and their application by Endsley (1995) originally related to occupations in the aviation industry, but the theoretical perspectives have been applied to other work settings. The ability of individuals to perform at all levels of situation awareness has been identified as a necessary part of safe operating and a method of avoiding critical situations in many complex occupational settings, including healthcare (Salmon et al., 2009). Across all settings, it is considered vital for individuals to be aware of what information is relevant, how actions of self or others will impact upon current or future events and anticipate what data are needed to inform decision making and avert error (Salmon et al., 2009).

Situation awareness can be influenced by many individual or cognitive factors that affect attention or awareness, and system factors arising from high workloads or task complexity (M. C. Wright, Taekman, & Endsley, 2004). Situation awareness is also known to be obscured by distractions to mental processing in stressful and complex environments by noise, demands on concentration or secondary tasks, quality of information, physical factors affecting attention e.g. tiredness (Gawron, 2008). In addition, time pressure is highly significant. Increased time enables processing for situation awareness. However, time constraints can lead to omission of vital situation awareness components as individuals become ‘cognitive misers’ by taking mental short cuts and making assumptions about environmental data (Singh et al., 2012; S. Taylor & Fiske, 1978) or resort to panic (reactive) inclusion of environmental data (Gawron, 2008). The interpersonal, team and interprofessional dynamics in the work environment can also influence situation awareness. Settings with overly assertive people in authority or environments with interpersonal tensions can obscure situation awareness when individuals become fearful of the reaction of colleagues (Salmon et al., 2009).
Measuring Situation Awareness

Within much of the theoretical literature the focus is on the many methods used for situation awareness measurement. Freeze probe techniques can be used with on-line or scenario associated exercises in simulated settings. The exercise can be ‘frozen’ to question participants and elicit their level of situation awareness. An example is the Situation Awareness Global Assessment Technique (SAGAT) by Endsley (1995) designed to measure situation awareness by pilots using flight simulation systems. The technique is viewed as intrusive and does not capture real world activities or influencing factors (Salmon et al., 2008). However, it has been used in studies with anaesthetists (M. C. Wright et al., 2004).

Real time probes can be used to reduce intrusion and capture situation awareness as it occurs in both simulated and naturalistic settings. The situation present assessment method (SPAM) is a real time probe technique designed originally for aviation studies where participants are questioned by the researcher during activities (Durso, Hackworth, Truitt, Crutchfield, & Manning, 1998). The technique is less intrusive in simulated studies but in naturalistic settings it is still disruptive and responses are delayed when participants are experiencing high work volumes.

Self-rating techniques can be used by participants to self-report situation awareness and they are easy and cost effective to administer. The Situation Awareness Rating Technique (SART) (R. Taylor, 1990) was designed for aviation settings but has been used to measure situation awareness by anaesthetists (Schulz et al., 2013). Typically self-rating techniques are used post-intervention to establish changes in situation awareness but measures are subjective, rating questions can lack sensitivity and participant recall is reported as problematic (Schulz et al., 2013).
Performance measures have been used to quantify situation awareness. The use of measurement instruments in practice settings or automated computer scoring in simulated scenarios can measure situation awareness and the degree to which tasks are accomplished. Non-technical skills studies with anaesthetists (Fletcher et al., 2003), surgeons (Yule et al., 2008) and theatre scrub nurses (NHS Education for Scotland & University of Aberdeen, 2010) have used performance measures. In these studies, quantifiable elements of behaviours associated with desirable NTS were used to measure situation awareness in practice.

Situation awareness performance may also be quantified with process indices that measure the processes involved with situation awareness during tasks (Salmon et al., 2008). The indices can take the form of tracking, such as measuring eye movement, in computer generated exercises, or focus on exhibited behaviours in simulated or naturalistic settings. As with all performance measures, process indices can lack sensitivity, particularly when scoring situation awareness during complex tasks. However, sometimes these methods are used in tandem with concurrent ‘think aloud’ dialogue that can be transcribed to form verbal protocols as a means of gaining additional insight into the cognitive aspects of complex behaviours. Salmon et al. (2008) identified observer rating as the most effective and frequently used technique for situation awareness measurement in naturalistic, occupational settings. However, observer rating is most effective when complemented with other data collection methods such as participant interviews, ‘think aloud’, measurement instruments or field notation systems (Patrick & Morgan, 2010). The success of observer rating is dependent upon the expertise of the researcher in the occupational domain, interpretation of the levels of situation awareness related to occupational tasks and understanding of contextual factors related to situation awareness (Patrick & Morgan, 2010).
Situation Awareness in Healthcare Environments

Situation awareness is increasingly recognised an essential skill for clinical health professionals, including nurses, in effectively managing decision making in complex and challenging situations (Brady et al., 2013; Cooper et al., 2010). Dekker (2011) identified that healthcare practitioners, including nurses, experience significant cognitive and system challenges causing fluctuations in situation awareness levels that impact on decision making. The specific challenges in clinical settings included: escalating problems, where the tempo, criticality, volume and coordinative demands of tasks increase; multitasking, where practitioners defer tasks until others are completed; reliance on prospective memory as practitioners have to remember to complete unfinished tasks; possession, organisation and application of complex knowledge; managing risk and contradictory goals arising from organisational or professional incompatibilities (Dekker, 2011).

A study undertaken in the USA investigated diagnostic decision making error by doctors arising from compromised situation awareness (Singh et al., 2006). The analysis of sub-optimal decisions by doctors revealed that situation awareness was obscured by system and cognitive factors including a lack of time, excessive workload, interruption, poor communication and information overload. This was further compounded by ‘framing’ of information by consultants, leading doctors to comprehend and project information as it was presented and from a single focus rather than using situation awareness to consider other forms of data (Singh et al., 2006). Consequently, sub-optimal decision making resulted, with situation awareness continuing to be obscured until another team member, who could be a nurse, independently evaluated environmental data and perceived the situation differently.
The findings by Singh et al. (2006) related specifically to doctors. However, another study identified both similar and additional aspects impacting on the situation awareness of doctors and nurses in critical care (CC) environments (Miller & Sanderson, 2005). Miller and Sanderson (2005) video recorded 27 nurses and 30 doctors in the CC unit of an Australian, metropolitan hospital to identify commonalities in situation awareness. The data were statistically analysed and revealed that nurses had to sense cues for situation awareness in a tactical manner as information was not always communicated, whereas doctors, in possession of the data, were more strategically orientated. Nurses used situation awareness for decision making related to patient care over the course of their shift but doctors sought situation awareness to predict future goals for patient care. This difference may be due in part to the work roles of these professional groups, but additionally, behavioural, communication, coordination and cultural factors were barriers to nurses accessing information to develop situation awareness. Professional tensions were reported on the basis that medical goals were not shared with nurses.

There were also differences in professional thinking between disciplines arising from the use of different models of health. Professional difficulties resulted in misalignment of situation awareness as professional groups perceived assessment cues differently and as tensions escalated nurses ‘tunneled’ their thinking (Miller & Sanderson, 2005). Tunneled thinking results in attention deficits, reduced levels of assertion, discontinuity of situation awareness processing, reduced awareness of poor situation awareness in colleagues and decision making error (Endsley, Bolte, & Jones, 2003). The finding by Miller and Sanderson (2005) is an important consideration for nurses as tunneled thinking could obscure situation awareness by nurses and result in less effective monitoring or reporting of discontinuities or discrepancies in patient care.
Several studies have investigated or evaluated the introduction of NTS systems for clinical teams in operating theatres (Fletcher et al., 2003; Flin et al., 2007; Mitchell et al., 2013; Yule et al., 2008) or pan-hospital settings (Guimond, Sole, & Salas, 2009) in an attempt to heighten situation awareness through improved communication and teamwork. Situation awareness by doctors was compromised by the negative behaviours of dominant, senior medical staff or doctor-doctor communication issues and behaviour modification systems were introduced to improve these aspects (Fletcher et al., 2003; Flin et al., 2007; Yule et al., 2008).

Other studies include nurses (Guimond et al., 2009; Mitchell et al., 2013; Stead et al., 2009). Guimond et al. (2009) reported on the development of the TeamSTEPPS program by the Department of Defense for heightened situation awareness in the aviation sector and implemented by the Agency for Healthcare Research and Quality in the USA. The program was subsequently introduced across hospital sites in South Australia (Stead et al., 2009). The aim of TeamSTEPPS was to create a ‘just’ culture as it was recognised that healthcare environments had hierarchical barriers impeding safe decision making. These barriers in practice prevented essential information flow, impeded communication, and restricted the ability of nurses to monitor or raise concerns relating to the decision making of colleagues. Although the publications do not specify participant numbers in each country, the authors state that the multidisciplinary program was evaluated as successful in improving decision making and patient safety (Guimond et al., 2009; Stead et al., 2009).

The program terminology referred to awareness for decision making rather than the term situation awareness(Guimond et al., 2009; Stead et al., 2009). However, as the origins of the program are from aviation and include the work of Endsley (1995), it is fair to assume that they are reflecting the same concept. The precise methods of evaluation are not specified in the
publications but four aspects were indicated as essential for practitioner awareness: Team leadership, that focused and fostered a positive environment; Situation monitoring, for environmental awareness where interventions were promoted to avoid sub-optimal decision making; Mutual support, where nurses in particular should not have to request support or it be assumed; Communication, focused on concise information exchange (Guimond et al., 2009; Stead et al., 2009).

A study by Mitchell et al. (2013), conducted in Scotland, identified hierarchical barriers and poor communication as impeding situation awareness. Analysis of data from focus groups with 16 experienced scrub nurses elicited factors that compromised performance, including situation awareness, in operating theatres (Mitchell et al., 2013). The findings complemented those from a previous interview study by the same research team where qualitative interview data with 25 scrub nurses and 9 surgeons were analysed (Mitchell et al., 2011). Situation awareness was most often compromised by dysfunctional interpersonal and interprofessional dynamics within the team (Mitchell et al., 2013). As a result, a behavioural marker system (SPLINTS) was introduced to provide a framework for team performance improvement by achieving optimal situation awareness, communication, teamwork, leadership and decision making. Although these investigations focused on operating departments, the findings resonate with those from studies undertaken with healthcare professionals, including nurses, in other settings.

An intervention study observed patient ward round reviews to investigate interdisciplinary situation awareness in acute ward settings of one hospital in the USA (Cornell, Townsend-Gervis, Vardaman, & Yates, 2014). The interventions introduced were structured ward rounds and communication protocols. Participant numbers are not stated, and it is unclear if doctors were directly included, but the sample was identified as nurses, dieticians, pharmacists and case
managers. The findings indicated a statistically significant relationship between reduced situation awareness and ‘miscues’ by nurses (Cornell et al., 2014). The study does not provide qualitative explanations for the precise reasons why nurses’ perception of environmental data was compromised or how they missed vital cues for situation awareness and decision making. However, data derived from field notes indicated that communication breakdowns, particularly between nurses and doctors during urgent and time-critical situations, organisational hierarchy, power, training and status were contributory factors.

Cornell et al. (2014) indicated that the qualitative analysis of field notes provided some information that interdisciplinary situation awareness and ‘miscues’ in hospital settings were highly contextual. They indicated that communication for situation awareness was complicated by the work setting; patient status changed quickly; staff were dispersed; not all staff saw ‘the whole’ despite accessing information as understanding was restricted by time and concentration; and nursing work was dynamic, and highly interrupted, with considerable task switching and multitasking. The discussion highlighted that combinations of these factors have been cited in other publications (Cornell, Riordan, Townsend-Gervis, & Mobley, 2011; Leonard, Graham, & Bonacum, 2004) as significant in 65% of adverse events involving healthcare staff.

Cornell et al. (2014) did not further investigate the implications for nurses’ situation awareness from the contextual factors and ‘miscues’ but it could be assumed that they pose an equally significant risk to effective decision making by nurses and patient safety. However, they underline the fact that the introduction of the interventions were statistically significant in improving situation awareness overall and in mitigating some contextual factors affecting situation awareness. Changes to situation awareness exhibited by practitioners appeared to have
occurred as structured rounds promoted greater awareness of technical requirements but importantly ‘intuitive’ perceptions by nurses declined or went unreported (Cornell et al., 2014).

The technical ability and knowledge components identified by Endsley (1995) as essential skill factors for situation awareness and decision making performance are less obviously investigated in healthcare situation awareness studies. However, the intervention study undertaken in a USA paediatric hospital by Brady et al. (2013) does identify the importance of clinical knowledge. The study involved nurses, doctors, therapists, managers and safety officers but precise numbers were not specified. The introduction of an interdisciplinary planning tool to mitigate undetected patient deterioration and critical incidents during patient transfer assisted new learning and provided a process to improve situation awareness. The shared tool recorded risk factor scoring, interprofessional communication concerns and difficult to articulate ‘gut feelings’ about patient status. The learning took the form of weekly case reviews, with all professional groups identifying how situation awareness aspects could be improved. Patient transfers were tracked and charts were audited for statistical analysis. Interestingly, learning about situation awareness was reported to increase situation awareness in practice but how this was measured in this quantitative study was not indicated. The study by Brady et al. (2013) is from the medical domain, with the identified multidisciplinary learning needs reflecting medicalised knowledge aspects related to physical assessment abilities, treatment and interventions. However, it is important to note that the post-intervention findings indicated a 50% reduction in serious safety incidents, leading the researchers to conclude that situation awareness was the most transformative concept for healthcare systems.

In summary, the healthcare related literature related to group situation awareness rather than that of individuals and the majority of studies used quantitative research methods. Situation
awareness was most often investigated from the perspectives of patient safety and non-technical skills. Common non-technical skills factors were identified as significant to the use and level of situation awareness used by healthcare practitioners and these aspects were contextualised to the work setting. However, the studies reviewed indicated that situation awareness could be improved with the introduction of staff behaviour modification systems or learning. The situation awareness literature provides insights into the context of situation awareness in clinical settings.

Clinical Studies of Situation Awareness in Nursing Practice

Five empirical, clinical studies of situation awareness in nursing practice were retrieved. These are reviewed in the section to follow, and summarised in Table 1 (Cooper et al., 2010; McKenna et al., 2014; Sitterding et al., 2012; Tower & Chaboyer, 2013; S. Wright & Fallacaro, 2011). Three studies were Australian (Cooper et al., 2010; McKenna et al., 2014; Tower & Chaboyer, 2013) and two were conducted in the USA (Sitterding et al., 2012; S. Wright & Fallacaro, 2011). The sample sizes range from 7 – 97. Two studies were undertaken in the naturalistic setting (Sitterding et al., 2012; Tower & Chaboyer, 2013). Three were simulation studies (Cooper et al., 2010; McKenna et al., 2014; S. Wright & Fallacaro, 2011).

The study by Cooper et al. (2010) used mixed methods to elicit the levels of situation awareness used by final year nursing students during deteriorating patient scenarios. The analysis indicated that situation awareness demonstrated by students was generally low. Participants focused on a limited number of data cues associated with the patients’ physiological status and had less awareness of other environmental data. It can be concluded that this limited view impeded development of situation awareness for decision making. Although knowledge levels were good, students were unable to apply it to appropriate care actions and poor situational comprehension
hampered their ability to integrate important environmental information. These results relate to final year students in a simulated setting rather than RNs in practice, but it is concerning that situation awareness for safe and effective decision making was not sufficiently developed at a point close to graduation. It is equally concerning that students did not use situation awareness to action the decision to seek assistance despite recognising physiological cues identifying patient deterioration.

Cooper et al. (2010) identified that participants’ scores identified that those who were primary cue focused developed less situation awareness which resulted in incorrect decision making. This narrow focus demonstrates how concentration on a single cue can obscure other data for situation awareness and safe decision making. It is also important to note that positive correlations between situation awareness scores and individual participants identified that some students exhibited higher levels of situation awareness that others. Cooper et al. (2010) acknowledged many study limitations including the fact that it was conducted in a simulated setting; students exhibited video recording anxiety; experience related to students not RNs; and there was a limited sample size for statistical inference. The participants were from one Australian university and the results may not be transferable to other undergraduates due to curriculum differences. However, the results were clearly presented, were consistent across the data collection methods used, with no statistical differences found in situation awareness levels between observers or scenario topics.

The study by McKenna et al. (2014) was also a simulation that investigated students focusing on the deteriorating patient. The publication specifically focused on situation awareness arising from the results of a larger study (Cooper et al., 2012) investigating multiple factors related to students and deteriorating patients. McKenna et al. (2014) used the Situation Awareness Global
Assessment Tool (SAGAT) (Endsley, 1995) with the key indicators for behaviour ratings associated with situation awareness adapted for nursing. The findings revealed large individual variations in the levels of situation awareness recorded (McKenna et al., 2014). The highest situation awareness scores were associated with physiological parameters and the lowest scores were associated with environmental, global situation awareness. There was a positive correlation between situation awareness level and clinical performance, thus, those students with higher level situation awareness had higher rated clinical performance.

McKenna et al. (2014) concluded that final year student levels of situation awareness are not well developed in the majority of individuals. As situation awareness was identified as an attribute associated with improved clinical performance, the findings suggest that undergraduate curriculum developers should consider methods to improve learning opportunities for situation awareness. The study limitations included the use of simulated scenarios, which may not replicate practice in the naturalistic clinical setting; the universities were located in two Australian states, which may differ from curricula elsewhere. The research also used a volunteer sample that may have included students who were more motivated or more able. However, similar to the study by Cooper et al. (2010), the results were consistent between scenarios and across the range of data collection methods used. Both Cooper et al. (2010) and McKenna et al. (2014) emphasised the need for researchers to conduct naturalistic enquiry as it would be presumptuous to assume that student situation awareness is similar to that of RNs practising in the naturalistic setting. Further research in the naturalistic setting could add greater depth of understanding of situation awareness by nurses, indicating if there is a distinction between students and RNs or if environmental factors in the clinical setting impact on situation awareness and decision making performance.
The simulation study by S. Wright and Fallacaro (2011) investigated predictors of situation awareness. The study used a number of computerised data collection methods typically employed by the aviation industry. The researchers found a mild positive correlation between memory and situation awareness and it was assumed that this result related to working memory as the data were obtained from the DIGIT SPAN instrument. The cognitive abilities of the individual nurse were concluded as the best predictors of situation awareness, as no correlation existed between automaticity derived from experience and situation awareness, the authors questioned the current pre-requisite critical care experience for anaesthetic nurse trainees (S. Wright & Fallacaro, 2011). The findings revealed that some nurses functioned at a significantly higher cognitive level than others and demonstrated greater situation awareness. However, the WOMBAT-CS test was used to determine the levels of cognition and situation awareness. In aviation studies using WOMBAT-CS, particular personal characteristics, related to confidence, assertion and enquiry, were also found to be predictors of higher situation awareness (Salmon et al., 2008). S. Wright and Fallacaro (2011) did not indicate if the test instrument data were analysed further to identify personality traits or characteristics. However, in the discussion, the authors identified that individual characteristics and behaviours, such as critical thinking, good management and non-technical skills, can enhance cognition and situation awareness. The authors suggested purposely recruiting participants who exhibited higher situation awareness ability, and who had other desirable but largely undefined characteristics, into anaesthetic nurse courses in the future.

S. Wright and Fallacaro (2011) acknowledged that there was a high participant attrition rate, as the 111 initially recruited were unable to complete all of the tests, with only 71 complete data sets being analysed. Another issue is that the data collection methods were designed for aviation,
and they are highly related to the technical instrumentation that pilots would be more familiar with, and do not measure clinical environmental factors that could influence situation awareness. It is possible that lack of familiarity with the testing techniques or equipment could have impacted on attrition rates or the results obtained from nurses in the study. However, the results are consistent with measuring aspects of situation awareness in individuals related to the speed of cognitive processing environmental data, cognitive levels and intelligence. The scope of the study did not extend to providing evidence of how these aspects relate to effective clinical decision making using situation awareness or if environmental factors in the naturalistic setting affect situation awareness by nurses. S. Wright and Fallacaro (2011) provided future researchers with an understanding that situation awareness abilities differ between individuals and there may be possible personal attributes that enhance situation awareness. How the identified situation awareness traits are used by nurses in practice and relates to clinical decision making requires further investigation.

The hybrid concept analysis by Sitterding et al. (2012) investigated the concept of situation awareness related to nursing work by reviewing situation awareness literature and interviewing nurses in a variety of practice settings. Five situation awareness themes were identified: expertise; cognitive overload; interruption management; task management; cognitive stacking. Although the analysis revealed that nurses’ expertise and knowledge was evident when developing situation awareness it is interesting to note that they did not always use the situational knowledge. This finding revealed that nurses do not always use recently acquired, environmental situation awareness for decision making and subsequent actions may not be influenced by the most relevant or contemporaneous information. Situational knowledge was not explored further, so it is not possible to identify if nurses are aware they were not using all the current information
available or if it was a selective process. Further analysis of situational knowledge could have revealed more information regarding cue recognition for situation awareness when nurses experienced cognitive overload. The analysis revealed that cognitive overload and interruptions are a significant factor in compromising situation awareness and this was related to decision making error. Sub-optimal decision making most frequently occurred when cues were present but the nurse was unable to attend to the situation possibly due to interruptions. As a result, decision making and patient care was undertaken by other members of the nursing team who lacked knowledge of the situation.

Sitterding et al. (2012) aimed to identify situation awareness related to ‘nursing work’ and their analysis revealed many important practice findings. Situation awareness by nurses in practice was influenced by task management abilities, prioritising and workload. The effects of such influences were evident in the participant quotes and included obscured situation awareness; sub-optimal decision making; non-adherence to standards; omission or missed nursing care; and concentration on decision making for patients that were considered the ‘sickest or most labile’. It was interesting to note that situation awareness by nurses was influenced by patient satisfaction, with RNs prioritising lower level patient satisfiers over more clinically urgent tasks at times. The reasons why this occurred are not further analysed but the participant quotes suggested that attending to less urgent tasks was used as a pacifying strategy to prevent patient complaints.

‘Cognitive stacking’ was used by RNs, particularly those more experienced, to effectively maintain situation awareness (Sitterding et al., 2012). Cognitive stacking is the formation of mental lists of multiple to-do tasks. Nurses memorised lists of tasks as a failure-sensitive, workload management strategy during busy periods to prevent error and maximise outcomes. The study findings are limited to the context of one hospital in the USA and relied on verbal
accounts by nurses to identify situation awareness. The sample description did not indicate the participant numbers from particular clinical fields so it is not possible to distinguish differences between clinical environments. However, the study examined situation awareness in acute care settings and indicated that situation awareness is affected by environmental influences in medical/surgical fields.

When examined in light of situation awareness literature from other occupational domains, the findings of the study produced the working definition for situation awareness by nurses. The definition by Sitterding et al. (2012) has been endorsed as representative of situation awareness relating to nurses in the clinical setting and provides researchers with a nursing specific situation awareness definition to use in future studies (McKenna et al., 2014). Sitterding et al. (2012) demonstrated how qualitative techniques can elicit data for an in-depth, rich thematic analysis to reveal important insights into influences on situation awareness by nurses in the clinical setting.

The study by Tower and Chaboyer (2013) investigated the use of situation awareness as a precursor to decision making by medical nurses whilst documenting changes to patients’ conditions. The precise situation awareness levels used by nurses and how situation awareness was used to influence what was documented were reported. The analysis revealed three themes related to situation awareness. The first theme, patient deterioration, confirmed that nurses considered multiple sources of data to develop situation awareness and confirm deterioration in the patients’ condition. Participants pattern matched information and drew on all 3 levels of situation awareness but interestingly they used situation awareness to varying degrees. The analysis revealed the difficulties associated with eliciting levels of situation awareness from verbal accounts as nurses used colloquial phrases (e.g. ‘he’s having a bit of trouble’) that did not adequately articulate nurses’ situation awareness in terms of understanding or projection. It is not
clear if these aspects were clarified in the follow-up interviews to establish precise situation awareness levels. However, the findings reinforced the need of researchers in the field to have an understanding of the context and esoteric language used in the occupational setting.

The second theme, not responding to treatment as expected, identified situation awareness by nurses being articulated more implicitly (Tower & Chaboyer, 2013). They used a fluid process, of going back and forth, seeking additional data cues for Level 1 situation awareness, and verbalised the significance of their deductions based on higher situation awareness levels. It is interesting to note, that the researchers recognised similarities to the cognitive continuum theory for decision making (Hamm, 1988), which led them to recommend this theory as the most useful theory on which to base integration of situation awareness for decision making in contemporary nursing practice.

The third theme, documentation of practice issues, used Level 1 situation awareness to describe the issue and level 2 situation awareness was demonstrated as nurses identified some understanding (Tower & Chaboyer, 2013). However, there was a lack of evidenced Level 3 situation awareness, which the authors highlighted as a lack of understanding by nurses of the potential significance of the issue for patient outcomes. The study findings are in the context of two hospital sites in Queensland, Australia and may not reflect nurse populations elsewhere. A sample breakdown was not given so it is not possible to deduce if there were environmental differences between the sites or medical specialties. However, the results indicated that nurses use complex mental models to develop situation awareness for decision making. The study by Tower and Chaboyer (2013) demonstrated that the use of the ‘think aloud’ method generated pertinent data from the naturalistic environment and that thematic analysis was useful in providing an in-depth exploration of situation awareness by nurses.
The studies reviewed indicated that nurses do develop and use situation awareness for clinical decision making. However, challenges in practice can cause situation awareness levels to fluctuate which can result in less optimal decision making and affect subsequent patient care. The challenges identified mostly reflect system aspects rather than interpersonal or interprofessional dimensions that are widely reported as affecting situation awareness when nurses are investigated as part of a healthcare team. There is some evidence to suggest that individual nurses may possess characteristics that improve the ability to acquire and use situation awareness in practice. The role of experience or age appears to have little bearing on situation awareness. It is acknowledged that there is limited research focusing on situation awareness by nurses in practice but the findings from simulated studies mirror those from other occupational domains (Cooper et al., 2010; McKenna et al., 2014). Sitterding et al. (2012) and S. Wright and Fallacaro (2011) point out that the relevance of situation awareness is under reported in nursing research, despite having increasing relevance in practice.
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<tr>
<th>Author (Year &amp; Country)</th>
<th>Sample</th>
<th>Aim</th>
<th>Design and data collection methods</th>
<th>Findings</th>
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<tr>
<td>Cooper et al. (2010) Australia</td>
<td>51 final semester student nurses from 1 university</td>
<td>To examine, in a simulated environment, the ability of final year nursing students to assess and manage patient deterioration and to measure the relationships between knowledge, SA and skill performance</td>
<td>Mixed methods Performance measures of knowledge, skill and SA during simulated scenario. Reflective interviews</td>
<td>• SA scores were generally poor and not influenced by age or experience • Physiological cue focus and were able to generally anticipate what would happen • SA perception and comprehension of global environmental data, such as awareness of functioning emergency equipment, was poor • Knowledge level was good but not applied • Poor comprehension of the situation and inability to integrate information • Anxiety affected clinical reasoning in simulated setting • No difference in SA level between scenario topics but subsequent scenario practice improved scores • SA domains (levels) were significantly positively correlated to the total SA score • Comprehension and projection were significantly positively correlated with each other • Clinical reasoning was flawed, possibly through anxiety, lack of education or clinical experience • Participants primary cue focused which indicated how a single information cue can obscure other data for SA • Single cue focus led to incorrect decision making</td>
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<tr>
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| McKenna et al. (2014) Australia | 97 student nurses from 3 universities | To explore nursing students’ SA while engaging in patient deterioration scenarios | Triangulated convergent design following intervention (FIRST2ACT educational process) Multiple choice questionnaire (based on TEAM and SAGAT), video recorded team simulations, reflective performance review | - No correlation between SA scores and age; previous nursing employment experience; previous exposure to deteriorating patients; or knowledge questionnaire  
- Correlation between SA level and clinical performance - higher level SA related to higher rated clinical performance  
- 12 key indicators used for behaviour ratings for SA – large variation between these. Highest scores for actions associated with heart rate and blood pressure changes that were aligned with projection. Lowest scores for environmental, global SA  
- SA scores were low. When all SA levels were examined together score averages were:  
  - Physiological cue perception 26%  
  - Physiological cue comprehension 44%  
  - Projection of physiological cues, medications or investigations 59% |
| Sitterding et al. (2012) USA | 7 RNs from paediatric & adult CC, emergency care, medical and surgical wards (precise breakdown not given) | To analyse the concept of SA related to nursing work | Hybrid concept analysis Semi-structured interviews in clinical setting |  
- 5 SA themes identified: expertise; cognitive overload; interruption management; task management; cognitive stacking  
- Nurses’ expertise and knowledge evident in SA  
- SA disrupted with cognitive overload. Overload affected by situation, ability to make sense of interruptions and varying levels of expertise  
- Cues present but SA not apparent when nurses are interrupted and subsequent task not undertaken  
- Poor task management influences SA resulting in operational failures including non-adherence to standards and omission or missed nursing care. Relationship between SA and multitasking – task management associated with prioritising  
- Cognitive stacking used as a workload management strategy for dealing with multiple tasks |
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| Tower et al. (2012) Australia | 17 RNs, ≥ 2 years experience, from six medical wards in two urban hospitals (specific breakdown not given) | To describe RNs SA as a precursor to decision making about what to document when recording changes in patients’ conditions | Interpretive study ‘Think aloud’ by RNs during documentation episodes in clinical setting and follow up interviews | - Nurses used complex mental models for SA  
- Nurses used all three levels of SA to varying degrees.  
- 3 themes were identified: changes to the patients’ condition; deterioration; not responding to treatment as expected and issues related to professional practice  
- Cognitive continuum theory most useful DECISION MAKING theory to base SA in contemporary nursing practice |
| Wright and Fallacaro (2011) USA | 71 student registered nurse anaesthetists (SRNAs) from 3 universities | Aim: To identify predictors of SA in SRNAs | Exploratory, non-experimental, correlational study  
WOMBAT with participant self-reporting: DIGIT SPAN: SPM | - Positive correlation between cognition and SA  
- Memory and SA had mild positive correlation  
- No correlation between automaticity derived from experience and SA  
- Higher cognitive abilities correlate with higher levels of SA  
- Reported in thesis only - Higher positive scores in individuals with enquiring/assertive personality types |

Legend:  
CC – Critical Care  
DIGIT SPAN – Computer based instrument for the measurement of working memory and intelligence  
FIRST2ACT – Emergency intervention educational process  
SA – Situation Awareness  
RN – Registered nurse  
TEAM – Team Emergency Assessment Measure  
SAGAT – Situation Awareness Global Assessment Technique  
SPM – Standard Progressive Matrices, computer based quantitative instruments to measure cognition  
SRNAs – Student Registered Nurse Anaesthetists  
Pressure Injury Prevention

In order to relate situation awareness to pressure injury prevention, the literature was searched for best practice guidelines and pressure injury prevention interventions and pressure injuries. Boolean combinations and pressure injury nomenclature terms were searched in the date range of 2000 to present. The decision to revise the search parameters to exclude literature prior to 2000 was made after appraising the initial evidence retrieved in best practice guidelines and studies. Several sources initially retrieved indicated that the introduction of supportive surfaces and changes to best practice guidelines rendered earlier study findings no longer relevant (Australian Wound Management Association, 2012; Defloor et al., 2005; Moore, Cowman, & Conroy, 2011; Vanderwee, Grypdonck, De Bacquer, & Defloor, 2007).

Best Practice Guidelines

Over the past decade there has been considerable revision or creation of best practice guidelines in light of research indicating a high incidence of Pressure injuries. Currently international best practice guidelines serve to direct national pressure injury prevention policy by advocating preventative interventions and treatment for pressure injuries. These include two major international guidelines. The collaborative effort by the European Pressure Ulcer Advisory Panel (EPUAP) and the American National Pressure Ulcer Advisory Panel (NPUAP) culminated in guidelines that have been adopted across the continents of America and Europe, as well as some African nations (European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009). The Pan Pacific Clinical Practice Guidelines for the Prevention and Management of Pressure Injury (Australian Wound Management Association, 2012) are used in Antipodean and Asian countries.
Both guidelines outlined pressure injury prevention in terms of: risk assessment; preventative interventions including repositioning; skin protection; good nutrition; pressure relieving surfaces; assessment and monitoring; and appropriate treatment for pressure injury wounds (Australian Wound Management Association, 2012; European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009). The international guidelines are summarised in Table 2.

Specific pressure injury treatments and guidance for pressure injury prevention in non-medical/surgical adult patient groups (e.g. neonates) have not been included in the table as these areas were not within the remit of the study.

Three systematic reviews related to pressure injury prevention interventions were also critiqued and are summarised in Table 3 (Gillespie et al., 2014; McInnes, Jammali-Blasi, Cullum, Bell-Syer, & Dumville, 2013; Reddy et al., 2006). The researcher prioritised the systematic reviews and guidelines for appraisal as they were considered higher forms of evidence (Merlin, Weston, & Tooher, 2009).

The review of the guidelines emphasised pressure injury prevention as a nurse sensitive outcome and highlighted the importance of pressure injury prevention by nurses in reducing pressure injury incidence, despite limited empirical research being available (Australian Wound Management Association, 2012; European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009). A recurrent theme was that pressure injury prevention interventions by nurses have strong ‘face value’ but limited supporting evidence (Australian Wound Management Association, 2012; Reddy et al., 2006). Despite the paucity of evidence, it has been universally accepted that repositioning, risk and nutritional assessment, and the use of pressure relieving devices are vital for inclusion in pressure injury prevention guidelines (Australian Wound Management Association, 2012; Reddy et al., 2006).
The two practice guidelines showed many similar and consistent practices advocated for pressure injury prevention including risk assessment strategies, patient positioning, pressure redistribution surfaces, nutrition, pain management, continence management and patient education (Australian Wound Management Association, 2012; European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009). The EPUAP/NPUAP guidelines (European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009) contained more specific information regarding devices considered detrimental to pressure injury prevention (e.g. round Sorbo rings). Many of the items or techniques mentioned are now considered obsolete, being surpassed by the widespread introduction of improved products, and may not have been deemed necessary for inclusion in the Pan Pacific guidelines (Australian Wound Management Association, 2012).

EPUAP/NPUAP (2009) had more of a focus on nursing practices for patients with an existing pressure injury, whereas the pan pacific guidelines appeared to have a more visible preventative care focus for patients at risk but without a pressure injury. This shift in emphasis could have arisen as the Pan Pacific Guidelines (Australian Wound Management Association, 2012) were published later, considered more recent research findings and presented evaluative evidence of the EPUAP/NPUAP guidelines implementation. The Pan-Pacific guidelines (Australian Wound Management Association, 2012) recommend specific tools or scales for the assessment of pressure injury risk and incorporated more assessment factors for all patients on admission. In addition, the need for nurses to plan pressure injury prevention is highlighted, which is particularly evident in relation to the provision of more effective and earlier nutritional interventions. This emphasis also may have been included following the publication of more recent evidence.
Table 2 – Summary of international pressure injury prevention guidelines

<table>
<thead>
<tr>
<th>Publication</th>
<th>Risk assessment</th>
<th>Preventative interventions</th>
<th>Skin protection</th>
<th>Nutrition</th>
<th>Surfaces</th>
<th>Assessment and monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPUAP &amp; NPUAP PIP Guidelines</td>
<td>• O/A, consider nutrition, factors influencing perfusion and oxygenation, skin moisture, age, friction, shear, sensory perception, temperature and general health status</td>
<td>• Reposition patients on all surfaces. For patients on PRSSs, for frequency follow the manufacturer guidelines</td>
<td>• Consider film or hydrocolloid dressings to protect risk areas from friction or injury from tape</td>
<td>• Screening O/A; for those with PI, referral to dietician.</td>
<td>• Evaluate effect of previous and current prevention plans prior to mattress selection</td>
<td>• Assess pain with recognised tool for PI patients and develop management plan.</td>
</tr>
<tr>
<td>(2009)</td>
<td>• Follow up at least weekly</td>
<td>• Appropriate positioning to reduce shear and friction</td>
<td>• Avoid pressure on skin from tubes and devices</td>
<td>• O/A assess eating, weight loss</td>
<td>• Match individual needs for pressure redistribution, shear reduction, and microclimate control</td>
<td>• Prevent pain with medication, techniques and education to patient, family, staff.</td>
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<tr>
<td></td>
<td></td>
<td>• Appropriate manual handling and transfer aids to reduce friction/shear</td>
<td>• Carefully remove dressings on fragile skin</td>
<td>• Provide specified calories and protein. Use supplements, vitamins or other nutritional support if required</td>
<td>• Limit head-of-bed elevation to 30° unless contraindicated</td>
<td>• Bariatric: Get adequate assistance to fully inspect all skin folds.</td>
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<td></td>
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<td>• Avoid ring-shaped devices, and long periods on bed pan</td>
<td>• Do not massage or rub reddened skin</td>
<td>• Provide and encourage adequate daily fluid intake</td>
<td>• Encourage sleep in a flat or 30° to 40° side-lying position</td>
<td>• Use validated pressure injury healing scale if have PI.</td>
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<td>• Increase activity as rapidly as tolerated</td>
<td>• Use water-based skin emollients to maintain skin hydration</td>
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<td>• Use redistribution cushion in chairs for individuals with stage I/II PI</td>
<td>• NPUAP/EPUAP 2009 PI classification system to identify and communicate severity of PIs</td>
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<td></td>
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<td>• Minimise seating time and support feet. Individuals with sacral PIs limit to 3 periods of 60 minutes daily, avoid erect sitting posture</td>
<td>• Develop and implement an individualised plan for incontinent patients</td>
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<td>Publication</td>
<td>Risk assessment</td>
<td>Preventative interventions</td>
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<td>Pan Pacific PIP Guidelines (2012)</td>
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<td>Publication</td>
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<tr>
<td>Pan Pacific PIP Guidelines (2012) continued</td>
<td>• Use Braden Scale, Norton Scale or Waterlow Score</td>
<td>• Position 30° lateral, alternating sides; 30° incline recumbent position; prone position if medical condition precludes options</td>
<td>• Do not massage or rub reddened or fragile skin, use water-based skin emollients</td>
<td>• Provide adequate fluids for hydration</td>
<td>• Consider using a medical grade sheepskin as an adjunct for patients at risk or when high specification constant low pressure or alternating pressure mattress, or overlay not available/not tolerated</td>
<td>• PI patients regularly and routinely assessed for pain with validated pain assessment tool</td>
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<td>• Assess, record and provide PI prevention education to all patients within 8 hours</td>
<td>• Check positioning of heels and other bony when reposition</td>
<td>• Implement continence management plan if applicable</td>
<td>• Consider using a hydrocolloid dressing to promote healing in non-infected stage II PIs</td>
<td>•教育 in the prevention, assessment and management of pressure injury should be provided to all health professionals</td>
<td>• 教育 in the prevention, assessment and management of pressure injury should be provided to all health professionals</td>
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<td></td>
<td>• Reassessment if patient’s condition changes</td>
<td>• Limit seated time without pressure relief</td>
<td>• Implement continence management plan if applicable</td>
<td>• Consider using a hydrocolloid dressing to promote healing in non-infected stage II PIs</td>
<td>• Education in the prevention, assessment and management of pressure injury should be provided to all health professionals</td>
<td>• 教育 in the prevention, assessment and management of pressure injury should be provided to all health professionals</td>
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</table>

Legend:
BMI – Body Mass Index
EPUAP – European Pressure Ulcer Advisory Panel
NPUAP – National Pressure Ulcer Advisory Panel (USA)
O/A – On admission
RCT – Randomised Control Trial
PI – Pressure injury
PIP – Pressure injury prevention
PRSSs – Pressure relieving support surfaces
Systematic Reviews of Pressure Injury Prevention

The evidence provided by systematic reviews was mostly reflected in the international best practice guidelines. There appeared to be consensus that comprehensive pressure injury risk assessment, patient repositioning, the use of pressure relieving support surfaces (PRSS) and some pressure relieving devices are vital interventions for inclusion. The inclusions are despite the authors of the systematic reviews having found limited, robust evidence. A summary of the systematic reviews critiqued in the study are presented in Table 3.

The authors of two systematic reviews were unable to endorse specific support surfaces for pressure injury prevention as all randomised control trials (RCTs) were found to have limitations but overall pressure relieving surfaces were concluded as beneficial (McInnes et al., 2013; Reddy et al., 2006). Equally, RCTs of patient repositioning frequencies were considered to have limitations, therefore the optimal time span for best practice was not established (Gillespie et al., 2014; Reddy et al., 2006).

The reported limitations of RCTs mainly related to difficulties with establishing control groups of non-repositioned patients due to ethical considerations and impracticalities in practice (McInnes et al., 2013). However, it was identified that the major research contribution originally stemmed from Belgium and the Netherlands, with the pressure relieving surface and patient repositioning study by Defloor et al. (2005) being considered as most influential (McInnes et al., 2013). The systematic review by Gillespie et al. (2014) focused on patient repositioning for pressure injury prevention. The authors reported a lack of robust studies to evaluate repositioning frequency and specific patient positioning for pressure injury prevention as the RCTs compared were considered grossly under-powered. Gillespie et al. (2014) acknowledged that although
uncertainty remained it did not mean that repositioning interventions were ineffective. Repositioning was considered an integral component of pressure injury prevention, based on sound theoretical rationale, which should continue to be widely recommended in best practice guidelines. The lack of robust RCT evidence appeared to prevent the inclusion of definitive guidance for pressure relieving surface selection and the frequency of patient repositioning in the best practice guidelines.
Table 3 – Overview of systematic reviews for pressure injury prevention

<table>
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<tr>
<th>Publication</th>
<th>Review aim</th>
<th>Data synthesis</th>
<th>Conclusions</th>
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| Gillespie et al. (2014)| • To assess the effects of repositioning on the prevention of PIs in adults, regardless of risk or in-patient setting  
• To ascertain the most effective repositioning schedules for preventing PIs in adults  
• To ascertain the incremental resource consequences and costs associated with implementing different repositioning regimens compared with alternate schedules or standard practice  | • 3 RCTs were reviewed  
• All reported proportion of patients developing PI of any grade, stage or category. None of the trials reported on pain, or quality of life, and only one reported on cost  
• All RCTs were at high risk of bias  
• 2 RCTs of 30° tilt vs. 90° were very imprecise with very low quality evidence and underpowered. The 3rd trial was also underpowered, at high risk of bias, with low quality evidence  
• 1 RCT examined cost-effectiveness but only included cost was nursing time. The intervention was reported to be cost saving compared with standard care and nurse time cost per patient  | • Repositioning integral component of PIP; it has a sound theoretical rationale; and is widely recommended and used in practice  
• There is a lack of robust evaluation of repositioning frequency and position for PIP as all comparisons are under-powered  
• Uncertainty of PIP effectiveness but it does not mean PIP interventions are ineffective  
• Current evidence is small in volume, at risk of bias and no strong evidence of a reduction in PIs with the 30° tilt compared with the standard 90° position or good evidence of an effect of repositioning frequency  
• A need for high-quality, adequately-powered trials to assess effects of position and optimal frequency of repositioning on PI incidence  
• Limited data derived from one economic evaluation means it remains unclear whether repositioning every 3 hours using the 30° tilt is less costly in terms of nursing time and more effective than standard care involving repositioning every 6 hours using a 90° tilt  |
| McInnes et al. (2013)  | • To undertake a systematic review of the effectiveness of pressure redistributing support surfaces in the prevention of pressure ulcer  | • 53 trials were identified with a total of 16,285 participants  
• Overall risk of bias in trials was high  
• Pooled analysis showed that foam alternatives to standard hospital mattress reduced incidence of PIs in patients at risk  
• Australian standard medical sheepskins prevent PIs compared to standard care  
• Pressure-redistributing overlays on the operating table compared to standard care reduce postoperative PI incidence  | • Good evidence that higher specification foam mattresses, sheepskins, and some overlays in the operative prevent PIs  
• Insufficient evidence to conclude value of seat cushions, limb protectors and various constant low pressure devices  
• The merits of higher-tech constant low pressure and alternating pressure devices for prevention are unclear  
• More robust trials are required to address the research gaps  |
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| Reddy et al.     | • To systematically review the evidence examining interventions to prevent PIs | • 59 RCTs were selected  
• RCT interventions assessed and grouped into 3 categories, impairments in mobility; nutrition; and skin health  
• Methodological quality of RCTs was variable and generally suboptimal  
• Effective strategies addressing impaired mobility included, the use of support surfaces; mattress overlays on operating tables; and specialised foam or sheepskin overlays  
• Repositioning the mainstay in most PIP protocols, but insufficient evidence to recommend specific turning regimens for patients with impaired mobility  
• In patients with nutritional impairments, dietary supplements may be beneficial  
• The incremental benefit of specific topical agents over simple moisturizers for patients with impaired skin health is unclear | • Evidence for using support surfaces, repositioning, optimising nutrition, and moisturising sacral skin are appropriate strategies to prevent PIs  
• Many RCTs that evaluated PIP strategies had methodological limitations  
• There is a need for well-designed RCTs that follow standard criteria for reporting non-pharmacological interventions and that provide data on cost-effectiveness for PIP interventions |

Legend:
RCT – Randomised Control Trial  
PI – Pressure injury  
PIP – Pressure injury prevention
Pressure Injury Prevention Clinical Studies

Fourteen clinical studies were retrieved and originated from Belgium (n=2); Sweden (n=2); USA (n=2); Australia (n=1); Netherlands (n=1); Netherlands and Germany (n=1); Germany (n=1); Multinational Europe (n=1); UK (n=1); Ireland (n=1); and Japan (n=1). The studies retrieved are summarised in Table 4.

The search revealed two RCT studies focusing solely on patient repositioning (Defloor et al., 2005; Moore et al., 2011). In the study by Defloor et al. (2005) RCT protocols were possibly breached in the nursing home settings as patient repositioning was sometimes instigated by family members and may not have been recorded. For the purposes of the study, additional nurses were allocated to the ward settings to assist with increased repositioning regimes. Additional staffing may not have reflected usual repositioning practice or provided equal controls between hospital and nursing home settings.

The study by Defloor et al. (2005) was a RCT with a limited scope of investigation, with aspects that could have impacted on Pressure injuries for elderly patients, such as incontinence, not considered. The inherent difficulties with the patient group resulted in high attrition rates due to deterioration of condition and deaths. However, the study by Defloor et al. (2005) has been highly influential in changing international best practice guidelines and provided a focus for pressure injury prevention. The four hourly repositioning of patients at a 30 degree angle on a pressure relieving mattress was adopted as ‘industry standard’ at the time and has provided a basis for subsequent pressure injury prevention research (Moore et al., 2011).

A subsequent study revealed that positioning on a 30 degree tilt, use of pressure relieving devices and minimum three hourly repositioning further reduced Pressure injuries (Moore et al., 2011).
Moore et al. (2011) endeavored to replicate the study by Defloor et al. (2005) by using similar research criteria in long-term elderly care hospital wards. As the study by Moore et al. (2011) was undertaken some six years later it reflected the use of more modern pressure injury prevention guidelines and devices which may account for some of the differences in findings. Limitations were reported relating to the patient group. In addition to attrition from patient deaths, different proportions of participants from some wards were transferred to other facilities. As a result, the final sample numbers from some of the settings were diminished and this may account for variance in those cluster samples.

A study of CC patients examined patient repositioning and pressure injury incidence (Kaitani, Tokunaga, Matsui, & Sanada, 2010). Although the study cohort was 98 patients, the significance of repositioning was calculated for those with Pressure injuries (n=11) which reflected a small number for statistical inference. However, the entire cohort analysis presents some interesting findings. More pressure injury prevention interventions were delivered to patients at risk than to those with an existing pressure injury. The reason for this focus is not further explored nor is whether existing pressure injuries were acquired while in critical care. If the patients were admitted with pressure injuries it would be possible to conclude that pressure injury prevention provided by critical care nurses was successful in preventing acquired Pressure injuries. The researchers identified that haemodynamically unstable patients were repositioned less frequently and these patients did develop Pressure injuries. However, other pressure injury contributory factors in the patient group were not explored.

Most studies examining pressure injury prevention interventions identified that a pressure relieving mattress alone does not reduce pressure injuries and repositioning is vital (Defloor et al., 2005; Moore et al., 2011). The exception is noted by Rich et al. (2011), where human factors
academics and health economists in the USA investigated pressure injury prevention by nurses. They found no association between pressure injury prevention interventions and reduced pressure injury incidence (Rich et al., 2011).

The discussion by Rich et al. (2011) was focused on cost containment and the non-nurse authors do acknowledge their limitations related to the nuances of nursing care. Therefore, the findings could be viewed sceptically by some. However, the discussion presents a logical, fiscal argument that if RNs are not providing appropriate care they will be perceived as an ineffective but costly labour force in a healthcare market focused on austerity. The study data were collected over a three year period, in a number of settings and the number of data collectors or inter-rater reliability aspects not stated. Conflicts of interest were considered as the study was funded by a number of organisations but these were accredited clinical foundations, unconnected to institutions with a financial or health insurance bias.

The other publication from the USA (Haller, 2011) similarly highlighted finance limiting actions by governments. However, Haller (2011) did explore the nuances of nursing in terms of nursing sensitive outcomes and organisational aspects related to pressure injury incidence. Pressure injury treatment improved as nurses increased their pressure injury prevention knowledge but patient non-compliance, the rapid increase in bariatric patient admissions and time pressures remained significant barriers to providing effective pressure injury prevention. The study recruited ‘interested’ nurses so it may not have represented the views of all nurses at the site investigated. The education sessions and the observations were curtailed by staff release issues which could have limited knowledge uptake and data collection. The study recommended future inclusion of care assistants in educational programs as they were increasingly delivering pressure injury prevention interventions in practice.
Multinational research indicated that pressure injury prevention was insufficiently undertaken by RNs for multifarious reasons and, as a result, patients acquired pressure injuries (Vanderwee, Clark, et al., 2007). The study focused mainly on repositioning, finding that it was often not undertaken and preventative measures were not accurately allocated to high pressure injury risk patients (Vanderwee, Clark, et al., 2007). The authors acknowledged that data collected from nursing documentation was poor, necessitating measurement instrument refinement which indicated that pressure injury prevention intervention results were lower than previously assumed. National variations were also significant in terms of incidence rates and anatomical pressure injury locations. The multinational results were subjected to inter-rater reliability scrutiny and no significant factors related to observers in different countries were noted.

Despite pressure injury prevention being documented as planned or completed, observational evidence identified that it was often not undertaken (De Laat, Schoonhoven, Pickkers, Verbeek, & Van Achterberg, 2006). Poor nurse charting may have led to some inaccuracies in data collection from clinical documentation and ‘outlier’ patient data may have been counted twice (De Laat et al., 2006). De Laat et al. (2006) revealed that up to 10% of pressure injury prevention interventions reported by nurses did not occur, concluding that reduced pressure injury rates were due to new mattress policies and information being more widely available for patients and carers. Nurses’ care behaviours remained unchanged and were not associated with reduced pressure injury incidence suggesting that improved attitudes to pressure injury prevention could improve patient outcomes further.

Some very large pressure injury prevention studies exist, using data from annual, health facility surveys completed by nurses, undertaken to measure quality of care in Germany and the Netherlands (Lahmann et al., 2012; Tannen, Dassen, & Halfens, 2008). Issues with validity and
reliability are only addressed by comparison to the previous year’s results. The increased use of support surfaces and devices was identified as a substitute for more appropriate pressure injury prevention interventions by nurses and led to an increased incidence of pressure injuries (Lahmann et al., 2012; Tannen et al., 2008). Conversely, clinical settings that prioritised ‘basic’ pressure injury prevention interventions such as patient repositioning, good nutrition and incontinence care but used less devices had a reduced level of pressure injury incidence (Lahmann et al., 2012; Tannen et al., 2008). Pressure injury incidence was eight times higher in clinical settings with high device use and low levels of ‘basic’ pressure injury prevention interventions (Tannen et al., 2008). The reasons why nurses decide to use particular pressure injury prevention strategies are not reported in these large, quantitative studies (Lahmann et al., 2012; Tannen et al., 2008). However, the discussion suggested that prioritisation of device use over other pressure injury prevention interventions, or omission of appropriate care, could be attributed to national variations, facility policy, staffing deficits, workload and nurses’ lack of awareness (Tannen et al., 2008).

Elliott (2010) identified that nurses who focused on pressure relieving devices were more reluctant to undertake other pressure injury prevention interventions. The methodology for the study was not described in-depth in the publication. Data collector details are given but the inter-rater reliability statistics are not published. A challenge for the study was eliciting pressure injury prevention data from poor clinical documentation. The findings suggest that documented pressure injury prevention does not necessarily equate to interventions being undertaken in practice. However, it is possible that assistants in the clinical setting provided pressure injury prevention but they are not responsible for documentation and the researcher only observed pressure injury prevention delivered by RNs.
The type of facility or clinical field also had a bearing on the quality of pressure injury prevention. This may be due in part to the nurse patient ratios in specific nursing fields as CC was found to have the highest repositioning rates of patients at risk and acute care wards had the lowest pressure injury prevention rates, with nurses largely unaware of the needs of seated patients (Gunningberg, 2005). The statistics in the study may reflect some inconsistencies in the results of variables in some fields as the authors describe difficulties with weighting. For instance, patients nursed in chairs are usually less likely to be in ICU than in the geriatric ward but this interpretation may arise from the way the statistical evidence was presented.

A subsequent publication by the same author hypothesised that sub-optimal pressure injury prevention was due to poor awareness by nurses or lack of technical knowledge that could be overcome with training (Gunningberg & Stotts, 2008). Pressure injury prevention education programs increased nurses’ knowledge and use of pressure reducing mattresses, but pressure injury prevention interventions decreased, leading to more severe and atypical pressure injuries. The authors acknowledged limitations with the measurement instrument sensitivity and this may have affected the prevalence and prevention statistics. It is also possible, given the concerns with pressure injury prevention documentation, that more or less pressure injury prevention was actually delivered in practice.

Pressure injury prevention was not correlated with nurses’ knowledge or training but to a positive attitude towards pressure injury prevention (Beeckman et al., 2011). Nurses with positive attitudes delivered more, appropriate pressure injury prevention and reduced pressure injuries. It was noted that in ‘positive’ wards there was some evidence to suggest that patients assessed as ‘not at risk’ of pressure injury had unnecessary pressure injury prevention interventions, devices and interventions recorded. It could be argued that this was maximising
pressure injury prevention, albeit not necessarily warranted. Equally, it could be viewed as a misappropriation of resources which could have been used to greater effect with patients at higher risk of pressure injury. It is also possible that all the pressure injury prevention interventions documented were not necessarily delivered. Beeckman et al. (2011) acknowledged that the random sampling may have included participants less motivated to complete the lengthy measurement instrument. Consequently, the authors perceived that the attitudes reported were more negative. It is also worth considering that the attitude reports may have been influenced by socially desirable responses.

An Australian study identified significant statistical associations between the development of Pressure injuries and comorbidity level; risk assessment level (Braden Scale); and the lack of appropriate equipment available for repositioning (Santamaria et al., 2005). Although the study investigated Pressure injuries in nursing homes, it identified that many residents returning from episodes of care in acute wards had hospital acquired Pressure injuries and were considered more severe than those usually acquired in nursing homes. Santamaria et al. (2005) concluded that pressure injury incidence in acute care wards may reflect the lack of focus on pressure injury prevention by hospital nurses. The authors acknowledged the potential for bias as the nurses in the nursing homes used in the study were possibly more focused on pressure injury prevention, had volunteered and had previous contact with the pressure injury prevention research team.

In summary, it is evident that the emphasis on reducing Pressure injuries has been significant. Several large European studies found that Pressure injuries were reduced as revised international best practice guidelines were introduced into local policies (De Laat et al., 2006; Gunningberg & Stotts, 2008; Lahmann et al., 2012; Tannen et al., 2008). However, the reduction in Pressure injuries varies and improvements are largely due to changes to bed surfaces as opposed to
improved repositioning or other nurse actions (De Laat et al., 2006; Elliott, 2010; Gunningberg & Stotts, 2008).

The variations in practice suggest that there is a gap between best practice guidelines and the care delivered in clinical settings. This suggests that pressure injury prevention decisions by nurses, time and resources are not always appropriately focused. It is possible that other factors, such as work intensity, delegation of tasks to assistants or attitudes of nurses to pressure injury prevention, have a bearing on pressure injury incidence. Best practice guidelines, quality initiatives and training have increased nurses’ knowledge on the needs of pressure injury prevention to reduce pressure injuries. However, there appears to be limited evidence to suggest that knowledge is transferred to nurse awareness, decision making and actions to improve care in an attempt to reduce pressure injury incidence in healthcare facilities.
Table 4 – Summary of pressure injury prevention clinical studies

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<thead>
<tr>
<th>Author (Year) Country</th>
<th>Sample</th>
<th>Study aim, design and data collection</th>
<th>Findings</th>
<th>Limitations</th>
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<tr>
<td>Beeckman et al. (2011) Belgium</td>
<td>Random sample: Hospitals n = 14 Wards n = 94 Nurses n = 553, Patients n = 2150</td>
<td>To explore knowledge and attitudes of nurses to pressure ulcer prevention. Cross sectional multi-centre study – Quantitative, clinical observation and nurse completed attitude instrument</td>
<td>• 13.9% of patients received adequate PIP (including repositioning) • Adequate PIP correlated to attitude • Adequate PIP not correlated to knowledge • 71.5% of patients received unnecessary or inefficient PIP (including repositioning) • Training did not improve attitudes to PIP • Tissue viability and senior nurses had more positive attitude to PIP • Wards with nurses where attitudes were most positive had more effective PIP</td>
<td>• Random participant nurses may be less motivated to complete instrument – authors cite attitude reporting may be too negative • Attitude reporting may record socially desirable responses</td>
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<td>Defloor et al. (2005) Belgium</td>
<td>Random sample: Nursing homes n = 11 Wards n = 32 Elderly patients n = 838</td>
<td>Investigation into various combinations of turning by nurses and mattresses in reducing pressure ulcers in elderly patients RCT – clinical observation</td>
<td>• Pressure reducing mattresses alone not significant in preventing PI • 2 hourly repositioning on standard hospital mattress more effective PIP than 3 hourly • PIP most effective with VE mattress and 4 hourly patient turning</td>
<td>• Protocols possibly breeched due to patient changes or family care - not observed or documented • Additional nurses assigned to wards with most frequent turning</td>
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<td>De Laat et al. (2006) Netherlands</td>
<td>2147 acute care, adult ward patients, 1 hospital site</td>
<td>Determination of effects of EPUAP policy on PI care Survey, series of 1-day measurement over 30 month period Quantitative Nurse reporting on instrument/verbal questioning</td>
<td>• Nurse documentation indicated reduced PIIs, increased adequate PIP, 3% repositioning increase – but verbal patient and nurse responses reveal only 10% of patients received PIP as per policy • Reduced PIIs attributed to new mattress policy and information flyers for staff, patients and relatives not changes to nurse care behaviour</td>
<td>• Authors acknowledge some ‘outlier’ patients may have been counted twice • Nurse charting may have led to inaccurate reporting</td>
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| Elliott (2010) UK     | 1906 adult ward patients in 3 hospitals (not specified further) | Exploratory study of PI reduction campaign and evaluation of 3 interventions (support surfaces; revised repositioning/documentation; heel offloading) Quantitative observation and documentation audit | • Support assistants raised awareness of devices required and improved mattress early access  
• Documentation: repositioning regimes increased by 7%; repositioning evidence decreased by 1%  
• Some nurses reluctant to use repositioning documentation – too busy, onerous paperwork  
• Nurses focussed on devices, not interventions  
• Competing demands on busy wards detracted from interventions and documentation | • Tissue viability nurses data collectors – precise methodology unclear  
• Repositioning may have been undertaken more frequently but not documented |
| Gunningberg (2005) Sweden | 612 adult patients, 1 hospital site ICU n = 30 Acute care n = 460 Neurology n = 36 Geriatric n = 86 | Investigation of PI risk, PIP and variables in patients from different care groups Cross sectional survey Pressure care nurses data collected with EPUAP instrument Quantitative | • Low PIP for bedbound patients with PIs  
• Planned repositioning for at risk patients occurred: 70% ICU; 33.8% geriatrics; 13.9% neurology; 6.7% acute care  
• Repositioning patients in chairs only occurred in geriatric wards for 27.9% of at risk patients  
• Variables associated with receiving appropriate interventions: ICU; geriatric care; low Braden score; inactivity; long hospital stay  
• Omitted PIP attributed to resource availability and ‘ethical issues’ including pain and comfort | • Variables appear non-weighted between clinical fields causing potential bias. For instance patients in chairs less likely to be in ICU than geriatrics |
| Gunningberg & Stotts (2008) Sweden | 1244 adult ward patients, 1 hospital site, 2 census years 2002 n = 612 2006 n = 632 | Comparison of PIs and PIP before and after quality improvement program Comparative surveys in 2002 and 2006 and retrospective documentation audit Observation and recording on EPUAP instrument | • PIs did not decrease despite 4 year quality improvement program  
• Use of pressure reducing mattresses increased but repositioning decreased  
• Little PIP documented  
• Sacral and heel PIs common in both cohorts but 2006 survey revealed increase in elbow, ears and feet PIs  
• Number of PIs per patient decreased but severity increased, author attributes this to reduced repositioning | • Author acknowledges limitations with methodology and instrument in determining prevalence and effects of prevention on PIs.  
• Possibly more PIP undertaken but not documented |
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| Haller (2011) USA     | 121 adult ward nurses 1 hospital site | To examine if educational intervention increases knowledge and treatment of PIs Quasi-experimental study - Quantitative Nurse completed questionnaire | • Education improved PIP knowledge but study did not elicit if care improved  
• 97.5% of participants perceived barriers to implementation appropriated care. Including: 64% patient too heavy; 57% patient non-compliance; 52% insufficient time; 52% equipment unavailable  
• Atypical PIs in obese patients challenging  
• Assistant grade nurses significant PIP providers but not included in educational updates | • Small study of ‘interested’ nurses  
• Education program prior to implementation curtailed due to staff availability  
• Convenience sample with subsequent self-selection |
| Kaitani et al. (2010) Japan | 98 CC patients in 1 hospital ICU/HDU unit | Identification of PI risk factors and appropriate PIP interventions Prospective cohort study Quantitative | • Increased PIs if turned less frequently than 2 hourly  
• Patients with existing PI turned less frequently than those without PI but assessed at risk  
• Type of admission significant to PIs. Emergency ED admissions highest risk of PI  
• Patients with haemodynamic instability turned less frequently but only 6.25% developed PI | • Small study and only 11 patients developed a PI |
| Lahmann et al. (2012) Germany | 32,400 adult patients in 256 hospitals Wards n = 30,163 ICU n = 2237 | Comparison between ward and ICU PI occurrence Cross sectional study of National Annual survey Hospital nurses record on standardised form | • Insignificant difference between Ward and ICU for patients acquiring PIs in terms of PIP, patient age and gender  
• Greatest difference was repositioning rate to EPUAP guideline: 50% ICU; 10% wards  
• EPUAP recommended surfaces and repositioning 2-4 hourly most preventive measure | • Incomplete documentation may underestimate results  
• Other parameters may be significant but not included on reporting form |
<p>| Moore et al. (2011) Ireland | 213 patients from 16 long term aged care hospital settings | RCT investigating repositioning using 30degree tilt for PIP | • Repositioning 3 hourly with 30 degree tilt at night is the most effective PIP (67% reduction in PIs) | • Final sample numbers diminished causing variance in cluster samples sizes |</p>
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| Rich et al. (2011) USA | 269 hip fracture patients, aged ≥ 65 years, from 9 hospitals, recruited over 3 year period | To elicit frequency of repositioning and incidence of PIs in bedbound elderly hip fracture patients | • Patient repositioning occurred only on 53% of inspection days  
• New PIs occurred in 12% patients repositioned 2 hourly and 10% repositioned less frequently  
• Repositioning data taken from charts only  
• No association between frequent repositioning and lower PI incidence  
• Patients on PRSS more frequently repositioned  
• Repositioning rates differed between hospitals | • Study funding from various sources and focus to justify PIP in labour shortage and cost containment. Possible conflict of interest.  
• Weighting estimating equations used for missing data (10% charts, 9% PIs) |
| Santamaria et al. (2005) Australia | 1956 residents from 23 nursing homes in 4 Australian states | To investigate the effectiveness of an integrated PI management system (PRIME) in reducing PI prevalence and incidence in nursing homes | • Significant associations between the development of PIs and comorbidity level; risk assessment level (Braden Scale); and the lack of appropriate equipment  
• Residents who developed a PI whilst in an acute hospital ward showed a trend to develop more than one ulcer  
• Hospital acquired PIs were of higher severity than those developed in the nursing home  
• Authors conclusion: the acute care facilities were possibly were less focused on PIP than the nursing homes in the study | • Facilities in the study volunteered – possible bias  
• The research team selected the facilities to approach based on previous contact. This may have introduced a bias and these nursing homes may have been more motivated in PIP than others who were not approached  
• Hospital PI conclusions not fully substantiated |
| Tannen et al. (2008) Germany (GER) & Netherlands (NL) | 31,381 in-patients. Nursing homes 29 German n = 2531  
71 Dutch n =10,098  
Hospitals 39 German n = 8515  
60 Dutch n =10,237 | Comparison of PIP and PI incidence in hospital and nursing home patients in 2 countries  
Cross sectional study of National Annual surveys  
Nurse recording on standardised form | • NL – High pressure relieving device use, less frequent PIP interventions (including repositioning)  
• GER less device use but more PIP care, including repositioning and nutritional emphasis  
• NL had 8:1 times higher PIs than GER  
• Gap between EPUAP guidelines and care reality – attributed to deficit in training, time, staffing, lack of awareness and facilities not fully implementing PIP standards | • National survey standardised questionnaire does not facilitate scoping of all relevant variables |
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<td>Vanderwee et al. (2007) Europe - Multinational</td>
<td>5947 hospital ward, adult patients Belgium n = 871 Italy n = 1097 Portugal n = 786 UK n = 2544 Sweden n = 649</td>
<td>Investigation of PI prevalence, development of data collection instrument and gain insight into PIs in patient groups in Europe Survey and observation using SME developed instrument, patient examination</td>
<td>• 61.8% of ‘at risk’ patients not repositioned in bed or had no repositioning plan; 80% of seated patients not repositioned  • Preventative measures not accurately allocated: 7.2% of patients ‘not at risk’ frequently repositioned and allocated pressure relieving devices  • 18.1% of ‘at risk’ patients acquired PI  • National variations: UK and Italy high incidence of sacral PIs; Sweden and Portugal high incidence of ankle and hip PIs  • Inappropriate PIP assumed to be due to lacks in equipment, knowledge of effective PIP and frequency of repositioning</td>
<td>• Pilot study– may not be representative sample  • Author acknowledges repositioning documentation poor and actual figures of executed repositioning assumed lower</td>
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Legend:
EPUAP – European Pressure Ulcer Advisory Panel
GER – Germany
NL – The Netherlands
PI – Pressure Injury
PIP – Pressure Injury Prevention
PRSS – Pressure relieving support surface
SME – Subject matter expert
UK – United Kingdom
Summary of Findings from the Review of the Literature

The importance of situation awareness to inform decision making in the clinical setting is supported by growing evidence. Although there is limited literature demonstrating that situation awareness by nurses improves decision making in clinical settings, the findings appear to reflect those from other healthcare research where heightened situation awareness was found to improve decision making efficacy and ultimately patient care. The potential significance of situation awareness by nurses is slowly emerging from nursing researchers, but to date the phenomenon has only been examined in a limited number of settings and perspectives. The role of situation awareness in directly informing the decisions made by qualified nurses in wider clinical practice appears to be largely uninvestigated.

Where nursing research exists, it appears that cognitive ability, personal characteristics and the ability to use foresight may influence the inclusion of situation awareness in decision making. Such characteristics are reported in practitioners working in more autonomous roles, such as anaesthetic nurses. While these aspects have not been examined in detail it is difficult to elicit why this phenomenon occurs, and if it is specific to nurses working in particular clinical settings or is common throughout nursing. Additionally, environmental factors and NTS related to interpersonal dynamics may play an important role. However, the degree to which these aspects impact on the situation awareness of nurses, in clinical practice, seems at present to be largely unproven.

Research explicitly investigating the role of situation awareness informed decision making by nurses and the link to specific patient outcomes, such as pressure injury prevention, seems not to have been undertaken as yet. It is evident from the literature that nurses can miss opportunities to
improve care and this is sometimes related to their lack of awareness. It is clear that other aspects in the clinical setting may impact on decision making by nurses for appropriate pressure injury prevention interventions. These aspects include adherence to policy, equipment resources, attitudes to pressure injury prevention, patient factors, workloads and documentation. How these influences could affect situation awareness for pressure injury prevention decision making has not, to date, been investigated. By investigating the influences on situation awareness for decision making researchers could achieve a deeper understanding of the concept related to pressure injury prevention and patient outcomes.
Chapter 3

Methodology

The aim of this chapter is to describe the methodology and research design features, including the sample, setting, data collection and analysis, used in the study. The ethical considerations related to the study are presented. To provide an understanding of the chosen methodological approach, the paradigm focus is explained, followed by the research activities undertaken for the two study phases.

Research Paradigm

The interpretive paradigm was used in the study as it has philosophical foundations which purport that the phenomenon may have multiple truths and realities (Angen, 2000). As situation awareness theory arises from studies by human factors scholars, the paradigm selected required the capacity to accommodate exploratory aspects related to the experiences of nurses in practice. Interpretive paradigms focus on the person, with the concept being investigated through the eyes of people engaging in the experience (Drew & Dahlberg, 1995). Interpretive research is based on the premise that reality is socially constructed and fluid. Therefore, it is contextualised and influenced by culture, settings and interpersonal relationships. The use of an interpretive paradigm can create greater appreciation of the value of qualitative studies (Morse, 2012) and is increasingly being used by researchers undertaking empirical clinical studies in the naturalistic environment (Leeman & Sandelowski, 2012). The interpretive paradigm supported the methodological approaches selected by the researcher which were congruent with investigation of nurses’ practices (Weaver & Olson, 2006).
Research Design

An exploratory, descriptive design based in the clinical setting was selected for the study as little was known about the phenomenon of situation awareness related to medical/surgical nurses or how it was allied to pressure injury prevention. When attempting to understand the application of a concept from another field, exploratory studies using qualitative methods are most appropriate to elicit features of the concept related to participants (Morse, 2012). By engaging in a qualitative descriptive study, the researcher was positioned close to the data, enabling a comprehensive summary of events and descriptions of situation awareness in context (Sandelowski, 2000).

To achieve comprehensive description, qualitative descriptive designs are typically an eclectic, but reasoned, combination of sampling, data collection and analysis (Sandelowski, 2000). As qualitative, descriptive studies use methods such as interviewing or observation, an analysis of the literature relating to the concept and the context in which it is being investigated is vital (Angen, 2000). The knowledge derived from literature analysis can promote a more informed and sophisticated understanding of the dialogue between the researcher and participants in order to construct meaningful reality (Morse, 2011).

Two phases were undertaken for comprehensive investigation and triangulation across sources was used to provide a multidimensional understanding of situation awareness by nurses in practice. The use of multiple data collection techniques provided a mechanism to validate findings with the potential to provide completeness, depth and quality of qualitative data for analysis and increase confidence in the research findings (Morse, 2011). This was achieved in the study by triangulating the data from the different methods of collection used in the two phases.
The conceptual framework that guided the study was based on Endsley’s (1995) theoretical model that originated in cognitive theory. Her work, originally based on aviation research, adopted an information processing approach to examine how decisions were made in the context of occupational settings.

Endsley’s Model (1995) identified three incremental levels of situation awareness related to data acquisition and use that are integral to decision making; Level 1 – perception; Level 2 – understanding; and Level 3 – anticipation of future states. The model suggested that decision making occurred following the progression to Level 3. She identified the important influence of workplace factors on decision-making in complex, busy occupational settings. These factors included the environment (interference from noise, time pressure and equipment); system capacity (workload, workflow, stress, leadership, automaticity and interpersonal dynamics); and individual factors (individual objectives, autonomy, memory, knowledge, technical ability and information processing). Clearly, the application of this model is relevant to nursing environments, in which complex and often time dependent decisions must be made.

At the outset of the current study consideration of Endsley’s Model (1995) in terms of nurses’ situation awareness and the practice environment led to the development of a concept map to aid data collection (Fig.1). The concept map provided a template within which to guide data collection and analysis in terms of ward nurses’ situation awareness. The concept map included the levels of situation awareness as identified by Endsley (1995) and related these to nurses’ acquisition of patient data for decision making. Also included were Endsley’s categories of environmental, system and individual factors as concepts integral to nursing decision-making.
The concept map (Fig 1) guided specific observations of nurse behaviours, targeted observations and questioning of participants, and enabled a method of conceptualising prompts during the think aloud phase of data collection. The concept map was an asset to the study as it added value to previous theoretical assumptions, guided analysis, and identified additional aspects affecting situation awareness in practice that could be used to further develop or modify the conceptual framework.

The concept map was published in a peer reviewed nursing journal (Stubbings, Chaboyer, & McMurray, 2012). It has subsequently been cited by other situation awareness researchers in their publications as a credible framework to conceptualise situation awareness in contemporary nursing practice (Fore & Sculli, 2013; McKenna et al., 2014).
Figure 1. The conceptual framework and measurement strategy for situation awareness in decision making by nurses as developed from the concept map (Stubbings et al., 2012, with permissions from John Wiley & Sons, 2014) based on Endsley’s model (1995).
**Researcher-as-Instrument**

A characteristic of qualitative studies is that the researcher is positioned in the clinical setting as the observer and interpreter of all the forms of inquiry, with the notion termed ‘researcher-as-instrument’ (Streubert & Carpenter, 2011). The researcher-as-instrument refers to the researcher as an active respondent in the research process, using his/her senses to grasp the study objects, mirroring them in their consciousness, forming representations to be interpreted (Turato, 2005). In studies incorporating data collection through conversation it is vital that the researchers’ facilitative interaction creates a climate where participants feel safe to share their experiences (Owens, 2006).

Self-reflexivity, where the researcher examines their own assumptions or preconceptions in view of how these might affect the research, and robust interview strategies ensure that the researcher-as-instrument is an effective method of data collection and interpretation (Pezalla, Pettigrew, & Miller-Day, 2012). To effectively collect data, and limit the potential of influencing collected material, the researcher uses certain characteristics to establish interpersonal connections and rapport with participants. The researcher should appear neutral, but be congenial and constructive, not display too much empathy or self-disclosure, but show sufficient knowledge to demonstrate mutual understanding (Pezalla et al., 2012). Additionally, the researcher should fully appreciate the clinical complexities underpinning practitioner behaviour and to appropriately contextualise participant verbal responses observers should be knowledgeable of the area under investigation (Wood & Ross-Kerr, 2011).

The researcher has been a RN for almost thirty years. Since qualifying as a RN, the researcher has worked extensively in practice in several countries and as a university lecturer in an overseas
interprofessional health faculty. Over this period, the researcher has developed the requisite communication qualities to closely engage with the study and its participants, as well as being familiar with the clinical interventions and settings.

**Study Aims**

Phase 1 of the study was devised to fulfil the research aim of exploring SA as the precursor to decision making and influences on the use of situation awareness by nurses in medical and surgical wards. Phase 2 investigated nurses’ level of situation awareness whilst making pressure injury prevention decisions in practice and the influences on using situation awareness for pressure injury prevention decision making at these levels.

Two phases were devised to provide an extensive and thorough understanding of situation awareness used by nurses when making decisions for pressure injury prevention. Phase 1 was an interview study to elicit nurses’ thoughts on their decision making and to identify situation awareness components related to pressure injury prevention. Phase 2 was an observational study in the clinical setting identifying how nurses used situation awareness for pressure injury prevention decision making and what influenced this. An overview of the setting and participants is presented in the section below. For each phase, the research design, sample, data collection techniques, analysis and interpretation are explained.

**Research Setting**

The setting for the study was an outer metropolitan public hospital with 365 beds in South East Queensland. The hospital serves a population of 300,000, with 33,000 admissions a year (Queensland Health, 2013). It provides a range of services including critical and acute care,
mental health, maternity and paediatrics but does not provide cardiac surgery or major burn services. Wards in two of the hospital units were selected initially for purposive sampling: a surgical unit (n = 2 wards) and a medical unit (n = 4 wards).

**Study Samples**

The researcher recruited participants for each phase separately. Engagement with RNs at ward meetings took place prior to each phase of recruitment. RNs were given a verbal outline of the intended study phases by the researcher and study information sheets were distributed in staff areas. RNs from four medical wards and two surgical wards volunteered to take part in the study. The information sheet that was used for both phases is contained in Appendix 1.

Criteria for inclusion in the study were:

- RN’s with direct patient care role who worked day shifts

Criteria for exclusion from the study were:

- Temporary staff including agency nurses
- Nurse unit managers (NUMs), Specialist Nurses and university facilitators
- RNs on extended leave or secondment away from the ward
- RNs with less than two months of experience in QLD Health and who had not completed hospital clinical induction

Prior to the commencement of the study, the researcher noted that one medical ward was a pilot site for a nursing initiative project. This involved many changes to usual practice, clinical documentation, handovers and skill mix. Discussion with the NUMs and the area Director of Nursing Research revealed that they considered the RNs on this ward to be ‘research weary’. The
changes being implemented potentially rendered RN practice as atypical. For these reasons it was decided to exclude RNs from this medical ward from the study. As a result, three medical wards had 75 RNs and the two surgical wards had 44 RNs who fulfilled the inclusion criteria.

**Phase 1**

Phase 1 of the study aimed to explore the use of situation awareness by nurses in medical and surgical wards. Phase 1 was conducted from December 2012 to February 2013.

The remit of the study promoted in the hospital setting was that of situation awareness for decision making by nurses during patient care but the specific pressure injury prevention focus was not disclosed. The research strategy to deliberately withhold information from people who have a role in a study is most frequently referred to as ‘blinding’ (Polit, 2011). Although blinding as a strategy to reduce bias is widely endorsed, and typically used in RCTs, the concept can be adapted for use with other research methods (Polit, Gillespie, & Griffin, 2011). The rationale for the strategy is to prevent awareness of a particular focus that could affect people's typical behaviour and thoughts (Polit, 2011). When employing information withholding strategies it must be assured that the action itself does not introduce bias by impairing the ability of participants to demonstrate, and researchers to assess, typical behaviours (Karanicolas, Farrokhyar, & Bhandari, 2010). In the study, after gaining HREC approval, non-disclosure of the pressure injury prevention emphasis was used to prevent participants focusing on pressure injury prevention, altering their typical nursing behaviours and to preclude socially desirable responses.
Phase 1 Sample

In Phase 1 the potential sample population selection was purposive but a convenience sample was accessed to take into account the distribution of nurses undertaking day shifts across the wards (Medical wards n = 3, Surgical wards n = 2). As many as nine nurses on each ward volunteered to be part of the study. However, after five nurses from each ward were recruited and interviewed (n=25), data saturation across the distribution of wards was achieved. Access to participants whilst on-duty, their release from ward activities and the use of interview rooms was granted by the NUMs.

Phase 1 Data Collection

Semi-structured interviews were selected as the data collection method as they provide data from which meaning can be inferred from individual accounts and experiences (DiCicco-Bloom & Crabtree, 2006). To provide some structure an interview guide was used (see Appendix 3). The semi-structured interview approach allowed scope for individual views and opinions representing participant thoughts, their reflections on actions and provided a basis for the exploration of attitudes (Kvale, 1996). The interview guide questions were based on recommendations from the literature, the conceptual framework (Stubbings et al., 2012) and discussions with the researcher’s supervisors. The open-ended questions reflected decision making by nurses and related generically to patient care interventions to initiate conversation to elicit data. The use of the open-ended questioning technique was undertaken to encourage nurses to express their thoughts through the use of practice examples and situations as suggested by McConnell-Henry, James, Chapman, and Francis (2009). The subsequent conversation enabled the researcher to further probe aspects revealed by nurses to provide context and application to
the phenomenon of situation awareness which aligned to the recommendations by McConnell-Henry et al. (2009).

Interviews for data collection do have disadvantages and limitations. The large quantity of data produced often means that sample sizes are small, making generalisations to other research populations more difficult (Kvale, 1996). Data collection can be resource intensive in terms of time and transcription. Also there is the potential for interviewer cause and effect relationships that are impossible to determine (McConnell-Henry et al., 2009).

The interview sessions were scheduled at agreed times when participants could be released from ward activities. Sessions were conducted in offices adjacent to the ward to ensure privacy, minimal interruption and comfort. The researcher introduced herself and reiterated the purpose of the interview. All participants were asked to complete a consent form (Appendix 2) after reading the information sheet and raising any questions with the researcher. Demographic details (e.g. age, gender, years in practice and experience in different clinical fields) were collected to describe the sample (Appendix 4). Participants were assured that their interview and demographic information would be confidential, stored securely and they were free to remove themselves from the study at any time without judgement or penalty. The contact details of the researcher, researcher’s supervisors and the ethics administrator were pointed out on the information sheet should the participant have any further questions or concerns about the study.

Recording audibility was tested at the start of the interview. Each participant was assigned a code number corresponding to the sequence in which they were interviewed to protect anonymity. The semi-structured interview guide was used with all participants and the researcher undertook all interviews, increasing the reliability of the data collected. Participants were asked to ‘think
about what you do during your usual shift’ and posed questions such as: ‘Can you tell me a bit about the clinical decisions you make related to patient care interventions?’ These questions were intentionally general in nature at the start of the interview to facilitate ease of conversation.

As the interview progressed, participants were encouraged to give examples related to pressure injury prevention interventions or expand on their responses if they discussed pressure injury prevention with further probes. An example of this was: ‘Are there any particular strategies you use when making clinical decisions? [Further probe] Such as in the pressure injury prevention example you’ve just mentioned for instance?’ The audio-recorded sessions lasted a maximum of 25 minutes, with some terminated earlier by the researcher to prevent participant conversation becoming exhausted which aligned with the recommendations of Morse (1995).

The audio-recording was checked at the end of the session to ensure data completeness. Interview data were transcribed verbatim as soon as possible by the researcher. Although this was a lengthy, time consuming process, it immersed the researcher in the detail of the data. To ensure rigour, the researcher’s supervisors examined the transcripts, questioning possible dialogue anomalies which were then rechecked with the audio-recordings. As suggested by Thomas and Magilvy (2011), participants were asked to read their transcript and confirm that it was a true account by adding their signature.

**Phase 1 Data Analysis**

Thematic analysis was selected as a suitable method for identifying, analysing and reporting patterns within the data (Braun & Clarke, 2006). It provided a system to organise the data, facilitated rich, detailed data description and a way of identifying patterns of meaning across the datasets to answer the research questions (Streubert & Carpenter, 2011). Braun and
Clarke (2006) identified thematic analysis as a rigorous process of data familiarisation, data coding, theme development and revision. Thematic analysis can be approached from a number of different ways and is dependent upon the concept being investigated. As situation awareness by medical/surgical nurses in the naturalistic setting is a largely unexplored phenomenon the deductive approach taken was directed by the content of the data to enable coding and theme development (DeSantis & Ugarriza, 2000).

The thematic analysis followed the sequential approach outlined by Braun and Clarke (2006). The researcher achieved data familiarisation by reading and re-reading the transcripts, becoming immersed and intimately familiar with the content. The next stage involved data coding. Succinct category labels, or ‘codes’, were given to identify features within the entire dataset. The codes were collated, along with the relevant data extracts in the form of participant quotes, to form subthemes for use in the later stages of analysis. By examining the subthemes and collated data in the participant quotes, the researcher searched to identify significant patterns of meaning to form potential themes. The themes were reviewed by checking the participant quotes against others in the dataset. Braun and Clarke (2006) suggest reviewing the data at this stage enables the researcher to determine if participant accounts present ‘a convincing story of the data’ that will provide relevant answers to the research question. The researcher refined the themes at this stage by splitting, combining or discarding some of the potential themes.

Revision enabled a detailed analysis of each theme, resulting in a defined focus so that themes could be named. Although these stages appeared sequential, each built on the previous iteration and formed a recursive process where the researcher moved back and forth between the different stages. Finally, the themes were woven together to form analytic narrative, with data extracts from participant quotes used to form a provisional presentation of findings. The themes were
considered provisional until the researcher had undertaken several more iterations through the data and sought contextualisation by linking the findings to the literature.

**Phase 2**

The research aim of Phase 2 was to describe nurses’ level of situation awareness whilst making pressure injury prevention decisions and to explore the influences on the use of situation awareness for pressure injury prevention decision making. Phase 2 was conducted from November to December 2013. The research design selected considered the impracticalities in the clinical setting of typical situation awareness ‘freeze frame’ techniques and sought to minimise disruption to nurses and patients. To ‘get inside’ a situation for a complete understanding of situation awareness complexity, the researcher can prompt participant verbalisation in real time, or with post decision making questioning, using the ‘think aloud’ (TA) technique (Bell & Lyon, 2000; Salmon et al., 2008). TA was considered an alternative method for use in the clinical setting with nurses and adopted for use in this study which aligned with the recommendations of Lundgren-Laine and Salantera (2010).

**Think Aloud Technique**

‘Think aloud’ (TA) is a technique that views the flow of information from a participant’s mind while reasoning. Participants are requested to provide a contemporaneous commentary of what they are thinking whilst undertaking tasks. The technique arises from the information processing model developed by Newell and Simon (1972) and seeks to explore the cognitive processes involved with working memory whilst undertaking tasks (Ericsson & Simon, 1998). Working memory processes long-term and short-term memory. Hence, it has the capacity to simultaneously process visual and verbal data that can be rapidly reorganised for an immediate
response in decision making (Linden, 2007). The recording of concurrent think aloud dialogue captures these cognitive processes through dialogue which can be audio-recorded and analysed.

Since the 1980s, the think aloud technique has been used to elicit nurses’ cognitive processes for decision making (Aitken & Mardegan, 2000). Think aloud was described as the most effective technique to elicit working memory processes used in decision making (Heerkens & Heijden, 2005). The think aloud technique negates problems of collecting data that involves recall, which may be affected by memory failure or enhancement from additional decision making. Additionally, when the method is used in the naturalistic setting, the participant is engaged in a ‘real’ activity, where results are considered to be more reliable than using recall or simulation to gather data (Young, 2005). Think aloud can be used to complement other data collection methods intended to examine other foci of a shared phenomenon (Heerkens & Heijden, 2005).

Using think aloud for data collection can have some limitations. Participant confidence can affect think aloud data collection as there are considerable differences in the ease with which people verbalise their thoughts (Heerkens & Heijden, 2005). The think aloud technique when used in clinical practice, as opposed to simulation, elicits more realistic ‘real life’ data but it is considered more stressful (Fossum, Alexander, Goransson, Ehnfors, & Ehrenberg, 2011). Think aloud commentary has the potential to distract participants and have a negative effect on task performance and cue recognition but there is limited evidence to support this claim (Lundgren-Laine & Salantera, 2010). In one clinical study, it was purported that patient care or work routine can be disrupted (Fonteyn & Fisher, 1995) but as Aitken and Mardegan (2000) pointed out, in that instance participants could not stop think aloud; but where think aloud is practitioner controlled and can be stopped, these concerns are not borne out.
A trial session using a scenario is recommended to ensure that participants are conversant with the technique and not simply ‘talking aloud’ (Hoffman, Aitken, & Duffield, 2009). Practice scenarios may be related to broad, clinical interventions, such as patient admission (Lundgren-Laine & Salantera, 2010), or more commonly, general thought processes such as counting the number of windows at home (Hoffman et al., 2009). Although preparation of participants may be considered labour intensive, it is used to allay participant anxieties related to think aloud and observation (Heerkens & Heijden, 2005).

The time span for data collection using think aloud varies according to the tasks being investigated by the researcher (Lundgren-Laine & Salantera, 2010). Brief prompts should be initiated if participants refrain from think aloud for over a minute (Ericsson & Simon, 1998). However, less strict guidelines maintain dialogue flow and make it more naturalistic in the context of nurses caring for conscious patients (Lundgren-Laine & Salantera, 2010). Nielsen, Clemmensen, and Yssing (2002) advocated speaking reminders quickly followed by probing prompts in naturalistic settings as a more effective way of ‘getting access into what goes on in peoples’ heads’. In practice settings, concurrent think aloud data may have gaps (Aitken & Mardegan, 2000). These occur when participants feel the patient should not hear as it may cause distress or they are uncomfortable verbalising their thoughts at the bedside. Although TA dialogue gathered after the event is considered retrospective, dialogue recorded within five minutes of the event is considered to be concurrent as the focus is still that of working memory (Broom, Capek, Carachi, Akeroyd, & Hilditch, 2011).

The recording of additional, retrospective data, for example from follow-up interviews, occurs in some think aloud studies but not all. Nielsen et al. (2002) suggested that this arises from a common misunderstanding by researchers investigating human factors that one stand-alone
method is insufficient but think aloud is an exception to that rule. Think aloud transcripts generate the most valuable data and, when combined with other retrospective methods, it is difficult to establish when participants are relying on additional non-conscious, memory processes (Heerkens & Heijden, 2005). Undertaking post think aloud interviews is advocated by some researchers but this can involve additional non-conscious, memory processes and produce reflective responses (Heerkens & Heijden, 2005). However, inviting participants to review their transcribed think aloud allows them to clarify their dialogue and assist the researcher’s interpretation, gaining further insight into the data (Young, 2005). Short field notes recorded by the researcher during think aloud can be used to aid contextualisation of the data (Hoppmann, 2009).

**Phase 2 Sample**

In the study, consideration was given to the numbers required for a representative sample. In think aloud studies, sample sizes are typically small and adopt the rule ‘five is enough’ as cognitive processes in ‘like’ groups are considered to deviate minimally (Kaniz & Arisz, 2000). Small samples can elicit major thought processes but larger sample sizes of 10 to 20 may identify minor deviations and yield more stable results (Faulkner, 2003). Although qualitative sample sizes may be considered small it is the intention to yield comprehensive, rich data from a limited number of participants but the sample does need to reflect the number of sites, potential participants and phenomena under investigation (Sandelowski, 1995). The primary aim is to obtain a sample that reveals all the dimensions of the phenomenon under investigation and achieve data saturation (Lundgren-Laine & Salanter, 2010). Studies using TA
with nurses reflected sample numbers ranged from seven in one unit (Aitken, Marshall, Elliott, & McKinley, 2009) to 55 across a number of fields (Lamond, Crowe, & Chase, 1996).

In the study, nurses were recruited at ward meetings where the researcher explained Phase 2 of the study. Nurses from two medical wards and two surgical wards used in Phase 1 agreed to participate. The additional medical ward used in Phase 1 was not included as during the period of data collection it was closed to patient admissions. A convenience sample of nurses were observed using think aloud until data saturation was achieved (medical n= 4, surgical n=3).

**Think Aloud Data Collection**

In the study, nurses participated in a trial think aloud session, in a quiet room adjacent to the ward, prior to data collection. They were familiarised with the recording device and used think aloud to indicate their thought processes when thinking about a scenario based on the windows in their home. During the trial sessions participants were asked to complete a consent form (Appendix 2) after reading the information sheet (Appendix 1) which contained the contact details of the researcher, researcher supervisors and the ethics administrator should the participant have any further questions or concerns. Demographic details (e.g. age, gender, years in practice and experience in different clinical fields) were collected to describe the sample (Appendix 4).

The potential difficulties of sensitive data were discussed with participants. Participants were made aware that in the study they could stop think aloud or observation at any time without repercussions. In such circumstances, audio-recording would be paused and the researcher would ask permission a short time later to capture think aloud. Participants were assured that their audio-recorded think aloud would be confidential, stored securely and deleted once the dialogue
had been transcribed. It was reiterated that they could stop recording at any time, for any reason, and they were free to remove themselves from the study at any time without judgement or penalty. The researcher negotiated with the participant a subsequent morning shift for observation. Each participant was assigned a code number corresponding to the sequence in which they would be observed to protect anonymity. In the study, participants were observed for one weekday, morning shift for consistency.

On the morning of observation, once the participant was aware of his/her patient allocation, the researcher and the nurse introduced themselves to the patients and informed them of the study taking place. Patients and visitors were asked for their permission for the researcher to be present during care interventions as per HREC protocol. They received a verbal explanation of the think aloud process in regard to the constant talking being undertaken by the nurse caring for them. Both patients and participants were able to ask questions or express concerns about think aloud and they could ask for think aloud, recording or researcher observation to be discontinued at any time without repercussions. A lapel microphone was attached to the participant, the nurse was observed recording think aloud and the recording checked for sound quality. As the shift handover was about to commence the researcher introduced herself to the ward team and reiterated the purpose of the observation.

The researcher followed the nurse throughout the shift whilst they undertook their usual duties. Prompts were used to maintain the flow of think aloud when appropriate. In the study, the researcher used the prompts:

‘Please think aloud’

‘Remember to think aloud’
The researcher made brief field notes during the shift for contextualisation of think aloud data. The audio-recording was checked intermittently during the shift to ensure data completeness. In the study, follow-up interviews were considered. The practicalities of conducting follow-up interviews after a morning shift were discussed with participants. Most were unable or unwilling to stay directly after their shift, despite nurse managers agreeing to grant time in lieu. Given that contemporaneous field notes were taken by the researcher during the observation of think aloud it was considered that the study was not compromised by the absence of follow-up interviews. Think aloud data were transcribed verbatim as soon as possible by the researcher. Participants were asked to read their transcript at a later date, and they were invited to add comments or delete text if it did not represent their think aloud correctly and confirm that it was a true account by adding their signature.

**Phase 2 Data Analysis**

Studies using think aloud and/or interview dialogue in clinical settings have shown that different methods can be used for analysis: verbal protocol analysis model (Cioffi & Markham, 1997; Lundgren-Laine & Salantera, 2010); deductive analysis (Fossum et al., 2011); and inductive analysis (Aitken, 2003; Marshall, West, & Aitken, 2013). In the study, a deductive content analysis approach was selected as it enabled theory from another field to be explored and related to the concept of situation awareness by medical/surgical nurses in the clinical setting (Elo & Kyngäs, 2008).
The thematic analysis followed the sequential approach outlined by Braun and Clarke (2006) and was similar to that adopted in Phase 1 of the study. The researcher became immersed in the data by reading and re-reading the think aloud transcripts. The data was coded using category labels as features in the dataset emerged. The coded categories were collated and the relevant data extracts in the form of participant quotes were attached. Reexamination of the categorised data and the field notes to ensure correct contextualisation of participant quotes, allowed the researcher to identify patterns of meaning to create subthemes and form potential themes. The process involved several iterations and revisions until defined themes were identified. An analytic narrative was formed from an integration of themes, with data extracts presented as participant quotes, to reveal the provisional findings prior to the researcher linking the findings to the literature.

**Investigation Rigour**

The quality and robustness of the study was considered using the framework by Whittemore, Chase, and Mandle (2001). In the framework (Whittemore et al., 2001), the term ‘validity’ is used to describe the overarching goal of assuring that qualitative studies maintain research rigour. The criteria are credibility, authenticity, criticality and integrity. Credibility of the data and analysis in the study was established through researcher debriefing sessions with supervisors during the data collection and analysis as advocated by Whittemore et al. (2001). The study outlined and followed a methodology congruent with investigating nursing practice to present an accurate description and interpretation of participant experiences. Participant quotes were used to present data findings which concurred with the recommendations by Sandelowski (1994). Quotes were taken from transcripts that were signed by participants to acknowledge a
true account of their dialogue, a process aligned with the recommendations of Thomas and Magilvy (2011).

The verbatim narrative of the participant experience, in context and with their language, demonstrated authenticity. Criticality was achieved by the researcher as all the decisions related to the research process were outlined then discussed in detail, which concurred with Whittemore et al’s (2001) recommendations. The researcher conducted all of the observations and provided a thorough description of the study methods and procedure to aid transferability to investigations of nurses in other fields of practice. The researcher adopted a reflexive approach to maintain integrity of the analysis. Discussions with the study supervisors and the Director of Research at the study site also enhanced confirmability of the findings. Conducting conference presentations of the work in progress provided the researcher with additional opportunities to consider the study findings based on the input from knowledgeable audiences. Presentation of the findings provided acknowledgement and resonance with audiences that were comprised of nursing academics, educators and clinical practitioners.

**Ethical Considerations**

Formal approval for the study was obtained from the Research Ethics Committees of Queensland Health (HREC/12/QPAH/407) and Griffith University prior to commencement of the study. Issues of data confidentiality and nurse participation were considered during the study. Participants were assured of confidentiality, data were protected by restricting access to participants’ identities though participant coding and names were omitted from transcribed documentation. Participation was free from coercion and nurses could decide not to take part or leave the study at any point. Nurses were required to sign an informed consent form after they
read a participant information sheet. Data storage was in accordance with current research governance guidelines (National Health and Medical Research Council, 2007). All data sources were secured in a locked cupboard within a locked office. All data will be destroyed after five years.

At the time of the observations, patients and/or relatives were asked for verbal assent for the researcher to be present in the room. The potential harm to participants and patients were considered as: perception of loss of privacy; and minimal interruption to care flow and nurse-patient communication due to presence of observer. The researcher respected patient privacy at all times and maintained a professional demeanour wearing Griffith University clinical apparel in practice areas. During observations the researcher did not directly interrupt nurse–patient interactions, waited until interventions were concluded and questioned nurses after they exited the patients’ room/bed space. The potential benefits to participants and patients included: satisfaction that the information gained may improve the care of patients with similar needs; and satisfaction that fundamental nursing interventions (pressure injury prevention and decision making) in medical/surgical wards are valued and worthy of further research.

Summary

The complexity of nurses decision making and the challenges of capturing situation awareness in the clinical context necessitated the use of an interpretive methodology and multiple data collection methods. The study employed qualitative methods in order to identify and describe the concept of situation awareness related to nurses in practice. The use of a single data collection method would have limited the study in that the findings may have been narrow
and unrepresentative. The study required two phases to fulfill the research aims and provide a rich exploration of the concept under examination.

Phase 1 was an interview study undertaken to provide a description of the concept of situation awareness related to decision making by medical/surgical nurses and pressure injury prevention. Thematic analysis involved an inductive approach whereas Phase 2, the TA study, used a deductive approach to analyse the levels of situation awareness and the influences on situation awareness in practice. The findings from Phase 1 and Phase 2 are presented in Chapter 4.
Chapter 4

Findings

This chapter presents a description of the sample and the study findings. Phase 1 findings report on the analysis of the interview data examining nurses’ perspectives on how they made decisions and what they thought influenced their decision making in practice. Phase 2 findings, arising from the analysis of think aloud data captured during observations, explain the levels of situation awareness used by nurses during decision making, including the factors that may have influenced this in practice. The findings include participant quotes which are italicised and attributed to individual participants using P1 (Participant 1), P2 etc. Finally, a synthesis of the findings from both phases is presented.

Phase 1

Twenty five registered nurses (RNs) were interviewed. All were female as no male nurses who were approached consented to be part of this phase of the study. The sample provided substantial breadth as there was a broad range of nurses in terms of age, experience and education. Participants ranged in age from 21-63 years (mean = 36.8, SD 11.5). Their time in practice ranged from 10 months - 35 years (mean = 7.4, SD 8.9) and employment in their current ward setting ranged from 10 months - 6 years (mean = 2.6, SD 1.65). The majority of participants held a bachelor’s level qualification (n=22), with others holding a European diploma (n=1), hospital certificate (n=1) or master’s level clinical qualification (n=1). Many participants had previous experience of working in different fields of nursing and at other facilities (n= 17). In addition, some participants had previously obtained diploma or certificate level qualifications
and gained experience working in nursing or allied healthcare settings prior to qualifying as a RN (n= 8). Because the study used a volunteer sample, the findings may not be representative of all nurses.

**Themes**

The analysis of the interview data revealed three themes that encompassed nurses’ use of situation awareness to inform decision making related to pressure injury prevention. The three were: deciding priorities; gaining new knowledge and skills; and making confident decisions. Each of these themes were comprised of subthemes which were formed from clustered data categories. A summary of themes, subthemes and data categories is presented in Table 5. The findings from each category are presented in the section to follow, with their corresponding subthemes.
Table 5 – Phase 1: Themes, subthemes and data categories

<table>
<thead>
<tr>
<th>Themes</th>
<th>Subthemes</th>
<th>Categories</th>
</tr>
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<tbody>
<tr>
<td>Deciding Priorities</td>
<td>Assessing the patient situation</td>
<td>How nurses assess Information sources and data gathering</td>
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**Theme: Deciding Priorities**

The interview data identified a number of ways in which the participants prioritised decisions for patient care. Responses indicated that gathering data was the most important aspect underpinning decisions about the order of priorities for patient care. Participants described what data was required, how it was acquired and how it was used to assess priorities. Decision priorities and subsequent decision making to prioritise patient care were affected by a number of factors, used in varying degrees and frequently in combination. The nurses described these factors as: assessing the patient situation; assessing pressure injury prevention needs; and assessing the ward situation. For ease of reading, each of these factors is individually explained in the subtheme text below.

**Subtheme: Assessing the Patient Situation**

Most participants identified assessing the patient situation as their starting point for decision making and prioritisation of decisions. The nurses described the need to ‘sight’ the patient during or shortly after handover from nursing staff on the previous shift and indicated that the patient situation assessment at the start of a shift was ‘highly visual’. The visual assessment was used to collect data to identify the current status and acuity level of the patient, with participants describing the patient status by their colour or evidence of pallor.

> “Patient status, I see it when I walk into the room. Like what’s his colour. It’s how they look” (P13)

Participants identified that following their initial visual observations they would physically examine the patient and have a provisional notion of acuity and urgency. Nurses combined visual observations of the patient with other physical examination techniques to check their provisional assessment and to develop greater awareness of the patient’s condition for
decision making. They then systematically sought additional information from clinical
documentation to verify their initial perceptions or provide details to extend or modify their
initial decisions. Systematic processes were identified as some nurses checked charts,
referred to other forms of clinical notes, information from handover, protocols or assessment
tools. The sources accessed most frequently were referred to by nurses as ‘bedside
documentation’ including handover information sheets generated from TREND (Clinical
Information and Nurse Workload Management System), observations and medication charts.
Secondary sources were patient progress notes, risk screening tools, including ADDS (Adult
Deterioration Detection System), Waterlow Scale and falls charts.

The nurses sought further data directly from patients or family members. Verbal information
from the patient was particularly important in assessing levels of pain, comfort and mobility.
They also used patient and family information to determine levels of patient independence,
provide emotional support and individual preferences in an attempt to deliver more holistic
care. The nurses suggested that care plans, or care pathways, were another source of
information. However, these were considered to be of less value and typically referred to at
the start of the shift when they customarily signed the care plans, despite this being in
advance of the care being delivered.

“Finding information, getting information and I’m sort of processing information on
the [bedside charts] physically, but in my mind, I’m putting into place what is a
priority for each patient” (P18)

In the context of assessment, the nurses described processes for developing situation
awareness that went back and forth between visual observation, examination and checking
documentation. These processes were fluid and cyclical in nature rather than linear.
Subtheme: Assessing Pressure Injury Prevention Needs

Participants identified that prioritising decision making for pressure injury prevention was dependent on a number of customary pressure injury prevention assessment practices and factors related to information quality. The nurses appraised pressure injury prevention data, highlighting that the quality of pressure injury prevention data was more widely varied than that used for other clinical decisions, creating a need to make careful judgements of the quality of assessment data available. Handovers were seen as containing inadequate information and verbal information was not always up to date. The documented data available for consideration was frequently inconsistent or deficient. Participants admitted to having a lack of trust in the written information provided by colleagues, leading them to appraise information after seeking clarification and additional clinical data prior to decision making. The nurses attributed the inadequacy of the pressure injury prevention data to other RNs not recording information, yet admitted that they themselves frequently did not record this information either.

“Not saying you don’t trust. You tend to know the staff that you work with constantly but, you know. You don’t actually document” (P17)

The elusiveness of data was highlighted as a particular issue. Recent policy changes had resulted in patients being admitted via the Emergency Department having pressure injury prevention risk assessment (Waterlow Scale) undertaken prior to ward transfer. This admission process was often repeated by ward nurses as they perceived the assessment to be inadequate. Ironically, ward pressure injury prevention assessments were frequently delegated by RNs to subordinates yet the quality of information was seen by some as lacking.
“I have to go back through them [Waterlow assessment] with students, they’re learning, and double ENs, they are filling it out and no-one is following it up. The admission [Emergency Dept. Waterlow assessment], that could be variable between some” (P18)

Some nurses emphasised that the Waterlow assessment should be checked daily but the data it contained was frequently not used to inform subsequent decision making. Others used the Waterlow Scale assessment as a prompt, adding additional data from further assessment strategies in an attempt to increase awareness for decision making and provide more holistic care. Despite the Waterlow Scale documentation having a flow chart, many nurses were still unsure of recommended pressure injury prevention practices, particularly repositioning intervals.

“I’m not sure. Who should be 2 or 4 hourly now?” (P3)

Participants described confusion over, or lack of continuity with, pressure injury prevention interventions as decisions were not always recorded. Some nurses revealed that improved documentation of pressure injury prevention decision making would be beneficial. A number of nurses advocated ‘turn charts’ (patient specific repositioning documentation), stating that they had seen them in a previous workplace but they were not standard practice in the current context. However, all nurses were reticent about more documentation.

“You don’t know when they have last been turned but if there was a chart. Oh, another chart, well there’s a chart for everything else. Do we really need another chart for that too?” (P25)
Participants described a broad and diverse array of information that contributed to pressure injury prevention specific decision making. Many RNs suggested they followed a customary, somewhat arbitrary, pattern of decision making related to repositioning patients for pressure injury prevention. This was based on a combination of various factors including ‘wardie’ (wardsmen – logistics ancillary worker) rounds, the previous nurse’s turn scheduling, changing of incontinence pads, ward routines, intuition, common sense and nurses’ discretion.

Many were unsure of individual patient needs regarding pressure injury prevention which was attributed to both the lack of reliable documentation and verbal information exchanges. Additionally, assessment and pressure injury prevention interventions were reported as being increasingly undertaken by students, enrolled nurses (ENs) or assistants (AINs), who were not responsible for documentation or shift handover.

**Subtheme: Assessing the Ward Situation**

The subtheme assessing the ward situation generated the most data. Participants highlighted that their assessment of the ward situation at the start of the shift was a major factor in predicting potential barriers to their decision making. Over time nurses developed knowledge of what they described as ‘ways of working’ that conformed to the practice ‘norms’ in that setting regarding how the delivery of patient care was managed. Participants described support processes or mechanisms that originated from numerous sources within the workplace but all were seen as having an impact on decision making.

Participants identified operational processes adopted on the ward as influencing their practice approach, or that of other nurses, which made their decision making focus highly task orientated. The task centred approach focused on getting the job done in the most perfunctory and timely manner, preventing nurses from considering additional, or more appropriate
methods, to enhance patient care decision making. When working with ENs, AINs or students, the participants outlined administering medications and patient hygiene needs as priority tasks driving their decision making, but few identified pressure injury prevention. They delegated ‘basic’ nursing care, including pressure injury prevention, to others and reported that their decision making was compromised by stress and fatigue.

“AINs or ENs, it’s their care. When with them you do little but the medications” (P16)

Inadequate staffing levels, multilevel skill mix and heavy workloads affected decision making. Almost all nurses expressed feeling overwhelmed with the number and complexity of clinical decisions. Time pressures led to compromised decision making, care being ‘basic’ or ‘patient safety’ focused and pressure injury prevention was not seen as an essential intervention. However, some participants suggested that compromised decision making was not only the result of being time pressured as it also arose from poor time management, sub-optimal decision making skills of colleagues and concentrating ‘the cares’ into the 9-11am timeframe.

“It’s task by task. Your focus changes to patient safety, the basics, get that done then the rest. You prioritise more acute issues than turns” (P21)

Participants stated that competing priorities, interruptions and a lack of available staff to assist with interventions took them off-task and hampered decision making. Repositioning for pressure injury prevention was the most frequently given example of a delayed or omitted intervention.
“You get caught up. I feel my name is called a thousand times. Lots of multi-tasking. I’m not saying I don’t do it [pressure injury prevention] it’s just late. I aim to get it done, well unless I can’t” (P5)

The provision of pressure relieving equipment, including mattresses, pumps and dressings, was seen as being available most of the time. The nurses identified a recent change impacting on pressure injury prevention decision making had arisen due to the introduction of national standards and potential financial disincentives for the hospital.

“There’re new ‘laws’ for hospital pressure ulcers so there is a lot of awareness now, whereas there wasn’t. It’s the hospital being worried it’s going to be fined” (P25)

Almost all participants believed interpersonal processes influenced the ward culture and their decision making. Good ward leadership was identified as a combined effort by the Nurse Unit Manager (NUM) and senior clinical nurses (CNs). Some nurses were concerned about colleagues not following policy, having a blasé attitude, or a lack of focus on holistic care and patient safety, which caused frustration and fear of litigation for others. In practice, participants rarely communicated these concerns with others and chose silo working rather than working collaboratively with colleagues. An unhelpful, non-supportive or unengaged attitude by colleagues was the greatest challenge. Participants approached senior staff for decision making advice or to report concerns based on their past experience of their reaction, management style and personality.

“Senior nurses, they make comments, so negative. I don’t want, you know, my confidence affecting my decision making. So I just keep away. Keep away” (P24)
Responses indicated that personality traits and characteristics of particular, individual nurses had some bearing on decision making. Participants described characteristics, recognised in themselves or in others, that appeared to demonstrate a different personal or professional orientation to other nurses. This orientation was more holistic, inquiring and assertive. Participants identified decision making deficits in nurses that had a non-enquiring nature, took less ‘risks’ or did not demonstrate stronger opinions.

“No forward thinking, they [other nurses] panic, don’t ask, not game enough to do it. I’m not afraid find out or speak up. That comes from, I don’t know, me!” (P14)

In an attempt to improve decision making, participants checked for changes to prescribed care by initiating communication with other members of the multi-disciplinary team (MDT) but this was often challenging. Pursuing medication orders or retrieving uncommunicated information, particularly from doctors, delayed their decision making. The positive interpersonal skills of MDT professionals were identified as corresponding to particular clinical specialties or teams.

“Doctors from [medical team] easier to run something by them, discuss your decision concerns, they’re very willing. [Other medical team] they’re totally different” (P18)

In summary, the theme of deciding priorities identified that how nurses gathered, appraised and used data to make decisions. Data gathering for pressure injury prevention decision making was highly visual in nature and not always supported by documentation. Participants identified that decision making was increasing and more complex due to a number of operational influences in the work setting. Interpersonal processes were perceived by nurses as highly influential in determining how they made decisions for patient care. Interactions and associated behaviours contributed to the ward culture, with clinical settings having
underlying assumptions, beliefs and expectations that influenced a nurses’ decision making performance.

**Theme: Gaining New Knowledge and Skills**

The participants were asked how they knew how and what decisions to make for pressure injury prevention. This was intended to elicit what constituted knowledge linked to pressure injury prevention, in what way the knowledge was acquired and how this was associated with skill acquisition. The interview analysis identified a number of ways that nurses gained pressure injury prevention knowledge to develop skills and how this influenced how the prioritisation of their decisions. Responses were grouped into two subthemes: Assessing Knowledge Needs Related to pressure injury prevention; and Linking Experience and New Thinking. Participants described self-perceptions of the knowledge required to underpin pressure injury prevention interventions, and how this was acquired, and identified where knowledge deficits may exist. They also described other knowledge or ‘ways of knowing’ that had occurred over time that influenced their decision making for pressure injury prevention. For ease of reading, components of this theme are detailed in the subtheme text below.

**Subtheme: Assessing Knowledge Needs Related to Pressure Injury Prevention**

During the interviews, participants focused on distinct aspects of their knowledge needs related to pressure injury prevention. The foci could be grouped into two categories, Perceiving Own Ability and Acquiring Pressure Injury Prevention Specific Knowledge. The first category, Perceiving Own Ability, grouped responses that indicated nurses’ thoughts about their own underpinning knowledge, and how this supported decision making and perceived capabilities. Participants were reflective, identifying knowledge deficits in
themselves or in colleagues. Acquiring Pressure Injury Prevention Specific Knowledge formed the second category in this subtheme.

Participants highlighted how they had gained knowledge and identified sources of awareness related specifically to pressure injury prevention. Many nurses perceived their ability to have improved through experience. Some responses indicate that decision making ‘gets quicker’ with experience but participants mostly referred to repeated exposure.

“Related to doing interventions more often, over a longer period of time, I think you get good at making decisions in a split second” (P15)

Some nurses acknowledged their own increased ability over time and frequently referred to ways of ‘knowing’ or intuitive decision making. These interviewees identified longer service in nursing roles, but not necessarily as RNs, as contributing to their experience and formation of intuitive senses. Those who had previously worked in another capacity in health care stated emphatically that this previous experience had contributed to their practical capabilities and decision making skills.

“My gut tells me. Of all the times I’ve gone through my gut, it was the right decision” (P17)

The RNs felt knowledgeable about pressure injury prevention on qualification but quickly found their knowledge became obsolete and relied on educational input to update. Pressure injury prevention policy and underpinning evidence was seen as an area of practice that had undergone recent change. The Waterlow Scale assessment tool used in the facility was reported to have additional information, including a flow chart to direct interventions, which was relied on by a number of participants. Despite recognition of this, many nurses seemed unfamiliar with current evidence and practice.
“Originally, yes I think so, but it [pressure injury prevention] has been updated and I haven’t looked at that again yet” (P3)

Participants identified that there was copious information regarding pressure injury prevention. Some participants identified the NUM as key to pressure injury prevention education and instigator of resource materials. Pressure injury prevention specific knowledge was acquired mostly from in-service training sessions. Information was gained from other sources, including policies/protocols, on-line searches, wound care courses, university study, graduate program modules, competencies, books and journals. Posters outlining pressure ulcer staging, dressings and interventions were identified specifically as a ward pressure injury prevention best practice resource for treatment of pressure injuries.

“Posters, current best practice and things, but it’s in-services really, that’s how I know my pressure injury prevention” (P6)

Other nurses were a pressure injury prevention knowledge resource. Participants identified ‘experts’ as the wound nurses, senior/experienced CNs and education staff. Preceptors, peers, students and pressure injury prevention policies were also sources of pressure injury prevention knowledge.

Subtheme: Linking Experience, New and Old Thinking

Participants described how new knowledge and skills linked to their existing knowledge from practice. For some, newly gained knowledge had established new ideas or a mindset that contributed to changing their established practice. The nurses’ descriptions of the link between experience and new ways of thinking could be grouped into two categories, Reflecting on Prior Experience, and Recognising Expertise. The first category, Reflecting on Prior Experience, captured participant perspectives on how previous practice had influenced
their current decision making thinking. The second category, Recognising Expertise, identified participants’ assumptions of what constitutes expert knowledge and skills for pressure injury prevention decision making.

Experience was described as having a strong bearing on their current practice and thinking. Some participants found it difficult to articulate how, why or what experience had a bearing on their current practice. Many reiterated the importance of experience and appeared to use the term interchangeably to equate to years in post or qualified. Many gave examples from previous practice that, when coupled with new learning, gave them a better sense of understanding.

“You’ve heard or seen something happening and it sticks. Without education you might never do it but all of a sudden it comes on like a little light bulb. So I don’t now think it’s [education] a waste. I’d sit there and think ‘God, I’ve done this 20 times’. But now I think yeah!” (P17)

Experience in other facilities and clinical fields was perceived as highly beneficial and these nurses reported having a different outlook. However, it was sometimes difficult to integrate change to improve current practice in the new ward. Participants who had previously been carers, AINs or ENs felt that their pressure injury prevention knowledge and skills were mostly gained during that employment or training.

“In aged care as AIN and EN I learnt my pressure area care. I’ve got a different outlook” (P20)
Some nurses commented that they pressure injury prevention was sometimes perceived as ‘old school’, with RN engagement in ‘basic’ care, which included pressure injury prevention, as being at dated concept.

“I mean, we are going back to pressure area care” (P17)

Expertise was recognised in terms of experience, knowledge and skills. Participants identified nursing expertise in others, particularly CNs, Wound Care Nurses, Clinical Nurse Consultants (CNCs) and NUMs. Participants often referred to the ‘Wound Nurse’ for advice or requested a secondary patient assessment. Some suggested that an over-reliance on specialist wound nurses had occurred resulting in RNs becoming deskillled or lacking initiative with pressure injury prevention decision making. These RNs reportedly undertook less pressure injury prevention assessment and referred directly to the Wound Care Nurse. Conversely, some viewed consultation with seniors to access expertise an important factor and part of their role.

“I’d consult with the wound care nurse, they leave that for the wound nurse. Don’t know what to put on it and it’s get the wound nurse” (P10)

In summary, participants described a synthesis of new knowledge and existing understanding that enhanced their skills for pressure injury prevention decision making and interventions. Some described this synthesis as generating ‘ways of knowing’ or intuition. The nurses acknowledged the plethora of pressure injury prevention learning resources in the work environment but in-service education was the most effective means of knowledge transfer. Exposure to pressure injury prevention practices in different fields of nursing or facilities made them more aware of other or alternative practice approaches. Equally, exposure to pressure injury prevention during previous employment in healthcare roles that
predominantly deliver ‘basic’ patient care, such as carers or AINs, appeared to heighten the importance of pressure injury prevention decision making. The role of specialist nurses was viewed as a source of expertise to assist pressure injury prevention decision making by some but for others it brought about a sense of skill dilution.

**Theme: Making Confident Decisions**

The interview data revealed a number of ways that nurses gained confidence in decision making. The nurses described what and how their confidence affected pressure injury prevention decision making and subsequent pressure injury prevention interventions. Participants revealed what aspects constituted being ‘knowledgeable about pressure injury prevention’ and how this promoted their confidence in decision making, particularly in challenging clinical situations. The analysis identified that knowledge was used operationally as nurses made pressure injury prevention decisions at the bedside and how it assisted with tailoring their decisions to the individual needs of the patient. Responses were grouped into two subthemes: using the knowledge with patients; and making confident pressure injury prevention decisions. For ease of reading, components of this theme are individually explained in the subtheme text below.

**Subtheme: Using Knowledge with Patients**

Participants identified that using their pressure injury prevention knowledge operationally with patients promoted decision making confidence. Integrating new and existing knowledge improved their ability to respond to patient and family needs and facilitated delivery of more holistic patient care. Decision making became more patient-centred as they felt more confident in adapting decisions to accommodate the needs of patients and their family. Increased confidence was identified as assisting decision making in more ‘difficult’ and challenging situations.
Some nurses expressed confidence in decision making that deviated from their conventional, planned patient care. Participants highlighted an increasingly diverse patient population and described how language and cultural needs of patients altered their decision making. A few participants stated that their decision making had become more compassionate in an attempt to provide more holistic care. Knowledge gained from education and caring for patients and families had encouraged them to base decisions on standards of care they would like delivered to their own family. Participants acknowledged that there were instances when care was refused, or more commonly, delivered differently in response to patient or family preferences. However, their aim remained optimal, safe care delivery.

“Sometimes families request for them not to be turned, even though they are a risk. That’s a personal weigh up but in all cases we try to give them the optimum care”

(P11)

Some nurses highlighted that they were confronted with increasingly regular and more ‘difficult’ situations on the ward that impacted on decision making. There was consensus that patient and family behaviour towards nurses was becoming more demanding and aggressive. Although many felt confident in addressing these issues, they were largely managed by appeasing complainants and altering decision making for planned care.

“We have families that are ‘in your face’ all the time. It’s just easier to do what they want. If they want their relative turned every hour then that’s what you do. It stops all their noise” (P24)

Participants emphasised their dissatisfaction with placating ‘difficult’ patients and families. They explained that this took time that often was not warranted and impacted on decision making for other patients and their care. Some stated that decision making for ‘difficult’
patients was often avoided by seniors as they did not have the inclination or assertiveness skills required. This led to them feeling frustrated and unsupported when left to make decisions for these patients.

“They’re big decisions because he’s got a load of [behavioural] issues, other staff avoid this patient. It’s senior staff not having ‘guts’ to sort these issues” (P5)

The majority of participants generally felt confident in making clinical judgments in their current role provided they had sufficient information. Most stated that there were occasional times when they had to seek advice and decision making was more difficult when they were new to the ward area, but gradually their confidence and ability improved. A few admitted not feeling at all confident and they relied on checklists, protocols and supportive colleagues.

“No. More confident with checklists” (P7)

Participants expressed more decision making confidence as they developed assertiveness skills. Instances such as moving facility or changes to the ward specialty challenged decision making skills, requiring up-skilling and caused participants to consciously examine and reflect on their decision making ability.

“Since the ward changed [specialty] CN’s have up-skilled, stronger in our decision skills and saying no for the safety of the patient” (P11)

Subtheme: Making Confident Pressure Injury Prevention Decisions

This subtheme was comprised of responses that indicated nurses’ confidence specifically to pressure injury prevention decision making. They felt that as decision making improved they became more confident, indicating that this made them more comfortable and
assured with their own clinical judgments. Confident decision making led to tailoring decisions to the patient situation by altering their decision making to accommodate changes for patients who were atypical or required an alternative approach. Participants who expressed confidence in decision making conveyed ideas to develop practice strategies to advance future decision making and pressure injury prevention interventions.

The nurses described instances when their decisions for pressure injury prevention needed to take precedence or alter as the patient situation required a deviation from typical practice. This occurred when a patient’s acuity or condition altered, especially in patients who were cognitively impaired or obese. Higher acuity patients took preference for pressure injury prevention. Other patients were prioritised by nurses according to their change in dependency status and mobility capacity.

“The sickest, they’re bed bound so they are high on the list, we’d reposition them first. A patient that needs assistance will be next and independent ones you check later. And a change in the patient’s status also” (P1)

Elderly patients were identified as a high pressure injury prevention priority. Patients with cognitive impairment were identified as requiring additional pressure injury prevention monitoring and decision making was considered to take more time, which had to be factored into nurses’ workloads. A limited number of participants suggested that patient comfort was important when considering decisions for elderly patients. Repositioning adjuncts, such as pillows or air mattresses were often provided earlier for comfort rather than pressure injury prevention or related to the level of pressure injury risk, and these supports were considered an overly cautious measure by some. Participants identified that elderly ward patients, even if considered independent, were sitting for long periods. However, the importance of educating
all patients to encourage independence with pressure injury prevention, especially whilst sitting, was stressed by only a few nurses.

“I encourage independence otherwise they just sit there. A young patient or an older patient, both will receive the same [pressure injury prevention] education. But old ladies sitting out in chairs, not moving for 2 or 3 hours, it’s way too long. I go up and say ‘stand up with me’. Others get them out of bed, shower, then they sit there until lunchtime” (P8)

Many nurses commented on the increasing number of obese and bariatric patients. These patients were reported as presenting challenges for pressure injury prevention decision making in terms of repositioning, equipment, dependency and time. Some participants thought that decision making with bariatric patients was seen as a difficult issue and more likely to be avoided.

“A bariatric patient at the moment who has been on a normal bed for the last three days and no-one has decided to change his bed, he needs one twice the size” (P5)

Some suggested ideas for future practice strategies. They stressed the importance of raising nurse awareness and accountability. Some participants suggested that nurses need to take more responsibility for pressure injury prevention decision making and not become dependent on specialist nurses. Improved communication was seen as important development for handovers, with more informed entries into current documentation and provision of some form of repositioning record such as a ‘turn chart’. Some advocated an increased involvement by RNs in repositioning and a re-emergence of systematic clinical practices that may not be evidenced based but had strong face value, such as the side-back-
side turning regime. Participants highlighted that the ward climate needs to alter to ‘allow’ RNs to concentrate on ‘basic’ patient care.

“I have asked why they don’t have the side-back-side approach. I think it’s something we’re going to have to bring on board because there is a huge need. And a working environment that allows you to spend the time with your patient” (P8)

The need for clinical research surrounding pressure injury prevention was also highlighted as a strategy to influence RN clinical practices. Many participants saw research as a means to highlight the importance of communication with patients and patient education as an important way forward in increasing patient involvement in pressure injury prevention practice.

“Research. It needs to be done, really does need to be done here. You need to get them [nurses] to see, so we can get it right for patients” (P4)

Phase 1 Summary

Participants associated their highly visual patient assessment as the starting point for pressure injury prevention decision making. Most nurses sought additional data from documentation but they often found it failed to provide a further understanding of the patient’s pressure injury prevention needs and instigated a lack of trust in the capabilities of colleagues. pressure injury prevention was not generally perceived as a high priority. Consequently, in busy settings, most nurses made decisions from a task orientated approach that resulted in pressure injury prevention often being delegated, based on routines of others, delayed or omitted. Participants thought decision making was enhanced by strong leadership, nurses with positive attitudinal characteristics and good interpersonal or team dynamics.
Decision making was challenged when nurses worked with unsupportive colleagues or they were taken off-task by interruptions.

The nurses generally assumed their knowledge for decision making was good, enabling them to effectively identify and care for patients at risk of Pressure injuries. The combination of experience and knowledge was purported to make decisions better suited to the holistic needs of the patient and less task orientated. A better understanding of patient needs improved decision making confidence but this was negated when nurses felt unsupported by colleagues during stressful clinical situations, particularly related to ‘difficult’ patient or family behaviours. Many nurses used their knowledge in an attempt to formulate ideas for future practice changes that could lead to improvements in patient care.

This phase of the study provided a better understanding of nurses’ thoughts on their decision making and what influences their decisions in complex ward environments. The findings identified aspects of perception, comprehension and anticipation related to decision making as well as influences that may enhance or detract optimal decision making for pressure injury prevention. The nurses interviewed were made aware of the situation awareness emphasis of the study but few mentioned situation awareness explicitly when describing their decision making. As their interview progressed, some nurses considered their perception related to visually assessing patients. They suggested that the study had made them aware of situation awareness and given them a new and different perspective with which to examine their decision making.

**Phase 2**

The aim of Phase 2 was to examine how medical and surgical nurses used situation awareness for decision making in practice from their explanations whilst undertaking typical duties. The findings of this phase are presented below using a selection of italicised quotes to
illustrate nurses’ use of situation awareness followed by a description of contextual influences on nurses’ thinking for pressure injury prevention decision making. The data were deductively analysed according to the three established levels of situation awareness: Level 1 - perception of cues: Level 2 - comprehension; and Level 3 – projection (Endsley, 1995; Sitterding et al., 2012).

Seven nurses (surgical n = 4, medical n = 3) took part in this phase. Six were female and one was male. One nurse took part in both phases of the study. Participants ranged in age from 24-42 years (mean = 33.7, SD 8.1). Their time in practice ranged from 1-7 years (mean = 3.7, SD 1.9) and employment in their current ward setting ranged from 1– 6 years (mean = 2.7, SD 1.9). All participants held a bachelor’s level qualification (n=7). Two participants had previously worked in different fields of nursing and some had previously gained experience working in nursing or allied healthcare settings prior to qualifying as a RN (n= 3).

**Perception of Cues: Level 1 Situation Awareness**

Level 1 situation awareness was used by all nurses. Analysis revealed that Level 1 situation awareness consisted of nurses gathering cues from their observation of the patient and the patients’ surroundings. At the start of the shift, participants observed patients during the bedside handover and scanned the environment to gather cues they perceived necessary to make an assessment of the patient. Seeing pressure relieving devices in the patient’s bedside environment, whether in-situ or not, prompted nurses to gather more cues. The nurses explained that cue collection initially was highly visual and necessitated the need to be ‘close’ to the patient. Participant dialogue frequently included the phrase ‘I’m looking’:

“I’m looking, to get an idea. Yeah, I’m trying to get an idea, so I know what to look for and work out what to do first for him” (P3)
Participant 3’s quote identified that nurses looked for initial cues then gathered more cues from the patients’ condition to assess the patients’ needs and to aid with the prioritisation of care. For some nurses however, thinking most often centred on gathering cues related to routine medications and hygiene needs at the start of the shift, as these activities represented their main priorities. For many nurses, gathering cues for pressure injury prevention decision making was prioritised lower than these higher priority tasks:

“It’s meds, everything else, hygiene then pressure area care” (P2)

The nurses’ cue gathering involved a number of methods that formed a pattern of data collection. Observation was sometimes followed by physical examination to check for pressure injuries (Pressure injuries) on easily accessible risk areas, such as heels. Examination of less accessible areas, such as the sacrum, occurred later and typically when patients were assisted with hygiene needs. When nurses perceived they needed further pressure injury prevention cues they gathered these in the first instance by asking colleagues who had ‘knowledge’ of the patient or information from the falls risk assessment documentation. Specific pressure injury prevention information contained in documentation, such as risk assessment scales, clinical notes or care plans, were referred to less frequently or later in the shift. Some participants revealed that they did not use documentation to help develop situation awareness, preferring to rely on their visual impression of the patient and perceived records only as a legal imperative:

“I don’t read the nursing notes, well not now. I read them at the end of the shift when I’m going to document” (P1)

The nurses often related cues for pressure injury prevention to the patients’ ability to toilet or wash themselves. Participants’ clinical judgement of the patients’ abilities indicated that they
perceived cues at Level 1 and quickly progressed to Level 2 situation awareness. They used a fluid process of cue recognition, assessing cues and linking their understanding to the meaning of these cues. Because nurses often explained this within the same phrase or sentence, it was sometimes difficult to isolate Level 1 situation awareness as it was not explicitly explained during the think aloud or intertwined with Level 2 and Level 3 situation awareness. The process is exemplified by quotes such as:

“Thinking she’s sitting for most of the time so it’s important to get her up and off it now. That’s so her bottom doesn’t deteriorate” (P2)

**Comprehension: Level 2 Situation Awareness**

The analysis showed that when participants used Level 2 situation awareness they did so to analyse cues to develop understanding and comprehend the significance of their findings to pressure injury risk. Once they had collected cues, they pattern matched data. Pattern matching involved considering the visual cues, physical assessment data and sequence of events on the basis of previous knowledge and expectations, such as linking skin condition with nutrition status, mobility and interventions to alleviate pressure:

“I’m looking. Well, he’s really bony, thin, so I am considering things like that. Like his hip, boney areas like that. He’s got heel protectors. Doesn’t look like he’s been eating” (P5)

Level 2 situation awareness most often occurred during task orientated hygiene interventions later during the shift. When the patient was moving or being repositioned for the purposes of hygiene, toileting or interventions, the nurses checked for skin changes in areas considered at risk of pressure injury. Participants made sense of the physical signs they identified by
attaching significance and reaching an understanding of the situation to inform decision making. Reflection on previous knowledge was also evident in the way they explained their insights into the patient’s condition. Knowledge sources included previous learning and ‘knowledge of the patient’. The following quote exemplifies this type of Level 2 thinking:

“Says she can mobilise but can she? I’m not sure. I’m going to talk to [buddy RN] so I know what’s going on, she looked after her yesterday” (P7)

Analysis revealed that some nurses at times experienced difficulty in developing Level 2 situation awareness. This was demonstrated when they tried to make sense of patient assessment data that did not match a coherent pattern. When the nurses identified cues suggesting an alteration in the patients’ situation they tried to use information from colleagues, doctors or physiotherapists to gain an understanding of why changes had occurred. If this information did not clarify the situation or was unavailable, especially early in the morning, they delayed their decision until later:

“At the moment I can’t make a decision because I don’t know why. I need to wait ‘till the docs come round and physios get on the ward” (P5)

Participants who consistently sought input from other nurses to gain understanding recognised this process of data gathering as a characteristic in themselves and others. Their approach to seeking input relied on their opinion of others in terms of communication style and personality:

[Senior RN asks for pressure injury prevention advice from P6] “Thinking that’s what I like about her. We’re experienced but will always ask someone, give advice
and take it, not that she needed it, she was right anyway. It’s just what you’re like”

(P6)

The nurses’ explanations indicated that they used their assessment findings most often to comprehend the PI risk they associated with the patients’ mobility abilities and falls risk. They reiterated phrases from falls risk charts, such as ‘at risk’ or ‘high risk’, and described the patients’ ability which was explained as a clinical judgement of patients being ‘independent’ or ‘dependent’. Most nurses associated a level of pressure injury prevention or typical pressure area care linked with the independence/dependence mobility and falls risk labels which indicated a degree of comprehension typically associated with Level 2 situation awareness:

“Yeah, he’s high falls. He’s independent, well sort of, but in that pressure area ‘risk’ sort of area. Not that he can’t move but he’s restricted in a way. That’s why it [care plan] has ‘encourage pressure area care’ ” (P5)

Only a few participants verbalised thoughts revealing a comprehensive understanding of the patient’s pressure injury prevention needs and other identified pressure injury risk factors such as nutrition or incontinence. Some nurses thought of pressure injury prevention as a higher priority at the start of the shift. They explained that factoring in pressure injury prevention early on was important and they highlighted the significance of other aspects related to pressure injury prevention, such as managing pain and nutrition. These nurses explained that they thought their process of prioritising was different to that of colleagues, was more holistic and arose from a more positive attitude to pressure injury prevention and less automated thinking:
“It’s about assessing for pain relief and seeing if these guys [patients] can sit up for breakfast. They’re [other nurses] in more of an automatic mode doing medication, getting it done. Well that’s me and my reckoning anyway” (P6)

Anticipating: Level 3 Situation Awareness

The analysis showed that not all nurses anticipated patient needs at a level that would reflect Level 3 situation awareness. However, for some nurses, Level 3 situation awareness was evident, and comprehension of assessment findings was often followed by anticipatory thinking. When nurses used Level 3 situation awareness they did so to anticipate what could happen in the future, what interventions were required and what pressure injury prevention decision they would make:

“Thinking about what I’ve seen so far. Looking ahead. Now I know how I am going to get them moving around” (P6)

Level 3 situation awareness was used by the nurses to make decisions for pressure injury prevention when they anticipated that other health professionals would want to assess the patient and potentially alter treatment:

“I want to prevent any further deterioration. I’m getting a dressing, a temporary one, as the doctors and wound nurse will want to look at it later on” (P7)

A few nurses planned and initiated pressure injury prevention interventions using level 3 situation awareness, but for some participants, thinking was often centered on routine, task orientated, usual interventions and highlighted expected or likely patient outcomes. This was shown in comments such as:
“See he’s a total assist, so I’ll put him for 3 hourly pressure area care, that’s what they have” (P3)

Decision making for patients with complex pressure injury prevention needs prompted many comments about nurses’ use of anticipatory processes. This mostly occurred when nurses encountered pressure injury prevention decision making associated with bariatric patients, patients who did not conform to conventional practices, imposed immobility, such as from orthopaedic casts and family wishes. Some nurses anticipated pressure injury prevention needs for these patient groups, whether they were present on the ward or an expected admission, and they used level 3 situation awareness to form alternative pressure injury prevention strategies tailored their needs:

“He’s a young guy, he’d usually be fully mobile but he’s had arm surgery, thinking about his mobility” (P4)

For other participants, thinking focused on positive patient outcomes, professional practice and the wider aim of involving the patient in their care. These nurses used Level 3 situation awareness to make decisions having considered the use of alternative interventions and having anticipated the need for further information to advance their practice toward more patient centred pressure injury prevention:

“Put them in their own clothes, make them feel they can get up and moving. Thinking of my aims and his dressing on his leg. It’s to make life easier for him and [PIP] easier for us so I’m improvising and using this [alternative equipment]. Informing patients what is going on is so important, so he is aware there is a plan. It [PIP] comes down to our professional practice, national standards and acuity of practice across wards” (P6)
The nurses’ explanations often included aspects that they considered influenced their thinking and decision making. The influences stemmed from interruptions, poor communication, attitudes of colleagues, documentation, skill mix and delegation. Timing of decision making was explained as an issue by some nurses and their comments showed that pressure injury prevention decision making earlier in the shift appeared less stressful. As the shift progressed, most nurses increasingly expressed negative thoughts about their ability to make decisions about pressure injury prevention, with quotes often containing the words ‘frustrated’ or ‘annoyed’. Frequent interruptions disrupted the nurses’ cue seeking and the development of situation awareness. This was particularly evident later during the shift when they had decided to give analgesia prior to further pressure injury prevention assessment and interventions, as interruptions would delay medication administration. Participants expressed their frustration with interruptions taking them off-task, delaying decision making and affecting their ability:

“I’m feeling frustrated, that I’m not getting anywhere. I feel a bit incompetent. I’ve got people constantly interrupting. I can’t think straight but thinking of [pressure injury prevention/patient name] I’ve got to do. I had to call the doctor for the physio and now they have left the ward. Great. Need to do his [analgesia] now, I promised him ages ago but the doctors went off with the chart” (P4)

Colleagues, whether nurses or other health professionals, who were considered poor communicators, hindered the development of situation awareness at all levels:
“He’s [other RN] really annoying. Why do they [patient] need that [PIP intervention]? He always does that, he never asks and he should check. Then we’d know what was going on” (P5)

The analysis showed that the potential reaction of colleagues influenced how nurses sought further information from other nurses to develop situation awareness. Some nurses often sought information verbally and demonstrated development and use of situation awareness at all levels. Other nurses were reluctant, describing feelings of inadequacy or anxiety related to the attitudes of colleagues or fear of their knowledge being assessed:

“I feel a bit, well, scared when she’s [Wound Care Specialist] here. Not bad, like afraid, but a bit nervous. Feels like you are being assessed. Feel I should know more” (P1)

All participants experienced difficulty using documentation when trying to achieve an understanding to assist with pressure injury prevention decision making. The nurses explained that often charts, such as pressure injury prevention risk assessment, were full, out of date, contained a mismatch or absence of information, resulting in feelings of confusion and delayed decision making. Some nurses considered that this arose from students’ documenting and copying previous entries, yet ironically RNs frequently delegated documentation to students. All participants explained that detailed information was needed to inform nurses caring for the patient in the future. However, most were reluctant to update documentation due to the time constraints or perceived it as a task for the ‘last’ or ‘next’ shift. Participants showed in-depth understanding of the importance of documentation, describing it as a legal imperative. Some related their understanding to financial penalties incurred by hospitals if patients developed Pressure injuries. The analysis showed that few participants
used documentation to develop situation awareness and drive pressure injury prevention decision making, as the nurses lacked trust in written information, had little motivation to read it and felt the need to personally assess the patient further to gather cues to develop situation awareness:

“I don’t think this has been filled out properly, they don’t do half the time. That’s so annoying. The night staff should have replaced them [charts], that’s from two days ago. So I still have no idea what [pressure injury prevention] he’s having. These charts are [expletive]. I don’t really get it, it doesn’t say that on there. So I don’t know. People have just copied, so I don’t feel it’s a true indication of what’s going on” (P5)

The nursing team skill-mix also influenced levels of situation awareness. Participants sometimes made decisions using Level 3 situation awareness. However, they acknowledged that they may not have gathered patient cues (i.e. Level 1) to inform Level 2 situation awareness to fully comprehend patient pressure injury prevention needs. This occurred most often when nurses were working with an assistant in nursing (AIN) or students. At the start of the shift nurses decided to delegate pressure injury prevention and concentrate on tasks considered a higher priority. This delegation prevented participants from being ‘close’ to the patient to gain knowledge of the patients’ condition and cues for pressure injury prevention:

“I don’t get to see. Do they have pressure sores? I feel the best person to ask is [AIN name]. Anyone who’s been another priority I get the student” (P1)

Several pressure injury prevention ‘critical incidents’ were reported where participants had made decisions based on limited situation awareness levels or assumed situation awareness gathered vicariously. This typically led to delegation of pressure injury prevention, with less
than optimal outcomes. The nurses became aware of issues later during the shift when AINs reported compromised skin integrity, inability to reposition patients or patient complaints. The following quote illustrates an incident where an AIN reported she was unable to reposition the patient during the shift as delegated, which resulted in the nurse addressing a complaint from the patient and family:

“Just had to get out of there. All I could see were words, like a bit panicked, like big words in my mind, like flashing across. Neglect, negligence, fail. If they [nursing team] were thinking about pressure area care, I’m thinking ‘what have they been thinking?’ It’s not been happening has it? I feel ashamed, I’m thinking how did they miss it, it’s basic stuff, how did I miss it?” (P2)

Nurses expressed thoughts of panic, regret, mistrust of colleagues and fear of litigation when faced with critical incidents. The analysis showed that they immediately sought cues, illustrating Level 1 situation awareness by examining the patient, comprehended their findings at Level 2 and, in some cases, escalated their pressure injury prevention decision making using Level 3 situation awareness. Although critical incidents may be considered an outcome or impact of nurses’ delegation decisions, these incidents demonstrated how situation awareness can be obscured where there is a multilevel skill mix, and underlined the importance of developing situation awareness at Levels 1 and 2 to fully inform nurses’ Level 3 situation awareness for pressure injury prevention decision making.

**Phase 2 Summary**

The participants demonstrated the levels of situation awareness to a large extent but with some constraints related to workplace contextual factors and their own knowledge, experience and expertise. The flow of their thinking followed a fluid pattern of going back
and forth between collected cues and developing understanding. The nurses’ thinking began with cue collection that was highly visual or vicarious, with input from others to form a mental picture of the patient (Level 1 situation awareness). Nurses mostly gathered cues at the bedside and they were most often related to how the patient appeared to move combined with physical signs such as skin condition or body mass. Other cues were collected verbally from colleagues and sometimes from documentation. The nurses often pattern matched cues from all sources, including their prior experience, to provide understanding of the patients’ needs (Level 2 situation awareness) and, in some cases, made decisions for pressure injury prevention by anticipating and planning future interventions (Level 3 situation awareness).

All nurses used Levels 1 and 2 situation awareness for pressure injury prevention decision making but Level 3 was demonstrated to varying degrees. For many, their thinking for pressure injury prevention decision making was most often task orientated and based on expected patient outcomes. However, the nurses used increased levels of situation awareness when patients had deviated from expected outcomes, had more complex or atypical needs or when they were faced with PI ‘incidents’. Nurses who demonstrated Level 3 situation awareness consistently appeared to perceive pressure injury prevention as a higher priority and promote a different thinking perspective which encompassed a ‘bigger picture’ of pressure injury prevention. For many nurses, pressure injury prevention was not regarded as high a priority as other preventative care practices such as ‘falls risk’ that was supported by the documentation that was used by all nurses. However, documentation for pressure injury prevention did not always appear to support the development of situation awareness. It was often disregarded due to inaccuracy yet, ironically, documentation of care at the end of each shift was seen as a legal imperative and a communication means to inform other practitioners.

A number of other factors in the clinical setting also impacted on nurses’ situation awareness. The skill-mix and delegation of pressure injury prevention interventions to AINs or students
often precluded nurses from gathering pertinent assessment cues and information on which to base pressure injury prevention decision making. On occasions, these factors contributed to critical incidents that created an urgent need for nurses to gather pertinent data for situation awareness and escalate decision making. Individual characteristics, interpersonal aspects and communication also had an impact on their ability to develop and use situation awareness.

The analysis revealed that there were some aspects of the conceptual framework (Fig 1) that did not conform in the practice setting. These included finding that nurses made decisions using Level 2 data. Another finding indicated that, not all decision making used Level 3 data. In addition, some environmental factors, such as noise, appeared not to be detrimental to nurses’ situation awareness in the ward environments used in the study. Conversely, some workplace factors particularly team dynamics and patient aspects had more impact on nurses’ situational awareness. These study findings enabled the researcher to reconsider the elements of the model that could provide the basis for future studies across a range of clinical settings.

This phase of the study provided a better understanding of how situation awareness is used by nurses working in complex ward environments. The analysis identified how situation awareness can be developed, the factors that enhance or impede its successful development and how it was used by this group of nurses for pressure injury prevention decision making.

**Synthesis of Phase 1 and Phase 2 Findings**

The findings of both phases were synthesised to provide an integrated interpretation of situation awareness and pressure injury prevention decision making in the clinical setting. The aim of the synthesis was to characterise the relationship between representation (nurses’ views in Phase 1) and reality (nurses’ thoughts while decision making in practice) through the exploration of identified themes (Sandelowski & Barroso, 2003). The synthesis enabled identification of aspects that, when analysed further, highlighted consistencies and
differences in the findings of each phase to produce an integrated summary of both phases. The synthesis findings are presented below.

The samples used in the phases differed. However, the broad range of age, education and experience ensured that variation was captured within the sample.

The synthesis was undertaken to identify shared themes arising from both of the study phases. The synthesis of findings revealed that there were four shared themes across the phases: data gathering; using situation awareness to prioritise decision making; contextual influences on situation awareness in practice; and enacting situation awareness in pressure injury prevention decision making.

The first shared theme, data gathering, was identified as the most important element for decision making. The process of data gathering was initially highly visual in nature in both phases. Phase 1 findings reported a fluid process of systematically reviewing documentation linked to information gained from handover but Phase 2 identified that back and forth processes adopted were largely due to contemporary data unavailability. Consequently, participants demonstrated that a lack of trust in the pressure injury prevention data prevailed and pressure injury prevention decision making was based on information related to mobility, previous knowledge of the patient or customary ‘ways of working’. These approaches enabled nurses’ development of situation awareness at Level 1 and 2 but anticipatory decision making demonstrating Level 3 situation awareness was not always apparent.

The second shared theme related to nurses using situation awareness to prioritise decision making. In both phases, nurses used Level 1 and 2 situation awareness to develop an understanding of the needs of the patient and formed the basis for task prioritisation. Phase 2 demonstrated that pressure injury prevention decision making and interventions were often perceived as a lower priority, not always considered at the start of the shift and an aspect of
patient care that could be delegated. In practice, critical incidents quickly raised situation awareness levels as nurses collected data at Level 1, developed understanding at Level 2 and actioned decisions for future care using Level 3 situation awareness. Nurses who consistently demonstrated Level 3 situation awareness monitored the pressure injury prevention undertaken by others and made more anticipatory decisions during the shift regarding pressure injury prevention.

Contextual influences affecting situation awareness and decision making were reported in both phases. Nurses in Phase 1 described more examples of how interpersonal or team dynamics, and the attitude of colleagues affected their decision making. In Phase 2, team dynamics, individual behaviour of colleagues and the attitude to pressure injury prevention of RNs were reported as affecting pressure injury prevention decision making in practice in some instances, which were also observed by the researcher. It is possible that the researcher presence and the data collection methods may have lessened reporting of ‘sensitive’ interpersonal tensions in the clinical setting. In instances where participants did not pursue data because they anticipated difficult interpersonal interactions, there was no evidence that all levels of situation awareness were used. In these cases, information was not shared and nurses worked without seeking further situation awareness or assistance to develop situation awareness. Where colleagues were considered supportive nurses gathered more and detailed information to develop Level 2 and 3 situation awareness.

In both phases ‘busyness’ was related to low skill mix and high workload. RNs reported that decision making was more difficult, frequent and complex and they were less aware of what was going on when they were buddied with non-RNs in the team. Interruptions in practice occurred frequently, distracting and taking participants off-task, compromising situation awareness and necessitating nurses to re-evaluate patient data to update their understanding prior to making subsequent decisions. These disruptions had a cumulative effect during the
shift as the nurses’ situation awareness became more obscured and often resulted in delayed or omitted decision making for interventions associated with pressure injury prevention such as administering analgesia prior to pressure injury prevention or repositioning patients.

The nurses used situation awareness to enact decisions. Combined with knowledge, the nurses used situation awareness to plan and initiate pressure injury prevention interventions tailored to the needs of the patient. For some nurses this enhanced their decision making confidence and assisted with more difficult and complex situations. For others, difficult situations resulted in situation awareness being developed to Level 2 but avoidance strategies or a lack of support from seniors prevented development of Level 3 situation awareness.

Personal characteristics were also seen as affecting situation awareness development. The findings from the two study phases identified that situation awareness was not pervasive and most nurses consistently demonstrated Levels 1 & 2 but not always Level 3.
Chapter 5

Discussion

This study explored the use of situation awareness by medical/surgical nurses when making decisions about pressure injury prevention. This chapter discusses the significance of the findings from themes arising from both of the study phases and the four shared themes in the synthesis of findings, which were data gathering; using situation awareness to prioritise decision making; contextual influences on situation awareness in practice; and enacting situation awareness in pressure injury prevention decision making. The findings are presented and discussed in relation to the research questions, the conceptual framework and contemporary literature on situation awareness and pressure injury prevention. The contribution of this research to the body of knowledge on situation awareness is made explicit and the strengths and limitations of the study are outlined. Finally, the implications and recommendations for practice, education and future research are presented.

This thesis presents the first known study examining situation awareness in the context of pressure injury prevention decision making by medical/surgical nurses in practice. As the existing evidence exploring situation awareness has been largely undertaken in a simulated setting, the strength of this research lies in the empirical examination of situation awareness used by nurses in the clinical environment. The recommendations from simulated studies suggested that future research should be undertaken in clinical practice as contextual, environmental factors are undoubtedly significant but cannot be identified in the laboratory setting (Cooper et al., 2010; McKenna et al., 2014; S. Wright & Fallacaro, 2011). By exploring situation awareness in clinical practice, this study provided an understanding of the contextual influences impacting on situation awareness by nurses.
The conceptual framework (Stubbings et al., 2012) outlined nurses’ situation awareness for decision making in a sequence of incremental levels (Endsley, 1995) and identified potential influencing factors that could affect situation awareness development in the clinical environment. The influencing factors highlighted in the framework were drawn from the critical appraisal of the situation awareness literature, identifying the possible aspects impacting on nurses’ situation awareness in busy, complex clinical settings. These aspects included environmental factors, such as time pressure, issues associated with clinical equipment and noise levels; clinical system capacity factors related to workload or flow, physical stressors, the dynamics of interpersonal and interprofessional working and leadership/management approaches; and aspects related to the individual nurse, such as their abilities associated with decision making and personal factors. The inclusion of these aspects within the framework proved useful to the analysis, enabling the exploration of situation awareness as a complex clinical phenomenon related to nurses and their decision making practice within the real life setting. The pressure injury prevention emphasis provided a focus with which to examine situation awareness as pressure injury prevention decision making lies mostly within the domain of the nurse.

**Nurses’ Use of Situation Awareness**

The first research question explored the use of situation awareness by nurses in medical and surgical wards in the context of decision making for pressure injury prevention. The use of situation awareness by nurses was identified throughout the study and spanned all four themes arising from the synthesis of findings. However, the data gathering theme presented many of the rich, in-depth insights into the use of nurses’ situation awareness. Situation awareness was used by all nurses to inform their decision making, but to varying degrees, congruent with findings from other studies (Sitterding et al., 2012; Tower &
Chaboyer, 2013; S. Wright & Fallacaro, 2011). The data gathering theme revealed that participants perceived and collected environmental data cues and those associated with the patient’s status, which were ‘highly visual’. This form of data gathering allows nurses to pattern match data cues in an attempt to mentally visualise the situation and inform their decision making (Tower & Chaboyer, 2013). Through visualisation nurses achieve a sense of ‘what is going on’ (Salmon et al., 2009) and form a starting point from which deeper levels of situation awareness for assessment can be developed (Tower & Chaboyer, 2013).

The data gathering theme findings concur with findings from some decision making studies. There are many previous decision making studies identifying that nurses use a variety of processes to gather data but three emphasise that visualising is most significant in providing data for decision making (Cioffi, 2001, 2012; Currey, Browne, & Botti, 2006). In these studies visualising was identified as a typical aspect of decision making as nurses gathered data from seeing physical patient cues (Cioffi, 2001, 2012) or as they sought to integrate oral with observable data cues after handover (Currey et al., 2006). Although these studies did not examine situation awareness, they suggest that visualisation by nurses is highly subjective and individual abilities determine how accurately visualised data is transferred into optimal decision making (Cioffi, 2001, 2012).

Nurses sought to systematically collect data to inform situation awareness by using a fluid process of going back and forth between different data sources, using a similar approach to that identified in a nursing situation awareness study (Tower & Chaboyer, 2013). The cyclical nature of data collection has been associated with nurses’ use of a cognitive continuum for decision making (Hamm, 1988). Other research that showed the use of a cognitive continuum for decision making, suggested that the use of the systematic approaches for data collection in practice, such as the nursing process stages, is an additional method of improving decisions by nurses (Dowding & Thompson, 2004; Tower & Chaboyer, 2013).
Other researchers however, found that although cyclical data collection could instigate a review of decision hypotheses to improve decision making, the nurses in their study were not as revisionist as nursing process scholars suggested (Rashotte & Carnevale, 2004). Cyclical data collection has the potential to provide nurses with more, contemporary information on which to base their decision making. However, in clinical practice, Phase 2 participants in the current study did not always use all current information available to inform situation awareness, even though they seemed to use a cyclical process. They gathered data from documentation, colleagues and family members less often than the nurses reported to the researcher in Phase 1 of the study. Some of the participants described their data gathering as unsystematic or disorganised that, on occasions, resulted in them missing data components that could have contributed to situation awareness. To some extent, this finding concurs with Sitterding et al. (2012), where disorganised data gathering by nurses resulted in omission of the most recent data to inform situation awareness.

Sitterding et al. (2012) attributed disorganised data collection to environmental influences, such as workflow interruptions, but how and why data selection was approached by nurses was unexplored. The findings of the current study indicated that participants were selective, judging data quality and choosing to omit or select data sources based on their previous experiences or individual preferences. This new finding identified that many nurses were sceptical about documentation as a reliable data source for situation awareness for pressure injury prevention decision making.

Poor documentation has been linked to sub-optimal pressure injury prevention interventions (De Laat et al., 2006; Elliott, 2010) and compromised quality of care and patient safety concerns (Prideaux, 2011). The impact for nursing team dynamics related to situation awareness for decision making has not been investigated. The findings from this study indicated that poor documentation instilled in individual nurses a mistrust of colleagues. Poor
documentation made nurses doubt the abilities of their colleagues in terms of time management, multitasking, level of engagement and ultimately the quality of pressure injury prevention they delivered to patients. A climate of mistrust has implications for situation awareness and decision making by nurses and other members of the multidisciplinary team. Mistrust mitigates collaborative working, and creates a perception of suboptimal care delivery by nurses (Sommerfeldt, 2013) that could exclude nurses from vital, shared situation awareness and decision making with other professionals.

Many participants selected data based on their expectation of what sources would contain the data required and they were quite deliberate in making choices about the most appropriate sources for data they needed. Nurses in practice are often mindful of the fact that information is not always available or communicated, so they sense cues and process data in a tactical manner as they anticipate data may be missing (Miller & Sanderson, 2005). This tactical data collection approach may demonstrate situation awareness for some anticipatory decision making, but is almost always limited to decisions for immediate interventions or those to be delivered during their shift (Miller & Sanderson, 2005). In the current study, participants demonstrated this approach by selecting data sources where they expected to find information for immediate decisions and did not often seek data relating to projected patient needs such as those required to influence care on subsequent shifts. As a result, nurses may have difficulty perceiving their decision making as part of a ‘bigger picture’ or use situation awareness to project decision making. As was the case in Miller and Sanderson’s (2005) study, nurses sometimes had a restricted global view for future decision making as opposed to doctors who had greater access to patient care information. A restricted global awareness could also limit other members of the multidisciplinary team, such as physiotherapists, that make independent clinical decisions for their remit of patient care (Miller & Sanderson, 2005). However, nurses appear to be more hesitant to rely on their situation awareness, perhaps due to a more
restrictive model of care that prevents them being able to act on their awareness. This is somewhat ironic given the contention that pressure injury prevention lies within the nursing domain.

Nurses’ use of tactical data gathering for situation awareness could have the causal effect of compromising anticipatory pressure injury prevention decision making. A lack of anticipatory decision making was a significant finding as it addressed the gap in evidence between participants’ use of situation awareness and optimal pressure injury prevention decision making in practice. This new evidence was considered alongside studies examining pressure injury prevention quality improvement initiatives studies where it was reported that nurses continued to use limited data for decision making, seldom considered future care needs and provided sub-optimal pressure injury prevention (Elliott, 2010; Gunningberg & Stotts, 2008). When these findings are examined in light of those from this research project, it would appear to indicate that situation awareness by nurses remained underdeveloped.

As reflected in the theme prioritising care, participants selected data sources on the basis of what they needed to know to form an initial patient assessment to give them a notion of urgency and prioritise care. Pressure injury prevention decision making and associated interventions such as continence care and good nutrition were often not considered as a high priority. The prioritisation of pressure injury prevention decisions in comparison to those made for other nursing care interventions has not been explicitly or comprehensively explored previously. Quality of care and decision making clinical studies have indicated that a hierarchy of priorities exists, with medication administration by nurses considered the highest priority (Aiken, Sloane, Bruyneel, Van den Heede, & Sermeus, 2013; Ball, Murrells, Rafferty, Morrow, & Griffiths, 2014; Milton-Wildey & O'Brien, 2010). However, pressure injury prevention as a specific care entity is not distinguished in these studies, but incorporated into ‘basic’ care that includes patient ambulation, nutrition/fluids and continence
care. Despite the fact that these are vital components of pressure injury prevention, they have been considered the least important priorities of RNs (Aiken et al., 2013; Ball et al., 2014; Milton-Wildey & O'Brien, 2010).

Studies exploring the adequacy of pressure injury prevention in terms of patient repositioning and the use of appropriate pressure relieving devices found that nurses chose to prioritise and undertake other duties rather than attending to required pressure injury prevention interventions (Elliott, 2010; Vanderwee, Clark, et al., 2007). Researchers who have studied pressure injury prevention and other areas of essential care have found that the quality of decision making and delivery of care requires comprehensive awareness of the situation (Aiken et al., 2013; Ball et al., 2014; Elliott, 2010; Milton-Wildey & O'Brien, 2010; Vanderwee, Clark, et al., 2007). This broad perspective is vital for nurses to perceive pressure injury prevention as a higher decision making priority and accept the responsibility of delivering high quality, appropriate care.

A limited perception of the ‘bigger picture’ and the focus on decisions related to ward routine could have concentrated nurses’ use of situation awareness on single tasks, particularly medication administration. Hospital routine is an important factor in establishing how ward nurses work, providing a structure for the patients’ day and logistically necessary for services such as catering (Rytterström, Unosson, & Arman, 2011). At the start of the shift or at scheduled times, nurses may be aware of the need for other interventions but ward routine or habit sees them develop a rather narrow focus on routine tasks (Rytterström et al., 2011). In the study, the nurses reported that they were highly task driven. Their focus on customary task driven practices governed by routine resulted in some decisions being made with limited situation awareness that encompassed many aspects of patient care.
The impact of limited situation awareness for decision making has been reported in other studies exploring situation awareness in a number of healthcare disciplines (Cooper et al., 2010; Cornell et al., 2014; Dekker, 2011; Singh et al., 2012; Singh et al., 2006). The consequences of less developed situation awareness have serious ramifications for patient care including inappropriate decisions (Cooper et al., 2010), where nurses miss obvious high risk warning signs (Singh et al., 2012) and a heightened risk of decision making error (Dekker, 2011). Appropriate decision making to meet pressure injury prevention needs is essential and the drive to ensure quality decision making can be attributed to the individual nurse or specific ward areas. Individuals or wards identified as having a strong pressure injury prevention commitment provided more appropriate decision making and considered preventative measures more often than those with a lesser engagement (Beeckman et al., 2011; Cho, Park, & Chung, 2011; Lahmann et al., 2012; Tannen et al., 2008). The theme of enacting situation awareness for pressure injury prevention decision making in the current study yielded similar findings but additionally found that the participant situation awareness focus was for decisions associated primarily with patient repositioning or the treatment of existing pressure injuries. To provide a more proactive, preventative emphasis nurses need to enhance situation awareness associated with all the care elements related to pressure injury prevention. Enthusing nurses to become more engaged and insightful is vital for a stronger preventative emphasis for decision making as individual nurse commitment highly determines the quality of preventative care delivered and reduces Pressure injuries (Beeckman et al., 2011; Cho, Park, & Chung, 2011; Lahmann et al., 2012; Tannen et al., 2008).
Levels of Situation Awareness

The second research question examined the levels of situation awareness used by nurses whilst making pressure injury prevention decisions for medical/surgical patients. The levels of situation awareness used by nurses were identified in all four of the themes that emerged from the synthesis of Phase 1 and 2 findings. The study identified that all nurses used situation awareness and typically in the incremental sequence outlined in the conceptual framework. There was more consistency at Levels 1 and 2 with Level 3 situation awareness not pervasive. Although other researchers have identified that nurses use all levels of situation awareness (Sitterding et al., 2012; Tower & Chaboyer, 2013; S. Wright & Fallacaro, 2011), the relevance of inconsistent Level 3 situation awareness for decision making for pressure injury prevention had not previously been examined. In the current study, inconsistent situation awareness at Level 3 led to decision making that was mostly based on routine or expected care and limited pressure injury prevention being tailored to the individual needs of the patient.

Nurses in the practice setting have been found to demonstrate varying levels of situation awareness (Sitterding et al., 2012; Tower & Chaboyer, 2013). Similarly, participants in the study used varying levels of situation awareness but at times they did not perceive and integrate all available environmental data to increase their global understanding of the situation and develop higher levels of situation awareness. This important finding endorses evidence from simulation studies where student nurses’ situation awareness was found to be limited due to a lack of global environmental data inclusion (Cooper et al., 2010; McKenna et al., 2014). The finding is important as it suggests that superficial decision making can occur if situation awareness is compromised by omitting important environmental data for decision making in practice.
To understand patient needs nurses have been found to use perception, comprehension and anticipating reflecting sequential Level 1, 2 and 3 situation awareness (Sitterding et al., 2012; Tower & Chaboyer, 2013). However, in the current study the nurses did not always use Level 3 situation awareness. They indicated that their decision making did not always anticipate pressure injury prevention interventions that could impact on the quality and delivery of future care. At times, participants appeared to rapidly process or omit data for Level 2 situation awareness to make decisions. In effect, this demonstrated that sometimes the nurses bypassed some of the sequential levels of situation awareness (Endsley, 1995) that were outlined in a linear fashion in the conceptual framework. The conceptual framework was helpful in including the levels of situation awareness and elements for the assessment of situation awareness that were congruent with the literature. However, in practice, nurses used a cyclical process that was more varied than the conceptual framework described. They went back and forth to access data, were highly visual and thought things through, considering the nuances of practice and aspects such as mistrust associated with information impacting upon their situation awareness.

Anticipatory decision making using Level 3 situation awareness sometimes occurred when nurses assumed or vicariously gathered situation awareness at Levels 1 and 2. Assumed or vicarious data gathering is a ‘cognitive miser’ behaviour that occurs under stress, time pressure or for other reasons associated with inattention (S. Taylor & Fiske, 1978). The findings demonstrated that nurses exhibited cognitive miser behaviours similar to those described in other occupational situation awareness studies where decision making based on assumed data can omit vital situation awareness components at Level 1 and 2 (Singh et al., 2012; S. Taylor & Fiske, 1978). Frequently, nurses’ decision making using Level 3 situation awareness was linked to routine, conventional practices or expected outcomes and, at times, they described this as an automated process which is included in the conceptual framework.
This automated behaviour indicated that nurses’ thinking could omit important elements of perception and understanding, which according to other situation awareness research could increase the likelihood of decision making error in practice (Sitterding et al., 2012).

The outcomes of some decisions based on limited situation awareness levels or assumed situation awareness gathered vicariously can manifest in practice on occasions as ‘critical incidents’ (Singh et al., 2012). When faced with critical incidents such as the consequences of inappropriate or missed care, the study participants exhibited similar reactions to those reported in occupational situation awareness studies including panic reactions (Gawron, 2008) and bewilderment at missing warning signals, which indicated their lack of awareness prior to the incident (Singh et al., 2012). In addition, participants expressed guilt, regret, frustration with colleagues and fear of litigation, which are reactions that have been reported by nurses after critical incidents (de Boer, van Rikxoort, Bakker, & Smit, 2014). However, not all of these reactions have been previously been reported in occupational situation awareness studies (Gawron, 2008; Singh et al., 2012). Although unfortunate, critical incidents lead to an urgent need for practitioners to increase data gathering for Levels 1 and 2 situation awareness and in the process they develop greater perception and understanding for anticipatory decision making using Level 3 situation awareness (Singh et al., 2012).

Given the number of participant comments regarding the importance of individual characteristics in positively influencing decision making it is possible that higher levels of situation awareness could be attributed to specific personal traits. The scope of the study did not facilitate further exploration of how the individual characteristics of nurses impact on situation awareness in practice. However, evidence from simulation studies of nurses’ situation awareness that indicated individual personality attributes were associated with development of situation awareness and improved decision making as these nurses were
considered to be more perceptive and anticipatory thinkers (Cooper et al., 2010; McKenna et al., 2014; S. Wright & Fallacaro, 2011).

The conceptual framework indicated that an individuals’ knowledge was an influencing factor and participants drew on their existing knowledge to develop situation awareness and enact their decisions. Simulated studies with students found no correlation between knowledge and situation awareness (McKenna et al., 2014) or that situation awareness remained poor in those with good knowledge as it was not applied and appropriate decisions were not operationalised (Cooper et al., 2010). However, in a study in practice, RNs knowledge application was an important factor in heightened levels of situation awareness (Sitterding et al., 2012). The current study identified heightened levels of situation awareness occurred with nurses’ application of knowledge to enhance their understanding for Level 2 situation awareness, and assisted with Level 3 situation awareness development for complex decision making. In addition, heightened situation awareness appeared to make nurses more confident in their decision making abilities. The cause and effect relationship of confidence and situation awareness was not precisely determined but it is possible that confidence is an important precursor or prerequisite to situation awareness for decision making.

**Influences on Situation Awareness**

The final research question explored the influences on medical/surgical nurse’s use of situation awareness whilst making pressure injury prevention decisions. The synthesised theme identifying contextual influences on situation awareness in practice provided many of the findings related to this research question. The findings indicated that the influences in the clinical environment were of major importance and highlighted the effects of the interpersonal and environmental aspects as outlined in the conceptual framework. These findings highlighted that the conceptual framework used was appropriate in that it included
the environmental, individual and clinical system capacity factors in the area under investigation.

Situation awareness was affected by interpersonal dynamics as nurses often avoided seeking information or advice from colleagues based on past experience of negative behaviours. This finding has not been reported by other researchers, perhaps due to the paucity of clinical studies focusing on nurses’ situation awareness, but it is congruent with evidence from studies investigating situation awareness in healthcare teams or in other occupational settings (Mitchell et al., 2013; Yule et al., 2008). However, the findings concur with a decision making study where nurses consistently sought assistance from colleagues who they trusted, yet they were reticent to seek information from those they considered unsupportive (Gazarian, Henneman, & Chandler, 2010). Situation awareness by nurses was obscured by the negative behaviours of colleagues, particularly those in senior roles. This finding concurs with those identified in studies examining situation awareness as a non-technical skill in healthcare teams, where situation awareness was obscured in individuals who experienced domineering, aggressive or unhelpful responses from others whilst trying to work collaboratively (Guimond et al., 2009; Mitchell et al., 2013; Yule et al., 2008). The current study presents new evidence, indicating that the doctor – nurse and nurse – nurse interactions are equally affected by negative behaviours that can negate situation awareness. This new evidence revealed negative effects on situation awareness by dominant, over assertive behaviour or poor communication by other multidisciplinary team members but also indicated that more commonly challenging nurse-nurse behaviours affected interactions and situation awareness development.

Participants managed interpersonal tensions in different ways, with those describing themselves as more assertive having less detrimental effects on their situation awareness. However, for many nurses intraprofessional tensions can lead to ‘tunneling’ of their thinking.
(Endsley et al., 2003; Miller & Situation awarenessnderson, 2005). With tunneled thinking nurses ‘lock in’, whereby they concentrate on fewer decisions, communicate less effectively and reduce their ability to scan for environmental changes (Sitterding et al., 2012). These negative responses have implications for ward nurses and situation awareness as they can become reluctant to seek information, ask for assistance or report discrepancies. Conversely, working with helpful colleagues and in a supportive clinical climate can enhance situation awareness (Mitchell et al., 2013).

Participants identified that strong leadership by the NUM and CNs coordinating the shift was the most important factor in ensuring a supportive ward climate. The conceptual framework identified that leadership qualities were closely aligned with good management skills. Participants noted the importance of both leadership and management skills to support decision making that are as essential for senior nurses coordinating shifts as they are in individual nurses managing patient care workloads. Strong nurse leadership in the clinical setting is important in creating and supporting a management ethos that enhances the delivery of patient care (Tomey, 2009).

When enacted, leadership that is focused on people and building optimal working relationships produces a quality work environment for increasingly busy and stretched nursing workforces (Wong & Cummings, 2007). These researchers indicated that nurse leaders influence optimal working relationships. Leadership also plays an important role in improving the non-technical skills of staff working in the environment (Tomey, 2009; Wong & Cummings, 2007). Although not explicitly identified as situation awareness, the changes required to optimise working relationships could be construed as heightened situation awareness and improved communication, similar to those advocated in other healthcare studies (Mitchell et al., 2013; NHS Education for Scotland & University of Aberdeen, 2010; Yule et al., 2008). These improvements would create a nursing environment with a more
holistic approach to decision making, less task focus, enhanced nursing care performance and improved patient care outcomes (Brady-Germain & Cummings, 2010; Cummings, 2011).

The attitudes of individuals were influential in a number of ways and participants with a positive attitude towards pressure injury prevention engaged in more appropriate decision making and interventions tailored to the patient’s pressure injury prevention needs. Although previous research has identified some significance between nurse attitude and positive pressure injury prevention patient outcomes, these studies did not investigate why and how this occurred (Beeckman et al., 2011; Tannen et al., 2008). The current study findings identified that positive attitudes to pressure injury prevention led nurses to question preventative practices and increased information sharing to improve situation awareness for more anticipatory decision making. Those with positive attitudes anticipated the need for pain relief, the importance of nutrition and perceived pressure injury prevention as a high care priority. As a result, decision making for appropriate preventative measures and interventions occurred for pressure injury prevention aspects that have previously been found to be typically overlooked in practice, including repositioning seated patients and appropriate use of pressure relieving devices (Beeckman et al., 2011; Vanderwee, Clark, et al., 2007). Nurses who identified a more positive attitude had a more holistic approach to pressure injury prevention management, promoted patient involvement in their care and monitored preventative interventions undertaken by other staff.

The attitudes and behaviour of patients and families had a bearing on nurses’ situation awareness and decision making. Situation awareness levels were compromised when participants encountered patient non-compliance, or challenging or aggressive behaviour from patients or families. Such behaviour is reported as increasing in acute care settings, with nurses often making decisions to avoid or minimise their interaction with these individuals (Zampieron, Galeazzo, Turra, & Buja, 2010). Avoidance strategies by nurses limit data
collection for comprehensive patient assessment and their ongoing care needs (Miksanek, 2008). A consequence of avoidance strategies is reduced nurses' situation awareness levels (Sitterding et al., 2012). The current study revealed more in-depth findings related to difficult encounters and nurses situation awareness. Situation awareness levels during difficult encounters with patients or families were compromised but this was not limited to decision making associated with just the care of those individuals. Development of situation awareness for decision making for patients in the same bay and adjacent locations, sometimes for their entire shift, was also disrupted. Participants felt that their optimal decision making was negated in these situations, which is an aspect reported in a healthcare study where colleagues seldom supported the decisions of others or chose to appease complainants during difficult situations (Miksanek, 2008).

Besides interpersonal issues, there were several influences on nurses’ situation awareness related to the practice environment. In practice, situation awareness for decision making was influenced by the ward skill mix. A less than optimal skill mix occurred when the proportion of RNs on the shift decreased and were substituted by ENs or AINs. When RNs work in nursing teams with a multilevel skill mix they frequently delegate pressure injury prevention interventions to ENs, AINs or students (Hinno, Partanen, & Vehviläinen-Julkunen, 2012). Subsequently, little development of situation awareness for pressure injury prevention decision making occurs as nurses are time pressured and busy undertaking other duties away from the patient. High activity and reliance on a skill mix which is comprised of few RNs increases nurses workload (Ball et al., 2014) and often pressure injury prevention becomes relegated to a non-essential task that can be undertaken by unqualified staff, often delayed and not adhering to contemporary policy (H. Lee, Blegen, & Harrington, 2013). Although the study by Lee et al. (2013) was undertaken in nursing homes, similar findings related to acute care ward skill mix have been reported in international studies (Aiken et al., 2013; Hinno et
al., 2012; Papastavrou, Andreou, & Efstathiou, 2014). Busy RNs working with multilevel staff are more likely to decide to omit basic care interventions associated with pressure injury prevention (Ball et al., 2014), ration basic care during busy periods (Papastavrou et al., 2014) or assume that care has been undertaken by unqualified staff (Hinno et al., 2012). These conditions heighten the risk of pressure injuries (Beeckman et al., 2011; Elliott, 2010; Haller, 2011). Pressure ulcer development is more likely to occur as a result of omitted interventions or poor quality care delivered by non-RNs in settings with higher levels of unqualified staff (H. Lee et al., 2013). These issues are compounded by inadequate supervision of AINs working in nursing teams and the difficulties associated with unqualified staff following best practice as communicated by RNs (Potter, Deshields, & Kuhrik, 2010).

High activity levels and a limited number of RNs meant that nurses were more frequently interrupted when trying to gather data for situation awareness or deliver pressure injury prevention interventions. Although the detrimental effects of interruptions to workflow have been identified in patient safety studies (Hopkinson & Jennings, 2013; Jones, 2009), the study’s findings demonstrated new and pertinent evidence. Interruptions became more frequent as the shift progressed, with nurses becoming increasingly frustrated which disrupted their thinking, memory and workflow, reducing the development of situation awareness and limiting access to patients for pressure injury prevention interventions. The cumulative effects of frustration led to physical stressors such as stress and fatigue presenting later during the shift which compounded in further reducing the nurses’ abilities to develop situation awareness.

In practice, interruptions are often important for the exchange of vital, timely information essential for patient care decision making; thus disruptions should not always be construed as having a detrimental effect (Hopkinson & Jennings, 2013; Sørensen & Brahe, 2014). However, researchers investigating practice interruptions noted that nurses’ frustration
stemmed from annoyance associated their own perceived inability to effectively manage unnecessary disruption (Sørensen & Brahe, 2014). The interruption study did not refer to situation awareness but it reported that disruptions confront nurses with a dilemma between being accessible to others and remaining focused in order to ‘see the big picture’ (Sørensen & Brahe, 2014). Such distraction from the ‘big picture’ has implications for situation awareness and could be construed as compromising situation awareness in practice. However, some individuals exhibited personal characteristics that limited the effects of interruptions and they were able to sustain a clear and objective focus (Sørensen & Brahe, 2014). The conceptual framework illustrates all of these elements that in isolation or in combination reflected the pressures on situation awareness development in the clinical setting.

Participants who described themselves as having a holistic orientation to patient care identified that colleagues did not always verbally articulate pressure injury prevention strategies in a detailed or clear way. The use of colloquial phrases rendered precise pressure injury prevention patient needs or interventions open to different interpretations and therefore did not facilitate the development of situation awareness. Differences in articulation and the use of esoteric language used by healthcare practitioners impacts on situation awareness (Miller & Sanderson, 2005). The use of language to effectively relay verbal data for situation awareness differs between professional groups, is culturally bound and is largely the product of healthcare professional training (Miller & Sanderson, 2005). Doctors were found to use a greater array of language codes and units than nurses when verbalising aspects of patient care and consequently their situation awareness for decision making was more evident (Miller & Sanderson, 2005). This use of language suggests that professional culture influences situation awareness and has implications for decision making related to patient care delivery.

In the study, language in pressure injury prevention associated documentation typically contained unspecific, customary statements, such as ‘care attended’, and an absence of
clarity. Suboptimal articulation by nurses can lead to reduced situation awareness (Tower & Chaboyer, 2013), power differentials and miscommunication between professionals making care decisions for the patient (Sommerfeldt, 2013). All participants expressed a desire for more specific care detail and uncomplicated paperwork to guide pressure injury prevention practice by assisting with decision making to produce clear pressure injury prevention nursing objectives so they could follow contemporary policy. However, nurses may consider more detailed entries by others essential to gain insight into patient care but they seldom improve written documentation individually as they consider it onerous and time restricting (Traynor, Boland, & Buus, 2010). This is a major point arising from the study and one that highlights the recommendations of other researchers regarding the need for better pressure injury prevention documentation strategies (Elliott, 2010; Gunningberg & Stotts, 2008).

Participants associated policy changes with more, tedious paperwork, with the nurses focusing negatively on the top down, punitive nature of ‘fining’ hospitals for poor pressure injury prevention performance rather than perceiving changes as an opportunity to refocus care and improve pressure injury prevention for patients. In contrast, they highlighted the effectiveness and ease with which the falls risk policy and simplified documentation had been incorporated into practice. Although situation awareness studies have indicated that uncomplicated documentation in the form of algorithms or checklists is not the panacea for increasing all aspects of situation awareness, it does focus decision making, provide a more accurate record of undertaken interventions and can improve safety outcomes (Flin et al., 2008; Hughes, 2013).

In summary, the conceptual framework provided a robust structure with which to examine situation awareness by nurses in the clinical setting. The medical/surgical ward context of the research confirmed the credibility of the framework. Some aspects, such as noise and equipment were not major features in affecting situation awareness in these areas but they
were acknowledged by some nurses as a disruptive aspect. The research findings complemented many findings from other studies but more importantly it presented new evidence that can be used to improve situation awareness, decision making and pressure injury prevention by nurses and ultimately outcomes for patients. These new findings addressed some of the gaps in existing evidence and accurately identified the use of situation awareness by nurses in the reality of the practice setting.

**Study Strengths and Limitations**

The study findings answered the research questions and contributed to the existing knowledge and understanding of situation awareness by nurses. In this section, the study strengths, along with the limitations, are explored.

The research used the conceptual framework developed from a review of the literature (Stubbings et al., 2012). The framework demonstrated that it was applicable for use with the qualitative methods selected in the study to explore a complex clinical concept within the clinical setting. This was the first study that has explored the use of situation awareness by nurses in relation to pressure injury prevention decision making and examined the influencing factors in the context of medical/surgical environments. In doing so, this research has addressed some of the recommendations for future research, gaps in understanding and questions posed by other situation awareness researchers (Cooper et al., 2010; McKenna et al., 2014; S. Wright & Fallacaro, 2011).

This study contributes to the existing knowledge and understanding of situation awareness. The detailed exploration added new insights into how nurses use situation awareness in terms of their perception, comprehension and anticipation for clinical care decisions and how situation awareness may be compromised by influences in the work setting. This is a
sensitive clinical issue that may impact on decision making for optimal patient care for pressure injury prevention, patient outcomes and care quality.

The use of interviews and ta yielded an in-depth understanding of the concept of situation awareness in practice, illustrating the value of using interviews and ta as research methods in the clinical environment. Nurses caring for patients at risk of pressure injuries were interviewed and/or recorded whilst making clinical decisions for pressure injury prevention. The merit of this strategy was that nurses with a direct patient care remit were the most appropriate individuals to access a correct description of the how situation awareness was used for decision making and to identify what influenced situation awareness in practice.

The research was undertaken at one hospital site which could be considered a limitation as only the practices in that organisation are reflected in the study. However, qualitative research aims for conceptual understanding not generalisability. A limitation of undertaking the research in the medical / surgical setting is that the wards were extremely busy. Phase 1 interviews were limited to 25 minutes maximum, undertaken when there was staff capacity for participants to handover their workload and at less busy times agreed by the shift coordinator. For participants who may have felt time pressured, very busy or stressed during the shift this may have impacted on the data quality as the information recorded by participants may not have been as in-depth or detailed as it could have been. Yet there was depth to the data.

Interruptions to think aloud and the recording of think aloud as soon as practically possible after suspended taping could be seen as a limitation. Arguably, think aloud data could have been lost, contaminated by subsequent decision making or affected by memory but in the study, measures were taken and outlined in Chapter 3 to limit this occurring. The inability to capture all think aloud whilst nurses are busy in practice and the lack of follow up interviews
could have limited the data collected. However, follow up interviews would have collected retrospective data, contaminated by reflective thinking, recall and memory. To minimise these data collection limitations, field notes were taken by the researcher and participants reviewed their transcripts after being invited to make additions or omissions to ensure correct, completeness of data capture. All participants in each phase agreed their transcripts and none requested changes to be made.

Limitations of the research were minimised by the clear chain of evidence as outlined in Chapter 3 that included detailed research questions and precise rationale for the study design, sampling, data collection and data analysis techniques used. All aspects of the study were overseen by two very experienced research supervisors to ensure study robustness and minimise limitations. Despite the limitations described above, this study has contributed to the body of knowledge on the concept of SITUATION AWARENESS in the context of nurses’ decision making for pressure injury prevention in the medical/surgical environment. This study revealed that situation awareness is an essential aspect for optimal pressure injury prevention decision making that is often challenged in practice. The research raised some important aspects that would benefit from further investigation. The aspects raised provide a foundation for the following section, which presents the recommendations for practice, education, and research that have emerged from this study.

**Recommendations for Clinical Practice**

The importance of situation awareness for safe and efficient decision making by nurses has been highlighted by this study. Healthcare providers who are implementing the National Standards for Pressure Injury Prevention (Australian Commission on Safety and Quality in Health Care, 2010) and contemporary pressure injury prevention guidelines (Australian Wound Management Association, 2012) should consider how situation awareness
Improving situation awareness by nurses for pressure injury prevention in practice is dependent on behavioural change and an attitudinal shift in the clinical environment. Achieving change in behaviour is both challenging and complex but it is key to the success of practice improvement strategies for better quality patient care and outcomes. There are a variety of team building approaches that focus on developing non-technical skills including situation awareness.

To address these issues it is recommended that:

- Implementation of strategies that promote situation awareness such as TeamSTEPPS (Guimond et al., 2009) across all acute care facilities.

The study findings suggest that those who manage nurses need to be aware of the importance of situation awareness and understand the environmental influences that impact on situation awareness from the perspectives of the individual, ward climate and nurses as multidisciplinary team members. The importance of strong leadership and management skills by NUM and CNs coordinating shifts were revealed in the findings as key to promoting a ward climate conducive to situation awareness development.

To address these issues it is recommended that:

- Healthcare provider investment in leadership and management development activities for ward RNs, with the focus being on skill development and the ability to operationalise these in practice. This could be achieved by widening participation for all RNs in the leadership and management initiatives generally accessible to NUMs in each State health service (Health Workforce Australia, 2012).
● Strong leadership and management skills should be key criteria for appointing and assessing the performance of ward NUMs and CNs.

Those who lead nursing teams need to minimise ward nurses’ negative experiences and promote situation awareness development. Policy implementers need to continue to explore strategies and develop solutions to maximise nurses’ situation awareness for pressure injury prevention prioritisation and interventions. It is clear that nurses perceive current pressure injury prevention documentation systems in a negative light and this may explain why these systems were not effectively utilised in practice by this group of nurses. They were sceptical of pressure injury prevention policy and protocol changes as this typically entailed more paperwork yet recognised that the changes had little effect on improving their practice or patient outcomes.

To address these issues it is recommended that:

● Healthcare providers actively promote collaborative working, a supportive, ‘just’ culture and create a climate that prioritises essential patient care and safety. This could be achieved with the introduction of a team work program, such as STEPPS, that has been successfully implemented in South Australia (Stead et al., 2009).

● Pressure injury prevention protocol implementation considers a more pragmatic approach with a strong rationale for the change in practice.

● Current pressure injury prevention documentation is replaced with a clear reporting system, similar to the falls risk limitation system, which is used by nurses, evaluated as effective, non-repetitious and has improved patient outcomes (Peel, Travers, Bell, & Smith, 2010).
• Provision is made for pressure injury prevention documentation to be accessible at the bedside on acute wards and easily understood by all multilevel staff.

The changing composition of the skill mix within nursing teams is a challenging reality in practice. In the study, nurses often experienced difficulties when working in teams with less nurses and more unqualified staff. The deployment of ENs and AINs could be approached differently to improve care outcomes and reduce working pressures on nurses. The nurses in the study were working with sub-ordinate staff who were mainly deployed from a central nurse pool that comprised of ENs and AINs who did not consistently work on the same ward and had varying pressure injury prevention skills. As acknowledged in the literature, fostering an inclusive approach at ward level for peripatetic AINs develops their pressure injury prevention knowledge and skills, enhances communication with nursing staff and improves pressure injury prevention outcomes for patients (Elliott, 2010).

To address these issues it is recommended that:

• A deployment system is introduced where ENs and AINs are allocated a ‘home’ ward or a base in one unit to provide more continuity for both staff and patients.
• AINs are included in the verbal handover at the start of each shift.
• The healthcare facility provides AINs with updates on pressure injury prevention and the formation of competencies to be achieved during annual, mandatory manual handling assessments.

Nurses need to have more engagement with pressure injury prevention and different approaches to managing pressure injury prevention care delivery need to be developed by nurses as the configuration of nursing teams evolves (Haller, 2011).
These issues could be addressed by:

- An increased focus by nurses on pressure injury prevention as ‘essential’ nursing care rather than perceiving pressure injury prevention as a ‘basic’ task that can be typically delegated. Given that there is a national standard for pressure injury prevention, many states are developing such a focus on pressure injury prevention as an essential care element. This could be achieved with State wide initiatives similar to those successfully implemented to refocus and improve the care of patients with increased falls risk, with the responsibility and measurement of improvements led by NUMs at ward level (Queensland Health Patient Safety Unit, 2012b).

- Nurses improving their supervision skills to more effectively support those to whom they have delegated pressure injury prevention to ensure that care is delivered appropriately by others. This could be achieved through clinical supervision, role play and action plans overseen by nurse managers and similar to the strategies advocated in guidelines for remote nurse practitioners managing peripatetic, multilevel nursing teams (Queensland Nursing and Midwifery Office, 2013).

Assertiveness skills by nurses are an important aspect when considering the development of situation awareness. Nurses frequently had their work flow interrupted, often to relay important information, but commonly to assist other members of the multidisciplinary team with their non-nursing tasks. Refusing requests is challenging, with nurses seen as uncooperative or confrontational by multidisciplinary team members, and other nurses who are insufficiently assertive to support their nursing colleagues (Guimond et al., 2009). It has been acknowledged in both situation awareness literature and nursing studies that contributory factors for this disruptive behaviour stem from the hierarchical and dominant nature of some groups within the occupational setting (Dekker, 2011; Hopkinson & Jennings, 2013; Miller & Sanderson, 2005; Mitchell et al., 2011).
To address these issues it is recommended that:

- Ward climates are created that are equitable and value the views of all staff to minimise interruptions and maximise situation awareness. This can be achieved through interprofessional situation awareness training initiatives at ward level (Miller & Sanderson, 2005), multidisciplinary team ward rounds (Cornell et al., 2011) or the introduction of locally agreed interprofessional standards for communication behaviours, decision aids and shared checklists (Mitchell et al., 2013).

- The healthcare facility values, supports and promotes assertiveness skills for nurses. This could be achieved with the introduction of a quality assurance framework which includes communication and assertiveness training for nurses at ward level, for example CAPS (P. Lee, Allen, & Daly, 2012).

A consistent approach to addressing the pressure injury prevention needs of patients in ‘difficult’ situations is required. Rather than nurses avoiding these issues and obscuring their situation awareness for decision making, support in the ward setting is needed.

To address these issues it is recommended that:

- The healthcare provider, nursing colleagues and the multidisciplinary team use a consistent approach to effectively manage difficult situations in practice. This could be established by adhering to existing policy, where it exists, to establish a collaborative approach (Mksanek, 2008). Alternatively, guidelines could be developed for acute care wards using the learning and expertise of those who have successfully implemented similar policy changes in mental health and community nursing settings derived from the National Standards of Care (Queensland Health, 2012).
• Nurses actively encourage involvement of the patient and the family in pressure injury prevention care to promote more responsibility and understanding (Frojd, Swenne, Rubertsson, Gunningberg, & Wadensten, 2011).

**Recommendations for Future Research**

Research exploring situation awareness by nurses is gradually starting to emerge. However, there still remains a lack of understanding of situation awareness in practice and how this might differ across the many fields of nursing. The findings from this study identified that many nurses did not consistently develop and use situation awareness. Obscured or omitted situation awareness for decision making was typically the result of aspects related to nurse characteristics or environmental barriers and these findings are similar to those from simulation studies indicating that personality traits and cognitive ability are related to situation awareness use (Cooper et al., 2010; S. Wright & Fallacaro, 2011). It has been argued that personality traits are difficult to modify and improved selection of nursing students is required to recruit those with ‘desirable’ traits (S. Wright & Fallacaro, 2011). However, professional socialisation and standards for clinical performance have been used successfully to modify challenging behaviours in practice associated with personality traits (Mitchell et al., 2013; Singh et al., 2006).

To provide a comprehensive understanding of SA it is recommended that:

• Researchers develop accurate and valid instruments to measure situation awareness by nurses and influencing factors in practice.

• Future research explores the significance of individual characteristics as a predictor of situation awareness in practice.
The research findings indicated that nurses used avoidance strategies and ‘tunneled’ their thinking (Miller & Sanderson, 2005) which obscured situation awareness. This behaviour occurred because they were fearful of others’ reactions and being considered uncooperative or confrontational. There is a lack of understanding of how this situation awareness masking is borne out in practice and if nurses were more assertive it is unknown whether the barriers to situation awareness development created by others’ behaviour would still remain.

It is recommended that:

- Future research explores the perceptions, values and beliefs underpinning intraprofessional interactions in the ward environment. Although a plethora of health intraprofessional communication and interaction studies exist (Delunas & Rouse, 2014) further research is needed to fully understand these perspectives on situation awareness by nurses.

- Further research is needed to better understand intraprofessional interactions and optimal, collaborative practice. Although interprofessional research has identified obstacles in practice, such as confrontational communication between professional groups (Thistlethwaite, Jackson, & Moran, 2013), how this could be overcome and the significance for situation awareness by nurses are still to be explored.

- Where non-technical skills initiatives have been introduced, evaluative research is needed to assess the efficacy of these interventions in improving situation awareness by nurses, in reducing the environmental influences that prevent situation awareness development and improving outcomes of care.

The success of new policy and reporting systems is dependent on how they are transferred into improved practice by nurses. The study identified that attitudes and behaviours were challenging aspects to effective situation awareness development for pressure injury.
prevention decision making and indicated that best practice guidelines are not always fully integrated into ward nurses’ practice.

It is recommended that:

- Future research is undertaken to explore the policy changes that influence the provision of pressure injury prevention in practice.
- Deviations from best practice in pressure injury prevention can increase the risk of pressure injuries for patients. This risk suggests a need for further research to understand how ward nurses’ situation awareness can foster integration of standards of care and the policies that inform these standards.

**Recommendations for Education**

The study identified that situation awareness by nurses was at times undeveloped and consequently not used effectively for decision making. The concept of situation awareness was unfamiliar to participants until they were exposed to it by the researcher. Situation awareness improves when nurses are educated to increase their knowledge of what situation awareness is and how it is developed (Fore & Sculli, 2013). The study findings indicated that nurses in practice reported in-service education as the most preferable and effective method of learning.

It is recommended that:

- Nursing curricula should include knowledge of situation awareness.
- Situation awareness should be integral to all clinical education programs that are offered at orientation, as part of on-going courses or mandatory updates.
- All educational activities should include knowledge of the subject at hand, for example wound care, and the application of situation awareness so nurses can
recognise, develop and use situation awareness for decision making to deliver appropriate and safe care to patients.

Despite mandatory updates on pressure injury prevention some nurses remained unsure of current best practice and therefore were reluctant to document their practice. This finding indicates that ward nurses may not have the contemporary knowledge or skills to care for patients at risk of pressure injuries and may lack knowledge and understanding regarding documentation. As the study findings indicated, hospital provided pressure injury prevention education often centred on treatment of existing pressure injuries rather than holistic prevention.

It is recommended that:

- Continuing education providers examine the aims and content of pressure injury prevention programs to ensure that pressure injury prevention is the focus.
- Hospital and university educators need to consider the content, learning objectives and assessment strategies to ensure that situation awareness and decision making are appropriately incorporated into programs and curricula.

It is recommended that:

- Situation awareness is considered as an important inclusion in undergraduate programs, where practice can be perfected by using patient scenarios in a safe, simulated environment to improve decision making confidence.

**Concluding Statement**

This research aimed to create an in-depth understanding of the use of situation awareness in the context of medical/surgical nurses pressure injury prevention decision
making. It was anticipated that the study would contribute to the existing knowledge and understanding of situation awareness by nurses in clinical practice. This was the first known study to explore situation awareness in the context of pressure injury prevention decision making and use a conceptual framework specifically designed to examine nurses’ situation awareness in practice. By interviewing, using ta and observing nurses in practice, it was possible to develop new insights into nurses’ thinking as they made clinical decisions for patients at risk of pressure injuries. These insights provided a unique perspective and a basis for the in-depth examination of nurses’ situation awareness use in practice. The study demonstrated that nurses’ situation awareness was influenced by the complexities of the clinical environment as well as their individual abilities and characteristics.

The study findings indicated that nurses used all three levels of situation awareness as described in the conceptual framework but to varying degrees. Not all nurses developed anticipatory, Level 3 situation awareness. Participants sometimes collected data vicariously, they were deliberately selective and tactical, and at times deviated from the pattern outlined in the conceptual framework. They were often reluctant to use documentation or consult colleagues to heighten awareness because they lacked trust or anticipated interpersonal conflict. It also appears that confidence for decision making and situation awareness was negated when nurses felt unsupported and unable to assert themselves in difficult situations. In the study, recommendations were presented to address these issues in practice.

The research findings identified that when situation awareness is underdeveloped or not utilised it can contribute to suboptimal decision making and this was evidenced in practice by critical incidents with negative patient care outcomes. These are important findings as previous research has not explored these effects in relation to the use of situation awareness by nurses for decision making in practice. The thesis presented recommendations to address
deficits in situation awareness that can be proactively undertaken by practitioners, researchers and educators to improve decision making and ultimately the care delivered to patients.

In conclusion, using situation awareness for decision making in clinical practice is complex and challenging. As acute ward patient demography increases in age, acuity and obesity, pressure injury prevention needs will become more complex and demand greater, effective pressure injury prevention decision making by nurses. It is vital that situation awareness and pressure injury prevention are focused, high priorities for practitioners, researchers and educators. Greater situation awareness and anticipatory decision making is needed to integrate best practice guidelines into everyday clinical practice. By ensuring that decision making for pressure injury prevention is based on sound situation awareness, integrated in to practice and used by all healthcare staff it will create a safer and more comfortable hospital stay for patients.
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Merlin, T., Weston, A., & Tooher, R. (2009). Extending an evidence hierarchy to include topics other than treatment: revising the Australian 'levels of evidence'. *BMC Medical Research Methodology, 9*, 34.


Appendix 1: Research Study Information Sheet

Project Title: Understanding the contribution of situation awareness to decision making in nursing practice

Investigators: Liz Stubbings, Lecturer and PhD researcher (Griffith University)
Professor Anne McMurray (Griffith University)
Professor Wendy Chaboyer (Griffith University)

Contact Person: Liz Stubbings

Address: SONM, Logan Campus, Griffith University, Queensland 4131

Phone Number: (04) 88770263 Email: l.stubbings@griffith.edu.au

You are invited to participate in this important project, which is described below.

Background to the study:
Situation Awareness is the level of awareness a practitioner has of a situation in a complex environment, it is the level of insight into ‘what is going on’ and informs decision making. Research from other professions has indicated that situation awareness can be obscured in busy, complex work settings, affecting a practitioner decision making and subsequent actions. Many contributory factors have been identified including fatigue, stress, information quality, interruptions and time pressures. Additionally, human factors in the work place, such as interpersonal behaviours or team dynamics, are thought to be influential. The significance of these aspects is yet to be determined in medical and surgical ward nurses.

Aim of the Study:
The aim of this study is to gain a better understanding of situation awareness in decision making by nurses related to patient care interventions.
What participation involves:
You are being invited to participate because your routine clinical practice involves making decisions about clinical interventions for patients. The data will be collected in your normal clinical work setting and will involve the one or both of the following methods:

a) Informal interview 20-30 minutes (about your perceptions of your role in making decisions about clinical interventions. This will be audio-recorded).

b) Observation of routine clinical nursing practice while you ‘think aloud’ (you audio-recording your thoughts aloud whilst undertaking your usual practice in the presence of the researcher).

All participants will be asked to complete a short demographic questionnaire.

What you will be asked to do:
Interviews will be a maximum of 30 minutes in duration. The interviews will be semi-structured, with the following examples of questions acting as prompts:

• From your perspective, how are decisions on clinical nursing care made?
• Are there any factors that limit the decisions you make?
• What information do you need to know before you make a decision related to particular patient care interventions (examples will be posed)?

Observation of practice will be for one shift. You will be required to:

• Attend a trial session to familiarise yourself with ‘thinking aloud’ in practice
• Wear a lapel microphone to record your thoughts whilst caring for patients in the presence of the researcher

Confidentiality:
All information that is gathered during the interview will be treated in a confidential manner and your name will be changed to a coded number to ensure anonymity. The code will be kept in a separate file from the data. The tape will be destroyed following written transcript. All information will be kept in a locked cabinet in the Research Centre for Clinical Practice Innovation at Griffith University. Confidentiality will be maintained at all times. The research
report will use code numbers and report aggregated data, to ensure that individuals cannot be identified.

**Consent to participate:**
Participation in this study is voluntary, so while we would appreciate your taking part in this study, we respect your right to choose not to participate. There will be no consequences to you if you choose not to participate, and this will not affect your employment at the hospital or any future relationship you might have with Griffith University. If you decide to participate and then later want to withdraw from the research, you may do so without the need to provide an explanation.

**The possible benefits:**
Although taking part in the research may have no immediate advantages for you, the findings will provide valuable information that will contribute to the development of evidence-based guidelines related to nurse education, ward management and clinical nursing practices.

**The possible risks:**
There are no significant risks anticipated from taking part in this study. However, if you find that the interview or observation of practice is compromising in any way you can ask us to stop at any point.

**Questions:**
If you have any questions, or would like to discuss this study, the researchers would be happy to talk with you. We will be bringing a summary of the study findings to your clinical area but we will not be able to identify individuals so individual feedback will not be possible. You are also welcome to discuss any issues relating to the results.

**Contacts:**
If you have any queries about any aspect of this study, or any concerns about the conduct of the study, please contact Professor Anne McMurray. School of Nursing and Midwifery, Griffith University, telephone (07) 55528759.

or
If you prefer, you may contact Griffith University Human Research Ethics Committee Manager, Dr Gary Allen, Research Ethics, Gold Coast campus, Room 3.55 Science, Engineering and Architecture (G39), Griffith Parklands Drive, Gold Coast campus, QLD 4222, telephone (07) 5552 7226, Email: research-ethics@griffith.edu.au or
HREC Co-ordinator, Metro South Health Service District Human Research Ethics Committee, Centres for Health Research, Level 2 Building 35, Princess Alexandra Hospital, Ipswich Road, Woolloongabba, Qld 4102, telephone: (07) 3176 7672

The research team would like to thank you for your participation in this project.
Appendix 2: Participant Consent Form

METRO SOUTH HEALTH SERVICE- LOGAN HOSPITAL & GRIFFITH UNIVERSITY
CONSENT FORM FOR RESEARCH STUDIES

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Understanding the contribution of situation awareness to decision making in nursing practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigators</td>
<td>Liz Stubbings, RN, MA, RNT</td>
</tr>
<tr>
<td></td>
<td>Emeritus Professor Anne McMurray, PhD RN FRCNA</td>
</tr>
<tr>
<td></td>
<td>Professor Wendy Chaboyer PhD RN MN (Research)</td>
</tr>
<tr>
<td>Address</td>
<td>Griffith University, University Dr, Meadowbrook, QLD 4131</td>
</tr>
<tr>
<td>Phone Number</td>
<td>33821062</td>
</tr>
</tbody>
</table>

You are invited to participate in the research project titled ‘Understanding the contribution of situation awareness to decision making in nursing practice’. This research project will form part my PhD thesis being undertaken in the School of Nursing and Midwifery at Griffith University.

**Background to the study**

The aim of this study is to gain a better understanding of decision making by nurses in relation to patient care interventions. I will collect information from you in your clinical work setting. This will involve the following:

- A brief demographic questionnaire.
- Semi-structured, informal interview 30 minutes maximum (about your perceptions of your role in making decisions about clinical interventions).
- Observation of routine clinical nursing practice (the researcher observing you, making notes and asking questions about your thoughts related to clinical interventions).
Data management
I expect the analysis of data gathered from the study will allow us to better understand the factors involved nurse decision making in patient care interventions.

All information collected from you will remain confidential. There will be no identifying material on the any of the data collection tools (tape recorder or electronic forms). During the data collection and data entry periods all data will be stored in a locked filing cabinet, in a locked office, within a locked building in the School of Nursing and Midwifery, Griffith University. Data entered into computer files will be stored in secure computers and password protected. At the completion of the required information storage period, all information will be destroyed.

There are minimal risks associated with this project but if you feel uncomfortable in the study I assure you that your privacy and wishes are paramount and you are able to withdraw your consent at any time. Prior to the study I encourage you to contact myself or academic supervisor to address any questions you may have.

Consent
I acknowledge that I have read the above statement that explains the purpose, the method of data collection and the possible risks of the investigation, and the statement has been explained to me to my satisfaction. Before signing this document I have been given the opportunity to ask questions relating to any possible harm I might suffer as a result of my participation, and I have received satisfactory answers. I have also been informed that I may not receive any benefits from participating in this study.

I acknowledge I have been provided with a written Participant Information Sheet outlining the purpose, risks, benefits and anticipated outcomes of this study.

My decision whether or not to participate will not prejudice my future relations with the Metro South District Health Service or Griffith University. If I decide to participate, I am free to withdraw my consent and to discontinue participation at any time without prejudice.

I acknowledge I am able to choose to participate in phase one of the study (interview), without agreeing to participate in phase three of the study (observation of clinical practice).
I agree that research data gathered from the results of this study may be published provided my name is not used.

...........  ................................................................

Date        Signature of Participant

I have fully explained to the participant (Code number) ........................................ the nature and purpose of the study and the procedures to be employed as described above and such risks as are involved in their performance, and I have provided the participant with a copy of a written Participant Information Sheet.

...........  ................................................................

Date        Signature of Investigator

This study has been approved by the relevant ethics and research governance panels. In the event that you have any further queries in relation to any aspect of this study or any other matter related to the study or should you wish to speak to someone during the conduct of the study, the person to contact is Professor Anne McMurray, Griffith University, Gold Coast campus, QLD 4222, telephone (07) 5552 8759.

or

Griffith University Human Research Ethics Committee Manager, Dr Gary Allen, Research Ethics, Gold Coast campus, Room 3.55 Science, Engineering and Architecture (G39), Griffith Parklands Drive, Gold Coast campus, QLD 4222, telephone (07) 5552 7226, Email: research-ethics@griffith.edu.au

or

HREC Co-ordinator, Metro South Health Service District Human Research Ethics Committee, Centres for Health Research, Level 2 Building 35, Princess Alexandra Hospital, Ipswich Road, Woolloongabba, Qld 4102, telephone: (07) 3176 7672

Thank you for participating in this study.

Liz Stubbings
Appendix 3: Phase 1 Interview Questions

Interview Questions

Thinking about what you do during your usual shift:

1. Can you tell me a bit about the clinical decisions you make that are related to patient care interventions?
2. Are there strategies you use? (Further probe: Perhaps to decide about why, how or the timing of interventions?)
3. What do you consider before deciding on a particular intervention?
4. How do you make sure you have the information you need when you’re making clinical decisions?
5. Are there any particular sources of knowledge you use in making decisions?
6. Do you usually feel certain you have sufficient knowledge to make the decision?
7. Are there any particular strategies you use in making decisions about clinical issues? (Further probe: such as pressure injury prevention for instance?)
8. What would be the basis of your decisions to choose one or another approach? (Further probe: Let’s say using pressure injury prevention as an example)
9. Are there any factors that you feel help you make decisions for patient care?
10. Do you think there are any factors that limit making decisions for patient care?
Appendix 4: Demographics Questionnaire

WARD NURSES’ CLINICAL DECISION MAKING

QUESTIONNAIRE

Thank you for your co-operation and participation in this study. This questionnaire is concerned with your characteristics as a ward nurse. Please follow the instructions associated with each question.

Participant code:
Please circle as appropriate or write down your answer to record your response.

1. What is your age group?
   <24 years
   25-34 years
   35-44 years
   45-54 years
   55-65 years

2. What is your gender?
   Male
   Female

3. In what year did you first qualify as a registered nurse?
   (Please specify)

4. Where did you undertake your initial nurse education?
   (Please specify city/country)

5. What general nurse qualifications do you have? (Circle all that apply)
   Hospital Certificate
   Diploma in Nursing
   Degree in Nursing
   Other (Please specify)

6. How many years or months have you worked as a registered nurse?
   Please specify.

7. How many years or months have you worked on this ward?
Please specify.

8. In which other clinical area/s have you worked?

   Please specify all that apply.

9. What is your current position?

   Registered Nurse

   Clinical Nurse

   Other (Please specify)

**ABSTRACT**

**Aim:** To critically review the literature related to situation awareness and clinical decision making by nurses.

**Background:** International recognition that situation awareness positively contributes to clinical decision making has led to a growing body of healthcare literature. To date, research has predominately focused on anaesthetists and surgeons using measurement frameworks from the aviation industry. The evidence focussing directly on situation awareness in decision making by nurses remains limited.

**Data sources:** Databases: PROQUEST, Web of Science, CINAHL and PUBMED.

**Review methods:** An integrative review was undertaken following an extensive literature search with the date range January 1965 – March 2011. English language literature reviews, primary qualitative, quantitative and mixed method studies describing situation awareness in decision making by or including nurses were included.

**Results:** Five empirical studies of nurses’ situation awareness were reviewed. Of these, three included decision making and situation awareness by nurses within inter-professional teams; two related solely to situation awareness and decision making by nurses. Findings from the five studies could be grouped under three themes: individual factors influencing situation awareness, interpersonal behaviours influencing situation awareness and situation awareness improving working relationships and patient care.

**Conclusion:** Further investigation is needed to identify the situation awareness skills that are vital to decision making by nurses. Elucidating essential skills sets associated with situation awareness may inform the development of education and training to enhance clinical decision making by nurses.

**Key words:** situation-awareness, decision-making, nurse, literature review

**SUMMARY STATEMENT**

**What is already known about this topic**

Healthcare studies outline the importance of situation awareness to clinical decision making.

Both technical and non-technical skills are required for effective, safe decision making.

Incorporation of situation awareness and decision making to inter-professional education has improved collaborative working.

**What this paper adds**

Situation awareness is an essential skill for effective decision making by nurses and can be learned.
Non-technical skills are associated with situation awareness and influence clinical outcomes.

Increased awareness of vital technical, non-technical and environmental data for decision making is needed in practice.

**Implications for practice**

Multidisciplinary non-technical team training may help to develop situation awareness.

Enhanced situation awareness has the potential to improve decision making quality and ultimately improve clinical outcomes for patients.

Situation awareness can be learned indicating that undergraduate and continuing education programs should consider incorporating situation awareness training into curricula.

**INTRODUCTION**

Clinical decision making is integral to nursing practice and influences patient outcomes (Fonteyn and Ritter 2008). Over the past decade, the increasing complexity of clinical nursing has necessitated more informed decision making to ensure effective and safe practice (Parsonage 2010). This has stimulated research in relation to environmental or technical aspects of decision making (Bucknall 2007, Flin et al. 2008). Additionally, non-technical aspects, such as social and cognitive skills, identified as ‘situation awareness’ (SA), influence clinical decision making. There is increasing international recognition that SA impacts on the decision making of all healthcare professionals working in complex and dynamic environments, with higher levels of SA linked to improved clinical outcomes (Singh et al. 2006). However, much of this research evidence arises from the medical professions or clinical teams (Flin et al. 2008). For example, previous studies examining the performance of surgeons and anaesthetists have found that SA influences technical ability and clinical outcomes (Flin et al. 2007, Fioratou et al. 2010, Yule et al. 2008). This paper provides an overview of SA and then critically evaluates studies of nurses’ SA.

**Background**

*The Theory of Situation Awareness*

The origins of SA arise from the aviation industry where it has been used as a concept to understand causes of decision error and as a model for safe decision making (Singh et al. 2006). In essence, SA is, “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future” (Endsley 1995, p. 36). The Model of Situation Awareness (Endsley 1995) identifies three levels of SA linked to decision making. The SA levels are incremental: Level 1 – perception of current situation (gathering data); Level 2 – comprehension of current situation (interpreting information); Level 3 – ability to project what can happen in the future (anticipation of future states). These levels of SA are influenced by individual or cognitive factors, such as ability, preconceptions, memory and information processing. Task or system factors also influence SA, such as system capability, complexity, automated machinery, stress and workload. All of the elements collectively contribute to efficient, safe, decision making (Flin et al. 2008).
SA is the global term for the level of awareness and the dynamic understanding that a practitioner has of a situation. In order to make fully informed, safe, decisions practitioners have to be cognizant of relevant information and pertinent environmental data. Thus, SA is the first step of decision making, providing an understanding of ‘what is going on’ and ‘what is likely to occur next’ (Salmon et al. 2009). In practice, safe decision making depends on continuous extraction of technical, environmental information, integration of knowledge and formation of a coherent mental picture to direct perception and anticipate future events (Dominguez 1994). Therefore, SA is essential in all complex, dynamic occupational settings reliant on human operators making decisions where safety is paramount.

The aim of SA is to avoid critical situations evolving. If such situations occur, it is vital for practitioners to know what technical information is relevant and anticipate what data will be needed to inform correct decisions and avert disaster. Lapses in SA can arise from interpersonal behaviours, team dynamics and assertive authority figures (Gawron 2008). Additionally, SA can be obscured by distractions including stress, noise, multi-tasking and physical factors affecting attention e.g. tiredness. Time pressure is also significant as constraints can lead to ‘panic’ (reactive) decision making. Decision making and heightened SA is improved with training (Gawron 2008, McLucas 2003). Industries, including aviation, military and emergency services, use SA principles to inform decision making and skills learning so that operators are able to ‘sense’ the decision making process during critical events in practice, preventing adverse events (McLucas 2003).

**Situation Awareness and decision making in clinical settings**

SA is an essential skill for all health professionals in effectively managing complex systems where decisions are made rapidly and under stressful situations (McIlvaine 2007). Singh et al. (2006) suggest that SA lapses occur at many levels in clinical practice, with decision making error continuing due to subsequent SA gaps by other practitioners. The value of SA to healthcare in actual clinical settings has been predominately studied by medical researchers focussing on medical disciplines or inter-professional teams that include nurses. However, analysis of adverse clinical events do highlight that suboptimal decision making by nurses can be attributed to lapses in SA in the clinical environment (NPSA 2007). The antecedents to compromised clinical decision making by nurses through deficient SA are multifarious and often complex. However, they do relate to the levels of SA as described by Endsley (1995) and include environmental, clinical system capacity and individual factors. The role of experience, expertise and intuition in positively influencing clinical judgement has been perceived as highly significant in decision making by nurses (Benner 1984). However, more recent findings have shown that experience and intuition are used less frequently than previously thought and may not always impact positively upon clinical decision making by nurses (NPSA 2007, Traynor et al. 2010). A study of nurse practitioners found that experience and intuition was not necessarily indicative of anticipatory decision making but the ability to make decisions based on future patient needs was often reliant on individual nurse characteristics and personal insight (White et al. 1992). These findings support those from SA studies by researchers in medical and other industries (Singh et al. 2006, Flin et al. 2008).

Compromised SA and decision making commonly arises from failures in perception, shortcuts in reasoning and latent factors, such as fatigue, stress or interrupted workflow, time pressure, causing
cognitive inattention (Braithwaite et al. 2005, Woodward 2010, Yule et al. 2008). To increase SA by avoiding distraction, or confusion, some suggest that clinical settings adopt similar operational practices to aviation (Broom et al. 2011). This includes modifying practitioner behaviours and the ‘sterile cockpit concept’ that prohibits non-essential tasks and conversation during critical periods. Some distraction factors contributing to decision making error by nurses have been identified and preventative ‘sterile cockpit’ measures introduced. For example, altered procedures for medication administration with nurses wearing medication safety vests indicating that they should not be interrupted (Jones 2009). Noise and equipment such as bleepers or phones also cause distractions during critical decision making in clinical environments (McIlvaine 2007).

Studies have revealed that SA is influenced by deficits in non-technical skills including communication, teamwork, leadership and participatory decision making. These non-technical skill deficits resulted in compromised awareness of technical components, such as patient data monitoring, and were the most common antecedents to decision errors made by practitioners in operating rooms (Hazlehurst et al. 2007, Kranzfelder et al. 2011, Yule et al. 2008). Literature spanning several decades has repeatedly reported decision making by nurses to be negatively influenced by non-technical aspects particularly interpersonal interactions between medical staff and nurses (Bucknall 2000, Hofling et al. 1966, Odell 2010). The study by Hoffling et al. (1966) was the first to highlight that pressure from overly assertive medical colleagues resulted in serious decision making errors by nurses. This non-technical influence affected both experienced and inexperienced nurses, with errors remaining unchallenged, despite nurses being aware of mistakes. Additionally, decision making by nurses is influenced by decision autonomy, nursing objective and technical aspects such as knowledge and memory (Bucknall 2000).

It is evident from research that models of SA have been applied to various occupational settings and improved decision making. In healthcare, the concept of SA has been integrated into decision making systems and training programs by adapting Endsley’s model (1995) for surgeons and anaesthetists with reported benefits for decision making, team working and patient outcomes (Singh et al. 2006). The concept of SA related to decision making by nurses remains largely undefined despite the numerous research findings identifying technical and non-technical factors affecting decision making by nurses in clinical settings. A proposed concept map indicating how SA may be applied to decision making by nurses is displayed in Figure 1. The principal levels of SA are those by Endsley (1995) but reflect the nursing context by incorporating findings from studies that identify naturalistic work setting factors that compromise decision making by nurses.

THE REVIEW

Aim

The aim of this integrated review was to critically review the literature related to situation awareness and clinical decision making by nurses.

Objectives of this review

The objectives of this review were to: 1) identify published accounts of nurses’ use of SA theory and principles in decision making; 2) conduct a quality appraisal of studies of SA in decision making by
nurses; and 3) identify themes in the studies that advance nursing knowledge of the application of SA to nurses’ decision making.

**Design**

The diverse language and nomenclature arising from the different occupational fields that study SA required an integrated review which was broad enough to include primary sources using different methodologies from a variety of occupational fields whilst being sufficiently structured to remain focussed on the primary topic (Whittemore & Knafl, 2005). In order to provide methodological rigour, focus and boundaries for the review, the five stages suggested by Whittemore and Knafl (2005) were used. These are comprised of Problem identification: Literature search: Data evaluation: Data analysis: and Presentation. The five stages provided the review framework which was subsequently integrated under the typical research headings of search methods, outcomes, quality appraisal, data abstraction and synthesis for publication and dissemination.

The initial stage of review was to identify the problem to be addressed. Problem identification specifies variables of interest, including the concept, target population and clinical problem, which facilitate the differentiation of information into relevant or extraneous for data extraction. The problem to be addressed by the review was identified as the concept of SA, in nurses, involved in decision making in clinical practice.

**Search methods**

The second stage, the literature search, was designed to source all relevant literature, reducing limitations caused by inconsistent terminology or over reliance on medical databases (Conn et al. 2003). The search conducted interrogated four bibliographic databases: PROQUEST (combined health and psychology), Web of Science, CINAHL, PUBMED. As previous nursing research was known to have included decision making research from psychology and non-healthcare disciplines from the 1960’s onwards, the dates January 1960 to March 2011 were used as parameters, and scoping undertaken in these databases. The University book catalogue was also searched and interfaced with catalogues externally using the same date range. The following search terms and their Boolean combinations were used: situation awareness, decision making, nurse, non-technical skills, decision error, decision dynamics, clinical judgement, deduction, inference, cognitive task analysis. English language literature reviews, primary qualitative and quantitative studies describing situation awareness and decision making by or including nurses were considered.

**Search outcome**

The third stage, data evaluation, was undertaken for the 27 publications initially retrieved (Figure 2). Following agreed inclusion criteria delineated at problem identification stage from the variables of interest, 20 publications were discounted as they related to nurses and decision making but did not include SA. The remaining seven were identified for initial data evaluation. One study yielded two publications, the second being omitted as it duplicated some, but not all, of the original study. Of these six publications, five were empirical studies and one a literature review. The reference list of the literature review publication was used to substantiate inclusion. The cited references in the
literature review included SA studies, however, none related directly to nurses and this publication was omitted from the review. The remaining five primary studies were included in the review.

Quality appraisal

All three authors appraised the retrieved publications using the five stages for integrative review (Whittemore and Knafl 2005). Concern was raised over the inclusion of all five papers as some studied additional factors and a variety of methodologies. However, due to the small number of studies, identifying an additional predefined list to exclude papers further was viewed as counterproductive. The limited numbers of papers were considered on the basis of informational quality, methodological quality and representativeness (Kirkevold 1997). This was considered more appropriate to facilitate data abstraction, synthesis and understanding of the topic. The outcome of the quality appraisal is reported in Table 1.

Data abstraction and synthesis

In order to establish rigorous data abstraction and synthesis, data evaluation and analysis stages followed methods advocated by Whittemore & Knafl (2005). A standardised format to summarise descriptive, methodological data and findings was created. This format was used to inform the summary table outlining descriptive information (author, publication date, country of origin), study description and objectives (sample, aim, design, methods), study findings and limitations. The standardised table format allowed comparative analysis and patterns in the extracted information became apparent. This enabled further comparative analysis and it was possible to identify emergent key themes from the information. In identifying the themes both quantitative and qualitative aspects in the studies were given equal priority (Sandelowski 2000). A synthesis of important elements and conclusions was constructed into an integrated summation to inform the themes. The use of this form of data analysis and tables to present findings adhere to the stages for robust integrative review (Whittemore and Knafl 2005). Additionally, this facilitates ease of data comparison and incorporation of findings from a variety of research methods (Happ et al. 2006, Whittemore and Knafl 2005). The identified key themes were used to further analyse and discuss the findings from the retrieved studies.

RESULTS

Of the five studies that included nurses, three focussed on decision making and SA by nurses as members of inter-professional teams. Three related solely to SA and decision making by nurses. Countries of origin were Australia (n = 2), USA (n= 2), multinational Korea and USA (n=1). Table 1 summarises the five publications reviewed. Of the five retrieved empirical studies, three were inter-professional and include nurses. These three inter-professional publications relate to the high risk, technological clinical environments of intensive care, operating rooms and obstetrics. Samples sizes in these three inter-professional studies range from 30 – 63, with nurses forming the largest proportion of participants. Data collection was undertaken by video monitoring of practice in
hospital clinical settings in two of these inter-professional studies and by simulation exercise in the third study. Research focussing explicitly on SA and nurses accounted for two of the original five studies retrieved from the search. Both of these studies were undertaken in universities with final year undergraduate students or graduating anaesthetic registered nurses with a sample range of 51 -71. These two studies use simulated scenarios for data collection.

**Defining themes**

The general findings from the research were congruent across fields of nursing and note a paucity of SA literature. The attributes and deficiencies associated with SA and effective decision making are the most apparent characteristics reported in the literature. These attributes and deficiencies can be further categorised into three themes – individual factors influencing SA, interpersonal behaviours influencing SA and improved working relationships and patient care.

**Individual factors influencing SA**

The individual cognitive abilities of nurses are reportedly the best predictors of SA (Wright 2009). Individual personality traits, particularly associated with self-confidence and assertion were closely associated with cognitive abilities and SA in this study. Other attributes previously assumed to have a bearing on SA and decision making, such as memory and automaticity gained through experience, had little positive effect (Cooper et al. 2010, Wright 2009). The study by Cooper et al. (2010) found that SA was not related to age or experience but decision making skills did improve in subsequent scenario exercises once participants were cognizant of SA practices. SA was deficient in graduating students, with knowledge not applied to appropriate patient care and decisions. The researchers suggested that these deficiencies could be improved by undergraduate education incorporating more clinical teaching and practical experience linked to decision making and SA (Cooper et al. 2010).

It appears that nurses strive for a shared understanding of the patient’s condition to increase common SA when working with other healthcare disciplines. However, the research findings revealed a cognitive mismatch of professional thinking arising out of differences in professional orientation and perception of SA (Miller and Sanderson 2005). Miller and Sanderson (2005) conclude that healthcare disciplines are the product of their own professional education and remits of practice. That is, educational preparation and occupational socialisation significantly impacts on professional cognition and behaviours. Improvements to SA have been however achieved when inter-disciplinary teams were trained together (MacEachin et al. 2009, Miller and Sanderson 2005).

**Interpersonal behaviours influencing SA**

Interpersonal behaviours determine the dynamics between nursing and medical staff. Effective interpersonal communication, leadership and positive individual personality traits in nurses are strong indicators of positive team dynamics and highly influence SA in clinical settings (Wright 2009). Nurses were found to be pivotal to effective communication and promoting SA in team working environments particularly in rapid, high acuity work settings (Kim et al. 2009, Wright 2009). Environments where decision making skills are more transparent or scrutinised can cause anxiety for junior nurses (Cooper 2010, Kim et al. 2008). This affects nurses’ ability to use SA and negatively impacts on clinical judgements and may cause defensive practice.
Where differences in professional orientation, thinking and perception of SA exist there is greater staff tension, a higher risk of breakdown in care co-ordination with more likelihood of discontinuity in patient management (Miller & Sanderson 2005). However, in clinical settings where practitioners have shared understanding of patient care goals and SA is acknowledged there are more cohesive, participatory working practices (MacEachin 2009). This can contribute to shared working protocols or guidelines that have been shown to improve patient safety and care outcomes by reducing reliance on memory and subsequent decision error. Achieving consensus on SA in clinical settings is greatly enhanced by education and training practices that incorporate inter-professional learning. Improving SA can also improve patient management and logistics particularly in areas such as operating rooms (Kim et al. 2009).

**DISCUSSION**

It is evident that some nurses attain SA skills and incorporate them into decision making in practice. Where examined, the use of SA was most often a consequence of inter-professional team working in critical care areas (MacEachin et al. 2009, Miller and Sanderson 2005, Mitchell and Flin 2008) with the focus on improved SA cognition (Cooper et al. 2010, Wright 2009). Increased efficacy of decision making has been linked to improved SA cognition as a result of altered perception achieved by changes to professional behaviours and thinking (MacEachin et al. 2009, Miller & Sanderson 2005). The importance of SA in enhancing cognition to improve decision making is supported by numerous previous studies (Fletcher et al. 2003, Flin et al. 2008, Guimond et al. 2009, Mitchell and Flin 2008). Lapses in cognition due to lack of awareness or knowledge and the tendency to interpret patient data as single strands rather than collectively has been found to contribute to suboptimal decision making by nurses (Endacott et al. 2010). These findings are similar to outcomes of adverse clinical event inquiries where technical skills and non-technical influences involved in decision making are traditionally scrutinised to find the cause of clinical error (Braithwaite et al. 2005, Mitchell and Flin 2008, Lashoher and Pronovost 2010). These studies indicated that where SA cognition lapses were found, decision making deficits had the potential to occur and result in suboptimal patient care. Consistency in research findings points to the need for nurses to enhance their professional cognition to link patient data collectively to achieve improved SA and more anticipatory, effective decision making (Endacott et al. 2010, Guimond et al. 2009, Miller and Sanderson 2005). Several studies suggest that the use of SA and professional cognition in nurses is often only identified as lacking in practice settings, at post graduate level and when decisions are compromised by other factors such as time pressure (Cooper et al. 2010, Endacott et al. 2010, Guimond et al. 2009, Lauri and Salantera 2002, Miller and Sanderson 2005).

It is apparent that SA cognition can be influenced by individual personality factors but it is a skill that can be acquired by nurses and improved with learning (Fletcher et al. 2003, MacEachin et al. 2009, Miller and Sanderson 2005). This learning incorporates both technical and non-technical aspects that can promote decision making effectiveness. Guimond et al. (2009) suggested that inter-professional learning is the most effective method of enhancing SA and nurses are pivotal in communicating information for decision making due to structures such as handover and shift rotation. Learning in inter-professional groups promotes confidence and decision autonomy skills in nurses resulting in more assertive, safe decision making particularly in encounters with assertive medical colleagues.
Inter-professional SA learning has been effective in promoting more cohesive, participatory working practices, improving care co-ordination and increasing continuity in patient management (Guimond et al. 2009, Fletcher et al. 2003, MacEachin et al. 2009, Miller and Sanderson 2005, Mitchell and Flin 2008). It is, therefore, important that the essential skills set related to SA and nurses are identified by further research and subsequently incorporated into nurse education programs at both undergraduate and post graduate level to improve decision making and ultimately patient care outcomes.

SA and decision making abilities are identified from the research but it could be that additional factors impact on skills both in critical care environments and other fields of nursing. Investigation of decision making practices using both quantitative and qualitative research methodologies in a variety of clinical settings could possibly identify more examples to assist in determining working processes. Whilst, it is likely that nurses do use additional cognitive and non-technical skills impacting on clinical outcomes, identification of the precise constituents of these aspects remains to be determined.

The goal of this review was to present an analysis of the concept of SA as applied to decision making by nurses but this was limited due to the paucity of empirical studies found that included nurses or focused specifically on nurses. Nonetheless, all publications retrieved that covered the scope of the review were included. This provided a comprehensive view of all of the literature available at that point in time. Despite the limited number of sources available it was evident that emergent themes were consistent. However, the three themes that emerged should be viewed as preliminary as it is acknowledged that additional research may require their revision.

CONCLUSION

Many of the findings from nursing literature relate to those from non-healthcare disciplines and other healthcare research. However, it can be concluded from this review that there is scope for additional work in this area to identify the situation awareness skills that are vital to decision making by nurses. Identification of essential skills could be used to inform educational development practices for nurses at both undergraduate and post graduate level. Further study along with the identification of situation awareness and decision making skills has potential benefit to nurses in terms of effective decision making, inter-professional working, risk management, and patient safety.
Figure 1. Concept map - Situation Awareness and Decision making by nurses. Adapted from Endsley’s Model (1995) with permission from Human Factors and Ergonomics Society.
Databases searched:
PubMed, ProQuest (Health &

Keyword search terms: situation
awareness; decision making, error,
dynamics; nurse; non-technical skills;

Total search results (titles):
PubMed : ProQuest: WoS: CINAHL:

Articles included based on title
(abstracts):

Articles included based on abstracts
(Articles):
PubMed: ProQuest: WoS: CINAHL:

Articles included based on full text:
PubMed: ProQuest: WoS: CINAHL:
0 4 0 2

Articles included after removing
duplicates:

Articles excluded
based on title: 10

Articles excluded
based on abstracts: 10

Articles excluded
based on full text: 1

Figure 2. Flowchart -The screening process.
<table>
<thead>
<tr>
<th>Author (Year &amp; Country)</th>
<th>Sample</th>
<th>Aim and data collection</th>
<th>Findings</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper et al. (2010) Australia</td>
<td>51 final semester student nurses</td>
<td>Aim: To examination ability to assess, identify and respond to patient deterioration in relation to knowledge, SA and skills Mixed methods. Quantitative knowledge and performance measures during simulated scenario. Qualitative reflective review stated but not reported in this paper</td>
<td>• Focus on physiological parameters • SA perception low, unable to comprehend global data for decision making • Knowledge level good but SA not applied to appropriate decision action • Poor skills ability related to task decisions • Anxiety affected decision making • Subsequent practice improved scores • SA not influenced by age or experience</td>
<td>• Anxiety possibly related to video and observation in simulated environment • May not replicate true performance or transferable findings to RN's • Convenience sample – possible volunteer bias</td>
</tr>
<tr>
<td>Kim et al. (2008) International: Korea and USA</td>
<td>63 operating room staff: Nurses (n = 27) Medical (n = 24) Other (n = 12)</td>
<td>Aim: Understanding of staff acceptance of perioperative video monitoring for coordination and supporting SA Mixed methods. Quantitative survey and qualitative interviews</td>
<td>• Junior nurse anxiety about staff privacy but expressed through the form of patient privacy • Senior nurses less concerned about SA and decisions being scrutinised • Senior nurses less concerned about patient privacy issues • Video monitoring useful for examination of SA and decision making in patient logistics and workflow</td>
<td>• Study focussed on privacy issues • Data from one point in time - two months after installation • One surgical suite only</td>
</tr>
<tr>
<td>MacEachin et al. (2009) USA</td>
<td>Unspecified number (conference participants, included nurses, midwives and physicians)</td>
<td>Aim: Measurement of SA in fetal heart monitoring training program Precise methodology unclear. Quantitative data from module completion following DVD and review of fetal monitoring in practice. Qualitative data from subsequent discussion</td>
<td>• Inter-professional group learning improved SA • SA improved fetal monitoring safety and reduced decision error by 10% over project duration of four years • Development of algorithms and clinical guidelines to streamline decisions possible once shared SA acknowledged by all occupations</td>
<td>• Limited study information – time frame, precise participant details, design and measurement tools undefined • Some data collection methods stated but other findings relate to audit of improved practice outcomes, possibly from documentation, yet design of this not mentioned</td>
</tr>
<tr>
<td>Author (Year &amp; Country)</td>
<td>Sample</td>
<td>Aim and data collection</td>
<td>Findings</td>
<td>Limitations</td>
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<tr>
<td>Miller &amp; Sanderson (2005) Australia</td>
<td>Intensive care staff in one hospital: Nurses (n = 17) Doctors (n = 8) Patients (n = 5)</td>
<td>Aim: Analysis of clinical information used by medical and nursing staff during shift handover&lt;br&gt;Quantitative analysis of videoed observation of practice in the clinical setting</td>
<td>• Nurses and doctors are a ‘function’ of their training and practice based responsibilities&lt;br&gt;• Mismatch of care goals between professions&lt;br&gt;• Decisions by nurses are tactically orientated and not ‘big picture’ orientated; doctors more strategic and physiology orientated&lt;br&gt;• Different professional thinking alters perception of SA, causes tension leading to breakdown of coordination of care and discontinuity in patient care</td>
<td>• Sample involved only experienced and senior practitioners&lt;br&gt;• Undertaken in one hospital unit&lt;br&gt;• Inclusion of qualitative data would have enhanced some understanding of some of the findings</td>
</tr>
<tr>
<td>Wright, (2009) USA</td>
<td>71 anaesthetic nurse graduates from 3 universities</td>
<td>Aim: To measure relationship between memory, cognition and automaticity in SA&lt;br&gt;Quantitative analysis using computer based aviation assessment tool</td>
<td>• Cognitive abilities and SA positive relationship&lt;br&gt;• Memory and SA had little positive relationship&lt;br&gt;• No relationship between automaticity and SA&lt;br&gt;• Older participants more automaticity but poorer memory score (attributed to older nurses having more experience)&lt;br&gt;• Individual cognitive abilities and personality impact on positive SA (suggests ‘cultivating’ these ‘types’ as future anaesthetic nurses)</td>
<td>• Aviation measurement tool; not validated for healthcare&lt;br&gt;• Regression analysis produced associations between variables not causal relationships. Author alludes to causation but findings may be due to other unmeasured variables&lt;br&gt;• Possible volunteer bias – subset of randomly selected participants from volunteer convenience sample</td>
</tr>
</tbody>
</table>

Legend: RN – Registered Nurse<br>SA – Situation awareness
References


Odell, M. (2010) Are early warning scores the only way to rapidly detect and manage deterioration? *Nurs Times*, 106(8), 24-6.