Development and evaluation of an integrated clinical learning model to inform continuing education for acute care nurses

by

Beverley Duff, RN, EM, BN, MHM

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Supervisory Team

Principal Supervisor: Professor Glenn Gardner

Professor of Clinical Nursing, School of Nursing, Faculty of Health Queensland Institute of Technology

Director of the Centre for Clinical Nursing, Royal Brisbane and Women's Hospital

Associate Supervisor: Dr Sonya Osborne

Lecturer, School of Nursing, Faculty of Health, Queensland Institute of Technology

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Abstract

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Background

Significant ongoing learning needs for nurses have occurred as a direct result of the continuous introduction of technological innovations and research developments in the healthcare environment. Despite an increased worldwide emphasis on the importance of continuing education, there continues to be an absence of empirical evidence of program and session effectiveness. Few studies determine whether continuing education enhances or develops practice and the relative cost benefits of health professionals' participation in professional development. The implications for future clinical practice and associated educational approaches to meet the needs of an increasingly diverse multigenerational and multicultural workforce are also not well documented. There is minimal research confirming that continuing education programs contribute to improved patient outcomes, nurses' earlier detection of patient deterioration or that standards of continuing competence are maintained. Crucially, evidence-based practice is demonstrated and international quality and safety benchmarks are adhered to.

An integrated clinical learning model was developed to inform ongoing education for acute care nurses. Educational strategies included the use of integrated learning approaches, interactive teaching concepts and learner-centred pedagogies. A ***Re***spiratory ***Sk***ills ***U***pdate education (***ReSKU***) program was used as the content for the educational intervention to inform surgical nurses' clinical practice in the area of respiratory assessment. The aim of the research was to evaluate the effectiveness of implementing the ***ReSKU*** program using teaching and learning strategies, in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The education program aimed to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment. This research was guided by the work of Forneris (2004), who developed a theoretical framework to operationalise a critical thinking process incorporating the complexities of the clinical context. The framework used educational strategies that are learner-centred and participatory. These strategies aimed to engage the clinician in dynamic thinking processes in clinical practice situations guided by coaches and educators.

Methods

A quasi experimental pre test, post test non–equivalent control group design was used to evaluate the impact of the ***ReSKU*** program on the clinical practice of surgical nurses. The research tested the hypothesis that participation in the ***ReSKU*** program improves the reported beliefs and attitudes of surgical nurses, increases their knowledge and reported use of respiratory assessment skills. The study was conducted in a 400 bed regional referral public hospital, the central hub of three smaller hospitals, in a health district servicing the coastal and hinterland areas north of Brisbane. The sample included 90 nurses working in the three surgical wards eligible for inclusion in the study. The experimental group consisted of 36 surgical nurses who had chosen to attend the ReSKU program and consented to be part of the study intervention group. The comparison group included the 39 surgical nurses who elected not to attend the ReSKU program, but agreed to participate in the study.

Findings

One of the most notable findings was that nurses choosing not to participate were older, more experienced and less well educated. The data demonstrated that there was a barrier for training which impacted on educational strategies as this mature aged cohort was less likely to take up educational opportunities. The study demonstrated statistically significant differences between groups regarding reported use of respiratory skills, three months after ***ReSKU*** program attendance. Between group data analysis indicated that the intervention group's reported beliefs and attitudes pertaining to subscale descriptors showed statistically significant differences in three of the six subscales following attendance at the ***ReSKU*** program. These subscales included influence on nursing care, educational preparation and clinical development. Findings suggest that the use of an integrated educational model underpinned by a robust theoretical framework is a strong factor in some perceptions of the ***ReSKU*** program relating to attitudes and behaviour. There were minimal differences in knowledge between groups across time.

Conclusions

This study was consistent with contemporary educational approaches using multi-modal, interactive teaching strategies and a robust overarching theoretical framework to support study concepts. The construct of critical thinking in the clinical context, combined with clinical reasoning and purposeful and collective reflection, was a powerful educational strategy to enhance competency and capability in clinicians.

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. 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.

Signature

25/10/10

Date

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List of Publications Related To This Thesis

Conference Presentations

- The Australian Resource Centre for Health Innovations (ARCHI) convened the Conference in Sydney, June 2005, at which I was given the opportunity to present my research project at national level. My paper discussed the implementation of a respiratory assessment skills update (*ReSKU*) program in surgical wards in a Queensland regional hospital.
- Royal College of Nursing, Australia Annual Conference and the 39th Patricia Chomley Memorial Oration, July 2005, Adelaide, South Australia reviewing the current stages of my research.
- Fifth International Practice Development Conference in Hamilton, New Zealand, September 2006, discussing the methodology of my research.
- Thoracic Society of Australia and New Zealand 2007 Annual Scientific Meeting in Auckland, New Zealand in March presenting my research progress.
- Leadership and Learning in Nursing and Midwifery Conference, Mater Hospital, Brisbane, November 2007, presenting my research findings.
- Research Made Easy Seminar, Nambour General Hospital, Sunshine Coast, August 2010, presenting my research findings.

Publications

- Duff, B; Gardner, G; Barnes, M. (2007), 'The impact of surgical ward nurses practising respiratory assessment on positive patient outcomes', *Australian Journal of Advanced Nursing,* 24, 4, 52-56.
- Duff, B; Gardner, G; Barnes, M. (2007), 'Respiratory assessment skills for surgical ward nurses: does using a stethoscope make a difference?' *Respirology*, Vol. 12, March supplement, A8.

Chapter 1 - Introduction

1.1 Introduction

The contemporary hospital environment and acute care nursing practice have changed considerably in the last two decades. Improved lifestyles and scientific advances have contributed to reduced mortality rates with a concomitant growth in an ageing population and chronic diseases (Williams and Botti 2002; Fitzgerald 2007). Operations are undertaken on patients who would have formerly been deemed unsuitable because of comorbidities or advanced age. Patients that would have been admitted to an intensive care unit fifteen years ago are being cared for in the acute care medical and surgical wards (Woodrow 2002; Wood, Douglas and Priest 2004; Levett-Jones 2005). Nurses practising in inpatient clinical settings worldwide have reported complex challenges in meeting patient care standards (Williams and Botti 2002; Lambert and Gracken 2004). Shorter lengths of stay, greater patient acuity and sophisticated technology have contributed to the intensity of acute care nurses' workload. Both the range and invasiveness of surgical procedures have expanded. Patients in these areas commonly require care of intercostal catheters, central vascular access lines, complex wounds, tracheostomies, intravenous initiation and infusion therapy (Cutler 2002; Morrow 2009). Pressure has also been placed on the Australian health care system and the majority of western countries by an increasingly elderly, obese and chronically sick population.

Obesity has reached epidemic proportions in Australia and the western world in the last 20 years. Australia has recorded 35 per cent of the total population as overweight and 21 per cent as obese (Australian Institute of Health and Welfare 2007a). Influenced by a variety of genetic, dietary, environmental, socio-cultural and physiological factors, obesity constitutes a significant public health problem contributing to increases in both morbidity, length of patient stay and mortality (Hahler 2002). Postoperative pulmonary complications such as pulmonary emboli and pneumonia are more common in the aged and obese. Patients presenting with co-morbidities of chronic obstructive airways disease, asthma and cardiac disease are also considered high-risk groups for postoperative respiratory problems (Kremer 1998). Specific concerns regarding overweight surgical patients include appropriate respiratory assessment and provision of adequate oxygenation relating to decreased

lung compliance. Difficulties in mobilisation in the immediate postoperative period are also an issue (Keller 1999; Twedell 2003).

The elderly constitute about 30 per cent of patients undergoing surgery and present different clinical issues compared to younger patients. Approximately a third of all hospital separations in Australian hospitals occur in patients over the age of 65 (Australian Institute of Health and Welfare 2007b). Both the Australian Quality in Health Care study and the Harvard Medical Practice study concluded that the rate of adverse events and mortality almost doubles in this age group compared to younger patients. Therefore, there are important implications for patient care and clinical practice (Brennan, Leape and Laird 1991; Wilson and Lillibridge 1995). Age-related respiratory changes that impact on postoperative pulmonary function include decreased elasticity in the lungs reducing recoil capacity. Other detrimental effects include reduced respiratory muscle strength, increased chest wall stiffness and a consequent diminished cough and gag reflex predisposing the elderly to an increased risk of aspiration (Sheahan and Musialowski 2001). There is also a higher likelihood of patients over the age of 70 years developing atelectasis or lung infection, complicated by the presence of chronic lung disease and or pre-existing risk factors such as diabetes, smoking and obesity (Smetana 2003).

Patients admitted with complex health needs require skilled and prompt nursing intervention. High abdominal or thoracic incisions and prolonged periods of anaesthesia exacerbate the development of postoperative problems such as pneumonia (Bailes 2000).There is an ongoing requirement for clinicians to constantly maintain clinical updates and remain conversant with current evidence-based practice (Department of Education 2002; American Association of Colleges of Nursing 2008). This is despite time constraints and competing priorities for clinical nurses in busy acute care areas (Fowler 2008; Henderson and Winch 2008b). A public expectation that health professionals are safe practitioners who provide quality care puts pressure on health authorities to provide ongoing educational opportunities for staff (Griscti and Jacono 2006). Multiple educational challenges are presented.

The challenge for nurse educators is to modernise, rationalise and integrate education delivery systems to enhance clinical learning and reduce clinical and system errors in

a climate where healthcare information is readily available to the consumer. Quality and safety issues predominate as well as a clear need for closer inter-professional collaboration between education and clinical units (Levett-Jones 2005; Benner et al. 2008). Unprecedented media attention has been given to management of patient deterioration, adverse events, near misses and healthcare system errors (Gregory et al. 2007; Scholes 2007). Patient safety is paramount in an increasingly litigious society where treatments are readily available, resulting in lives being saved or prolonged that was not possible twenty years ago. High patient survival rates following hospitalisation are expected by the general public (Lindeman 2000; Billings 2008). New models of education are becoming increasingly crucial both as an investment and an important asset for clinicians and the patients they care for (Tanner 2006; Emerson and Records 2008).These models need to incorporate nurses having a more participatory role in their learning and ensure provision for lifelong learning in clinical education. The focus is on facilitating the ongoing development of clinical judgement, technical skills and ethical behaviour grounded in the best available evidence (Tanner 2006; Benner et al. 2008). Continuing education enables nurses to function in their roles safely and effectively by promoting knowledge acquisition in a changing healthcare environment (Munro et al. 2004; Barba and Fay 2009; Clinical Education Queensland 2009).

1.2 Background of the Study

Phenomenal growth in both technology and knowledge requirement has presented major challenges for the nursing profession and the educational standards and competencies underpinning the whole change process (Department of Education 2002). Given these rapid changes in technology at a time when acuity and age of patients has increased, clinical competency and technological expertise are essential attributes that healthcare consumers demand of their provider (Levett-Jones 2005). There has been a global call for change in professional education to ensure the application of evidence-based theoretical learning relevant to the clinical context. The engagement of the nursing workforce in life-long learning processes is vital and a requirement of national regulatory authorities including the Nursing and Midwifery Board of Australia (NMBA) (Griscti and Jacono 2006; Emerson and Records 2008; Henderson and Winch 2008b; NMBA 2010). Suggested strategies for educational change include the use of integrated learning strategies and interactive teaching

concepts. These involve use of a variety of learning activities including scenario-based learning and patient simulation as a complement to contextual learning and learner-centred pedagogies (National League for Nursing 2006; Shepherd 2009; Nagle et al. 2009).

Dewey has influenced educational arenas since the late 19th century with his concept of 'experience plus reflection equals learning' and problem–based learning has been included in 100 of 126 medical schools since the 1970s (Ridley 2007; Fowler 2008). In contrast, integrative teaching methods have only gradually been introduced by nurse educators from the late 1980s. 'Nursing education has a long history of squelching curiosity and replacing it with conformity and a non-questioning attitude' (Meleis 2005). Other authors agree. '19th century university models are still common using professor-centred lectures without discussion' (Lindeman 2000). Many teachers were taught in an era where their role was to impart knowledge and now have difficulty adapting to educational changes which emphasise learner engagement (Wharrad et al. 2002).The traditional teacher-centred approach to education in both academic and health care institutions encouraged rote learning and memorising of information purely to pass examinations (Schaefer and Zygmont 2003). Although this approach has proved remarkably enduring, the passive transmission of knowledge from teacher to learner has become obsolete in today's fast paced world. There is limited application between traditional didactic classroom learning and the reality of the clinical workplace (Neese 2003; Emerson and Records 2008).

Methods of dependent learning do not prepare nurses to become autonomous clinicians capable of anticipating and reacting appropriately to rapidly changing clinical situations. Remaining conversant with current teaching practices is as important as maintaining clinical currency (Neese 2003; Levett-Jones 2005). Nurses play a significant part in the restoration, promotion and maintenance of human health. Therefore nursing education plays a key role in facilitating the development of nurses who are competent and capable of responding to changing societal needs. Educators need to assist individuals to reach their full potential as clinicians, facilitating development of curiosity, investigative skills and capacity for continuous learning (Levett-Jones 2005). There has been a call to sacrifice the 'sacred cows in educational practice' and examine new educational strategies to promote independent

lifelong learning, clinical reasoning and critical questioning (Emerson and Records 2008). However, education today should be about choice and traditional didactic teaching does not preclude engagement of learners, innovation or teacher creativity (Hall 2009).

1.3 Nursing educational approaches/integrated learning

The current plethora of multi-modal educational approaches to clinical education reflects the global drive to promote independent lifelong learning, clinical reasoning and critical questioning (Henderson and Winch 2008b). New cohorts of nurses entering the profession include the 'technologically savvy' generation Ys and Xers or millenials (Duchscher and Cowin 2004; Mangold 2007). Technology is a consummate part of their life and web-based learning and the computer age are a given. The time honoured teacher-centred educational approach of didactic lecturing has become out of step with the learning needs of this technologically literate millennial generation (Mangold 2007). Nurses now comprise a cross section of generations and cultures, all with different learning needs. Three diverse groups of nurse graduates have been identified: the technologically competent school leaver, mature-aged entrants on a second career path and nurses seeking to upgrade their knowledge as part of ongoing professional development or post-graduate qualification.

These multi-generational learners present the nurse educator with the challenge of facilitating shared learning needs within and between groups as well as within the healthcare team (Wharrad et al. 2002). The number of Australian nurses aged over 50 increased from 24% in 2001 to 35% in 2004 with similar patterns occurring globally (Australian Institute of Health and Welfare 2007a; Rosenthal 2008). Canada, the United States, New Zealand and European countries have all reported an aging nursing workforce (International Council of Nurses 2006). Increasing numbers of mature-aged nursing graduates combined with an already ageing nursing workforce have compounded the issue (Moseley, Jeffers and Paterson 2008). Studies have demonstrated that this cohort are expert and accomplished professionals who value learner-centred participatory continuing education (Moseley, Jeffers and Paterson 2008; Drury, Francis and Chapman 2009). A learner-centred approach includes the creation of a learning environment which meets multi-generational

learning preferences as well as nurse registration competency requirements in both undergraduate and postgraduate environments (Schaefer and Zygmont 2003; Giddens et al. 2008; Ridley 2007; Roberts 2009). A major objective is ensuring the availability of a best practice dynamic learning environment and continuity of learning experiences (Clinical Education Queensland 2009).

A combination of technological advances, economic impacts and students' demands for relevant clinical experiences has changed the face of higher education (Lindeman 2000). These changes have also impacted on their healthcare industry partners. Nursing graduates and more experienced nurse clinicians from all age groups are becoming more conversant with independent learning strategies that have seen them expanding their use of technology. These include health informatics-based teaching, virtual instruction (web-based portal and conferencing interventions), laboratories for skills learning and other various e-learning strategies (Wharrad et al. 2002). Nurses in acute care settings worldwide are used to accessing patient information including pathology results, medical imaging and other patient data via computer. They ascribe to adult learning principles and are accustomed to clinical education providing 'instant information and being entertained in the process' (Ridley 2007).

Implications for nurse educators include the challenge to incorporate innovative integrative educational teaching strategies to facilitate neophyte and more experienced practitioners to apply critical reflective thinking and clinical reasoning effectively in the practice setting. The development of context-dependent experience and knowledge is considered crucial to the integration of theory and practice in a practice profession as complex as nursing (Benner et al. 2008). Reflection on practice is also vital for future development of clinical knowledge and practice improvement (Tanner 2006; Forneris and Peden-McAlpine 2007; Lasater and Nielsen 2009).

1.4 Professional development/life-long learning/continuing education

Nursing is knowledge-based so ongoing professional development and a commitment to lifelong learning, are essential prerequisites to quality care. Moreover health consumers demand a knowledgeable and skilled nursing staff (Levett-Jones 2005). The exponentially growing knowledge base occurring in today's health care

environment necessitates educational strategies which ensure continuing education for nurses (Jefferies 2005). These strategies and approaches need to adequately prepare nurses for successful practice in contemporary complex acute care settings. The rapidly changing technologically driven healthcare environment requires innovative evidence-based educational approaches to facilitate development and sustainability of a knowledgeable nursing workforce (Thorne 2006). The integration of learner-centred education and contextual learning in the clinical setting reinforces and embeds theoretical learning, narrowing the theory practice gap.

The nurse is better equipped to deal with the 'whirling dervish of nursing practice change' that Tanner (2002) described when discussing how rapid patient turnover and high patient acuity terrified novice nurses. The demands of the health system have continued to escalate, impacting not only on new practitioners but more experienced nurses. Experiential learning in the clinical setting, overseen by a coach with educator support, assists nurses to develop clinical judgement and decision making skills in their daily interaction with patients. The 'guide at the side' coaching role is seen as crucial to support the clinician progress from beginner to expert practice in assessment and intervention decisions (Neese 2003; Dracup and Bryan-Brown 2004). Too often, the many uncertainties, challenges and complexities that nurses encounter in the acute care practice environment are not addressed by theoretical learning (Forneris 2004).There has been a disconnect between theoretical knowledge and clinical application of practical skills. Integration of theory and practice and development of synergies between quality patient outcomes, critical thinking, clinical reasoning and expert nursing judgement are essential (Scheffer and Rubenfield 2006).

Facilitation of integrated education models is increasingly important to assist nurses to practice competently and safely in today's challenging healthcare environment. Integrative learning is defined as 'developing the ability to make, recognise and evaluate connections between disparate fields or contexts' (Huber et al. 2007). Learner-centred and adult learning principles, with the patient the focus of all teaching, are used by the educator (Giddens et al. 2008). Integrative teaching and learning exemplars include using technology to teach distant sites, clinical scenarios and use of patient simulation to teach a variety of topics. Interactive scenarios and

simulations are used to improve knowledge, competence and performance. All involve active engagement of the participant supported by teacher inquiry. Discussion and debate is encouraged together with application of clinical reasoning, critical thinking and reflection on practice (Schaefer and Zygmont 2003; Diekelman and Lampe 2004; Tanner 2006). Emphasis is placed on the learner's self-reliance, self-motivation and accountability for learning with the educator acting as an expert resource (Mangold 2007).

An integrated clinical teaching strategy was chosen for this research study because it is arguably an example of best educational practice based on a hierarchy of learning methods (Khan and Coomarasamy 2006; Kim et al. 2009). Clinically integrated teaching methods have been demonstrated to be more effective than stand-alone didactic methods in improving knowledge and attitudes related to evidence-based medical practices (Kim et al. 2009). Because substantial empirical evidence supports interactive teaching over didactic teaching as the most effective learning mode, integrated interactive teaching is considered to be an ideal approach that clinicians should use (Khan and Coomarasamy 2006). Reflective practice is encouraged together with deeper learning, important for facilitating understanding and transferring learning into practice. These methods constitute three hierarchal levels as represented in Table 1. Khan et al (2006) contend that learners who are actively engaged in learning experiences and fully participate in the processing of information are more likely to have sustained changes in both attitudes and behaviours. These changes then benefit patient care as exemplified in Figure 1.

Table 1.1: A hierarchy of evidence-based teaching and learning

Level 1:
Interactive and clinically integrated teaching and learning activities
Level 2:
a) Interactive classroom based teaching and learning activities
b) Didactic, but clinically integrated teaching and learning activities
Level 3:
Didactic, and classroom or standalone teaching and learning activities

From Khan and Coomarasamy, 2006.

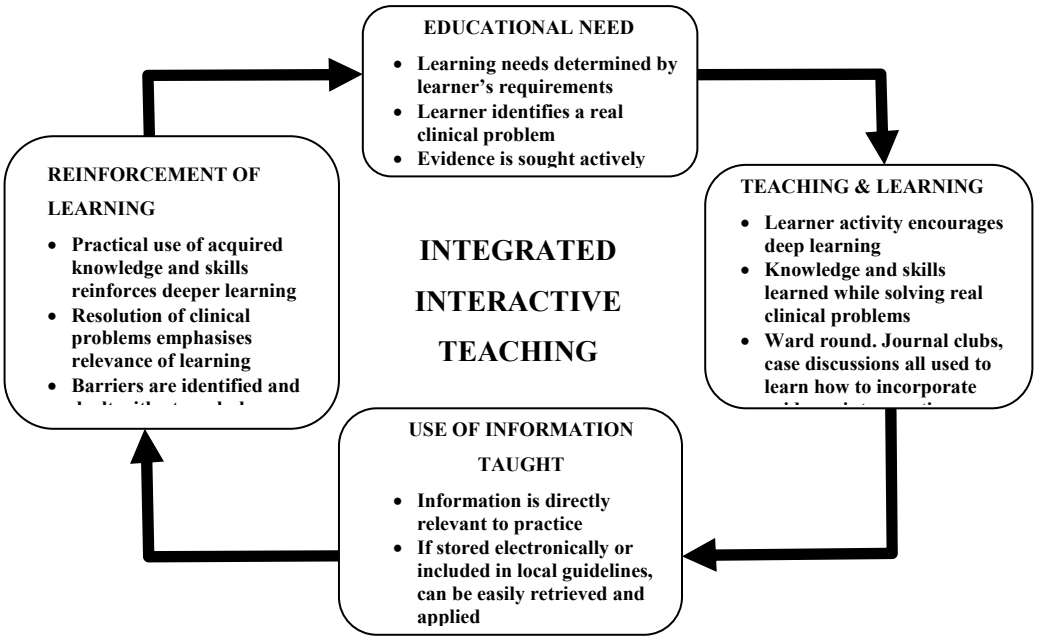


Figure 1 Reasons why clinically integrated interactive teaching may achieve better learning outcomes Adapted from Khan and Coomarasamy 2006.

1.5 Significance of the study

Australia, New Zealand, Canada and the United States of America have all integrated physical assessment into both undergraduate and postgraduate curriculum over the last three decades (Lesa and Dixon 2007). Despite the emphasis on assessment, there remains a large proportion of the nursing workforce that has not been exposed to assessment education as part of their hospital based training (Wheeldon 2005; Lesa and Dixon 2007).The teaching of respiratory assessment is critical in continuing nursing education because of significant patient safety issues related to respiratory dysfunction. An increased respiratory rate was seen as the most frequent physiological indicator of abnormality in patients prior to death, cardio-pulmonary arrest or critical care admission (Subbe, Williams and Gemmell 2004). There is good evidence to support the notion that subclinical respiratory problems contribute to adverse events including pneumonia, pleural effusion, pulmonary embolus, pulmonary oedema and pneumothorax (Considine 2005b; Doherty and Coote 2006; Moore 2007). Accurate respiratory assessment may indicate prompt need for investigation of a possible lung collapse, consolidation or pneumothorax, all significant adverse postoperative findings and promote early intervention that is vital to improved outcomes (Ahern and Philpot 2002). Failure to recognise respiratory problems resulting in suboptimal treatment are recurrent themes in the literature

(Crispin and Daffern 1998; Buist et al. 1999; Goldhill et al. 1999; Nadkarni et al. 2006). There is an increasing need for nurses to demonstrate competent application of respiratory assessment knowledge and skills in their clinical practice.

The aim of this study was to develop an integrated clinical learning model drawing on best educational practice. The model was developed to inform ongoing education for acute care nurses. The model tested specific educational processes and approaches in a clinical environment, using respiratory assessment education as a basis for the research. Three components were incorporated in the model:

- Theoretical, requiring completion of a self-directed educational module incorporating supported clinical activities in the ward context and on-line learning.
- Practical, involving participants attending a one day education program where the simulation of various clinical and psychomotor skills was practised in a non-threatening environment away from the dynamics of the workplace.
- Experiential, which included supported clinical practice, competency assessment and practice feedback of study participants for three months. The education process was then evaluated.

The ***R***espiratory ***Sk***ills ***U***pdate education (***ReSKU*)** program developed for this study was drawn from a self-directed respiratory assessment learning module produced by nurse specialists throughout the State using evidence-based criteria for module development. The learning module was part of a suite of modules designed to provide nurses with the learning experiences necessary to acquire the knowledge and skills to ensure effective functioning in acute care (Transition to Practice Nurse Education Program 2006). Learner-centred approaches were used incorporating situation-based learning strategies specific to the learners' work environment to both reinforce and embed clinical learning. Module contents included various clinical activities to be completed in association with an educator, preceptor or coach, as well as online-learning activities and links with reading materials and texts. Although the context-based respiratory assessment self-directed learning module encouraged self-directed learning and clinically focused activities, many module segments involved complex technical components specific to critical care environments. Components of

the module were therefore modified by the researcher for the surgical ward areas. For example, module segments relating to intubation and ventilation were removed with more emphasis placed on potential postoperative respiratory dysfunction and abnormal lung pathophysiology.

1.6 Study Aims

The purpose of this study was to develop and evaluate an integrated clinical learning model for continuing education for nurses in the surgical environment. The model tested specific educational processes and approaches using interactive and clinically integrated activities. The ***ReSKU*** program was used as the content for this research. The aim of the research was to evaluate the effectiveness of implementing the ***ReSKU*** program using integrated teaching and learning strategies, in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The education program aimed to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment.

1.7 Assumptions

There were a number of assumptions underlying this study:

- Competent respiratory assessment is an educational foundation requirement of postoperative surgical nursing practice.
- Respiratory assessment is a valuable patient management tool for facilitating early recognition of respiratory dysfunction.
- Nurses' twenty-four hour care delivery provides a pivotal position for early intervention and timely clinical referral to other members of the healthcare team.

1.8 Research Questions

Does participation in the integrated clinical learning program (*ReSKU):*

1. **increase the self-reported use of respiratory assessment skills** in clinical practice amongst surgical nurses? The specific skills to be examined include inspection, palpation, percussion and auscultation of the anterior and posterior chest, including rate, rhythm and work of breathing**.**

2. **change participants' self-reported attitudes and beliefs** regarding the use and application of respiratory assessment in clinical practice amongst surgical nurses?
3. **improve the knowledge** of surgical nurses relating to respiratory assessment?

Before proceeding to a discussion of the development and evaluation of an integrated clinical learning model to inform continuing education for acute care nurses, it is necessary to define and clarify terms that are used in clinical settings. These terms will form the basis for the parameters included in the study's outcome measures. Respiratory assessment is the collection of data through the four processes of inspection, palpation, percussion and auscultation of the thorax and lungs. Descriptions of these processes and other respiratory investigations are provided in Appendix A to inform the reading of the study.

1.9 Overview of the Thesis Structure

This chapter has provided an introduction to the development and evaluation of an integrated clinical learning model to inform ongoing education for acute care nurses. The expectation that education roles should include an increased emphasis on integrated learning has important implications for nursing education and practice. The aim of this research project, its assumptions and research questions are outlined in this chapter. A review and critique of the existing scientific literature and current research on the effectiveness of contemporary educational approaches is provided in Chapter 2. These strategies encompass integrated learning, nurses' professional development and continuing nursing education. Quality and safety issues are examined as is the relationship between concepts of nursing competence, nurse-sensitive patient outcomes and the application to clinical practice. These fields are systematically assessed to identify any gaps in the research.

The theoretical framework that forms the foundation for the study is described in Chapter 3. The framework is informed by the contemporary work of Forneris (2004), underpinned by educational theorists Friere (1970), Mezirow (1978), Schön (1983), Brookfield (1986), Tennyson (1990) and Argyris (1992). The development of the educational intervention is also described in Chapter 3. This section includes

explanations of the curriculum content and associated teaching and learning activities. The research design, methodology, sampling, recruitment process, instrument development strategy for data analysis, the associated data collection and ethical considerations are outlined in Chapter 4. The study results are reported in Chapter 5. Sample characteristics are described, comparison made between the experimental and control groups and study findings as they impact on the research hypotheses. A discussion of the study findings in the context of related research and identifies the study's limitations is recounted in Chapter 6. Finally, in Chapter 7, I present the study conclusions and recommendations for clinical practice, research and education.

1.10 Conclusion

Rapid technological advances and an exponential explosion of knowledge in the last two decades have influenced the need for the nursing profession to be responsive to societal change. Nursing education is an expensive commodity requiring skilled nurse educators and backfilling of clinicians for education time. Nonetheless, an ignorant workforce is not an option in a healthcare environment where patient care presents complex clinical challenges. Hence there is an increasing need for surgical nurses to demonstrate competent application of respiratory assessment knowledge and skills in their clinical practice. Continuing education should be viewed as an essential component of the Australian health care system requiring nurse leaders to plan proactively as a profession. Nurse educators need to be equipped to prepare nurses to manage practice change. They need to communicate effectively with ward teams and demonstrate how continuing education can illuminate current practice. Therefore, an integrated clinical learning model was developed to inform ongoing education for acute care nurses. Educational strategies include the use of integrated learning approaches, interactive teaching concepts and learner-centred pedagogies. The findings of a comprehensive literature review are described in the following chapter.

Chapter 2 - Literature Review

2.1 Introduction

Nurse educators are faced with the challenge of creating innovative and effective teaching approaches in response to ever changing practice requirements. Sophisticated technology and advanced procedures necessitate that nurses continuously update their skills to provide safe evidence-based patient care. Ideally, educational strategies should include integrative teaching and learning processes. These approaches facilitate the learners' ability to put theory into practice, preparing them to make informed judgements (Tanner 2007; Huber et al. 2007). The educator fosters clinicians' ability to think critically, use clinical reasoning, expert nursing judgement and clinical interpretation. There is a shift in emphasis from 'the doing of nursing towards the thinking behind the doing' (Girot 2000). Capable professionals develop the confidence and ability of effective decision making in both familiar and challenging circumstances, interact well with their colleagues and learn from the experience (Hase, Tay and Goh 2006; Christensen et al. 2008). A commitment towards life-long learning, creative problem-solving, clinical reasoning and reflective practice should therefore be promoted by the nurse educator (Schaefer and Zygmont 2003; Tanner 2006; Benner et al. 2008).

Many healthcare organisations and nursing regulatory authorities espouse the benefits of lifelong learning and continuing professional education on improving knowledge, clinical practice and patient outcomes. Continuing professional development (CPD) is defined as 'any post basic nursing education aimed at actively engaging nurses in a lifelong process of learning, with the ultimate goal of improving healthcare delivery' (English National Board for Nursing 1990; American Nurses Association 1994). CPD is further defined by the Australian Nursing and Midwifery Council (ANMC) as

> 'the means by which members of the profession maintain, improve and broaden their knowledge, expertise and competence, and develop the personal and professional qualities required throughout their professional lives. The CPD cycle involves reviewing practice, identifying learning needs, planning and participating in relevant learning activities and reflecting on the value of those activities' (ANMC 2009a).

The health of society is shaped by the degree that it develops and sustains a 'knowledgeable nursing workforce' (Thorne 2006). Given that nurses are key players in the delivery of health care, it is vital that nursing services are accountable for the quality, safety and ongoing effectiveness of the patient care they provide. Concepts of lifelong learning are critical to anticipating risks within the healthcare continuum, nurses' significant contribution to management of the deteriorating patient and positive patient outcomes (Levett-Jones 2005; Ridley 2007). An organisational culture that promotes skills development and regular review of clinical practice is essential to the maintenance of high standards of clinical practice (Clinical Education Queensland 2009). Continuing educational development of nurses in relation to clinical competencies and best practice principles is also a key component of clinical governance frameworks (McLaren et al. 2008).

One of the major tenets of clinical governance includes health professionals' access to educational programs (Harvey 1998). The application of processes such as ongoing education, clinical audits, clinical supervision, reflective practice, risk management and clinical effectiveness ensures patients receive the best possible quality care (Torrance and Wilson 2000). Clinical effectiveness involves clinicians regularly reviewing and auditing practice processes and maintaining conversancy with changes in both national and international standards (Spark and Rowe 2004). Continuing education and professional development of nurses was strongly recommended in an Australia-wide review of nursing education (2002). Nurse educators play a pivotal role in supporting the professional development of nurse clinicians. Positive responses can be facilitated to implement changes in the current turbulent healthcare environment. Because nurses are present most continuously with patients, they play a major part in the international agenda of patient safety and error reduction in healthcare. Educators are well placed to act as potential change agents for the incorporation of safe evidence-based practice knowledge (Penz and Bassendowski 2006).

The nurse's role requires immediate detection of risk, patient deterioration and appropriate intervention to reduce the incidence of adverse events (Levett-Jones 2005; Scholes 2007; Ridley 2008). Nurses must be able to anticipate and manage patients with increasingly complex conditions, drawing upon a combination of

cognitive, affective and psychomotor skills, higher order thinking abilities and clinical reasoning (Candela, Dalley and Benzel-Lindley 2006; Benner et al. 2008). The clinician is then better able to 'adapt to change, generate new knowledge, continuously improve performance' and operate effectively in unfamiliar contexts (Fraser and Greenhalgh 2001). Rapid turnover of nursing staff in teaching hospitals and continually changing practices and procedures necessitate that educational activities relating to acute care are not episodic in nature, but part of a continuing staff education program (Candela, Dalley and Benzel-Lindley 2006). These activities need to accommodate all generational cohorts to best support and enhance their lifelong learning experiences. Adult learning principles and a variety of integrated teaching techniques address the diversity of acute care nurses' skills and developmental needs (Jarvis 2005; Khan and Coomarasamy 2006). Staff at varying levels of proficiency, age and experience are required to participate in ongoing professional development activities to maintain best practice patient care (Wharrad et al. 2002; Levett-Jones 2005; Drey, Gould and Allen 2009). Continuing education is regarded as an imperative for the maintenance of professional competency because it positively influences nursing practice behaviours and patient outcomes (Underwood, Dahlen-Hartfield and Mogle 2004; Griscti and Jacono 2006).

The transfer of knowledge into clinical practice remains a challenge for learners. When a nurse attends a continuing education program to update knowledge and skills, improvements in practice do not necessarily follow (Aylward et al. 2003). It has been suggested that only 10-30% of training activities are transferred to ongoing performance (Broad 1997). A range of determinants can affect knowledge application to practice. These include organisational and system factors, adoption of innovations, research recommendations and high quality evidence (Shanley 2004; Strauss, Tetroe and Graham 2009). Although the intent of continuing education is to encourage lifelong learning and actively engage nurses in learning processes, inappropriate traditional didactic teaching methods are often used. These approaches promote a one way passive transmission of knowledge (Griscti and Jacono 2006).

A systematic review of studies examining the effects of continuing education programs concluded that interactive workshops using participatory teaching strategies were more effective in improving professional practice (O'Brien et al.

2003). Learners actively engaged in educational initiatives which encourage use of critical thinking, reflection and clinical reasoning processes are better able to draw on diverse perspectives to resolve issues in the clinical setting. Multi-modal teaching strategies recognise that different generations have divergent learning needs. Development of an understanding of the educational issues inherent in a multigenerational nursing workforce can foster a collaborative and cohesive workplace (Duchscher and Cowin 2004).

2.2 A Review of Continuing Education and Professional Development for Acute Care Nurses

The findings of a comprehensive and systematic review of the literature associated with the process and content of acute care nurses' continuing education are described in this chapter. The search was directed by the following question. What is the evidence base of research relating to continuing education in acute care nursing? A computerised search strategy was used to identify relevant studies and articles. The search method used six electronic databases (Medline, ProQuest, Ovid, ScienceDirect, Cochrane and Cumulative Index to Nursing and Allied Health Literature, (CINAHL, EBSCO publishing). A search of the databases was performed at regular intervals over a five year timeframe and table of contents from selected journals were reviewed on a monthly basis. Critical appraisal of the recovered papers was undertaken to determine the quality and outcomes of the papers. Papers were examined for their relevance and methodological rigour. Searching was guided by the terms listed in Table 2.1. This search produced 934 publications and titles and abstracts were then screened to refine the citation list further. In addition, the reference lists of retrieved articles were scrutinised and some additional hand-searching carried out. More than 260 papers published between 1985 and 2010 were included in the final review. Papers were chosen for their relevance or relationship to continuing nursing education as defined in the following inclusion criteria:

1. English language papers
2. Timeframes from 1985 to the present day, as this covers the period relevant to the introduction of integrated learning approaches into post registration nursing practice and continuing education in adult acute care settings.

3. Empirical research papers that contained search terms as identified in Table 2.1.
4. Grey literature pertaining to nurses' professional development and continuing education in adult acute care settings.

Exclusion criteria included:

1. Specialty areas including critical care, renal, oncology and high dependency units.
2. Accident and emergency departments.
3. Psychiatric, obstetric and paediatric wards.

Table 2.1 Search Strategy

Search terms	***Database***	***Number of research articles***
continuing education OR ongoing professional development OR nurses' staff development OR learner-centred education OR integrated learning OR educational intervention	ScienceDirect, ProQuest, Ovid, Medline and CINAHL (EBSCO publishing)	76
nurs* AND (clinical competen* OR capabilit*) AND educational outcome*	ScienceDirect, ProQuest, Ovid, Medline and CINAHL	74
(clinical coach* OR preceptor*) AND (clinical practice development OR change management strategies)	ScienceDirect, ProQuest, Ovid, Medline and CINAHL	58
(adult learning OR learning organisations) AND capability*	ScienceDirect, ProQuest, Ovid, Medline and CINAHL	52

The websites of the Australian Institute of Health and Welfare (AIHW), the Australian Department of Education, the American Association of Colleges of Nursing, Canadian Nurses' Association, British Department of Health and Queensland Health were also examined. This was done to obtain the relevant statistics and the most recent information relating to current educational approaches and continuing professional development in adult acute care. Papers were examined

for emerging concepts and their relevance to the development of an integrated clinical learning model to facilitate the ongoing education of acute care nurses. Six themes that represent the science of the literature relating to the content and process of continuing education were identified. These included: i) quality and safety in acute care nursing; ii) clinical competence, capability and clinical judgement; iii) clinical skills acquisition for acute care nurses ; iv) evaluation of continuing education v), educational methods and strategies and vi) barriers to ongoing practice change. Each of these areas will be reported on in this chapter.

Overall this review found that despite an international focus on the importance of continuing education activities evaluated in a number of studies, there continues to be an absence of empirical evidence of program and session effectiveness. There is also minimal research confirming that continuing education improves or develops practice (Lawton and Wimpenny 2003; Attree 2006; Draper and Clark 2007; Henderson and Winch 2008b). In the papers reviewed, a consistent contention was the importance of continuing education programs to promote knowledge acquisition, encourage lifelong learning and enable nurses to function in their roles safely and proficiently in a rapidly changing healthcare environment (Underwood, Dahlen-Hartfield and Mogle 2004; Griscti and Jacono 2006; Wolak et al. 2006). There was a paucity of studies determining whether continuing education programs change participants' practices, contribute to improved patient outcomes and are worth an organisation's investment. Importantly, that internationally required best practice quality and patient safety benchmarks are met and standards of continuing competence are maintained.

2.3 Quality and Safety in Acute Care Nursing

Patient safety has emerged globally as an important issue in health care receiving unprecedented attention among clinicians, researchers and managers (Hemman 2002; Baker et al. 2004; Levett-Jones 2005; Ridley 2008; Billings 2008). Consumer expectations of health care quality and increasing litigation have reinforced the need for healthcare organisations to comply with national accreditation guidelines and the nursing profession to maintain high standards of patient care (Benner et al. 2002; Jeffs, Law and Baker 2007; Gregory et al. 2007). Rapid technological changes combined with a major focus on hospital stay related adverse events have put

pressure on all healthcare professionals to demonstrate best practice. Amid increasing patient acuity, changing demographics and higher public information literacy, the development of complex systems and processes has potentially increased the scope for patient harm (Billings 2008; Fero et al. 2008). An older population and the rising prevalence of chronic disease have also contributed to the increasing incidence of patient deterioration, adverse events and near misses (Goldhill 2005; Scholes 2007). The focus on quality and risk management has become core business for healthcare with consumers demanding 'near perfect results' (Barraclough 2004).

The Quality in Australian Health Care Study Consortium in 1998, found that 16.6 % of admissions to Australian hospitals culminated in adverse events resulting in disability or a longer hospital stay. Of these, 51 % were considered preventable (Wilson et al. 1995). Given that the approximate cost of a hospital bed per day in Australia is between 700 and 800 dollars, this represents considerable extra pressure on the nation's healthcare budget, and poor patient outcomes (Queensland Health 2004). In 2004, the Agency for Healthcare Quality and Research (AHQR) annual report determined that quality of care and safety factors associated with patient care in the United States continued to cause concern (Axley 2008). The Canadian Adverse Events study (2004) found an overall incidence rate of 7.5% demonstrating that 185,000 of the almost 2.5 million annual hospital admissions in Canada are associated with an adverse event and close to 70,000 of these are potentially preventable (Baker et al. 2004). The number of adverse events or failure to rescue associated with death or permanent disability in this study was similar to the reported rates in the UK, New Zealand and Australian studies. Adverse events occur in 10.8% of admissions to British hospitals, at a rate of 850,000 annually (Vincent, Neale and Woloshynowych 2001). A New Zealand study found that the adverse event rate was 12.9% among patients admitted to hospital (Davis et al. 2002).

Root causes of sentinel events reported by the Joint Commission on Accreditation of Healthcare Organisations (JCAHO) in 2001 included the lack of education, poor communication and a flawed patient assessment process (2001). The Australian Council for Safety and Quality in Health Care (ACSQHC), in its third report to the Australian Health Ministers' Conference in 2002, focused on high priority areas such as infections, including pneumonia (2002). A national approach was coordinated to

improve clinical practice. These findings were endorsed in 2007 by a national report focusing on sentinel events in Australian hospitals (Australian Institute of Health and Welfare 2007b). Orientation, training and competence were identified by the JCAHO as major factors contributing to patient safety errors from 1995 to 2005 in the USA (Joint Commission on the Accreditation of Healthcare Organisations 2006). The National Institute for Health and Clinical Excellence (NICE) and National Patient Safety Association (NPSA) reports also identified the apparent inability of clinical staff to recognise and act upon patient deterioration (Scholes 2007). A culture of patient safety and quality across healthcare systems in which reporting of adverse events and prevention of system-based errors is both required and promoted has received worldwide endorsement (Australian Institute of Health and Welfare 2007b; National Institute for Health and Clinical Excellence 2007; National Patient Safety Agency 2007).

The International Council of Nurses (2002) supported a system-wide approach to patient safety that addresses human and system factors in adverse events. The American Organization of Nurse Executives advocated in 2004 that nursing education provide nurses with the essential competencies required to improve patient care quality and safety. Recommended competencies included the abilities to 'provide patient-centred care, collaborate as a member of an interdisciplinary team, understand how to access, interpret, and synthesize information and use evidence' to guide nursing practice and clinical decision making (Billings 2008). The National Health and Hospitals Reform Commission report (2009) made recommendations that a standard national curriculum for safety and quality be built into education and training programs as a requirement of course accreditation for all health professionals in Australia. In order to receive accreditation, hospitals are required to show a process is in place to assess, validate, track, and maintain or improve the competency of their staff on an annual basis (Axley 2008). Courses should incorporate an agreed competency-based framework as part of a broad teaching and learning curriculum (National Health and Hospitals Reform Commission 2009).

2.4 Clinical Competence, Capability and Clinical Judgement

Contemporary discussions of nursing knowledge, skill, patient safety and the associated ongoing education are usually combined with the term competence.

Ensuring patient safety is considered a fundamental tenet of clinical competence together with the ability to problem solve, think critically and anticipate variables which may impact on patient care outcomes (Girot 2000; Dick 2004; DeFloor et al. 2006; Axley 2008). 'The absence of competency may lead to serious medical errors resulting in serious consequences for the patient' (Axley 2008). Nurses are ideally positioned to identify, analyse and act on deteriorating patients, near-misses and potential adverse events. Gaining and maintaining competence is especially important given the regular changes in procedures, systems and products in present day healthcare institutions (Ponte et al. 2004). Educators should therefore make nurses aware that life-long learning is required to maintain competence. Competence in the nursing context is defined as 'the combination of knowledge, skills and personal attributes which enables nurses to provide nursing services of a standard acceptable to others in the profession of similar background and experience' (Queensland Nursing Council 2000). Similarly, the ANMC defines competence as 'the combination of skills, knowledge, attitudes, values and abilities that underpin effective and/or superior performance in a profession/occupational area' (ANMC 2009b).

There is confusion over the distinction between competence and competency with the two terms often used inconsistently and interchangeably (McMullen et al. 2003; Cowan, Norman and Coopamah 2005). Dictionaries provide minimal guidance, suggesting similar meanings to both words (Collins, 2008). Competence was perceived as 'the aspect of a job that an individual could perform', while competency was viewed as the behaviour underpinning that performance (Woodruffe 1993). Other authors suggest that competence and competencies are orientated towards a person's attributes indicative of effective or superior job performance (McMullen et al. 2003). Conversely, competence was also defined as a 'capacity, knowledge and potential to perform skills', whereas, competency was perceived as actual performance according to established standards of care (McConnell 2001; Mustard 2002). The Australian Nursing Council defined competency in 2002 as 'an attribute of a person which results in effective performance' (ANC 2002). However this specific definition for competency is not included in the recent National Competency Standards for the Registered Nurse (ANMC 2009b). The first nursing competency standards were first developed in 1990 and recently updated in 2009 to demonstrate

consistency across competency standards documents for enrolled nurses (ENs), registered nurses (RNs) and midwives (Chiarella et al. 2008). A competency unit 'represents a major function/functional area in the total competencies of a RN in a nursing context representing a stand-alone function which can be performed by the individual' (ANMC 2009b). Competency standards consist of competency units and competency elements, a sub-function of the competency unit (ANMC 2009b).

Competence is also postulated as an integrated holistic approach, emphasising the importance of context and the complex combinations of knowledge, skills, values and attitudes (Gonczi 1994; Cheetham and Chivers 1996). This notion of interconnected competence recognises the salience of critical thinking attributes and professional judgement in the disparate situations health professionals encounter (Cowan, Norman and Coopamah 2005; Chabeli 2006). The value of appropriate theoretical education and critical thinking to the practical application of capability and competent nursing care is exemplified by the comments of an experienced nurse, 'I would say its being busy and having to cut corners that sometimes makes using such knowledge advantageous. If you're cutting corners, you need to know which ones you can cut safely' (Cutler 2002). However, there is ambivalence in the literature reflecting differing views regarding the use of competency based testing and assessment credentialing in nursing education. Watson, Stimpson, Topping et al.'s (2002) systematic review investigating the evidence for the use of clinical competence in nursing found 'considerable confusion' regarding the definition and measurement of clinical competence and was critical of issues relating to reliability and validity. Their contention was that 'if a reliable and valid method of competency-based training has been produced then it has not, at the time of reporting, been published' (Watson et al. 2002).

Some authors advocated the importance of competency-based assessment in facilitating best practice and job satisfaction motivating nurses to both maintain and update their clinical practice (Chaboyer, Forrester and Harris 1999). Tanner (2002) contended that a competency-based nursing curriculum facilitates learner demonstration of clinical skills and health assessment according to 'observable and measurable standards'. This was highlighted by the recognition of links between clinical assessment problems and the individual nurse's ability to analyse the varied

factors contributing to patient problems and clinical decision making (Tracey et al. 2000; Tanner 2002). Other authors asserted that critical thinking, clinical reasoning and decision making processes contribute significantly to improved patient outcomes (Benner et al. 2008; Axley 2008).

Nurse 'thinkers' are defined as those who combine 'automatised skill with conscious problem solving to improve the health status of others' (Greenwood 2000). She contends that nurses derive professional esteem and personal satisfaction from providing patient focused care based on a systematic needs assessment of clinical competencies and conscious development of reflective and research skills. However, it has been reported that other authors regard competencies as reductionist and nothing more than checklists of observable behaviour. This reduces the function of nursing education to outcome-oriented technical procedures and the maintenance of minimum standards (McAllister 1998; Chapman 1999). McAllister does concede that competency assessment focusing on problem solving and communication skills provides clarity to nursing education and definition to the nursing profession's complex expanding role. Competency standards also provide the public with clear guidelines of professional accountability by which consumers can monitor the quality and effectiveness of nursing performance (McAllister 1998).

There is consensus that the perception of nurse competence as being task-based is redundant and a holistic framework should be agreed on (Cowan, Norman and Coopamah 2005; Chabeli 2006; DeFloor et al. 2006). Contemporary clinical practice needs to clearly demonstrate sound physiological knowledge, competent psychomotor skills and professional standards of practice. Emphasis should also be placed on critical thinking and clinical reasoning processes as well as interdisciplinary decision making (Tanner 2005; Benner et al. 2008; Axley 2008). Competence is much more than an array of skills attained by the clinician. The interplay of technical skills with knowledge, attitudes and values integrates the cognitive, affective and psychomotor domains of nursing practice. Other critical qualities involved in competent practice include nurses' 'attitudes, motives, personal insightfulness, interpretive ability, receptivity, maturity, and self-assessment' (Axley 2008). Acute care nurses practice within unpredictable and diverse settings, where rational decision-making and complex problem solving is expected. Clinical

competence is a given considering the quality and patient safety nursing practice standards required by healthcare organisations (Griscti and Jacono 2006; Covell 2009; Ironside and Sitterding 2009). The requisite competence-based education should reflect these requirements.

Because of the inherent limitations presented by the use of competencies to assess clinical skills, the concept of capability has been suggested as a 'potentially useful construct' to describe sustainable abilities more appropriate for today's complex healthcare environment (Gardner et al. 2007). The competent and capable individual has high levels of self efficacy and is able to respond appropriately to both planned and unanticipated situations (Hase 2002). Capability also encompasses attributes which are demonstrated by the clinician's ability to adapt to continual change, be creative, prioritise issues, generate new knowledge and collaborate well with colleagues (Hase and Kenyon 2001; Fraser and Greenhalgh 2001). The inclusion of reflective feedback on an individual's actions in the educational process facilitates the development of capability and self-directed learning (Fraser and Greenhalgh 2001). The use of team based structures where people are empowered to be learners, involved in decision making and accountable for their actions is recommended (Hase and Davis 2002).

Peer supported groups guided by a coach or educator enhance collaborative solving of complex problems in unfamiliar and changing contexts (Fraser and Greenhalgh 2001). The use of adult learning principles and collaborative experiential learning is also important given that context, social interaction and a clear rationale are vital components of adult learning (Gardner et al. 2007). Professional nursing practice standards require competent nursing assessment, resulting in earlier initiation of specific nursing actions and referrals to appropriate health professionals (Yamauchi 2001). Educators should therefore be challenged to encourage learning which builds both competence and capability and enables clinicians to keep up with the ever changing healthcare environment. Despite inconsistent curriculum recommendations in the current literature, there is a general consensus that specific educational needs apply to healthcare professionals caring for acutely ill patients (Wood, Douglas and Priest 2004; Odell, Victor and Oliver 2009).

2.5 Clinical Skills Acquisition for Acute Care Nurses

These educational requirements include the use of a structured approach to assessment, management and referral options of the acute patient. Recognition of patient deterioration, knowledge of when to seek assistance and an ability to anticipate, prioritise and communicate clinical urgency are considered especially important (McQuillan et al. 1998; Goldhill et al. 1999; Cioffi 2000; Scholes 2007; Odell, Victor and Oliver 2009). There is a growing recognition that indicators of acute deterioration are being missed, leading to adverse consequences for patients. Specifically, there is a lack of clinical significance attributed to dysfunction involving airway management and circulation. There is also a failure to appreciate the need for treatment urgency and appropriate action, contributing to both patient morbidity and mortality (McQuillan et al. 1998; Scholes 2007). Many initiatives have been designed to try to reduce these consequences, including the development of early warning scoring or track and trigger systems and medical response teams (Bellomo et al. 2004; Johnstone, Rattray and Myers 2007). Effectiveness of these various responses is reliant on appropriate monitoring of patients' vital signs, accurate interpretation and communication of clinical findings.

Up to 80 % of critically ill patients in Britain were said to receive 'suboptimal care' in acute care wards leading to potentially avoidable deterioration in their condition and impending signs of critical illness or cardiac arrest being missed by clinicians (McQuillan et al. 1998). The researchers used a combination of structured interviews with the admitting clinical team and the intensive care team, looking at critical events of 100 adult emergency patients between the initial hospital admission and admission to an intensive care unit. Despite the external assessors not being blinded to patient outcomes, the study provided clear guidelines for both nurses and doctors to facilitate early identification of critically ill ward patients. A physiological scoring system was devised to suggest that the doctor should be notified if three or more criteria were present. These criteria included:

- Respiratory rate over 30 or less than 8 breaths per minute
- Systolic blood pressure under 90mmHg
- Heart rate of over 140 or under 40 beats per minute

- Patient not fully alert and orientated (Glasgow Coma score under 12 or unexpected decrease in GCS of 2 or more)
- Oxygen saturation of under 90 per cent
- Urine output less than 30 ml per hour (McQuillan et al. 1998).

A pilot study was conducted in a 300 bed tertiary referral hospital in Australia, using a before and after design. Findings suggested that respiratory rate and circulation, key indicators of impending illness and physiological abnormalities, were mismanaged or overlooked. This was despite often long periods of documentation by both medical and nursing staff (Buist et al. 1999). Buist et al. formulated similar criteria for notifying the medical emergency team with additions including respiratory distress, any unexplained decrease in consciousness, repeated or prolonged seizures, uncontrolled pain, agitation or delirium. There were some limitations to this study in that it was non-randomised and based in only one tertiary teaching hospital. Findings regarding positive ward management of unstable patients may have been biased by the high profile of the research team and their known concerns regarding emergency response. Additionally, the presence of a dedicated research nurse may also have had an influence on improving team referral processes. Nonetheless, findings from this and other studies did demonstrate the benefits of clearly defined notification criteria (Buist et al. 2002; Subbe, Williams and Gemmell 2004; Hillman 2005).

A quasi-experimental study examined the short and long-term effects of introducing a patient vital signs chart and the Modified Early Warning Score (MEWS) on the prevalence of respiratory rate recording (McBride et al. 2005). The sample included two medical, two surgical and two orthopaedic wards. Baseline data collected demonstrated a low frequency of respiratory rate recording (29.5 ± 13.5%). Educational sessions regarding MEWS and the new chart were provided to staff on a continuing basis. In audit period two at week 23, the incidence of respiratory rate recording rose on all six wards to 68.9 ± 20.9%. At week 70 (audit period three), data demonstrated a statistically significant increase in respiratory rate recording prevalence between audit periods one and three (Fisher's exact test, $p<0.0001$) and incidence of 91.2 ± 5.6% (McBride et al. 2005). Other local initiatives such as the availability of a course related to the recognition of patient deterioration may have

impacted on the study. However, as the course was established two years prior to study commencement, a contamination effect is unlikely. The continuing educational sessions related to the new chart exemplified the benefits of enabling factors including guideline changes to implement new skills and reinforcing factors which support the learner (Davis et al. 2002).

A National Health Service trust in Southern England developed a specific one day course to address some of the causes of sub-optimal care, entitled: Acute life threatening events, recognition and treatment (ALERT). Course content included a comprehensive structured approach to the management and assessment of the critically ill patient, using demonstration and scenarios (Viner 2002). This strategy to address the learning needs of multi-disciplinary ward staff in relation to highly dependent critically ill patients was deemed valuable by the 40 attendees (60% of participants), who completed course evaluation three months after the program. Qualitative examples of the participants' responses demonstrated faster initiation of patient treatment. The three examples provided indicated participants' improved knowledge and skills acquisition and improved communication across the multi-disciplinary team (Viner 2002). Provision of more comprehensive evaluation data would have strengthened this conclusion. Further planned research, incorporating a larger sample size and a continuing education program to both facilitate and consolidate newly acquired skills will provide a more comprehensive study.

Variations of emergency strategies and response criteria exist in institutions worldwide. These include tools for improving communication between healthcare professionals, addressing key concerns regarding a patient's condition or physiological safety to enhance patient care. An example is the Situation, Background, Assessment and Recommendation (SBAR) tool which originated in America in the aviation industry in the late 1980s (Leonard, Graham and Bonacum 2004). Communication failures between healthcare professionals were seen to be a leading cause of inadvertent patient harm. Interdisciplinary communication factors were also identified as problematic within patient deterioration incidents in the (2007) NPSA report. Inadequate information sharing and documentation of observations were highlighted (Hairon 2007; Odell, Victor and Oliver 2009). Clinical handover is considered a high risk scenario for patient safety. Highlighted dangers

include discontinuity of care, adverse events and legal claims of malpractice (Wong, Turner and Yee 2008). Using SBAR guides clinicians through a systematic communicative approach to organise information concisely and factually while making a request for supportive intervention (Leonard, Graham and Bonacum 2004).

A clinical problem regarding a ward patient *Situation* (S) is succinctly communicated using specific criteria including information regarding the patient's *Background* (B) history and *Assessment* (A) findings and a *Recommendation* (R) made according to the perceived urgency of the referral timeframe and safe patient care (Leonard, Graham and Bonacum 2004). Leonard et al.'s descriptive paper provides a clinical scenario of a middle-aged patient having breathing difficulties (S), with chronic lung disease (B). The nurse is unable to detect breath sounds on the right side (A), suggests a pneumothorax is present and recommends (R) urgent review and a possible need for a chest drain. The subsequent enhancement of communication and decision-making skills in the early recognition of potential problems exemplifies the facilitation and resolution of a typically challenging clinical scenario that acute care nurses face. Similar mnemonics and variations of SBAR have been developed within Australia to reduce the breakdown in interdisciplinary communication processes demonstrated to contribute to adverse events. Consequences include unnecessary delays in diagnosis, treatment and care and incorrect treatment and errors (Australian Commission on Safety and Quality in Health Care 2008). Australian examples include iSoBAR developed by the Royal Perth and West Australian Country health service and ISBAR adapted for use in the national Clinical Handover Initiative project by the Hunter New England Health Service (Australian Commission on Safety and Quality in Health Care 2008).

Escalating demands on intensive care beds in the last two decades have increased the numbers of highly dependent patients being cared for in general ward areas. This change in patient demographics has put pressure on ward nurses who are often not equipped with the requisite knowledge and skills to care for this new patient profile (Haines and Coad 2001; Lesa and Dixon 2007). Furthermore, nurses working in these areas often lack skills especially relating to respiratory assessment, reflecting the need for more research and education in this area (Considine 2005b; Lesa and Dixon 2007). The literature has demonstrated that teaching of respiratory dysfunction

is critical in continuing nursing education because of clearly identified patient safety issues. An increased respiratory rate was seen as the most frequent physiological indicator of abnormality in patients prior to death, cardio-pulmonary arrest or critical care admission (Subbe, Williams and Gemmell 2004).

Failures to recognise respiratory problems early enough, resulting in suboptimal treatment, are recurrent themes in the literature (Crispin and Daffern 1998; Buist et al. 1999; Goldhill et al. 1999; Nadkarni et al. 2006). Respiratory rate is considered to be a 'highly sensitive marker' of predictable and preventable events in patients showing warning signs (Kenward, Castle and Hodgetts 2001). Concurrent observation of the work of breathing, use of accessory muscles and sputum production may indicate other physiological issues requiring intervention. The sounds of breathing including wheezing, coughing and stridor should also be noted. There is good evidence to support the notion that subclinical respiratory problems contribute to adverse events including pneumonia, pleural effusion, pulmonary embolus, pulmonary oedema and pneumothorax (Considine 2005b; Doherty and Coote 2006; Moore 2007). There is also substantial support for the contention that competent nurses can make a difference to timely respiratory care.

Nurses play a pivotal role in the prevention of adverse events relating to respiratory dysfunction, a well-recognised predecessor of cardiac arrest and medical emergencies resulting in increased mortality (Considine 2005b). An audit of 76 patients' physiological values in the 24 hours preceding transfer to intensive care from a ward found that 71% were categorised as having a breathing problem (Goldhill et al. 1999). Given that in 49% of cases chest infection or respiratory failure was the cause, early auscultation may have resulted in timelier emergency referral. The nurses' role in providing continuous surveillance is vital to the early detection of such dysfunction. High-risk patients exhibiting clinical instability related to respiratory problems can progress to adverse events such as cardiac arrest and death unless aggressive management measures are instigated early (Buist et al. 1999). Varying periods of clinical instability, where potentially reversible changes in predominantly respiratory vital signs are evident, precede approximately 80 % of cardiorespiratory arrests (Buist et al. 2002).

A 2006 prospective observational study from a multi-centre registry involving 36,902 adults and 880 children, assessed cardiac arrests over a four year period across American and Canadian hospitals. This study confirmed Buist et al.'s 1999 conclusion, finding that most in-hospital cardiac arrests are caused by progressive respiratory failure and shock, not by cardiac dysrhythmias as previously thought (Nadkarni et al. 2006). These findings were apparent despite reported data integrity, validation and sampling bias issues because of the multiple sites and differences in quality of care. The study demonstrated a clear need for nurses, in conjunction with other health professionals, to enhance their respiratory assessment strategies. This would reduce the likelihood of such events occurring and facilitate prompt action when required.

Considine's (2005) comprehensive literature review examined the relationship between specific respiratory dysfunction, clinical indicators and adverse events. Considine contended that when clinical antecedents such as respiratory rate alterations, hypoxaemia and dyspnoea are recognised and interpreted early by nurses, timely intervention can be implemented preventing further complications. The inclusion of respiratory assessment as a means of data gathering facilitates early detection of changes in a patient's health status and intervention following referral to appropriately skilled practitioners (Ahern and Philpot 2002; Finesilver 2003). Without thorough assessment, data collection is seldom done effectively (McQuillan et al. 1998; Subbe, Williams and Gemmell 2004; Wheeldon 2005). Early signs of respiratory dysfunction in acutely ill ward patients can be accurately identified by recording respiratory rate, highlighting changes in patient trends from baseline. Despite papers advocating the efficacy of regular respiratory assessment, nurses are demonstrating an unwillingness to fully adopt respiratory assessment in their clinical practice resulting in delays in essential treatment (Considine and Botti 2004; Hogan 2006; Moore 2007).

Increasingly complex technology, medications and systems, including surgical techniques such as laparoscopic surgery have necessitated surgical nurses having good assessment skills. This ensures higher dependency patients receive optimal safe care. Respiratory assessment skills need to be included in clinical practice to ensure that patient care is delivered in a safe and timely fashion and technology augments

clinical decisions (Hader 2004; Trossman 2005). Abnormalities such as fluid overload, atelectasis, pneumonia, pneumothorax and pleural effusions are then detected early on (West 2006). Respiratory assessment practices such as establishing the existence of normal breath sounds by auscultation and measuring respiratory rate are often overlooked (Doherty 2002; Doherty and Coote 2006; Hogan 2006). Respiratory rates are often not recorded despite being recognised as a more reliable marker than pulse oximetry to detect patient deterioration (Hogan 2006; West 2006). The importance of respiratory rate monitoring has only recently become apparent with few physical assessment textbooks emphasising its significance in the deteriorating patient (Cook and Smith 2004). Anomalies related to an altered respiratory rate reflect physiology disorders of cardiovascular, renal and respiratory systems which can progress to patient deterioration and adverse events (Subbe, Williams and Gemmell 2004; Goldhill and McNarry 2004).

Clinical emphasis has often been placed on the use of equipment such as pulse oximetry, important to measure patient's postoperative oxygenation requirements. The situation is compounded by the availability of equipment to automatically measure most other vital signs (McBride et al. 2005). Appropriate use should be made of available non invasive technologies such as oxygen saturation, postoperatively to reliably assess arterial oxygenation. However, some authors believe there is an over reliance on technology especially on pulse oximetry to measure ventilation function rather than its primary function of detecting hypoxaemia (Kenward, Castle and Hodgetts 2001; Hogan 2006). This finding was also established in a national enquiry where emphasis was placed on pulse oximetry readings rather than measurement of respiratory rate (Cullinane et al. 2005). A further study examining how nurses assessed patients' respiratory status in a cardiothoracic surgical unit demonstrated that the respiratory rate was not assessed as required, with oxygen saturations 50% more likely to be recorded than the respiratory rate (West 2003).

Similarly, in a study conducted by Bellomo et al, (2004) the majority of medical emergency team (MET) calls found no record of respiratory rate even in two calls triggered by an increased respiratory rate. Seven calls triggered for other reasons had rates recorded of over 30 breaths per minute, but were not used to trigger a MET call.

There was also inconsistent recording of respiratory rate in 37 calls associated with oxygen saturation levels less than 90%. This was despite administration of high flow oxygen therapy. The respiratory rate was often recorded as normal, unlikely given the clinical circumstances (Bellomo et al. 2004). Half of inpatients who suffer a cardiac arrest have documented clinical signs of deterioration in the 24 hours prior to the event which has not been acted on (Hodgetts et al. 2002). Nurses appear to be both misinterpreting and mismanaging the nursing knowledge 'basics' such as respiratory rate and oxygenation (Johnstone, Rattray and Myers 2007). Several authors have noted the lack of recording of respiratory rate by nurses while criticising the ignorance of the significance and portent of this practice omission (Woodrow 2002; Bennett 2003; Trim 2004; Butler-Williams, Cantrill and Manton 2005). A recent report by the NPSA investigating the quality and safety of the care of acutely ill patients in hospital, found that observations were incomplete with respiratory rates often not recorded (Hairon 2007). A decade after McQuillan et al (1998) reported on suboptimal ward care, clinicians are failing to recognise and act on patient deterioration (Scholes 2007).

A survey of critical care outreach nurses noted ward nurses' failure to both accurately assess respiratory function and record respiratory rate and rhythm. These omissions contributed to missing the first signs of impending respiratory failure, key predictors of both critical illness and cardiac arrest (Chellel et al. 2002). Support of ward-based nurses in many British hospitals is facilitated by critical care outreach teams who have undertaken specialist physical assessment training (Coombs and Morse 2002). The teams were set up specifically in response to a United Kingdom health department review of adult critical care services in 2000 (Chellel et al. 2002). Similar strategies have been implemented in Australian with the use of Intensive care Unit (ICU) liaison nurse-led teams. These teams provide advice, assessment and initiate treatment changes for patients in the ward environment (Green and Allison 2006). However, these measures appear to offer only short-term interim benefits. A long-term solution needs to include continuing education and empowerment of ward nurses. Ongoing clinical support and role-modelling of safe practice should be facilitated by educators and clinical coaches (Grealish 2000; Manning, Palmer and Yonekura 2003; Price 2004). A critical care outreach team set up to share clinical skills with ward staff acknowledged the benefits of nurses having good respiratory

assessment knowledge and skills. The team recommended the inclusion of physiotherapists in the team because of their expertise in early intervention related to respiratory problems (Watson et al. 2006). This suggested model negates the key role ward nurses can potentially play in adverse event prevention, following the relevant respiratory education and assumes physiotherapists have a 24 hour work pattern. Continuing education for acute care nurses is essential to build and maintain competence in these skills and change practice (Kenward, Castle and Hodgetts 2001; Bellomo et al. 2004; Lesa and Dixon 2007).

2.5.1 Continuing education for clinical skill acquisition

Clinical interventions by critical care and emergency nurses have been shown to facilitate early referral and continuity of care (Rushworth et al. 1998). Surgical ward nurses can play a key role in the early recognition and prevention of adverse events related to respiratory dysfunction. However, there remains a large proportion of the nursing workforce who underwent hospital training or undergraduate education where physical assessment was not included in the curriculum (Rushworth et al. 1998; Milligan and Neville 2003; West 2006). Holistic patient care is considered incomplete because of the omission of a thorough detailed assessment (West 2006). Links are not made between patient symptoms and the underlying physiology to inform nurse decision making. The most common location for intrahospital cardio-respiratory arrests is the general ward (Considine and Botti 2004). Given that these patients are under the direct care and surveillance of a registered nurse whose assessment findings influence care delivery decisions, it is vital that early detection and correction of abnormalities occurs.

Nurses are very often the only healthcare professionals who are in close and continuous contact with patients, so are best placed to notice changes in the patient's condition. Nurses consequently play a key role in the early recognition and notification to the appropriate health professionals of respiratory dysfunction necessitating preventive measures. Considine and Botti's 2004 literature review examined the early identification of patients at risk of sustaining an adverse event and the implications for nursing education. Response times in relation to nurses' detection, interpretation and action in terms of reporting of respiratory dysfunction to colleagues and medical officers, were found to vary considerably. Late or non-

reporting impacted adversely on the involvement of other health professionals and the subsequent timeliness of intervention and management (Considine and Botti 2004).

The pivotal role that nurses can play in both communicating assessment findings to other health professionals and influencing clinical decisions was emphasised by Considine in her 2005 literature review. She contended that nurses' recognition and interpretation of key respiratory indicators such as respiratory rate changes and airway and breathing problems, was an issue. Considine also asserted that most nursing observation charts did not allow for nurses' documentation of dyspnoea compounding the problem (Considine 2005b). Recommendations to highlight knowledge deficits related to physiological assessment and the requisite nursing education were made. Suggestions included ongoing research to examine the effects of nursing assessment and subsequent interventions on patient status (Considine 2005b). High levels of assessment skills are required by nurses to ensure optimum patient care. Detection of the deterioration of an acutely ill ward patient is considered to be within the realms of 'basic nursing assessment' (Ahern and Philpot 2002). However, there has been minimal recognition of the benefits of incorporating the respiratory assessment skills of inspection, palpation, percussion and auscultation into the routine nursing practices of patient care delivery (Milligan and Neville 2001). Knowing the right questions to ask, what signs and symptoms to look for and what to listen for when assessing patients' lungs, facilitates early detection of abnormalities. Perceived benefits credited to nurses performing respiratory assessment at regular intervals including continuity of care and initiation of early referral, have received minimal recognition in the United Kingdom (Rushworth et al. 1998).

Rushforth et al (1998) suggested that nursing roles are evolving in response to 'increasing patient dependency and monitoring technology'. They dispelled concerns that nurses conducting physical assessment may have less time to perform other aspects of their role, given the number of inappropriate administrative and housekeeping tasks still carried out by nurses. They contended that the key deficit in physical assessment literature is the 'lack of direct evidence of the effect of such skills on patient/client care' and recommended further research and audit (Rushworth

et al. 1998). The need for dedicated continuing education and follow up clinical coaching post-program were highlighted. The 'blurring' of nurses' roles in the continual adoption of perceived medical responsibilities was discussed by Wheeldon (2005), contending that there is minimal evidence supporting the use of physical assessment 'in any setting'. This statement was made despite the author's acknowledgement that the application of respiratory assessment could expedite peri-arrest symptom recognition. Conversely, Wheeldon supports nurses expanding their practice to deliver more holistic care by the inclusion of respiratory assessment as long as this practice is underpinned by appropriate education and training (Wheeldon 2005). The author's attitude reflects a common belief held by some nurses in the United Kingdom and Australasia that role change constitutes role extension or adoption of traditional medical skills rather than role expansion to facilitate more effective functioning in the contemporary nursing environment (Wheeldon 2005; Schroyen et al. 2005).

Milligan and Neville (2001) maintain that a 'tension exists between nursing education and practice in relation to health assessment'. They assert that many practice environments in New Zealand do not promote the use of health assessment skills despite post-registration courses being available for thirteen years. The inclusion of health assessment as a core component in the Nursing Council of New Zealand's examination of nurses' competence to practice was advocated (Milligan and Neville 2001). The requirement to assess changing health status suggests that stethoscope use by nurses should be regarded as an essential nursing tool to listen to respiratory, heart and abdominal sounds (O'Neill 2003). O'Neill suggested that normal, decreased, absent or abnormal sounds can all be detected using a stethoscope following appropriate education. However, evidence of nurses' use of comprehensive respiratory assessment as a routine part of competent safe practice, using this invaluable tool, was mainly limited to critical care areas (O'Neill 2003). Ongoing education combined with a supportive organisational culture and evidence-based policies will facilitate ward nurses' ability to anticipate respiratory dysfunction, interpret findings and initiate timely intervention (Considine 2005b). An educated nursing workforce has been shown to contribute positively to patient outcomes.

A study using cross sectional analyses of outcome data for over 230,000 surgical patients in 168 hospitals in the United States found that each 10 per cent increase in the proportion of RNs holding a bachelor degree was associated with 5 per cent lower mortality and reduced failure to rescue rates (Aiken et al. 2003). The main outcome measures examined by Aiken et al were the association between nurses' educational qualifications, patient mortality and patients experiencing complications within 30 days of admission. An RN survey conducted at the same time confirmed there was no response bias at the hospital level. Results demonstrated homogeneity of variables including hospital size, the available technology, nurse experience and nurse staffing ratios. The link between a higher proportion of RNs, educational qualifications and improved patient outcomes was attributed to nurses' constituting a 24 hour surveillance system. Nurses are therefore in the best position to ensure early detection of patient complications and initiate intervention (Clarke and Aiken 2003).

2.5.2 Nurse-sensitive patient outcomes in relation to respiratory care

There was minimal available data worldwide on the direct impact of nursing care in relation to patient outcomes prior to 1995. Few research studies preceding this date focused on the demonstration of the key role that nurses play in patient health outcomes. A set of quality indicators where nursing interventions might be shown to influence patient outcome measures were deemed to be 'nursing-sensitive' by the ANA in a 1995 pilot study conducted over a two-year timeframe (Lichtig, Knauf and Mulholland 1999). The project's aim was to test the feasibility of measuring nurse-sensitive patient outcomes while examining relationships between nursing staffing and patient outcome indicators in 295 acute care hospitals across California and New York (Lichtig, Knauf and Mulholland 1999). The study used nursing intensity weights (NIWs) to adjust for daily nursing acuity and patient data to determine average NIWs for each hospital for each year. Daily RN hours were divided by the average daily NIWs to provide both RN hours per NIW and total nursing hours per NIW. All secondary diagnoses were flagged by hospital medical record coders and then allocated by the research team into one of three categories (likely or unlikely to be an adverse patient outcome of patient stay, or not applicable). Diagnosis-related patient group calculations estimated adverse patient outcome rates for a period of two years for all hospitals included in the study. Investigation of specific respiratory

adverse outcomes in surgical patients included pneumonia and length of stay (Lichtig, Knauf and Mulholland 1999).

Study findings demonstrated a statistically significant relationship between nursing skill mix and nurses' early detection of pneumonia. The flagging mechanism used in coding was new and found to be unreliable across some sites. Problems were also related to under reporting of both complicating secondary diagnoses and nursing hours. Despite these difficulties, the study provided the nursing profession with exciting opportunities to quantify outcome measures as well as a comparative tool among hospitals (Lichtig, Knauf and Mulholland 1999). This paper is endorsed by similar findings relating to postoperative complications, all of which showed reductions in the incidence of pneumonia (Kovner and Gergen 1998; Needleman et al. 2002; Cho et al. 2003). These studies clearly highlight the relationship between higher education at undergraduate university level and nurse-sensitive outcomes. However, few studies have examined the relationship between continuing nursing education conducted within healthcare facilities, clinical practice and improved patient outcomes.

The relationship between nursing graduates educated to baccalaureate level, clinical expertise and reduced incidence of adverse events, including pulmonary infections and respiratory dysfunction, has been demonstrated by a number of North American studies (Aiken et al. 2003; Kovner and Gergen 1998; Needleman et al. 2002; Pringle and Doran 2003; Cho et al. 2003). An analysis of the discharge records of six million patients conducted by the Harvard School of Public Health focused on adverse outcomes and complications. Data from 799 American hospitals in eleven states was examined. Statistically significant relationships were found between staffing of a higher number of RNs and lower rates of pneumonia (Needleman et al. 2002). Nonetheless, the study highlighted weaknesses in the available data — mainly inconsistencies of nurse staffing data in data sets, detracting from the accuracy of study findings. A significant relationship was also found between RN staffing levels and the incidence of adverse events such as pneumonia and pulmonary compromise following major surgery, in a study conducted across 589 acute care hospitals in ten North American states (Kovner and Gergen 1998).

However, coding inconsistencies occurred and results may have been biased by sample selection creating homogenous samples used to calculate results, excluding patients with multiple diagnoses. No examination of the impact of ongoing education on nurses' competence was made. Despite research limitations, these studies provided guidelines for further research on the relationship between nurse staffing, provision of relevant education programs and reduction in adverse events. Study findings collectively facilitated the quantification of evidence relating to quality indicators of nursing care that contribute positively to patient outcomes. Justification for nursing-sensitive outcomes research includes the recognition that nurses make a difference to patient care. The data clearly demonstrates categorical evidence of professional accountability and clear implications for future nursing practice (Pringle and Doran 2003).

In a further study of 124, 204 surgical patients admitted to 232 acute care American hospitals, the effects of a 10 % increase of RN staffing was associated with a 9.5 % decrease in pneumonia (Cho et al. 2003). This study used two existing public databases and 20 common diagnosis-related groups in a homogenous sample of hospitals and patient groups. The study employed multilevel analysis and aimed to examine the effects of nurse staffing on adverse events and the related morbidity and mortality. Strong links were noted between adverse events and increases in both morbidity and mortality, especially in relation to pneumonia. Pneumonia was associated with a 1.74-fold increase in the patient's length of stay and a 3.39-fold increase in the death rate. The authors contended that postoperative pulmonary infections could be avoided in surgical patients with the provision of 'attentive lung care' by knowledgeable, skilled RNs (Cho et al. 2003). Interestingly, nurses' experience, educational background and access to continuing education were not considered as separate measurement issues in the study.

Similar studies were conducted in Australia during the 1990s using research objectives of quality improvement, nursing accountability and determining key performance indicators of best practice (Long 2003). The difficulties in attributing patient outcomes directly to nursing interventions were discussed. This was despite the recognition that areas of concern flagged by the Australian Council for Safety and Quality in Health Care committee included medication management, pressure

area care, falls reduction, deep vein thrombosis and infection control —all key areas of nursing practice. These are all clearly identified adverse event indicators where nurses' direct early intervention impacts significantly on patient outcomes. However, reliable software categorically linking data from patient outcomes and interfacing in particular with nursing workloads, staffing, ongoing professional development and indicators more specific to ward care are still under development in Australia (Duffield, Roche and Merrick 2006; Duckett, Coory and Sketcher-Baker 2007).

The recent introduction in Queensland of statistical process control charts using variable life-adjusted displays (VLADs) to monitor clinical outcomes provide a starting point in Australia to both the implementation of system changes and the improvement of the quality of care. VLADs use routinely collected data from 31 clinical indicators which incorporate simple visual tools for displaying variations in data quality, casemix structure, processes of care and carers. The clinical indicators include in-hospital mortality from pneumonia as well as surgical complications, long stays and readmission (Duckett, Coory and Sketcher-Baker 2007). Although definitive answers are not provided by the use of VLADs, ideas are being developed regarding the reasons for variations in reported patient outcomes. Methods to improve data quality and implement system changes are also being examined. These include planned expansion of the indicators to include information sensitive to ward care and prevention of adverse events and complications (Duckett, Coory and Sketcher-Baker 2007).

Provision of reliable data to establish indisputable links between nursing actions and patient outcomes has the potential to revolutionise nursing practice (Doran et al. 2006). Greater credence would then be given to the positive impact competent nursing care has on specific patient outcomes. Challenging research issues include variations between data sources, clarity of definitions and strategies for analysis, given that some researchers have used incident reports, others patient record review and diagnosis related groups. The establishment of large databases of nursing-sensitive quality indicators by the ANA provides valuable guidelines for standardising methods to identify best practice. This information has important implications for planning the future nursing workforce. This includes development of

the nursing role in acute postoperative care, educational strategies to guide practice changes and provision for comprehensive evaluation of continuing education.

2.6 Evaluation of Continuing Education

The literature revealed a paucity of needs analyses underpinning continuing education programs and limited evaluation of outcomes. Four aspects of evaluation were identified by Ferguson (1994), Sheperd (1994) and Kirkpatrick (1998):

1. Process evaluation appraising participant reaction and reported satisfaction with education delivery, training facilities and accessibility.
2. Content evaluation linking the learner's knowledge and skills acquisition and changes in attitude.
3. Outcome evaluation demonstrating the learner's ability to apply learning to the work unit and changes in practice.
4. Impact evaluation linked to the quality of patient care (did the learner's change in behaviour improve organisational effectiveness?

However, the outcome is often the nurse's personal view of the perceived benefit of the educational program (Jordan 2000). Hicks and Hennessey (2001) contend that most continuing education activities are evaluated with an emphasis on the participant's comfort or satisfaction with teaching factors rather than the impact of such experiences on patient care. Proponents of continuing education emphasise the positive response of American nurses for over thirty years to mandatory requirements for certificated continuing education (Furze and Pearcey 1999). Similar positive perceptions were determined by British nurses who are required to undertake a mandated number of education hours identified as necessary for continuing competence and the improvement of clinical services (Hughes 2005). Australian nurses and midwives on the nurses' and midwives' register are also required to participate in specified hours of continuing professional development per year from 2010 (NMBA 2010). However, many authors doubt whether mandatory schemes maintain competence standards, improve practice or promote lifelong learning (Furze and Pearcey 1999; Lawton and Wimpenny 2003; Hughes 2005; Griscti and Jacono 2006). Punitive measures to encourage clinicians disinterested in pursuing ongoing professional development are of questionable value (Griscti and Jacono 2006).

Concepts of a learning organisation where clinicians are encouraged to continually expand their learning capacity by the provision of learning opportunities are recommended (Senge 1990; Jeong et al. 2006; Rowley 2006). Stronger links between individual nurses' learning needs and the clinical context in which they practice need to be developed.

A classification system developed by Green, Kreuter, Deeds and Partridge (1980) and modified by Davis, Thomson-O'Brien, Oxman and Haynes (1992) sorted education interventional strategies by factors relevant to behaviour change:

1. Predisposing factors, where information dissemination is designed to modify a learner's knowledge, beliefs and attitudes via lecture, written or video material.
2. Enabling factors, such as conditions and resources within an organisation that provide the learner with practice opportunities or guideline changes to implement new skills.
3. Reinforcing factors which support the learner via peer advice, feedback or supervision to continue the use of newly learnt skills (Davis et al. 1992).

Facilitative nurse leaders and educators and a supportive clinical context are essential prerequisites for successful professional development and the achievement of sustained changes in clinical practice (Wallin et al. 2003; Henderson and Winch 2008b). Unless nursing education is a central part of core hospital business and best practice patient care is fully supported by healthcare administrators, proactive initiatives do not eventuate (Funk, Tornquist and Champagne 1995; Parahoo 2000; Penz and Bassendowski 2006; Henderson and Winch 2008a). The intervention method used in the majority of studies meeting the selection criteria was a quasi experimental design. Weaknesses in the methodological approaches affected about half of the studies. Samples were non-random and had small sample sizes using convenience samples. There were two exceptions where studies randomised the allocation of participants. Response rates were low and attrition rates were often as high as 50% at post intervention evaluation. Most did not include a control group. Follow up evaluation timeframes varied between three and 18 months. No studies included all levels of evaluation.

One study used structured observation methodology and performance feedback demonstrating reinforcing factors and supportive performance feedback at post evaluation (Day, Iles and Griffiths 2009). Two further studies demonstrated reinforcing factors at follow up evaluation three to four months post program by providing the clinical support and feedback important to encourage participants' behaviour changes (Tippett 2004; Rosalien and Alcock 2009). Learners may be motivated to both learn and make practice changes but are often hindered by insufficient ongoing educational support in the clinical setting, especially when concepts are complex (Czurylo et al. 1999). In a few of the studies that evaluated knowledge and reported behaviour, researchers concluded that staff behaviour changes were sustained at follow up (Czurylo et al. 1999; Guardini et al. 2008). These were largely self-reported changes. No longitudinal studies were used to determine whether clinical skills were still being used to inform clinical decision making over time. However, this finding may reflect time and financial constraints limiting nurse researchers' ability to evaluate application of long term educational initiatives and sustained changes in clinical practice (Attree 2006; Penz and Bassendowski 2006; Draper and Clark 2007; Emerson and Records 2008). Educational approaches and education program formats were often not described with only half of the studies discussing the use of educational strategies. These studies described various interactive approaches which included the use of role play, simulation and scenario based learning.

Considine, Botti and Thomas (2006) examined the effects of educational preparation on emergency nurses' oxygenation assessment and use of supplemental oxygen. A pretest/posttest controlled quasi-experimental design was used for the study. Two parallel sets of multiple choice questions measured emergency nurses' knowledge and a self-directed learning package comprised the intervention. Three major findings were established. The first found that educational preparation increased nurses' knowledge relating to oxygenation assessment and use of supplemental oxygen. The second determined that the pretest knowledge score was the only predictive factor regarding independent decision making in relation to nurses implementing supplemental oxygen. A significant positive relationship was found between the emergency nurses' postgraduate qualifications in emergency nursing and the effects of education ($p = 0.03$). These results indicated that nurses with specialty

qualifications may have been more responsive to education related to their area of practice (Considine, Botti and Thomas 2006). Study findings produced similar results to other studies showing that educational preparation results in increased knowledge (Bird and Wallis 2002; Tippett 2004).

Bird and Wallis (2002) examined the effects of a self-directed learning package on nurses' knowledge and assessment skills relating to epidural infusion management. The self-directed learning package had been completed by over three quarters of the sample (Bird and Wallis 2002). Study results showed that nurses who had completed the self-directed learning package had higher mean knowledge scores than other participants (29.21 compared to 25.55 $p< 0.0001$). Nurses who had ward experience had higher mean scores than participants who had not (29.15 compared to 27.22, $p = 0.017$). Study findings suggested a combination of teaching and learning strategies including learning packages, clinical skills demonstration and ward based clinical supervision enhanced clinical practice (Bird and Wallis 2002). However, participants did not perform well in the clinical decision making section of epidural assessment relating to efficacy of sensory blockade and communication of abnormal findings to colleagues. Poor knowledge of the pharmacological side effects of epidural infusions was also demonstrated emphasising important educational deficits in the learning package.

Tippett (2004) evaluated nurses' knowledge at four stages before and after attendance at a five day trauma training course. Stage One occurred six weeks prior to course commencement before distribution of course manuals, Stage Two at course commencement, Stage Three following the second day and Stage Four, three months after course completion. Short answer questions generated the study test scores. The study demonstrated an overall highly significant change in participants' knowledge levels ($p< 0.001$) following course attendance (Tippett 2004). Mean test scores increased slightly from 60.7% to 64.7% after pre-reading at Stage Two. Test score comparison before and after Stage 3 showed significant improvement with the mean test score increasing from 60.7% to 83% ($p = 0.018$) (Tippett 2004). However, knowledge levels were reduced significantly three months following the course with the mean test score decreasing to 73% ($p = 0.042$). These findings raise questions about approaches to support sustainability of learning. Educational strategies used in

the program were not discussed apart from the use of training manuals, invigilated examinations and logbooks to document participant's exposure to trauma post program. Further information may have helped to better interpret the results.

A randomised controlled trial investigated the effectiveness of individual performance feedback on nurses' and physiotherapists' knowledge retention regarding tracheal suctioning and related clinical practice (Day, Iles and Griffiths 2009). Study participants were recruited from general and high dependency wards in two acute hospitals and randomly allocated to receive performance feedback or not following a conventional lecture and practical demonstration of tracheal suctioning on a manikin. Randomisation was stratified by profession, seniority and site (Day, Iles and Griffiths 2009). Data were collected in a clinical setting at one site and a simulation setting at the other. Performance was assessed by structured observation and self-completion questionnaire within six weeks of the original teaching and feedback was given within eight weeks of teaching. Participants were then observed suctioning and completed the final knowledge based questionnaire sixteen weeks post teaching.

Post intervention findings demonstrated that there were statistically significant improvements in knowledge and tracheal suctioning practice following tailored feedback in both clinical and simulated settings. Participants receiving performance feedback had statistically significant higher knowledge scores ($f = 8.539$, $d.f. = 1$, $p = 0.004$) and practice scores ($f = 47.352$, $d.f. = 1$, $p = 0.01$) than the control group (Day, Iles and Griffiths, 2009). There were greater improvements for practice than knowledge in both settings demonstrating the inadequacy of knowledge evaluation alone to determine clinical performance. Effectiveness of the intervention was stated to be greater when based in simulated practice ($p = 0.01$) (Day, Iles and Griffiths 2009). Given that the final practice assessment in the simulated study environment was also a simulation, further research is necessary to demonstrate that this benefit transfers to actual clinical practice. Additionally, whether practice continues to improve and is sustained over time.

A larger study sample of 168 nurses used a pretest, post-test design to assess the effectiveness of continuing education in postoperative pain management. Participant

knowledge was evaluated immediately following course conclusion and after eighteen months (Guardini et al. 2008). The use of interactive educational strategies fostered an initial statistically significant increase in knowledge on every test item at the initial post-test ($p< 0.001$) but this was not maintained. After eighteen months, seven items relating to participant use of pain tool and dosing guidelines demonstrated statistically significant values at the follow-up post-test ($p< 0.001$), while there was marked decrease in a further three items (Guardini et al. 2008). Results indicated that there is a progressive reduction in knowledge retention unless refresher courses are held on a more regular basis. However, the low participant response rate of 55% at eighteen months reduced the study's validity.

A further pretest, post-test design aimed to measure nursing practice outcomes related to continuing education in postoperative pain management. A modified evaluation tool was used, adapted from Brazen (1995). Only 27% of 185 study participants completed the post-test at program completion and a further 37% (68 participants), four weeks post program. Ninety-eight per cent of respondents agreed that information use improved patient care while the authors contended that the program triggered practice changes (Czurylo et al. 1999). However, the evaluation tool had no documented evidence of validity or reliability and no statistical data was provided regarding the stated improved scores or how the study had improved patient care.

A one group pretest post-test design was used to examine the differences in staff knowledge, psychomotor skills and self-reported confidence involving peripherally inserted central catheter (PICC) care before and three months after a focused educational intervention (Rosalien and Alcock 2009). Participants' mean psychomotor skill scores increased significantly three months after the PICC intervention ($p = 0.003$). Participants' mean knowledge and self-reported confidence scores also significantly improved immediately after the intervention ($p = 0.005$) and ($p = 0.003$) but deteriorated post intervention ($p = 0.084$) and ($p = 0.562$) (Rosalien and Alcock 2009). The small sample size, participants' variable baseline PICC clinical experience and absence of a control group limited the ability to generalise these findings.

Lont's (1992) study used a non-experimental descriptive design, convenience sample and pre-coded questionnaire. The study objectives were to determine how nurses learned respiratory assessment skills, how often they used these skills, and whether the number of years spent practising influenced nurses' confidence in implementation of these skills (Lont 1992). One hundred and fifty nurses from the medical- surgical wards of a regional teaching hospital in Victoria, Australia were included in the study. Of the 117 participants who returned the questionnaires, 89 % stated they carried out respiratory assessment on a daily basis. Despite 50 % of respondents listening to chest sounds on a weekly basis, only one-third had learned this skill during undergraduate or hospital training. Twenty-seven nurses indicated their ignorance relating to distinguishing between different breath sounds, suggesting that training would increase their confidence levels (Lont 1992). The use of statistical analysis, a validated evaluation tool and a control group would have enhanced this study.

The practice outcomes of a venepuncture and cannulation study day were evaluated using a telephone survey three months post training (Hewitt and Roberts 2003). Four cohorts (two university based and two laboratory based) were questioned whether they were practising the skill or not, frequency of practice and what would help participants to achieve the skill. Employer support was found to be the main factor in 65% of university cohort practising their skills less than five times compared to 39% of the laboratory skills group. No control group was used nor establishment of survey validity and reliability. Despite a significant proportion of participants not achieving practice competency, there was no discussion regarding a review of educational strategies or contextual support. The processes that could have had a learning impact were not elicited nor were any enabling or reinforcing factors established which may have facilitated the use of new skills.

Underwood et al. (2004) conducted a study to evaluate a model that could be used by nurse educators to measure perceived changes in expertise, use and applicability of concepts gained from attendance at a convention. The outcomes of three different types of education programs were evaluated. The three programs included cancer care, grants writing and health information standards. Perceived nursing expertise was measured before, directly after and six months following program attendance.

Findings demonstrated that all changes in perceived expertise were significant at the .05 level from Time One to Time Two (Underwood, Dahlen-Hartfield and Mogle 2004). Insufficient responses were returned at six months (Time Three), to make meaningful analysis of transfer of learning over time.

Similarly, Brunt (2000) conducted a prospective study to examine behaviour change and learning outcomes resulting from attendance at an education program focusing on nursing research and research use. Participants were asked to complete evaluation instruments at three intervals, Time One immediately before the education program, Time Two immediately following and Time Three, three months afterwards. The authors' findings indicated that the education program resulted in positive behaviour changes. The matched t test was reported to be significant both for the pre- and immediately post-workshop ($p< 0.00$), as well as results comparing the pre- and 3 months post- workshop, all but one participant reporting they took specific actions after the workshop (Brunt 2000). These actions included planning ways to disseminate research findings, review of workshop materials, reading a research article and discussing workshop content with a colleague. Although 46 of the 70 participants were reported to have incorporated a research idea into practice, there were no details of specific research outcomes or patient benefits.

The literature therefore demonstrates some evidence of the application of new knowledge and best practices learned at conferences or workshops in the workplace (Halfer 2009). Many inservice sessions, workshop and conference evaluations focused on participant perceptions of session objectives, educational processes or teaching strategies. This approach was undertaken rather than researching whether attendance changed clinicians' attitudes and clinical decision making or modifications were made to work practices (Draper and Clark 2007). Educational strategies actively engaging learners and promoting participation have been recognised to be more effective in changing professional practice (O'Brien et al. 2003). A literature review of nurses' continuing education programs also concluded that participatory workshops are considered to be more effective to take account of different learning styles and application of learner-centred educational experiences (Griscti and Jacono 2006).

2.7 Educational Methods and Strategies

Technological advances and changes in healthcare delivery have necessitated that nurse educators adopt innovative teaching and learning strategies to better prepare acute care nurses for increasingly complex roles. High levels of critical thinking, clinical reasoning and clinical judgement skills are necessary for contemporary nurses to function effectively and safely in the current acute healthcare environment (Forneris 2004; Forneris and Peden-McAlpine 2006; Lasater 2007; Worrell and McGrath 2007; Benner et al. 2008). Clinical reasoning pertinent to nursing depends on the development of cognition and critical thinking. Both are inextricably linked to clinical reasoning processes (Kuiper and Pesut 2004; Forneris and Peden-McAlpine 2006). Nurses need to be able to provide knowledgeable patient care, make clinical decisions based on sound evidence and demonstrate a clear rationale for their actions (Ferguson and Day 2005). The development of context-dependent experience and knowledge is crucial to the integration of theory and practice in a practice profession as complex as nursing (Tanner 2007; Benner et al. 2008). Nurses must be able to anticipate and manage an increased complexity of patient care in the current dynamic healthcare environment (Candela, Dalley and Benzel-Lindley 2006).

Because of the rapid changes evolving in current healthcare, there is a constant need for acute care nurses to update their knowledge and demonstrate their continuing conversancy with current skills and competencies. This requires ongoing professional development to ensure nurses adapt quickly to new knowledge and skills, technological advances and the changing nature of the workforce. Suggested strategies for educational change include the use of integrated learning strategies, interactive teaching concepts, contextual learning and learner-centred pedagogies (Ridley 2007; Tanner 2007). Active learning strategies promote the development of critical thinking, clinical reasoning and reflection because of their cognitive triggering processes (Youngblood and Beitz 2001). Interactive teaching examples include the use of role play, scenario-based and experiential learning activities including simulation. Educational challenges are provided by increasingly diverse nurse characteristics such as ethnicity, age, gender and experience (Wharrad et al. 2002).

The use of integrated teaching strategies such as simulation learning meets the learning needs and multiple perspectives of these disparate groups (Giddens 2008). Learning principles supporting the adult learner are incorporated in simulation education. Active participation engages learners, fostering experiential learning, clinical reasoning and application of clinical knowledge to practice environments (Nagle et al. 2009). Learners are encouraged to take an active role in their learning, use critical thinking and clinical reasoning processes, consider different points of view and reflect on their experiences and learning outcomes (Forneris 2004; Tanner 2006; Ridley 2007; Benner et al. 2008).The educator assumes a facilitative role being a 'cognitive coach', challenging the use of critical reflective thinking while empowering students to be independent learners (Grealish 2000; Wharrad et al. 2002; Ridley 2007).

Thomson-O'Brien, Fremantle and Oxman's research in 2001 examined 32 studies, comparing didactic lectures and interactive participatory sessions. Despite generally limited reporting of methodology and a paucity of rigorous evaluation, overall conclusions were that interactive continuing education activities could improve both professional practice and patient outcomes (Thomson-O'Brien, Freemantle and Oxman 2002). Thomson-O'Brien et al also contended that participatory learning strategies should include assessment of competence by use of performance-based assessment incorporating demonstration of the individual's knowledge, skills and attitudes and follow up practice sessions. The promotion of group reflective practice, together with critical questioning, clinical reasoning and decision making is recommended in nursing education with strong application to clinical situations (Walsh and Seldomridge 2006a). Reflection attaches meaning to information while clarifying the 'why and the reason for what we do and how we critically discriminate what is relevant' (Forneris 2004).

Active learning strategies promote critical thinking and development of clinical judgement because they trigger cognitive processes. Individuals and groups learn to question and critique solutions, consider various perspectives, explore alternatives and evaluate therapies (Youngblood and Beitz 2001; Yeh and Hsing-Hsia 2005). Integrated thinking and learning is not a new concept, first used by Dewey in 1933 in conjunction with reflective practice. Other earlier proponents of reflective practice

include Argyris and Schön, (1974), Schön (1983), Mezirow (1990), Brookfield (1995) and Tennyson, (1997). All theorists postulated the importance of reflection as a learning tool to assist clinicians to make informed decisions, devise a practice rationale and effectively critique one's actions (Ruth-Sahd 2003; Forneris 2004). A model of coaching where expert role models work side by side with learners to reinforce appropriate action tendencies and reflective practice was first advocated by Schön (1983,1987). This process requires the active involvement of a clinical coach and a healthcare environment and organisational structures supportive of the learner's needs and possible practice changes (Teekman 2000; Dracup and Bryan-Brown 2004; Fowler 2008; Henderson and Winch 2008b).

The current educational focus on critical thinking reflects the complexity of the healthcare context and the need for nurses in acute care to be able to make knowledgeable decisions based on sound evidence (Ferguson and Day 2005). The predomination of patient safety issues in imperfect healthcare systems are frequently caused by errors in thinking (Scheffer and Rubenfield 2006). Fero et al (2008) contend that a nurse's critical thinking ability directly affects patient safety. Higher order thinking is characterised by the ability to anticipate risk, recognise changes in patient status and when and who to ask for assistance (Kataoka-Yahiro and Saylor 1994; Chabeli 2006). In a landmark study, Scheffer and Rubenfeld (2000) replicated a 1990 Delphi study conducted by the American Philosophical Association under the direction of Facione. A consensus statement by the expert panel defined critical thinking as:

> 'An essential component of professional accountability and quality patient care. Critical thinkers in nursing exhibit these habits of mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance and reflection. Critical thinkers in nursing practice the cognitive skills of analysing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge' (Schaefer and Rubenfield 2000).

However, the assumption that education relating to critical thinking will improve clinical competence and performance has proven unfounded (Brunt 2005; Ridley 2007). There has been little published evidence relating to how educational approaches impact on critical thinking in acute care nurses' clinical practice (Brunt 2005; Forneris and Peden-McAlpine 2006; Worrell and McGrath 2007). A quantitative, correlational study examined the relationship between nurses' educational level, role values, specialty level and clinical decision-making in medical-surgical wards in Australia (Hoffman, Donoghue and Duffield 2004). Although the sample was convenience, reliability and validity of the questionnaire was established and clear evidence of statistical analysis demonstrated. Results demonstrated a significant positive relationship between education and clinical decision-making ($r=0.561$), ($p<0.01$). Participants with higher levels of education wanted to be more involved in decision-making. There was also a significant positive relationship between level of appointment and decision-making ($r=0.338$), ($p<0.01$). Those holding higher levels of appointment participated more in decision-making (Hoffman, Donoghue and Duffield 2004). Interestingly, the study found there were differences in decision-making according to practice area, medical nurses participating more than their surgical colleagues. Further research is needed to uncover the rationale.

A study to identify the critical thinking needs of 2144 new and experienced American nurses used a post hoc retrospective analysis of Performance Based Development System (PBDS) Assessment data. Participants were given a set timeframe to view ten videotaped scenarios and write responses. The majority of the study sample (75%) met PBDS expectations in the following sub categories: problem recognition, reports essential data, initiates independent intervention, differentiates urgency, anticipates relevant medical orders and provides relevant rationale to support decisions (Fero et al. 2008). Of those not meeting expectations, 81% demonstrated subcategory information. New graduates comprised 56% of the sample and had the highest rate of not meeting expectations compared with nurses with over ten years experience (Fero et al. 2008). The study met reliability and validity criteria but had a number of limitations. Information relating to participant age, gender, prior experience and length of employment was not provided and clinical decision making in an actual clinical emergency may have differed from videotaped scenarios. Use of

high fidelity simulated manikins providing realistic activities that are more interactive may have been a better educational option. Participants should also have been given an opportunity of reflective practice and debriefing to facilitate learning and knowledge transfer (Nagle et al. 2009).

Benner et al (2008) contend that greater emphasis should be placed on multiple ways of thinking, including clinical reasoning and evidence-based physiological knowledge to facilitate quick action when a patient's condition deteriorates. Nurses' use of critical reflective thinking and clinical decision making in clinical circumstances such as practice breakdown is essential to deconstruct situations, decrease errors and sentinel events (Potter et al. 2005; Tanner 2007). Moreover, competent and capable individuals have 'an all round capacity to manage the unfamiliar, the unexpected and the turbulence of change' (Hase 2002). In addition, integrated educational approaches to quality patient care better address the complexities of current nursing practice and knowledge transfer to the clinical setting (Benner et al. 2008). Educational strategies actively engaging learners and promoting participation have been recognised to be more effective in changing professional practice (Thomson-O'Brien, Freemantle and Oxman 2002). Unpredictable patient care situations require healthcare professionals who can prevent patient deterioration by immediate action and skilled performance of tasks (Jenson, Meyer and Sternberger 2009). Innovative ways of integrated learning and teaching strategies using human patient simulated manikins have been used in response to the complex dynamic healthcare environment.

2.7.1 Simulated learning

Simulated learning combines the teaching of critical thinking and clinical reasoning processes in a non-threatening environment. Simulated training can be provided for a variety of clinical competencies from basic assessment to advanced emergency responses. Manikins adapt well to scenario-based education. Scenarios can mimic a variety of clinical situations including normal and abnormal lung, heart, bowel and heart sounds and monitoring of blood pressure and rhythms. This innovative educational tool is used as a complement to hands-on clinical experiences and incorporates adult learning principles by providing active participation that fosters experiential learning (Nagle et al. 2009). Simulation effectively prepares nurses for the complexities of practice they may encounter. Manikin use for educational

purposes facilitates nursing competence and confidence by imitating patient assessment in real life scenarios providing educational opportunities without compromising patient safety (Cioffi 2001).

Kneebone (2005) contends that simulation is an effective learning method because of the incorporation of the four key facets of nursing education. These include technical proficiency development through practice of psychomotor skills and repetition, expert assistance tailored to meet learners' needs, situated learning within context and incorporation of affective learning components (Kneebone 2005). Clinical reasoning is enhanced as participants learn to apply knowledge skills to make clinical judgements (Lasater 2007; Decker et al. 2008). The level of interaction with the participants and simulator can be tailored to meet learners' specific needs. This ensures that varying levels of confidence, experience, intergenerational differences, learning styles and capabilities can be catered for (Shepherd 2009). Simulated clinically-focused patient care scenarios offer the capability of reproducible learning situations in non-threatening environments. These strategies facilitate knowledge acquisition, teamwork processes and integration of learned skills into real life clinical situations (Nagle et al. 2009).

Ritualistic action lacking in clinical judgement or critical thinking processes relating to health assessment is dispelled by scenario-based learning, simulation use and learner-centred strategies. The high hazard environment that nurses work in is cognitively demanding with minimal margin for human error, requiring teamwork and interdisciplinary collaboration (Ironside and Sitterding 2009). Simulation of clinical practice scenarios facilitates clinician confidence, competence, clinical reasoning and critical thinking abilities without compromising patient safety (Fraser and Greenhalgh 2001; Cooper and Taqueti 2004; Shepherd 2009). Scenarios can be tailored to group size, participant learning needs and team requirements. Clinicians can practice a diversity of decision making situations in a self-paced manner and learn from their mistakes without negative repercussions (Ravert 2008). The establishment of team training strategies incorporating simulation to improve patient safety and support clinical practice has been recommended globally by healthcare organisations (Nagle et al. 2009; Shepherd 2009).

Given the makeup of most contemporary healthcare teams is multigenerational and positional hierarchy is not necessarily determined by age, or years of experience, conflict and miscommunication can contribute to adverse outcomes (Duchscher and Cowin 2004; Nagle et al. 2009). Specifically designed scenarios encourage development of a team culture in relation to a variety of crisis situations. Participants are guided to reflect on group and individual actions, discussions mediated and experiences critiqued (Shepherd 2009). Team members are valued for their contributions (Nagle et al. 2009). Ethical concerns are minimised and self-evaluation promoted by post-scenario debriefing and group reflection. This helps the learner to acquire new knowledge and receive constructive feedback regarding the consequences of actions and decisions while evaluating teamwork processes (Nagle et al. 2009). Situations can be practised repeatedly if necessary to enhance mastery of clinical and communication skills and teamwork while avoiding any risk to both patient and learner (Maran and Glavin 2003).

Initial models focused on medical resuscitation training, with human simulator manikins first being used in undergraduate nursing and medical programs in the United States in the 1990s (Good 2003). High fidelity patient simulation (HFPS) models are more sophisticated, including a range of computerised interactive programs demonstrating increasing degrees of realism. HFPS manikins offer a diversity of applications with realistic physiology which have gas exchange capacity, can sweat, bleed and respond to intravenous fluid and pharmacological agents (Shepherd 2009). Learners respond to the recreation of a clinical scenario, which reflects the complexities of clinical practice and work through signs, symptoms and appropriate responses or interventions in a group or individuals supported by an educator (Hawke 2002).The use of simulation modalities in nursing education is becoming increasingly commonplace as an adjunct to nursing and medical education.

This is despite limited robust empirical evidence to support the effectiveness of simulation technology on clinical practice in comparison with other teaching methods (Murray et al. 2008; Cant and Cooper 2009). Simulation has also received widespread global endorsement by nursing professional bodies and healthcare professionals (National Council of State Boards of Nursing 2005; National League for Nursing 2006; Nursing and Midwifery Council 2007; National Health Workforce

Australia Taskforce 2009). Unfortunately, manikins are expensive, limiting their use in healthcare institutions increasingly constrained by budgetary restrictions. However, these education costs are offset by the resulting efficiencies in care and reduction in errors, patient deterioration and adverse events (Gaba 2004; Shepherd 2009).

A study conducted in Taiwan, using a pre-test, post test design, examined the impact of an education program using interactive videodisc systems on improving nursing students' critical thinking abilities (Yeh and Hsing-Hsia 2005). Results demonstrated significant improvements in participants' problem analysis in the eight week period from pre-test to post-test, despite students with limited prior nursing related work experience displaying less evidence of maturity and 'inquisitiveness' (Yeh and Hsing-Hsia 2005). Further research would be necessary to determine more sustained decision-making abilities including participants' relative confidence and competence relating to the recognition and management of critical incidents in the clinical context.

A quality assurance study was conducted at two hospitals over a one-month timeframe by Wilson et al in 2005, assessing the user-friendliness of LFPS manikins in relation to the development and evaluation of nurses' health assessment knowledge and skills. Comparison with other teaching tools, training products and instructional programs was also made. Despite a sample size of seventy participants, results indicated overall nursing satisfaction with the degree of realism, suitability for teaching purposes and advantages over existing educational materials (Wilson et al. 2005). The potential for risk reduction related to adverse events and contribution to positive patient outcomes was noted with recommendations for further research testing LFPS sustained effectiveness on nurses' health assessment knowledge and skills. In the current climate of high patient acuity and complexity of care, 'the time has never been more pertinent' that contemporary nursing practice should encompass both vigilant and systematic physical assessment to enhance safe and effective patient care (Wheeldon 2005; West 2006).

A single randomised trial aimed to investigate the impact of three learning interventions on graduate nurse health assessment knowledge and skills (Shepherd et

al. 2007). Graduate nurses (n = 74) were randomly allocated to three groups (1: self-directed learning package (SDLP) only; 2: SDLP plus two scenario-based PowerPoint workshops; and 3: SDLP plus two simulation education sessions using a manikin with low-fidelity capabilities. Pre-test results established that graduate nurses across all three groups commenced with similar knowledge levels. After the education activities, graduates completed an individual test involving a systematic patient assessment upon a manikin. They were scored using a checklist of relevant responses. Results demonstrated that the mean test score for nurses in the simulation group (mean = 135.52, SD = 26.63) was significantly higher ($P < 0.001$) than those in the learning package group (mean = 107.42, SD = 29.82) and the PowerPoint group (mean = 102.77, SD = 31.68) (Shepherd et al. 2007). The study established that simulation is an effective educational tool for teaching patient assessment knowledge and skills to graduate nurses.

Simulation education provides unique learning opportunities to bring reflective practice and experience together through various learning activities. Scenario-based interactive exercises prepare participants for reflection-in action as discussed in Schön's (1983) seminal work on how professionals think in action or during practice. Debriefing after the event allows for thinking back on a situation to gain understanding and prepare the learner for similar future events (Dannefer et al. 2005; Rudolph et al. 2006; Kuiper et al. 2008; Gordon and Buckley 2009). The relevant feedback is consequently triggered that guides further action contributing to the learning experience. Scenario-based simulation prepares health professionals for the realities of clinical practice, encourages critical thinking, clinical reasoning and professional judgement as well as facilitating patient safety (Cooper and Taqueti 2004; Kuiper et al. 2008; Gordon and Buckley 2009). The use of small groups in simulation exercises can also be a powerful educational structure to promote clinician competence and capability. This is achieved by educators enhancing performance feedback and providing the challenge of learners working effectively in unfamiliar contexts (Fraser and Greenhalgh 2001).

Change is the only constant in the current healthcare environment as the pace and extent of developments in technology, medications and procedures continually drive patient care and length of hospital stay. As the nature and scope of nursing practice

changes to meet future challenges, competent assessment remains one of the central tenets of clinical nursing practice. Indeed, assessment is viewed as an important means of gathering important data in which health risks and changes are identified (Chellel et al. 2002).

2.8 Barriers to Ongoing Practice Change

Current Australian healthcare issues including hospital restructuring, staff multi-skilling, technological innovations, higher patient acuity, shorter patient stay and increasing nursing workloads have constituted a 'developmental background of change' providing an ideal timeframe to examine the surgical nursing role (Duffield and Wise 2003). Clinical practice change means culture change in a profession based on tradition and rituals (Ford and Walsh 1995; Philpin 2002; Penz and Bassendowski 2006). Barriers often exist, preventing respiratory assessment from being incorporated into everyday nursing practice in the general wards. Barriers include lack of self-confidence, insufficient education regarding the importance of respiratory assessment and 'organisational barriers related to moving beyond cultural norms' (Considine and Botti 2004).

The reality of nurses' practice is often enmeshed in rituals, routine and local cultures as evidenced by an Australian survey of postoperative observations (Zeitz and McCutcheon 2005). Routines and rituals were found to be driving care rather than clinical judgment and contemporary knowledge. It is only in the last few decades that nurses have been educated rather than trained (Philpin 2002). Education has equipped and empowered the professional nurse to question alternatives, think critically and analytically and consider the patient's perspective (Ford and Walsh 1995). Nurses' aspirations of delivering holistic patient care are often jeopardised by resistance to change and 'rituals, routines and cultures' (Tonuma and Winbolt 2000). These attitudes prevent the profession's achievement of ideal models of nursing care based on the best evidence. Traditionally, standard answers to problems have been produced by training focusing on a nurse's ability to perform tasks efficiently, resulting in routine solutions and actions (Philpin 2002).

Nursing practice has persisted with unthinking ritual and ungrounded opinions rather than well researched evidence-based practice (Blunt 2001; Penz and Bassendowski

2006). There are often differences between the rhetoric and reality of nursing practice. The notion that when clinicians are presented with both facts and evidence of better methods to improve practice, they will apply them is often not the case. How staff respond to new knowledge and new ways of doing things is variable and often met with 'we're too busy', 'it's not our job', or 'we have always done it this way' (Kitson et al. 1996). Nursing practice based on ritualistic action lacking in clinical judgement or critical thinking processes could potentially result in an adverse event because of failure to detect a patient problem (Penz and Bassendowski 2006). The taking of routine vital signs and patient observations to monitor patient progress postoperatively, an integral component of postoperative surgical nursing practice, has wide variations in individual hospital requirements and protocols. These disparities relate to the recommended intervals and timeframes. For approximately sixty years, nurses have collected the observations of temperature, pulse and respirations to detect patient complications following surgery; blood pressure taking commencing in the 1950s and 1960s (Zeitz and McCutcheon 2003). Patient assessment, re-assessment and vital signs is often 'performed by rote' irrespective of individual patient acuity (Deutschendorf 2003).

An Australian study examined postoperative observations (the measuring of vital signs), in 75 surgical hospitals in South Australia (Zeitz and McCutcheon 2002). Forty-seven procedures determining the guidelines driving practice and variations in practice between these organisations were analysed, finding no rigorous research recommending best practice in this area (Zeitz and McCutcheon 2002). A systematic review relating to vital signs conducted by the Joanna Briggs Institute for Evidence-based Nursing and Midwifery also concluded that the focus of the majority of studies was on measurement and technique rather than duration or frequency issues (Evans, Hodgkinson and Berry 1999). The study reviewed copies of the hospitals' documentation relating to the taking of vital signs, and details of any associated policies and procedures and how these were formulated, ratified and endorsed in relation to process standards, objectives and recommended outcomes.

Given that the return of documented information to the researcher was voluntary some of the requested paper work may have been selective, but overall the study provided valuable insight into the need for surgical nurses to change from traditional

postoperative practices to evidence-based postoperative care. There was minimal policy or procedural encouragement by individual hospitals for use of clinical judgement by nurses in determining frequency of monitoring. No consensus of best practice was identified and there was minimal encouragement of nurses' use of clinical judgement or critical thinking skills. Nurses were often reluctant to relinquish the frequency of their observations, as they maintained that patients were frequently checked postoperatively by inexperienced staff, providing a 'medico-legal safety net' (Zeitz and McCutcheon 2002). Study findings found minimal change from previous 1990 studies recommending ten sets of observations in the first 24 hours following surgery, including hourly monitoring for the first four hours then fourth hourly (Zeitz and McCutcheon 2002). Only one organisation recommended that frequency should be determined according to competent clinical decision-making and nursing expertise, depending on individual patent condition and surgical procedure. After several decades of nursing practice, there appears to have been minimal change to postoperative vital sign monitoring. This is notwithstanding vastly different surgical management, including anaesthetic practices, laparoscopic procedures, laser surgery, the move to day surgery for many procedures and shorter lengths of stay post surgery in the acute care sector (Zeitz and McCutcheon 2003). There remains little empirical evidence for existing regimes (Botti, Williamson and Steen 2001).

It is becoming increasingly important that as the scope of nursing roles and the very nature of clinical practice changes, the introduction of more technology does not lessen the need for the nurse to be cognisant of observational skills, including respiratory assessment. Barriers to the introduction of evidence-based practice using the example of postoperative vital sign observations were examined by (Zeitz and McCutcheon 2005). They reported that the 'one size fits all approach' to postoperative monitoring obviates the individual patient's clinical need. They conceded that hospital efficiency is assisted by routines and procedural requirements, but recommended the development of practice standards based on clinical judgement models and patient outcomes to enhance professional accountability (Zeitz and McCutcheon 2005). In terms of barriers to changing nursing practice in relation to respiratory assessment, a number of studies have found that nurses lack confidence in their ability to competently perform physical assessment and have divergent

perceptions of what physical assessment means in its application to clinical practice (Rushworth et al. 1998; Lillibridge and Wilson 1999).

Common barriers to the planned introduction of research findings into clinical practice were identified by a randomised study of 5,000 nurses, using a questionnaire (Funk et al. 1991). Despite a response rate of 40%, numbers remained sufficient to provide strong evidence to support the research findings. Barriers encountered by Funk et al included resistance to change and perceptions that nurses have insufficient time or authority to implement new practices. Lack of support from both colleagues and nursing administration was also established. Creation of a professional practice climate where the nurse was 'enabled to practice' was recommended to facilitate change in both the organisation and the nurse (Champagne, Tornquist and Funk 1996).

The barriers encountered by nurses to stethoscope use and implementation of physical assessment skills were highlighted in Reaby's (1990) study which investigated the effectiveness of a physical assessment educational program, using a pre-test, post-test design. In Reaby's study, twenty-two nurses were selected by Directors of Nursing from three acute hospital settings, two nursing homes and a community health service. Of these, 78 % returned the mailed post-test within three months of program completion. The major barriers identified by all participants prior to completing the program were lack of confidence in using clinical skills and blocking of skills application by nursing peers (Reaby 1990). After attending the education program, 76 % demonstrated an improvement in physical assessment skills, while 88 % indicated increased confidence in relaying assessment findings to colleagues (Reaby 1990). Lack of support from nursing peers post program was identified by 20 % of the sample, and lack of support from immediate supervisors and employers by less than 6 % of participants. Interestingly, there was no opposition from medical officers or the patients themselves. Pre-program statistics were not stated, reducing the impact of post-program results. The study was also limited by its small sample size and did not offer any direct measure of effect on clinical outcomes or continuing education.

With financial stringency prevailing in healthcare globally, the levels and types of outcomes achieved from organisation investment in continuing professional development are often limited to learners' reported practice changes rather any direct impact on practice or patient outcomes (Furze and Pearcey 1999; Attree 2006; Draper and Clark 2007; Covell 2009). Financial barriers and time constraints frequently preclude researchers' critical analysis of the impact of educational programs on nursing cohorts' clinical practice, related patient outcomes and quality of care longitudinally over prolonged timeframes (Griscti and Jacono 2006; Gijbels et al. 2010). Major difficulties have also been experienced in relation to random sampling and allocation to establish causal relationships between continuing education and practice outcomes (Ellis, Davies and Laker 2000; Clifton, Dale and Bradshaw 2006). Prideaux (2002) considers that patient health improvements are an inappropriate measure of outcome effectiveness in continuing education, contending that health is influenced by a myriad of factors outside the clinician's control including organisational culture and patient caseload.

Despite variable control being theoretically possible using randomised controlled trial methods, key factors determining intervention success or failure may be removed as a consequence (Prideaux 2002). Advocates of best evidence education recommend a scheme based on quality, utility and strength of evidence rather than grading studies according to the gold standard of randomised control (Harden et al. 1999; Prideaux 2002; Khan and Coomarasamy 2006). Observational studies in the clinical areas are the most appropriate method to evaluate change as observation determines participant discrepancies between actual and self-reported behaviours (Jordan 2000; Griscti and Jacono 2006; Burns and Grove 2009). However, budgetary, ethical and pragmatic issues and an increased probability of the Hawthorne effect make observational studies difficult to conduct (Jordan 2000; Polit and Beck 2004a; Watson et al. 2006; Burns and Grove 2009).

2.9 Development of an Educational Model

For the purpose of this study, an integrated clinical learning model will be developed and evaluated to inform continuing education for acute care nurses. The model will test specific educational processes and approaches using respiratory assessment education as a basis for the research. The application of multi-modal learning

strategies will include participation in an education program using patient simulation with scenario-based activities. A self-directed learning module and online learning are complemented by coaching support in the clinical areas to facilitate and sustain practice change. The continuing education program aims to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment. The need for evidence based care supported by competent and capable assessment is emphasised. Critical thinking concepts underpin the educational model. These concepts are applied to collaborative clinical reasoning by developing a learner's ability to discern both relevance and meaning given the context of a situation (Forneris 2004). Forneris' theoretical framework is derived from the work of educational theorists, Friere (1970), Mezirow (1978), Schön (1983), Brookfield (1986), Tennyson (1990) and Argyris (1992). The framework aims to operationalise critical thinking in practice and will be discussed further in Chapter 3.

It may be concluded that continuing education contributes to improved knowledge, clinical practice standards, patient safety benchmarks and reduced adverse events. The need for continuing professional development to maintain high standards of safe patient care was established. The best way to achieve practice change and overcome resistance remains inconclusive. The inability of the available software relating to nursing workloads, skill mix and qualifications to interface with organisational casemix databases continue to present immense research challenges in Australia. At a time of budget restrictions, increasing complexity of care and never-ending new technologies it is essential for the nursing profession to have a good understanding of what it actually does and how efficient and effective that care provision is. The literature suggests that barriers to implementing this nursing practice change include limited educational approaches and insufficient emphasis regarding the importance of lifelong learning. Importantly, the literature failed to address the transfer of knowledge into clinical practice following continuing education.

2.10 Conclusion

Few studies determined whether continuing education programs change participants' practices, contribute to improved patient outcomes and are worth an organisation's

investment. Further research is required to strengthen causality and examine whether continuing education programs and practical assessment in the acute care clinical areas increase nurse competence and capability and encourage lifelong learning. Furthermore, questions whether ongoing professional development facilitates changes in nurses' behaviour and reinforces practice implementation. Therefore this research will test an integrated learning model in a clinical environment using respiratory assessment as an example of teaching and learning to inform ongoing education for acute care nurses. The theoretical framework underpinning the educational model will be discussed in Chapter 3, together with the proposed educational intervention. The model operationalises critical thinking and clinical reasoning and applies evidence-based educational approaches. This includes the use of coaching support to facilitate and sustain practice change. The proposed research has the potential to inform ongoing education for acute care nurses to both encourage and support learning and have a meaningful impact on the future role and function of the surgical registered nurse.

Chapter 3 - Theoretical Framework

3.1 Introduction

Ongoing technological innovations over the last two decades have resulted in significant learning needs for the nursing profession. Continuing education provides opportunities for nurses to build on practice experience and better prepares clinicians for the complexities of the clinical setting. Despite an increased worldwide emphasis on the importance of ongoing professional development and continuing education activities evaluated in a number of studies, there continues to be an absence of empirical evidence of program and session effectiveness (Griscti and Jacono 2006). Few studies determine whether continuing education enhances or develops practice and the relative cost benefits of health professionals' participation in professional development (Covell 2009). There is also minimal research confirming that continuing education programs contribute to improved patient outcomes, nurses' earlier detection of patient deterioration or that standards of continuing competence are maintained. Crucially, evidence-based practice is demonstrated and international quality and safety benchmarks are adhered to.

Safe practice is promoted by nurse educators by the encouragement of a critical questioning, reflection and inquiry process (Forneris 2004; Randall, Tate and Lougheed 2007). However, few practical strategies for nurses to think more effectively and achieve this learning goal in the reality of clinical settings have been offered (Scheffer and Rubenfield 2006). Nurses need to be capable of clinical *and* critical thinking, including clinical judgement, reflection and decision-making abilities (Tanner 2005). Research studies should demonstrate how nurses' development and learning of critical thinking skills can be supported and operationalised in the context of clinical practice to help improve healthcare outcomes (Forneris 2004; Tanner 2005; Covell 2009).

3.2 The Theoretical Framework: Critical Thinking in Practice

The purpose of this study was to develop and evaluate an integrated clinical learning model in the service environment to inform ongoing education for acute care nurses. All three domains of learning; cognitive, psychomotor and affective, were incorporated into the educational model. This research was guided by the work of

Forneris (2004), who developed a theoretical framework to operationalise a critical thinking process incorporating the complexities of the clinical context. Forneris' (2004) framework, exploring the key attributes of critical thinking and contextual learning, underpinned the development of the educational intervention which informs this study. The framework uses educational strategies that are learner-centred and participatory. These strategies aim to engage the clinician in dynamic thinking processes in clinical practice situations guided by coaches and mentors (Forneris 2004).

Contextual learning is defined as an individual's 'ability to employ existing knowledge' to 'engage in higher order thinking' within a situational context (Forneris 2004). Critical thinking is then operationalised in clinical practice when the learner differentiates, ('knowing that') integrates, ('knowing how') and progresses to the construction of contextual knowledge ('knowing why') (Forneris 2004). This theory is applied to collaborative clinical reasoning by developing a learner's ability to discern both relevance and meaning given the context of a situation (Forneris 2004). Whilst the framework was developed by Forneris, the model builds on previous work from leading educational theorists, including Freire (1970), Schön (1983), Argyris (1992), Mezirow (1978), Brookfield (1986) and Tennyson (1990). Forneris' (2004) framework shares similar perspectives regarding processes of thinking in practice. These include the use of a reflective process, critical analysis and connecting past experiences to the present context to facilitate creation of new strategies to think and reason (Friere 1970; Brookfield 1986; Schön 1983).

The process of critical thinking also involves 'understanding perspective and unveiling hidden realities' (Forneris and Peden-McAlpine 2009). The emphasis on critical thinking is transformed, highlighting the process of '*being* critical' rather than application of facts and rules (Forneris 2004; Forneris and Peden-McAlpine 2009). The shift in focus incorporates the need for nurse educators to place more emphasis on context as advocated by Schön (1987) and 'theory in use' (Argyris and Schon 1996). This construct also better prepares learners to manage practice uncertainties, generate new knowledge and facilitate appropriate clinical action. A change in the emphasis on critical thinking to a '*process'* of thinking necessitates that

educators assume a 'proactive, collaborative and quality oriented approach' (Forneris 2004). This facilitates open discussion and shared decision making.

Forneris' (2004) framework is congruent with the findings from Scheffer and Rubenfeld's (2000) Delphi study. The expert panel's definition of critical thinking was inclusive of both critical thinking skills and habits of mind such as 'contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance and reflection' (Scheffer and Rubenfield 2000). This definition can be used to facilitate the development of teaching methods to specifically target these habits of mind to operationalise nurses' critical thinking in practice (Staib 2003). Nurses using critical thinking skills were said to practice the cognitive skills of 'analysing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge' (Scheffer and Rubenfield 2000).

These attributes are also compatible with concepts of capability which enable health professionals to work effectively in unfamiliar constructs and manage the dynamic environment they work in (Fraser and Greenhalgh 2001; Hase and Kenyon 2001). Capable clinicians are creative, have the ability to manage complex challenges, make judgements and work well with colleagues (Hase 2002). Tanner (2006) advocates interconnectedness between critical thinking and clinical reasoning. She exhorts nurse educators to facilitate nurses' acquisition of critical thinking skills in order that clinicians can become capable of analysing assumptions and taking appropriate action to improve patient care. Educators also need to support nurses' use of clinical judgement and clinical thinking underpinned by sound theoretical knowledge and reflective practices (Forneris 2004; Tanner 2006).

The theoretical perspectives of Freire (1970), Schön (1983), Mezirow (1978), Brookfield (1986), Tennyson (1990) and Argyris (1992) on reflection are particularly useful for the development of reflective thinking and the consequent action necessary for the learner to progress to expert practice. The shared perspectives of these theorists emphasise the importance of context to establish the relevance of practice and the notion that critical thinking and reflective thinking are inextricably linked (Forneris and Peden-McAlpine 2009). Four core themes were found to be evident in

the work of each theorist. These attributes included the concepts of reflection, context, dialogue and time which collectively operationalised a critical thinking in practice framework facilitating 'coherence of understanding' (Forneris 2004). (Figure 3.1). The application of these four critical thinking attributes to clinical reasoning principles, constitute an apt framework to conceptualise the various clinical practice elements and factors linked to critical thinking (Christensen et al. 2008).

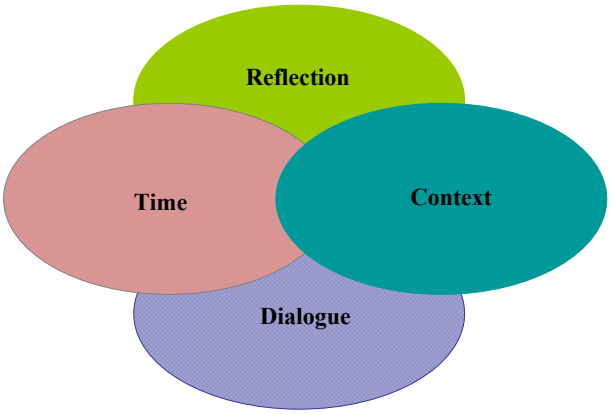


Figure 3.1 Incorporating a process of critical thinking in practice
(Adapted from Forneris 2004).

Forneris' (2004) theoretical framework which underpinned the educational model used in this study, demonstrated how the attributes of reflection, context, dialogue and time operationalise critical thinking in practice. Contextual learning shapes beliefs and attitudes by influencing the underlying assumptions that justify beliefs (Mezirow 2000). Brookfield (2000) contends that context provides a framework to facilitate the questioning and reordering of clinicians' thought processes which impact on knowledge and skills. The Forneris (2004) theoretical framework advocates contextual learning via the use of critical reflection and interactive dialogue. Context and social interaction are critical components of adult learning principles where learners participate actively in the learning process (Jarvis 2005; Gardner et al. 2007).

Learners actively engaged in educational initiatives which encourage use of critical thinking, reflection and clinical reasoning processes are better able to draw on diverse perspectives to resolve issues in the clinical setting (Fraser and Greenhalgh 2001; Forneris and Peden-McAlpine 2006). Experiences are 'reframed', insight

promoted, feedback given and comparative sense made of the clinical situation as links are made between theory and practice (Mezirow 2000; Forneris 2004; Forneris and Peden-McAlpine 2007; Decker et al. 2008). The use of a coaching process fosters operationalisation of questioning and critical thinking (Forneris 2004; Forneris and Peden-McAlpine 2006, 2009). When perceptions, assumptions and expectations are shared with colleagues in an open exchange, knowledge sharing is fostered (Weston 2001; Forneris and Peden-McAlpine 2006; Earle and Myrick 2009). Understanding is also influenced by time where the learner takes time to reflect, ask questions and discuss past actions in feedback and debriefing sessions.

3.2.1 Reflection

The most significant studies amongst contemporary literature on reflective thinking have been Schön's works, *The Reflective Practitioner* (1983 and *Educating the Reflective Practitioner* (1987). These seminal works were based on Dewey's (1933) notion of reflective thinking. Schön (1983) emphasised outcomes including the importance of reflective clinical practice for the development of professional knowledge. Schön developed the key concepts of reflection-in-action, reflection-on-action and reflection-for-action. Reflection-in-action referred to the spontaneous reflective thinking done while doing an action or 'thinking on your feet'. Reflection-on-action involves thinking through a situation after it has happened to evaluate whether anything should have been done differently, whereas reflection-for-action guides future action (Schön 1983).

Continued learning by nurses is stimulated by the provision of learning opportunities to reflect on care provision and clinical experiences. Reflection attaches meaning to information, clarifying the 'reason for what we do and how we critically discriminate what is relevant' (Forneris 2004). This concept has been developed and incorporated in Forneris' theoretical framework. The reflective process enables the clinician to make relevant connections within the context of a situation (Forneris 2004). Experiences are 'reframed', insight promoted, feedback given and comparative sense made of the clinical situation as links are made between theory and practice (Mezirow 2000; Forneris 2004; Forneris and Peden-McAlpine 2007; Decker et al. 2008) This approach encourages practice feedback enhancing future learning and

ongoing practice review (Dickerson 2005; Forneris and Peden-McAlpine 2007, 2009).

Schön (1987) advocated a coaching model based on active involvement of expert role models working with learner clinicians. Other studies have demonstrated that when educators and coaches provide guidance for learners on how to be reflective, significant practice changes occur (Ferry and Ross-Gordon 1998; Forneris and Peden-McAlpine 2007, 2009). The reflective process also creates the potential for improving practice as the clinician becomes aware of learning deficits and addresses them with coach support (Craft 2005). Opportunities are created for the learner to learn from their mistakes in the context of a safe collaborative environment (Gielselman, Stark and Farrugia 2000; Forneris 2004).

3.2.2 Context

Context is considered integral to the development of an individual's understanding of what is relevant and meaningful (Friere 1970; Mezirow 1978; Schön 1983; Brookfield 1986; Tennyson 1990; Argyris 1992). The concept of critical thinking in practice should be adopted to achieve a 'coherence of understanding' (Forneris 2004). Context is defined as 'the nature of the world in a given moment', encompassing culture, values, facts, ideals and assumptions which provide the 'building blocks of learning' (Forneris 2004). Similarly, Brookfield (1986, 1995, 2000), Argyris (1992) and Mezirow (1986, 1993, 2000) contend that context provides a foundation to examine underlying assumptions, shape critical inquiry and construct knowledge in practice. Learning occurs within a context. Therefore reflections, situations and learning experiences are central to this construct (Kaufman 2003; Forneris 2004).

All of these factors shape how knowledge is constructed in practice, including an individual's understanding of the salient issues in a specific context of a situation in a given moment of clinical practice. Clinicians apply critical inquiry by examination of facts and differentiation of data to make a meaningful interpretation (Forneris 2004). Past experiences influence individuals 'naming', or labelling of a situation and subsequent 'framing' or how to deal with a situation (Schön 1983). Contextual learning is the ability of an individual to use an existing knowledge base within a

situational context to engage in 'higher-order thinking' that progresses from 'knowing that' to 'knowing how' and knowing why' (Forneris 2004). Critical thinking in a practice situation is then operationalised when clinicians 'differentiate' (know that), 'integrate' (know how) and 'construct' contextual knowledge (know why) (Forneris 2004).

3.3.3 Dialogue

Dialogue involves an interactive process of critical constructive conversation with peers, coaches and patients to ascertain different perspectives and assumptions and achieve a greater understanding of the context of a situation (Brookfield 2000; Forneris 2004; Forneris and Peden-McAlpine 2007, 2009). Dialogue should 'invite questions in a reflective and critical manner' while the sharing of perspectives challenges thinking (Forneris and Peden-McAlpine 2009). The situational context is therefore shaped through dialogue (Forneris 2004). Critical thinking processes are operationalised in practice through interactive dialogue and critical conversations to develop understanding. The 'nature, direction and form of learning' are consequently influenced (Forneris 2004). Discussions and feedback incorporate Schön's (1987) notion of 'back-talk' using questioning and reflective dialogue to challenge information which supports and enhances knowledge transfer to the practice environment (Forneris 2004; Nagle et al. 2009). The clinician is also provided with an opportunity to self-examine by participating in constructive discourse to justify assumptions and decisions made based on the resulting insight (Mezirow 2000; Forneris 2004). The many facets of dialogue including critical thinking, clinical reasoning and reflective discussion facilitate experiential learning and the evaluation of assumptions within context (Forneris 2004; Christensen et al. 2008).

3.2.4 Time

Time is an attribute of critical thinking which acknowledges the influence of past learning experiences, as they are recalled in the present context. Time can potentially influence understanding or inform future action by bringing meaning to a present contextual situation (Forneris 2004). Understanding of complex clinical issues is informed by the learner's critical reflection on past experiences and actions. The notion that critical thinking and clinical reasoning is affected by past experiences and previous knowledge forms the basis for Mezirow's (1990) contention that skilled critical inquiry stimulates three types of reflection. The first is content reflection or

the ‘what’ of a problem. The second involves process reflection which identifies the ‘how’ of the issue and the last is premise reflection. This attempts to solve the ‘why’ of the problem. The application of previously learnt knowledge can then guide future activity and professional growth by provision of a rationale for practice (Ruth-Sahd 2003; Forneris 2004; Craft 2005; Forneris and Peden-McAlpine 2007, 2009). Schön, (1983, 1987) uses the concept of time, in his discussion on reflection-in-action, where the individual stops to think during the timeframe when one can still make a difference to the outcome. Mezirow (1978, 1990, 2000), also discusses a ‘hiatus’ in time to reassess perspectives. Similarly, Argyris and Schön, (1974) and Argyris, 1992), contend that there is time for a reasoning process behind every action, despite appearing automatic or spontaneous.

3.3 Intervention development

Forneris’ (2004) theoretical framework provides the structure for an innovative approach to continuing education. Technological advances and changes in healthcare delivery have necessitated that nurse educators adopt innovative teaching and learning strategies to better prepare acute care nurses for their increasingly complex roles. Learner-centred education effectively engages participants by encouraging discussion on differing viewpoints, building knowledge and minimising the distance between theory and clinical practice (Forneris 2004). Integrated educational concepts and contextual learning promote critical questioning, clinical reasoning and reflective practice while addressing practice shortfalls (Forneris 2004; Forneris and Peden-McAlpine 2007, 2009). Nurses are encouraged to take an active role in their learning, using reflective and critical thinking to achieve a ‘coherence of understanding’ in the clinical setting and enhance the quality of patient care (Forneris 2004).

The development and evaluation of an integrated clinical learning model in the service environment to inform ongoing education for acute care nurses was the impetus for this study. Forneris’ (2004) framework has been well researched in the undergraduate and novice nurse context, but has not been tested in a continuing education environment. Therefore the model used Forneris’ conceptual strategies with a different population of acute care nurses. This constitutes a sound educational process to facilitate changes in professional practice behaviours. A ***R***espiratory ***Sk***ills ***U***pdate education (***ReSKU***) program was used as the content for the educational

intervention to inform surgical nurses' clinical practice in the area of respiratory assessment. Development of the educational intervention was supported by nurse-sensitive patient outcomes research in relation to respiratory assessment and the recognition of the key role that nurses play in the management of the deteriorating patient.

In a study of 124,204 surgical patients admitted to 232 acute care American hospitals, the effects of a 10 per cent increase of Registered Nurse (RN) staffing was associated with a 9.5 per cent decrease in pneumonia (Cho et al. 2003). The authors contended that postoperative pulmonary infections could be avoided by surgical patients with the provision of 'attentive lung care' by knowledgeable, skilled RNs (Cho et al. 2003). A significant relationship was also found between RN staffing levels and the incidence of adverse events such as pneumonia and pulmonary compromise following major surgery in a study conducted across 589 acute care hospitals in ten North American states (Kovner and Gergen 1998). While these studies clearly emphasise the relationship between higher education at undergraduate university level and nurse-sensitive outcomes, few studies have examined the relationship between continuing nursing education conducted within healthcare facilities and clinical practice.

The literature has also highlighted that teaching of respiratory dysfunction is critical in continuing nursing education because of significant patient safety issues. An increased respiratory rate was seen as the most frequent physiological indicator of abnormality in patients prior to death, cardio-pulmonary arrest or critical care admission (Subbe, Williams and Gemmell 2004). Failure to recognise respiratory problems early enough, resulting in suboptimal treatment, are recurrent themes in the literature (Crispin and Daffern 1998; Buist et al. 1999; Goldhill et al. 1999; Nadkarni et al. 2006; Scholes 2007).

3.4 Development of the ReSKU program

The interrelated concepts that informed development of the ***ReSKU*** program were collectively related to principles of best practice underpinned by Forneris' (2004) framework and attributes of reflection, context, dialogue and time. The synthesis of these attributes operationalises critical thinking in practice where 'reflection on past

and present actions and events informs situational understanding' guiding future action (Forneris 2004). Educational strategies applying these concepts facilitate nurses' interpretation and understanding of the complexities of clinical practice (Forneris 2004). Research questions examined whether participation in the ***ReSKU*** program 1) improved participants' self-reported use of respiratory skills and knowledge, 2) changed participants' self-reported attitudes and beliefs regarding the use and application of respiratory assessment in clinical practice and 3) improved the knowledge of surgical nurses relating to respiratory assessment.

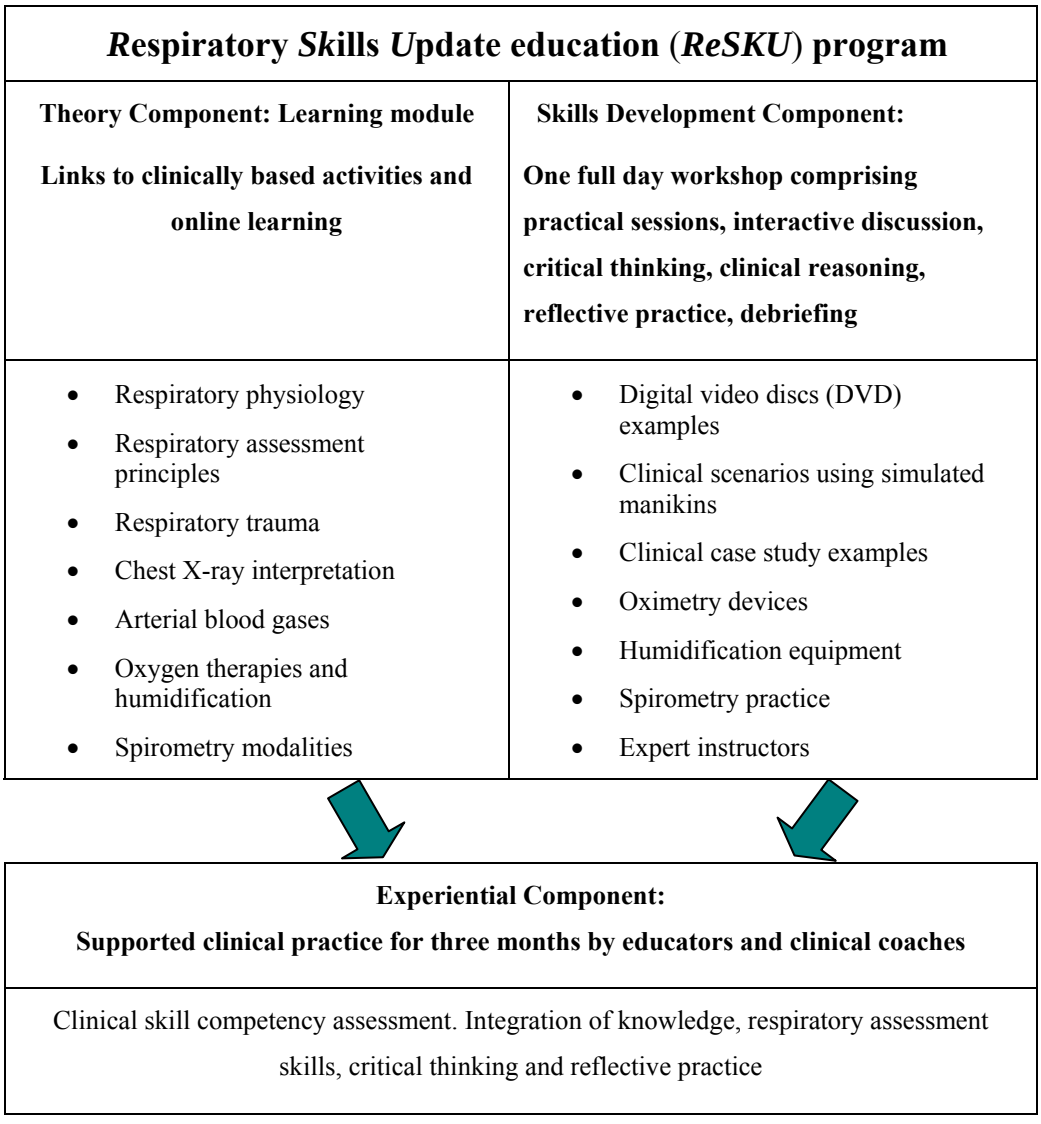


Figure 3.2 Respiratory Skills Update education (ReSKU) program

The ***ReSKU*** program comprising three components: theoretical, practical and experiential, was developed using a self-directed learning module on respiratory assessment, airway management and oxygenation as a basis for content. (Figure 3.2).

As the integration of these components is considered best practice in education, the study applied a combination of educational theory and best practice principles which advocate that the best context-dependent clinical learning is achieved through the integration of theoretical, practical and experiential learning (Haigh 2003; Distler 2006; Baxter 2007).

All workshop sessions incorporated a learner-centred approach, including the practical application of respiratory assessment skills, critical thinking, clinical reasoning, reflective practice and interactive discussion. The learning module was distributed to participants immediately prior to program commencement. The content was specific to the learner's work environment and clinical area, to both reinforce and embed clinical learning. Module content included written activity sheets and supported clinical activities for each section. Clinical activities were completed in association with an educator or clinical coach, providing opportunities for discussion, performance feedback and facilitation of critical questioning and clinical reasoning. The three sections included: (i) anatomy and physiology of the respiratory system; (ii) physical assessment of the respiratory system; and (iii) airway management including monitoring of oxygenation and ventilation. The learning module contained 25 activities, comprising a combination of clinical and written activities. Online-learning activities and links with reading materials, texts and video clips were also included. (***ReSKU*** program objectives and session plan in Appendix B and D).

Interactive educational sessions outlined the components of respiratory assessment and included the use of teaching digital video discs. All program participants received a pocket cue card to facilitate both the clinical practice of respiratory assessment and the associated documentation (Appendix C). The skills sessions using simulated manikins and scenario-based role play were held in a clinical training area adjacent to the program forum. (Session plan, clinical assessment tool in Appendix D; scenario and sample debriefing questions in Appendix E). This approach both reinforces and embeds learning, enhancing clinical skills while combining theory and practice in a non-threatening manner (Cioffi 2001; Distler 2006).

Nurses participating in the ***ReSKU*** program undertook clinical practice in the ward areas, with educator and coach support, for a three month timeframe following program attendance. (Clinical Response Verification tool in Appendix F). These strategies were designed to consolidate learning and foster the operationalisation of critical thinking in practice, clinical reasoning, reflective practice, capability and competence (Clay et al. 1999; Baltimore 2004; Thorne 2006; Distler 2006). Educational strategies reflecting (Forneris' (2004) theoretical framework and the four attributes of critical thinking: reflection, context, dialogue and time, were incorporated in the development of the educational intervention. These included the use of integrated learning approaches, interactive teaching concepts, contextual learning and learner-centred pedagogies.

3.5 Linking Attributes to Educational Strategies in the ReSKU program

Educational strategies used in the educational intervention reflected Forneris' (2004) four attributes of critical thinking in practice. These attributes explicated the theoretical components of the ***ReSKU*** program to facilitate operationalising critical thinking in practice.

3.5.1 Reflection

Simulated educational strategies included time for reflective practice and debriefing processes. Feedback to participants was provided following the simulated clinical scenarios in a debriefing session. The program was consistent with adult learning principles, setting a cooperative learning environment, creating mechanisms for mutual planning and incorporating learning objectives based on the clinicians' perceived needs. (Knowles 1996; Clay et al. 1999; Distler 2006; Thorne 2006). Simulated learning opportunities that integrated feedback and debriefing provided 'backtalk', which reframed the learning experience putting it into perspective (Schön 1987). Links were facilitated between practice and theory increasing the learner's uptake of knowledge and insight regarding situational understanding of each practice encounter (Bruce, Bridges and Holcomb 2003; Forneris 2004). Educational strategies using reflective practice processes, incorporating critical dialogue by coaches and educators supported study participants in the ward area post program. These strategies highlighted the importance of reflection in clinical practice, helping clinicians to interpret and understand specific actions and situational contexts.

3.5.2 Context

Coach support facilitates the how, why and when of the learner's ability to transfer critical thinking and reflective skills into clinical practice via dialogue and critical inquiry (Teekman 2000; Forneris 2004; Price 2004). This approach was reflected in the research environment where coaches and educators guided the how and why of specific actions within the context of the clinical setting. Explication of the use of critical thinking in practice facilitated understanding of past and present experiences to examine future actions within the situational context (Forneris 2004). This process ensured nurses were better able to recall what was learned and transfer the newly acquired knowledge to new patient care situations.

3.5.3 Dialogue

Concepts included in the program incorporated interactive learner-centred educational strategies engaging participants in sessions and group discussions rather than using didactic lecture formats. Practical sessions included the use of simulated manikins in scenario-based activities to stimulate critical thinking, clinical reasoning and reflective practice. Dialogue also occurred in educational strategies such as post-scenario debriefing, where interactive discussions occurred between educator, coach and learner. Participants were actively engaged in the learning process and encouraged to think critically, while reflecting on their practice in the debriefing sessions that followed. The use of critical dialogue encouraged participants to challenge information, focus on cues that highlighted situational patterns, justify actions and achieve an understanding of events (Forneris 2004).

Debriefing following simulation education included discussion regarding which scenario segment or patient situation went well. Possible reasons for failure, obstacles encountered and what the learner would change or incorporate in the clinical setting, in the future, were also considered. Rationales for action were examined and questioned using critical thinking processes. Coach and educator support in the clinical setting facilitated the how, why and when of the learner's ability to transfer critical thinking and reflective skills into clinical practice via dialogue (Teekman 2000; Forneris 2004; Price 2004). Important learning connections were made during the sharing of perspectives between learner and coach in the clinical setting. 'Thinking out loud' enables the coach or educator to establish

the learner's level of understanding, gauge the rationale for a clinical action and the possible need to correct misinformation (Forneris and Peden-McAlpine 2009). These approaches were reflected in the research environment.

3.5.4 Time

Time was encapsulated in educational approaches that allowed for sufficient instructional time to engage the learner to reflect on past and present action while planning future strategies (Forneris 2004). The use of relevant 'stories' such as clinical histories and case studies enabled the learner to analyse past actions, gain understanding and construct new knowledge (Schön 1983, 1987; Forneris 2004). Learners were consequently better able to prioritise patients' clinical needs, consider potential actions based on previous experiences and modify care accordingly. These educational approaches facilitated learners' understanding of time incorporating the recall of past learning experiences, comparing present actions to understand patterns and guiding future actions (Forneris 2004). These strategies and use of dynamic thinking processes were supported by coaches and educators engaging with learners to prepare them for competent, capable practice. The study incorporated these concepts in both the educational program and supported practice of participants by coaches and educators. Clinical teaching and coaching of respiratory competencies were continued for three months following the intervention. These strategies were implemented to consolidate knowledge, critical thinking abilities and reflective practice and facilitate ongoing use of respiratory assessment skills. This timeframe was also planned to provide capacity at the workface for embedding the changes into clinical practice.

3.6 Clinical coach and educator support

The facility was a teaching hospital, with the expectation that clinicians contribute to the coaching and mentoring of novice nurses and students. The concept of using experienced clinical coaches in the clinical context of the ward area to build and maintain skills, confidence, competence and capability is endorsed in the theoretical framework and the literature (Coad, Haines and Lawrence 2002; Forneris 2004; Shanley 2004; Lesa and Dixon 2007). All coaches had completed a statewide preceptorship program and had completed or were in the process of completing postgraduate degrees in education. The motivation and clinical support of these clinicians was vital given that nurses provide 24-hour patient care and the educators

provide clinical supervision and educational support during the daytime hours only. A clinical coach was based in each of the three surgical wards rotating, through all three shifts, seven days a week. This was especially important given the study does not examine the long-term effects of this specific education program on clinical practice.

Recommended mechanisms for supporting learning in the ward areas include role modelling and clinical coaching by experienced clinicians (Shanley 2004; Schroyen et al. 2005). Effective role modelling of competent respiratory skills potentially contributes to greater skill use by less experienced nurses. The process of role modelling whereby an individual is influenced by the perspectives, behaviours and value systems of another person is viewed as one of the most powerful learning tools in practice settings (Myrick 2002; Forneris 2004). A major component of the role is the enhancement of critical thinking through dialogue by promoting a 'model of passionate scepticism' to encourage openness, trust and questioning attitudes (Brookfield 1995; Forneris 2004; Myrick and Yonge 2004). When dialogue is used between preceptor and learner to invite questioning, challenge thinking processes and share perspectives, critical thinking is enhanced, empowering the clinician (Forneris 2004; Forneris and Peden-McAlpine 2007, 2009).

Coach support facilitates the how, why and when of the learner's ability to transfer critical thinking and reflective skills into clinical practice via dialogue (Teekman 2000; Forneris 2004; Price 2004). Nurses need ongoing support in both gaining and maintaining confidence and competence as new systems, technologies and procedures are continuously being implemented. Change champions are able to successfully debate relevant change issues, understand practice realities and are able to convince their colleagues of the benefits of change. Opinion leaders also have the ability to influence peers because of their 'status and technical competence' (Ward et al. 1998). Schön (1983) contended that resistance to change can only be overcome by energetic and persistent championing – 'the new idea either finds a champion or dies'. Change has frequently been reactive within the healthcare industry, and nursing in particular, with limited evidence of innovation, creativity, adoption of best practice standards and risk management practices (Ward et al. 1998). Provision of a framework for the learning and development of both individuals and teams and an

environment where innovative change is encouraged and supported is the cornerstone for successful change (Chin 2003). This study adapted these concepts involving clinicians in learning strategies relating to improving patient care by the development and evaluation of an integrated clinical learning model. This was supported by a robust theoretical framework to inform continuing education for acute care nurses.

3.7 Conclusion

The construct of critical thinking in practice combined with clinical reasoning and purposeful and collective reflection is a powerful educational strategy to enhance competency and capability in clinicians. This study was consistent with contemporary educational approaches, using a robust overarching theoretical framework to support study concepts. The four attributes of critical thinking in practice were used to develop and evaluate an educational model using a respiratory education program as a basis for the content. Provision of a supportive clinical learning network, opportunities for practice, reflective discussion and feedback in the workplace, reinforced strategies to perpetuate positive practice change. The next chapter will describe the research methodology including research design, instrument development, data collection and analysis and ethical considerations.

Chapter 4 - Methodology

4.1 Introduction

As demonstrated in Chapter 2, the literature has supported the notion that continuing professional development is required to create a strong learning culture and maintain clinicians' ongoing learning needs, competence and capability (Fraser and Greenhalgh 2001; Hase 2002; Griscti and Jacono 2006; Covell 2009; Drey, Gould and Allen 2009). Fero et al (2008) contend that a nurse's critical thinking ability directly affects patient safety. Global concern regarding patient safety, increased incidence of adverse events and delays in recognition of clinical signs of patient deterioration has continued to escalate (Scholes 2007; Thompson et al. 2007; Fero et al. 2008). Contributing factors to the reduction of patient safety errors in the last decade include education and competence assessment (Joint Commission on the Accreditation of Healthcare Organisations 2006; National Institute for Health and Clinical Excellence 2007; Australian Institute of Health and Welfare 2007b; National Patient Safety Agency 2007). The exponentially growing body of knowledge within health care mandates some form of continuing education for clinicians (Jefferies 2005). Limited research has been conducted determining whether continuing education programs contribute to nurses' earlier detection of deteriorating patients and the resultant expenditure by individuals and organisations is economically justifiable (Levett-Jones 2005; Covell 2009).

A ***Re***spiratory ***Sk***ills ***U***pdate education (***ReSKU***) program was used as the content for the educational intervention to inform surgical nurses' clinical practice in the area of respiratory assessment. A robust overarching theoretical framework, outlined in Chapter 3, was used to support study concepts and contemporary educational approaches. Forneris' (2004) four attributes of critical thinking in practice, reflection, context, dialogue and time, were used to develop and evaluate an educational model. The framework used learner-centred and participatory educational strategies guided by coaches and educators (Forneris 2004). Strategies included the use of integrated learning approaches, interactive teaching concepts and learner-centred pedagogies. The application of multi-modal learning strategies included participation in an education program using patient simulation with scenario-based activities. A self-directed learning module and online learning was complemented with coaching

support in the clinical areas for three months post program to facilitate and sustain practice improvement. This chapter outlines the research methodology, describes the research design, the research setting, strategies used in instrument development and the recruitment process. The population and sample considered are summarised as is the process of data collection and analysis. Ethical considerations are identified at the end of the chapter.

4.2 Research Aim

The aim of the research was to evaluate the effectiveness of implementing the ***ReSKU*** program using integrated teaching and learning strategies, in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The education program aimed to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment.

4.3 Organisational Utility

Considerations regarding organisational utility are important because of the resource implications of this program and the way changes in practice may be influenced by participants' self-reported attitudes, clinical skills and knowledge. The three phase education program was resource intensive; therefore justification of program effectiveness was necessary. Staff education is viewed as an investment by an increasing number of organisations with the expectation that there is a knowledge transfer to clinical practice, staff performance and organisational effectiveness (Henderson, Fox and Armit 2008; Covell 2009). Finite educational resources dictate astute cost-benefit analyses evaluating learning processes and outcomes (Menix 2007). Significant ongoing learning needs for nurses have occurred as a direct result of the continuous introduction of technological innovations and research developments in the healthcare environment in the last two decades (Levett-Jones 2005; Menix 2007; Covell 2009). Internationally, there is an increasing trend for continuing education to be aligned with compulsory registration (Hegney et al. 2010). Healthcare authorities are also pressured by public expectations and societal demands that healthcare professionals provide safe competent patient care (Griscti and Jacono 2006; Candela, Dalley and Benzel-Lindley 2006). The provision of safe,

cost-effective care is dependent on nurses maintaining conversancy with up to date knowledge and skills in an unpredictable, complex clinical environment. Organisations are often focused on short-term requirements and mandatory training rather than encouragement of lifelong learning and ongoing professional development (Griscti and Jacono 2006). Unless organisational infrastructure supports the application of evidence-based practice, changes encouraged by educational programs rarely come to fruition (Penz and Bassendowski 2006; Henderson and Winch 2008b).

4.4 Research Design

A quasi experimental pre test, post test non–equivalent control group design was used to evaluate the impact of the ***ReSKU*** program on the clinical practice of surgical nurses. The research tested the hypothesis that participation in the ***ReSKU*** program improves the self-reported beliefs and attitudes of surgical nurses, increases their knowledge and self-reported use of respiratory assessment skills. The gold standard for studying effectiveness is the true experimental design or randomised controlled trial. However, this method is not always practical or feasible in the healthcare setting (Coup and Schneider 2007). Many continuing education studies have been small scale with limited methodological design. Few researchers used the most rigorous randomised controlled trial (RCT) design or a quasi-experimental design without randomisation (Aylward et al. 2003). RCTs have important limitations in evaluating educational interventions where randomisation is often neither feasible nor justifiable (Harden et al. 1999; Prideaux 2002; Gijbels et al. 2010). Prideaux (2002) questions the justification of enrolling health professionals in postgraduate and continuing education programs where no choices are offered regarding the preferred learning methods they engage in. Furthermore, randomisation depends on the maintenance of blind allocation which is rarely possible in educational interventions (Norman and Schmidt 2000; Gijbels et al. 2010).

Methodological difficulties are particularly emphasised in the educational context. For example, the lack of research-based evidence supporting causal links between professional education and changes in nursing practice is often influenced by the complexities of learning and human behaviour in a social setting (Ellis, Davies and Laker 2000; Ellis and Nolan 2005). Tensions were also highlighted between the

recommended methodological approach of RCT, the pragmatics of program evaluation and difficulties of incorporating a control group (Wood 1998; Clifton, Dale and Bradshaw 2006; Draper and Clark 2007). Other difficulties were identified with use of the RCT design in conjunction with educational interventions in healthcare contexts. These included control of confounding variables such as facilities, nurses' practice area, patient caseload, resources, teacher and learner motivation, organisational culture and individual's expectations (Prideaux 2002; Attree 2006; Clifton, Dale and Bradshaw 2006; Watson, Thompson and Li 2010).

The use of a comparison group and repeated measures offer a partial control over validity, selection threats, attrition effects and bias. The comparison group also offers an alternative way to establish causal relationships in healthcare environments (Heard and Harris 2000; Eccles et al. 2003). Quasi experimental research using a non-equivalent control group approach is considered an appropriate methodology for the examination of cause and effect relationships between selected independent and dependent variables, where randomisation of participants is not feasible (Polit and Beck 2004a; Burns and Grove 2009). The quasi experimental design is useful for comparison of a changed procedure against a current regimen and the development of a policy recommendation in situations not conducive to experimental controls (Eccles et al. 2003; Burns and Grove 2009).

This design is also considered relatively robust to internal validity threats and more adaptable to clinical practice settings than controlled experimental designs (Coup and Schneider 2007).The rationale for using a quasi experimental design and a non-equivalent control group approach was dictated by local imperatives. Randomisation of research participants into either an intervention or comparison group was not possible given that attendance at educational programs was voluntary. It was ethically important to respect clinicians' autonomy regarding the right to make personal choices and not influence their decision to participate in research and the associated educational program (Coup and Schneider 2007). Clinicians needed to be facilitated to undertake the program; therefore the researcher was methodologically limited to working with self-defined groups. Recruitment followed best practice and ethical conduct as advocated by National Health and Medical Research Council (NH&MRC) guidelines. This design therefore reflects a pragmatic method to

credibly answer the research question, allowing for measurement of the independent variable (the ***ReSKU*** program) against the dependent variables (the self-reported use of respiratory assessment skills, beliefs, attitudes and knowledge), by surgical nurses in clinical practice.

	Pre test: Immediately prior to program commencement	Intervention	Post test: Three months after program attendance
Intervention group (n = 36)	**O_1**	**X**	**O_2 (n = 36)**
Comparison group (n = 39)	**O_1**		**O_2 (n = 39)**

Figure 4.1 Non–equivalent control group design (Polit and Beck 2004b)

O = Administration of Questionnaire
X = Intervention

The research design has elements of both a within-group design and a between-group design. Because of the difficulty in identifying a comparable control group, within group analyses compared change from baseline (pre-test), separately in both intervention and comparison groups, as well as between group analyses. Repeated measure designs such as the Wilcoxon test determined whether participants changed significantly across time on at least two occasions (Green and Salkind 2005). Data were therefore collected twice from both groups in this study. The questionnaire was administered pre- and post- participation in the ***ReSKU*** program where only the experimental group participated in the educational intervention (Figure 4.1).

4.5 Research questions and hypotheses

The purpose of this study was to develop and evaluate an integrated clinical learning model to inform continuing education for nurses in the acute care environment. The model tested specific educational processes and approaches using interactive and clinically integrated teaching and learning activities. The ***ReSKU*** program was used as the content for this research. The following research questions guided the study.

Does participation in the integrated clinical learning program (***ReSKU***):

1. **increase the self-reported use of respiratory assessment skills** in clinical practice amongst surgical nurses?

2. **improve participants' self-reported attitudes and beliefs** regarding the use and application of respiratory assessment in clinical practice amongst surgical nurses?
3. **improve the knowledge** pertaining to respiratory assessment of surgical nurses?

The hypotheses of the study were one-tailed given the strong theoretical rationale for a directional hypothesis (Polit and Beck 2004a) and include:

Surgical nurses who participate in the integrated clinical learning program (***ReSKU***) will have:

1. higher scores in the self-reported use of respiratory assessment in clinical practice than surgical nurses who do not participate in ***ReSKU***.
2. improved scores relating to self-reported beliefs and attitudes regarding the use and application of respiratory assessment than surgical nurses who do not participate in ***ReSKU***.
3. higher scores in knowledge relating to respiratory assessment than surgical nurses who do not participate in ***ReSKU***.

4.6 Independent and dependent variables

- The independent variable for the study was the intervention (***ReSKU*** program)
- The dependent variables were:
    - the self-reported use of respiratory assessment skills by RNs measured using a scale of one to five. These skills included assessment of:
        1. rate, depth and rhythm of respirations
        2. use of accessory muscles
        3. effort of breathing
        4. chest palpation
        5. chest percussion
        6. auscultation of lungs for breath sounds
        7. symmetrical chest movement

- the self-reported attitudes and beliefs of RNs regarding respiratory assessment, measured with a five point scale.
- the knowledge of RNs in relation to respiratory assessment, measured using percentages.

4.7 Research Setting

The study was conducted in a 400 bed regional referral public hospital, the central hub of three smaller hospitals, in a health district servicing the coastal and hinterland areas north of Brisbane. The district spans 6092 square kilometres with a population of 327,714 in March 2008 (PIFU 2008). The hospital includes a wide range of both acute care and community based health services. The hospital employs 1782 nurses, 1482 who are permanently employed and 300 casually employed. Registered nurses number 1506; enrolled nurses, 202 and assistants in nursing, 74 (HRDSS 2007).

4.8 Instrument Development

A systematic review of the literature revealed that there were no validated tools to measure the dependent variables, therefore tools from a related study were amended following permission from the authors. The aim of Wilson and Lillibridge's (1994) study was to evaluate if there were any changes in perceived knowledge and skill levels following an education program conducted as part of a post-registration Bachelor of Nursing Course (Wilson and Lillibridge 1994). The study used a pre- and post-test design and a sample size of 91. Wilson and Lillibridge's questionnaire had been developed from two other instruments (Wilbur 1987, Schare et al 1988). There were no details of changes to the instrument given by the authors, therefore the source document is reported. Schare et al's questionnaire aimed to determine nursing students' frequency and use of health assessment skills together with the body systems most frequently assessed. The tool also explored the relationship between students' attitudes and use of assessment skills before instruction and two weeks prior to course completion (Schare et al. 1988). The questionnaire included questions, using a five point scale, for the sections examining patterns of use of health assessment skills and and participants' attitudes towards these skills.

The Schare et al. instrument had been pre-tested for face and content validity and reliability, containing an index of content validity (CVI) of .94 and a coefficient

alpha of .87, specifically for the attitude scale of the instument (Schare et al. 1988). Traditionally content validity is determined by 'the proportion of items given a rating of 3 or 4 by both raters involved' using 4-point scales of item relevance (Walz and Bausell 1981). While the authors did not describe the process of establishing content validity, reference was made to using Walz and Bausell's recommendations (Schare et al. 1988). The Cronbach coefficient alpha demonstrated acceptable internal consistency at .87 (Polit and Beck 2006). Schare et al. contended that participants had improved attitudes towards use of health assessment skills although the results were not statistically significant, r (91) = 20 at the 94% confidence level (Schare et al. 1988). Wilbur's 91 item instrument (39 patient history and 52 physical assessment items),was presented as a criteria manual to evaluate health assessment skills of RNs prior to commencing a nurse practitioner graduate program. The tool was assessed for face and content validity by 12 faculty members skilled in health assessment, achieving an 80% ageement, although no details were given regarding discrepancies, changes or validity checks (Wilbur 1987).

Wilson and Lillibridge (1994), conducted a study using a pre and post-test design. The study focused on the various aspects of nurses conducting physical assessment, prior to and following completion of a health assessment subject at post-registration level in a university setting, The instrument comprised four parts, with the initial section consisting of demographic data (Appendix H). Elements of Schare et al.'s instrument and Wilbur's checklist regarding frequency of health assessment use and attitudes towards skill use were extracted. Part A contained 25 items which were grouped into five classifications regarding participants'attitudes towards health assessment. Classifications included:

1. the role of the nurse in health assessment
2. the scope of nursing health assessment
3. influence of health assessment on nursing care planning action and outcomes
4. communication of health assessment findings
5. professional and educational preparation for health assessment

Part B determined participants' perceived level of comfort relating to knowledge and skills of four body systems: respiratory, neurological, cardiovascular and gastrointestinal (Wilson and Lillibridge 1994). In Part C respondents were asked to indicate using a minute or hour response category, the amount of time spent performing health assessment and documenting the associated data. Participants were also asked to indicate their best and worst areas of health assessment in relation to body systems taught within the health assessment subject, using precentages in the results. The short answer responses to questions relating to time spent performing health assessment were incompletely reported. This was possibly related to the given reponse category options of either minutes or hours spent by participants each shift doing health assessment. Few details were discussed regarding questions relating to time spent documenting assessment other than the possibility that time for documentation was unacknowledged and not perceived as 'an important aspect of their practice' (Wilson and Lillibridge 1994). Although a control or comparison group was not used, the questionnaire provided clear measures of participants' attitudes relating to the use of health assessment. Given the limited information obtained by the data in Part C, this part was not replicated in the current study.

Reliability of Parts B and C of the Wilson and Lilibridge instrument was calculated by a Cronbach alpha coefficient of 0.83. Face validity was achieved by requesting faculty members involved in health assessment to comment on instrument items in relation to ambiguous, misleading or contradictory items (Wilson and Lillibridge 1994). No details were given in relation to adjustments made. A paired one-tailed t-test was used to determine statistically significant differences in pre and post-test responses.(Wilson and Lillibridge 1994). Part B of the instrument was structured in five discrete parts or classifications. Classifications used comprised questions pertaining to the nurses' role in health assessment, the scope of health assessment, influence on nursing care, communication of data and the educational and professional preparation required for health assessment. There were no items requiring reverse rating (Wilson and Lillibridge 1994). Correlation of subscales or factor analysis was not attempted by Wilson and Lillibridge, pre-test and post-test mean scores of individual items only being presented.

Factor analysis is not recommended in smaller sample sizes. Despite item communality also playing a role, larger sample factor analysis of over 200-300 subjects are considered more stable, also increasing the generalisability of the research conclusions (DeVellis 2003). Overarching guidelines for sample size in relation to use of factor analysis in research include recommendations to use at least 300 participants, with 150 to 200 considered 'adequate' if data sets contain communalities higher than .50, or with 10:1items per factor or construct, with factor loadings at approximately 1.41 (Worthington and Whittaker 2006). Therefore factor analysis was not done in the current study.

4.8.1 Instrument development for the ReSKU study

For this study the Wilson and Lillibridge tool, focusing specifically on the respiratory assessment component, was modified with the author's permission (Appendix G). The current questionnaire examined nurses' self-reported frequency of use of respiratory assessment skills in clinical practice (7 items), participants' self-reported attitudes and beliefs (26 items), and knowledge (10 items) specifically regarding the use of respiratory assessment skills by RNs following participation in the ***ReSKU*** program. The current survey tool contained four Parts as follows.

4.8.1.1. Part 1: Demographic data

Part 1 measured demographic data (n = 8 items) including age, sex, educational qualifications, practice area, length of time practising as a surgical nurse and previous respiratory education of participants. The rationale for including these fields was to determine whether the selected variables impacted on study participants' self-reported use, attitudes, beliefs and knowledge relating to respiratory assessment skills.

4.8.1.2 Part 2: Self-reported use of respiratory skills

A five-point scale was used to measure participant responses in items one to seven in Part 2 comprising the Skills section of the instrument assessing participants' use of respiratory skills. The Skills section differed from Wilson and Lillibridge's format in that questions aimed to specifically collate the self-reported frequency of use of respiratory assessment skills in clinical practice by study participants over the preceding month rather than measuring use of all physical assessment skills. Universally recognised criteria for respiratory assessment were used (Lehrer 2002;

Finesilver 2003; Bennett 2003; Neville, Gillon and Milligan 2006; Moore 2007). These criteria included inspection, palpation, percussion and auscultation of lungs for breath sounds. Inspection includes assessment of respiratory effort, rate, depth and rhythm of respirations, symmetrical chest movements and use of accessory muscles (Finesilver 2003). The number of times specific respiratory skills were used was estimated, scoring response alternatives from one to five. This numeric coding system facilitated data entry into the statistical software program used, Statistical Package for the Social Sciences, (SPSS). For example,

- several times a day scored five
- daily, four
- one to three times a week, three
- once or twice a month, two and
- none, scoring one.

Because the Skills section of the instrument was technical in nature, involving discrete clinical respiratory assessment and seven specific practical activities, this section was examined item by item, rather than as a subscale. Reliability of the Skills section of the instrument was established by measuring the internal consistency and homogeneity of items. The extent to which the instrument's seven items measured the same attributes was assessed using Cronbach's alpha.This reliability coefficient is a commonly used test of internal consistency for instruments using a Likert-scale response format (Coup and Schneider 2007). Cronbach alpha comprises an index with a normal range of values ranging between .00 and + 1.00, higher values reflecting a higher internal consistency (Polit and Beck 2004a). A Cronbach alpha coefficient of 0.84 was achieved, demonstrating a high level of internal consistency.

4.8.1.3 Part 3: Attitudes and beliefs subscales

Elements were extracted from Part A of Wilson and Lillibridge's survey tool. (Appendix H). A five-point Likert Scale was used to measure participant responses in items one to twenty-six, forming Part 3 of the instrument described as the Beliefs and Attitudes section. The current tool identified participants' attitudes and beliefs pertaining to respiratory assessment only. Similarly formed classifications or scale

descriptors to Wilson and Lillibridge's tool, with conceptually related groups of items, were included forming six subscales as shown in Figure 4.2. A scale is defined as a 'composite measure of a concept, a measure composed of information derived from several questions or indicators' (de Vaus 2002). Three to six items per construct is considered sufficient in scale development to adequately describe most underlying constructs (Tabachnick and Fiddell 2006). The sixth subscale, clinical development, was developed by the researcher to reflect the theoretical framework underpinning the study. Questions pertaining to participants self-reported perceptions of access to educational resources, performance feedback and clinical support in the ward environment were included in this scale.

Nurse Role	Extent to which respiratory assessment effects the nursing role
Scope of respiratory assessment	Extent to which respiratory assessment is included in routine nursing care
Influence on nursing care	Extent to which respiratory assessment influences nursing care planning, action and patient outcomes
Communication of data	Extent to which respiratory assessment findings were communicated appropriately to the healthcare team
Educational and professional preparation	Extent to which educational and professional preparation impacts on respiratory assessment
Clinical development	Extent to which clinical development impacts on ongoing educational support relating to respiratory assessment

Figure 4.2 Scale descriptors

4.8.1.4 Part 4: Knowledge quiz

Part 4 containing the Knowledge section of the instrument differed from the original tool as it included a short knowledge quiz relating to respiratory assessment, using eight multiple choice and two short answer questions. This section was developed using questions formulated from the health assessment literature. Questions pertaining to participants' 'comfortableness' with perceived knowledge and skills and participants' perceived best and worst areas of health assessment as used by Wilson and Lilibridge (1994), were not used in the current respiratory-specific study. This was because the questions used in the original study aimed to compare

participants' relative perceived confidence and competence between various body systems.

The multiple choice questions (MCQs) were sourced from the literature and critically reviewed by the expert panel. The format allows for large numbers of candidates and a wide range of content knowledge to be tested with little human intervention (Masters et al. 2001 ; McCoubrie 2004). Commonly accepted criteria were used to format the questions. For example, the MCQs consisted of a question or problem statement referred to as the **stem** and a series of four or five responses, **one** of which was correct (Tarrant et al. 2006). Each MCQ had a clear and focused question, contained the problem in the stem rather than the options and all distracters were plausible (Piontek 2008). All options were objective and grammatically consistent with the stem, containing one single, best answer as advocated by Tarrant et al, (2006). Irrelevant and complex options were avoided and correct answers spread equally among the choices (McMillan 2001; Brady 2005). True, false and absolute terms (always, never and all, or none of the above) were also avoided (Masters et al. 2001 ; Tarrant et al. 2006). Question content was directly related to the self-directed learning module.

There is a lack of consensus in the literature regarding the use of reliability coefficients to evaluate the reliability of MCQs. Indeed, there is a paucity of research examining the quality of MCQs in nursing (Considine 2005b). The Kuder-Richardson coefficient is the estimate of homogeneity used specifically for dichotomous questions (Considine 2005b; Coup and Schneider 2007). However, MCQs are considered more reliable than true/false or yes/no questions as the opportunity for guessing correct answers is reduced (Piontek 2008). Use of Cronbach alpha coefficient is recommended when the test content is homogenous (Kehoe 1995; Considine, Botti and Thomas 2005). When the number of test items are under 10, item-test correlations for precision or reliability using Coefficient Alpha decreases as the number of items decrease (Kehoe 1995). Other authors place more emphasis on cognitive level, use of higher level thinking and avoidance of ambiguity and trick questions than statistical reliability (Brady 2005; Tarrant et al. 2006; Piontek 2008). McCoubrie (2004) contends the assertion that MCQs are 'more reliable than other written forms of testing' is ill founded, suggesting that MCQs are considered reliable

only because of their time-efficiency. Because the MCQs used in the current study relating to respiratory assessment were not homogenous and contained a small number of multiple choice questions, a Cronbach alpha coefficient to establish reliability was not estimated.

4.8.2 Validity and reliability of the instrument

Content validity was achieved by requesting six respiratory experts within the facility to pass judgement on each item of the instrument and ascertain the tool was measuring what it purported to measure and clarity of content was appropriate (Elliott 2003). These experts included a respiratory clinical nurse consultant, a respiratory ward nurse unit manager, nurse educators from emergency medicine, intensive care and internal medicine and a respiratory medicine consultant. This scrutiny also established that consensus was reached on instrument's content validity by ensuring that all relevant aspects of the constructs were represented and in correct proportions (Greenwood 2000). The expert panel participated in assessing and evaluating the consistency, scientific accuracy and content validity of the instrument. A brief research proposal was provided to panel members to provide background for their evaluation of the content validity of the instrument. Panel members were asked to examine the questions in regard to relevance to clinical practice, ease of completion, grammar, ambiguity and presentation style (Bannigan and Watson 2009). A content validity evaluation tool was provided for completion. (Appendix M).

Comments were taken into account and relevant changes made to conform to the panel's recommendations on legibility, content validity and technical accuracy. Two minor changes were made to the knowledge test (Part 4 of the instrument) according to feedback and comments from the panel. For example, there was disagreement regarding the answer to the question on whether crackles are heard in atelectasis because of closed or open airways. The answer to this question was then clarified according to further information obtained. The definitive answer was that 'on expansion of the atelectatic lung, crackles are heard through the stethoscope because of the sudden opening of airways' (Lehrer 2002). The question was ruled ambiguous by a majority of the panel and removed. Another knowledge question was reworded

to enhance its understanding. For example, nursing measures taken to minimise atelectasis.

Multiple choice answer alternatives were modified to comply with recommended requirements. A yes/ no question was removed and answers using 'all of the above' as a choice (Tarrant et al. 2006). Correct responses were found to be unevenly distributed across the four options and option b) most frequently the correct answer. Therefore, the placement of correct answers in Questions 4 and 6 were changed to options d) and c). The survey instrument was then approved by the panel. A content validity index (CVI) of interater agreement then determined the proportion of consensus of opinion amongst panel members. A minimum of six or more raters are recommended together with a four point item- rating continuum:

1. 1 = not relevant,
2. 2 = somewhat relevant
3. 3 = quite relevant
4. 4 = highly relevant (Polit and Beck 2006).

Ratings of 3 or 4 are considered 'content valid' (Lyn 1986, Rubio, 2003 #603). As the majority of relevance ratings for the 44 items were established by the panel as either 3 or 4 on the scale, (40 of 44), a CVI of .90 was determined, consistent with the recommended level of CVI of .80 (Rubio et al. 2003; Polit and Beck 2006).

4.8.2.1 Reliability of subscales

As small variations were made to the subscales, the internal reliability of all subscales in Part Three was calculated for the modified survey using the Cronbach alpha coefficient to demonstrate the strength of the subscales in terms of inter-item correlation. This is an index of the degree to which all the different items in a scale demonstrate homogeneity by measuring similar attributes (Bowling 2006). The nurses' role scale consisted of five items in Wilson and Lilibridge's (1995) scale, four items were extracted with minor changes to avoid discrepancy between specific terms for respiratory assessment and comprehensive health assessment. A Cronbach alpha coefficient of 0.88 was achieved for this scale demonstrating a high level of internal consistency (Polit and Beck 2004a). Two items were removed from the

scope of health assessment scale as they did not correlate with the contents of the current study leaving four items.

Interitem estimation of the alpha score identified by SPSS should these items be dropped, also demonstrated a low item to total correlation, with a Cronbach alpha coefficient of 0.44. For example, item 4 stating that 'only doctors should do respiratory assessment',item 12, 'nurses should assess vital signs only' and item 18, 'nurses should perform respiratory assessment in collaboration with a doctor'. These three items were trialled in a separate scale, but achieved a low correlation coefficient score of .38 and were therefore removed from the scale. If the alpha increases over the current total scale alpha when an item is deleted, then the rule of thumb is to delete the item unless it is theoretically necessary for the analysis. Removing unreliable items to increase the alpha of the scale and therefore reliability is recommended (de Vaus 2002). The scale was then found to be internally reliable with a Cronbach alpha coefficient of 0.74. Whilst coefficients of .80 or greater are considered highly desirable, this score in the close vicinity of .70 is considered acceptable (de Vaus 2002; Polit and Beck 2004a). The Cronbach alpha coefficient of all subscales and specific items contained in each subscale, is summarised in Figure 4.3.

Scale	Number of items	Specific items in scale	Cronbach alpha coefficient
Nurse Role	3	1, 2, and 3	0.88
Scope of respiratory assessment	3	11, 14 and 21	0.74
Influence on nursing care	5	5, 6, 7, 15 and 17	0.81
Communication of data	3	9, 13 and 16	0.80
Educational and professional preparation	4	8, 10, 19 and 20	0.75
Clinical development	5	22, 23, 24, 25 and 26	0.86
Total scale	23		0.92

Figure 4.3 **Cronbach alpha coefficient for each subscale**

Two items were moved from the influence on nursing care scale to the communication scale as they were deemed more appropriate in this subscale. The

internal reliability of the scale was found to be maintained (Cronbach alpha coefficient of 0.81). One item was modified in the communication of data scale to reflect current communication protocols between healthcare professionals of reporting abnormal findings. For example 'I inform the doctor of my health assessment findings' was modified to ' nurses should inform medical staff of relevant abnormal respiratory assessment findings'. Internal consistency of the modified scale was retained, with a Cronbach alpha coefficient of 0.80 obtained for this scale. The educational and professional preparation scale contained four items, obtaining a Cronbach alpha coefficient of 0.75. Five items were added forming a separate subscale to reflect the clinical development component of the study as outlined in the theoretical framework. These items were sourced using contemporaneous educational literature (Tanner 2006; Forneris and Peden-McAlpine 2006). Internal reliability was found to be maintained (Cronbach alpha coefficient of 0.86). Cronbach's alpha for the total scale including the now 23 items contained in Part 3 was 0.91. These changes further refine and support the instrument and advance the tool for deeper psychometric testing in a larger study.

4.8.3 Pilot Study

The survey was piloted with a sample of 25 RNs to test recruitment processes, evaluate appropriateness and clarity of question inclusion and data content of the survey tool. An estimate was also able to be made regarding the time required for survey completion. A convenience sampling method was used in this pilot study. Because medical and surgical nursing share common skills, similar characteristics and clinical background, a medical respiratory ward was used for the pilot study. These participants were then excluded from the main study to minimise the bias of measurement effect (LoBiondo-Wood and Haber 2002) The survey instrument, with an information sheet explaining the purpose of the study was distributed to the staff mail boxes in the ward area, using individually addressed envelopes following assignment of a unique identification code number to each medical ward nurse. A separate instruction sheet for survey completion was included and space for participants' comments regarding question clarity and relevance. A self addressed envelope was included to encourage survey return. A repeat survey was sent to non responders, one month following the first distribution date.

The overall pilot survey return rate was 64%, (n=16). More specific instructions regarding provision of the correct responses to the short answer quiz and the approximate timeframe to complete survey answers were incorporated in a poster worded to increase participant response rate. (Appendix K). Any ambiguities and misleading or contradictory items were identified and removed, all comments considered and appropriate adjustments made to the tool. For example, Question 7 in Part Four containing a short answer quiz was found to contain ambiguous wording by the pilot study participants and was removed from the questionnaire. This question pertained to the physiology related to lung collapse and how surfactant prevents the air-filled alveoli from collapsing at low volumes (Lehrer 2002). All other survey sections remained unchanged, as reliability was demonstrated and face and content validity established. Therefore, the survey instrument was revised further to improve clarity, although the scales remained unchanged. The final version of the instrument is in Appendix J.

4.9 Population and Sampling

The research was conducted in the three surgical wards of a regional referral hospital. Surgical services comprise a 28 bed orthopaedic ward, a 30 bed general surgical ward featuring colo-rectal, urology, breast and vascular surgery, with the third ward including 24 beds for patients undergoing gynaecological, minor orthopaedic, ear, nose and throat, urology, ophthalmology and minor plastic surgery. All three surgical wards admit patients for both elective surgery and following emergency trauma. The sample included all 90 RNs working in the three surgical wards who were eligible for inclusion in the study. These nurses included both permanent and casual RNs on temporary employment contracts of three months. Study participants included 35 RNs from the orthopaedic ward, 29 RNs from the general surgical ward and 26 RNs from the mixed surgical specialties ward. Participants were assigned to study groups by a process of self selection, given that conditions of employment deemed that attendance at the ReSKU program, or any continuing education program, was not compulsory. The experimental group consisted of 36 surgical RNs who had chosen to attend the ReSKU program and had consented to be part of the study intervention group.

The comparison group included the 39 surgical nurses who elected not to attend the ReSKU program, but agreed to participate in the study. Comparison group participants were not exposed to any component of the study intervention before the final completion of data collection, which included the education program and clinical supervision of experimental group participants in the three months following the program. This decision did not influence comparison group participants' decision to attend future education programs following the conclusion of the study. A total sample of 90 nurses was used. This sample size was consistent with the Wilson and Lillibridge (1995) study and was dictated by the pragmatics of the research context. Using a paired samples test and an alpha or significance level of 5%, (0.05 significance criterion); the power and effect size of the sample was calculated as a medium effect size, d=0.50 where d=0.70 is considered a large effect size (Cohen 1998). These numbers ensured that the study results provided adequate power using a 0.05 significance criterion. Where the alpha level equals 0.05, there is acceptance of a 5% possibility of differences between the intervention and comparison groups having occurred as a result of chance, rather than because of the study intervention (Devane, Begley and Clarke 2004).

4.9.1 Recruitment Process

Information sessions and discussions were held in surgical ward areas over a four week period to recruit participants for the study. The researcher had visited each surgical ward area at staff shift changeover times to briefly introduce the research study and answer questions in relation to the study. The relevant information regarding the study purpose, risks and benefits in relation to study participation and confidentiality was also discussed during the information sessions. These included presentations and discussion at surgical ward meetings and strategic planning days as well as the research study details being published in the hospital's monthly newsletter. Study posters were also displayed in the nurses' station in all three surgical wards (Appendix L). Nurses were advised that participation in the research was entirely voluntary and not related to individual performance. They were also informed they could withdraw their consent at any time without penalty.

4.9.2 Inclusion and Exclusion criteria

Inclusion: All RNs working in the three surgical wards including permanent staff and casual RNs on temporary employment contracts of three months.

Exclusion: Endorsed enrolled nurses (EENs), enrolled nurses (ENs) and assistants in nursing (AINs). The work of AINs and ENs has supervision requirements according to Queensland Nursing Council (2005) guidelines. The study required a homogenous group of clinicians, therefore ENs were excluded.

4.10 Data Collection

4.10.1 Pre test

The questionnaire was distributed to both intervention and comparison groups, one month prior to commencement of the ***ReSKU*** program (Figure 4.4**)**. Surveys were consigned in the hospital's internal mail in individually addressed envelopes following assignment of a unique identification code number to each surgical ward nurse. This code number was recorded in a coding manual which tabulated the date each individual survey was sent, returned and when a repeat survey was sent to non responders. Each survey envelope contained a self addressed return envelope, study information and a study consent form (Appendix O). Repeat personalised survey mailing to non-respondents was done one month following the initial mail out, immediately prior to commencement of the ***ReSKU*** program, to maximise participant response rate as recommended by (Dillman 2000).

4.10.2 Intervention

The intervention comprised the ***ReSKU*** program which consisted of three components: theoretical, practical skills development and experiential including a self-directed learning module, a one day education program and supported clinical practice for three months by educators and clinical coaches as discussed in Chapter 3 and outlined in Figure 4.4.

4.10.3 Post-test

The questionnaire was distributed to both groups three months following the ***ReSKU*** program including supported practice (Figure 4.4**)**. Follow-up mailing with an

accompanying letter and replacement questionnaire was sent to non-respondents again one month following the first mail out.

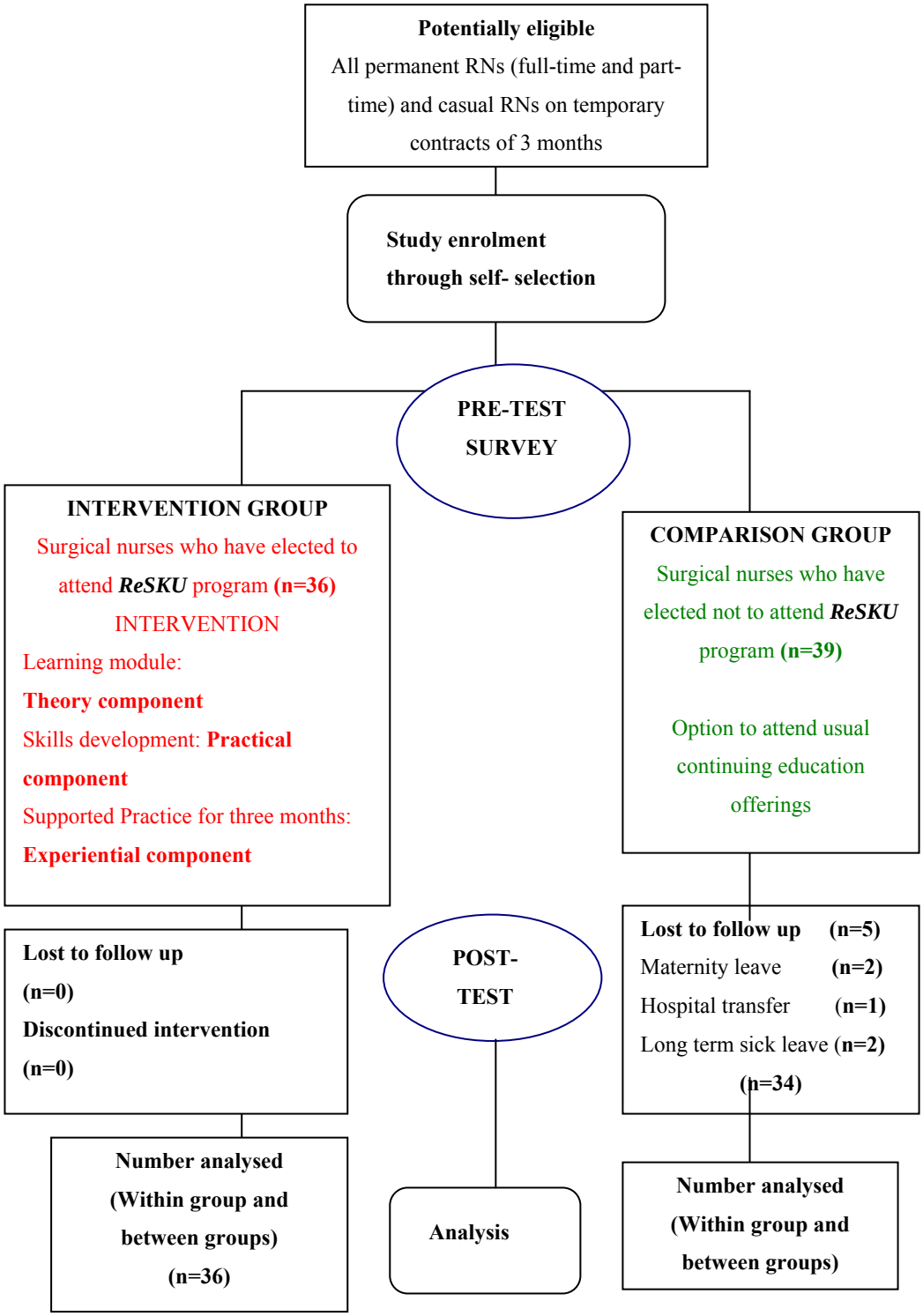


Figure 4.4: CONSORT Flow diagram of participant progress through study phases
(Moher, Schultz and Altman 2001).

4.11 Data analysis

Data from the pre and post program surveys was entered into the SPSS Version 14 database and analysed. Each step of the preparation for analysis including coding, data cleaning and data verification follows.

4.11.1 Data cleaning

After the data had been coded numerically, entered into the database, and comprehensive descriptive labelling of variables completed, crosschecks of the data collection sheets were performed by an experienced second person to ensure accuracy, consistency, frequency and completeness of the data details entered. Codes for missing values were also clearly stipulated together with valid codes and meanings assigned to survey questions. Coding errors such as duplication of data entry or missing cases were minimised by the second person verifying consistency and integrity of data entry. The existence of typographical errors or missing values were checked manually by the second person, as well as using SPSS drop down menus to identify missing or duplicate cases (Bowling 2002). Missing responses for the Knowledge section were recorded 'incorrect' on the premise that a known answer would have been recorded. Missing data for the Attitudes and Beliefs section were set to a neutal score of 3 = Unsure.

4.11.2 Descriptive statistics

Descriptive statistics of the participants' characteristics, demographic data, response and attrition rates and key study variables including knowledge of respiratory assessment, at baseline and across time at three months, were conducted to synthesise and organise the data and calculate parameters. However as these variables were categorical: nominal or ordinal, yielding relative rank-order attributes, nonparametric tests were applied. Nonparametric statistics are considered appropriate when ordinal variables are used (Wackerly, Mendenhall and Scheaffer 2002; Fisher and Schneider 2007; Field 2009b). Because 20 % of the response categories had a frequency of less than five, the Fisher's exact probability test was used (Field 2009a).

4.11.3 Bivariate statistics

Differences were determined between pre and post test data, both between intervention and comparison groups and within groups. A significance level was set

at $p<0.05$. Because the independent variable was nominal and the dependent variables were on an ordinal scale, nonparametric tests were applied (Burns and Grove 1997; Wackerly, Mendenhall and Scheaffer 2002). Consequently a Mann Whitney *U* test was done to establish whether there were any significant differences in pre- and post-test responses, between the intervention and comparison groups, for the Skills section and the subscales of the Beliefs and Attitudes section of the survey. Unlike parametric t-tests, this nonparametric test makes no assumptions about the normality or distribution of data. The scores on the test variable are converted to ranked scores.The Mann–Whitney *U* test is then used to evaluate whether the mean ranks differ significantly between groups where an ordinal scale and two independent samples are used (Green and Salkind 2005). The Mann Whitney *U* test is performed on the ranked data that yield equivalent *p* values, rather than actual values (Coup and Schneider 2007).

The ***U*** statistic calculates and compares the sum of ranks for the two groups and because this test has a tendency to discard less information than a median test, is therefore considered more powerful (Green and Salkind 2005; Field 2009b). A Mann–Whitney *U* test was conducted to test the hypothesis that participants attending the ***ReSKU*** program would score higher on average mean rank scores relating to the use of respiratory assessment skills than study participants who did not attend the program, comparing survey time two (T2), three months post intervention. The number of times respiratory skills were used was calculated using a five point scale, as previously described. A Mann–Whitney *U* test was also conducted to test the hypothesis that participants attending the ***ReSKU*** program would have improved scores in beliefs and attitudes regarding the use and application of respiratory assessment. The Mann Whitney *U* test was examined for underlying assumptions and found to be met except for the random sampling in assumption one. These assumptions include:

1. The cases representing random samples from the two populations, the scores on the test variable being independent of each other
2. Similar shape and variability across continuous distributions for the two populations

3. A sample size of at least 42 to achieve accurate *p* values (Green and Salkind 2005).

Ranks were assigned to two groups of measures (intervention and comparison), while the *U* statistic was calculated by comparing the sum of ranks for the two groups. When both group sample sizes are greater than twenty, the sampling distribution of *U* approaches a normal curve facilitating the reporting of *z* scores based on the *U* distribution (Green and Salkind 2005; Field 2009b). A *z* approximation test is used to compute a *p* value. The *z* score or *z* approximation test can be calculated if the number of pairs of non-tied scores is equal to or greater than 26 (Green and Salkind 2005). When the sample sizes are larger than twenty, using a nonparametric test, then the sampling distribution approaches a normal curve. The *z* score provides an indication of distance and direction an item is from the distribution's mean, whereby every item within a distribution is transformed to a *z* score. This transformation is deemed useful when relative comparison is sought of items from distributions with differing means. The converted scores have a mean of zero and a standard deviation of one (Green and Salkind 2005; Field 2009b).

In order to strengthen the design, within group comparison was conducted for both groups. Possible changes pre to post intervention in both groups using a within-group comparison were calculated for the Skills section and the subscales of the Beliefs and Attitudes section of the survey instrument. A within-group comparison using a nonparametric Wilcoxon Signed Ranks (WSR) test was used because the independent variable was nominal, the dependent variable on an ordinal scale and ordinal-level data paired (Green and Salkind 2005; Field 2009b). The difference between ranks of paired scores of the two groups was calculated, ranking the absolute difference between times. The WSR test was examined for underlying assumptions and found to be met except for the random sampling in assumption one.

Underlying assumptions for the WSR test are:

1. 'Each pair of observations must represent a random sample from a population'. and be independent of any other subject's paired scores

2. A sample size of at least 16 pairs of non-tied scores to achieve accurate *p* values
3. The difference scores are continuous (Green and Salkind 2005).

The Knowledge section of the survey, containing the short answer and multiple choice quiz, was compared using two tailed chi-square analysis where a difference between results was possible, testing the difference in proportions in the two independent groups and nominal categorical outcome variables were used (Green and Salkind 2005; Field 2009b). The two tailed chi-square test was examined for underlying assumptions and found to be met except for the random sampling in assumption one. These assumptions include:

1. The observations should be from a random sample
2. Participants should contribute a single score to the data (sampled independently)

4.12 Ethical Considerations

Ethical clearance was obtained from the Royal Brisbane and Women's Hospital (RB&WH) Human Research Ethics Committee. (Appendix N). Participants were provided with a comprehensive participant information sheet and detailed consent form regarding their potential involvement in data collection. (Appendices J and O). Study purpose and aims were clearly communicated including the basis for participant selection. The researcher was available to provide information and support as needed. The study information form was kept in each ward area as a reference. Clinicians' right to autonomy was respected given that participation was voluntary and participants could leave the study at any time without giving a reason. Sufficient time was allocated at staff handover to discuss the study purpose, aims and answer any questions. There was no coercion or inducement of participants during the consent process. All participants were RNs and were supported by a nurse educator or clinical coach if the skill was new to them. These strategies ensured that patients were not exposed to any level of risk through this study.

The study complied with organisational clinical guidelines, procedures and national nursing practice standards. Professional nursing standards and guidelines as provided

by the Australian Nursing Council's Code of Ethics (2006) and the National Health and Medical Research Council (NHMRC) were closely adhered to (ANC 2006; NHMRC). All data collection was undertaken with the participant's full knowledge. Participants were clearly advised of their right to withdraw from the study at any time and given an opportunity to ask questions and seek clarification relating to the study at any stage. Contact details of the investigator and the supervisor were made available should participants have further queries. Staff were given an assurance of privacy, confidentiality and anonymity that in the event of study results being published; participants would not be identified in any way. Staff who declined to participate in the study were given assurance that their professional development would not be compromised. No payment was made for participation or in compensation for any time lost.

The nurse educator's role as a researcher in the study and research process was clearly outlined with full disclosure of participants' rights, the nature of the study, explanation of any risks and their management (Polit and Beck 2004a; Coup and Schneider 2007). The expectation of privacy, confidentiality, basic human rights and respect for human dignity is extremely important and an integral part of the overall process (Polit and Beck 2004a; Coup and Schneider 2007). Participants were assured of their access to the results or findings of the research study. Entry to the study database stored on a computer was via a secure password which only the researcher and her immediate supervisor could access. All data were coded, de-identified and aggregated, further protecting and maintaining participants' privacy and anonymity. All collected data will be stored in a locked filing cabinet in a secure location for seven years following publication of the study, consistent with the requirements of the (RB&WH) ethics committee and in accordance with the NHMRC guidelines.

4.13 Conclusion

Conducting educational research in the clinical environment poses methodological challenges. The use of a quantitative quasi experimental pre-test, post-test non-equivalent control group design was appropriate given that allocation of participants to a specific group was not feasible. Attendance at the ***ReSKU*** program was voluntary and could not be based on random assignment of participants. This chapter described methods used to determine whether participation in a ***ReSKU*** program

would influence an improvement in respiratory assessment practice amongst surgical nurses, specifically their self-reported use of respiratory skills, attitudes and knowledge. For example, whether accurate and timely respiratory assessment was performed, documented and communicated effectively to other healthcare team members. The study design, study aims and characteristics of the study population were outlined together with a description of data collection processes, storage and proposed analysis. The next chapter will present the study findings and results.

Chapter 5 - Results

5.1 Introduction

The previous chapter described the methodology used to investigate the effectiveness of an integrated learning model in the clinical setting. A ***Re***spiratory ***Sk***ills ***U***pdate education (***ReSKU***) program was used as the content for the educational intervention. The aim of the research was to evaluate the effectiveness of implementing the ***ReSKU*** program using integrated teaching and learning strategies, in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The education program aimed to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment. The program comprised three components, theoretical, practical and experiential including a self-directed learning module, a one day education program and supported clinical practice and competency assessment of study participants for three months following the program as discussed in Chapter 3. The study applied a combination of educational theory and best practice principles which advocate that the best context-dependent clinical learning is achieved through the integration of theoretical, practical and experiential knowledge (Haigh 2003; Distler 2006; Baxter 2007). The need for evidence based care supported by competent and capable assessment was emphasised. Critical thinking concepts using Forneris' (2004) theoretical framework underpinned the educational model as outlined in Chapter 3. The model operationalises critical thinking and clinical reasoning and applies evidence-based educational approaches. This includes the use of coaching support to facilitate and sustain practice change.

The demographic and clinical characteristics of participants and presents the data analysis used to establish study findings are reported in this chapter. A quasi experimental pre-test, post-test non–equivalent control group design was used to evaluate the impact of the ***ReSKU*** program on the clinical practice of surgical nurses. It was hypothesised that surgical nurses who participate in a ***ReSKU*** program will have higher scores in the self-reported use of respiratory assessment in clinical practice, improved scores in self-reported attitudes and beliefs and higher scores in knowledge and skills, relating to respiratory assessment, than surgical nurses who do

not participate in respiratory education. A description is given of study participants and comparison made between the control and intervention groups.

5.2 Attrition Rates

A total of 90 nursing staff in three surgical ward areas of a regional referral hospital were recruited of which 75 completed the first survey immediately prior to the commencement of the intervention. This constituted an 83 % questionnaire response rate. Following an audit of staff lists and ward rosters after distribution of the first survey, initial participant losses were attributed to maternity leave (n = 2), or hospital transfer (n = 1). Further attrition of study participants occurred following long term sick leave (n = 2). This accounted for a reduction in the questionnaire return rate in the post test comparison group of five non-respondents, a retention rate of 93 %. There was no further attrition from the study's intervention group.

5.3 Participant Characteristics. Baseline Measures

A total sample of 75 nurses was enrolled in the study. Study participants included 28 RNs from the orthopaedic ward, 25 RNs from the 30 bed general surgical ward featuring colo-rectal, urology, breast and vascular surgery and 22 RNs from the third mixed surgical specialties ward including 24 beds for patients undergoing gynaecological, minor orthopaedic, ear, nose and throat, urology, ophthalmology and minor plastic surgery. There were 39 RNs in the comparison group and 36 RNs in the intervention group. Seventy respondents completed the second survey three months following the intervention 36 RNs in the intervention group and 34 RNs in the comparison group. Descriptive statistics were applied to describe the characteristics of the data including the frequency and distribution of variables. The data were checked for normality and demographic results indicated that the general characteristics of participants were not equally distributed between groups for age and sex, educational qualifications, years of nursing experience and number of shifts worked in a fortnight.

The control and intervention groups' histogram were both negatively skewed (educational qualifications), and postively skewed (participant age and sex) precluding the use of parametric analysis. Non-parametric tests were used as the data could not be assumed to be at the interval level of measurement and the

normality of the underlying distribution could not be inferred (Field 2009b). Because the data were ranked at ordinal level, the Mann-Whitney *U* signed rank test for independent groups and Wilcoxon matched pairs test were used to analyse the data. The Chi-square test was used to examine nominal data. When the sample size was small with cell sizes and response categories less than five, the Fisher's exact probability test was applied (Fisher and Schneider 2007; Field 2009b). This procedure is used to test statistically whether there is any relation between two categorical variables. The null hypothesis is that the relative proportions of one variable are independent of the second variable. For example, the null hypothesis would be that the proportion of age is the same in the two study groups. There were similarities in some areas between the groups, as presented in the following results. Proportions of age, sex and educational qualification in the entire research sample were consistent with the nursing population across the hospital (HRDSS 2007).

5.3.1 Participant Age and Sex

A larger number of study participants in the 20-29 age brackets elected to attend the ***ReSKU*** program and be part of the intervention group. Smaller proportions of participants in the 30-39 age group and those over the age of fifty agreed to participate in the study. (Table 5.1). Because the Fisher's exact test was statistically significant, (p = 0.000), the intervention and comparison groups differ significantly for this variable and the null hypothesis can be rejected (Field 2009a). There were similar numbers of female and male participants in both groups with only seven males among the seventy-five participants (9%). The intervention group contained two males and the comparison group, five. These results are consistent with national statistics denoting female/male ratios in the nursing profession. Of all employed nurses in Australia, 91.4% were females and 8.6% males (Australian Institute of Health and Welfare 2008).

Table 5.1 Age of participants amongst study groups

Age	*Intervention Group n=36*	*Comparison Group n=39*	χ^2	*Exact Sig. (2-tailed)*
20-29	14 (38.9%)	3 (7.7%)		
30-39	5 (13.9%)	13 (33.3%)		
40-49	14 (38.9%)	10 (25.6%)		
50 and above	3 (8.3%)	13 (33.3%)		
Total	**36 (100.0%)**	**39 (100.0%)**	20.017	*p*=0.000

5.3.2 Number of years of nursing experience

Table 5.2 indicates that a larger proportion of participants who had less than six years clinical experience were in the intervention group. There were similar proportions of participants in both groups with nursing experience between six and nine years, 16-20 years and 26-30 years. Conversely the majority of participants with over 31 years nursing experience elected to be part of the comparison group and not attend the ***ReSKU*** program. Fisher's exact test was statistically significant, (p = 0.058), indicating that there is a significant difference between groups in relation to years of nursing experience (Field 2009b).

Table 5.2 Number of years of nursing experience amongst study groups

Number of years of nursing experience	*Intervention Group n=36* **(%)**	*Comparison Group n=39* **(%)**	χ^2	*Exact Sig. (2-tailed)*
Less than 6 years	15 (41.6%)	6 (15.4%)		
6-9	4 (11.1%)	4 (10.2%)		
10-15	3 (8.3%)	7 (17.9%)		
16-20	4 (11.1%)	4 (10.2%)		
21-25	6 (16.6%)	8 (20.5%)		
26-30	3 (8.3%)	2 (5.1%)		
31-35	1 (2.7%)	3 (7.7%)		
Over 36	0	5 (12.8%)		
Total	**36 (100.0%)**	**39 (100.0%)**	8.007	*p*=0.058

5.3.3 Surgical nursing experience

Table 5.3 demonstrates that there were more participants in the intervention group component of the sample who had less than one year's experience as a surgical nurse, (n=14 compared to n=3). Similarly more participants who had been surgical nurses for over ten years elected to be part of the comparison group (n=22 compared to n = 13). Numbers were more evenly distributed in both groups in participants working in surgical areas for less than three years, (n = 3, n = 3). Because the Fisher's exact test was statistically significant, (p = 0.000), there is no evidence that the two groups are similar for this variable (Field 2009b).

Table 5.3 Number of years of surgical nursing experience amongst study groups

Years of surgical nursing experience	*Intervention Group n=36* **(%)**	*Comparison Group n=39* **(%)**	χ^2	*Exact. Sig. (2-tailed)*
Less than 1 year	14 (38.9%)	3 (7.7%)		
1 less than 3 years	3 (8.3%)	3 (7.7%)		
3 less than 6 years	3 (8.3%)	6 (15.4%)		
6 less than 9 years	3 (8.3%)	5 (12.8%)		
Over 10 years	13 (36.1%)	22 (56.4%)		
Total	**36 (100.0%)**	**39 (100.0%)**	22.583	p=0.000

5.3.4 Area of major specialty

Table 5.4 demonstrates that similar proportions of the sample from both study groups nominated the general surgical, (n = 19 intervention and n=21, comparison) orthopaedic areas as their major specialty, (n=12 intervention and n = 17, comparison). Other specialties such as gynaecology and colorectal surgery and medicine were selected by a minority of participants in both groups. The result is (p = 0.884), indicating that the groups are similar in relation to area of major specialty (Field 2009b).

Table 5.4 Area of specialty amongst study groups

Specialty	*Intervention Group n=36 (%)*	*Comparison Group n=39 (%)*	χ^2	*Exact. Sig. (2-tailed*
General surgical	19 (52.7%)	21 (53.8%)		
Orthopaedic	12 (33.3%)	17 (43.6%)		
Other	5 (13.9%)	1 (2.6%)		
Total	**36 (100.0%)**	**39 (100.0%)**	7.896	$p = 0.884$

5.3.5 Educational qualifications

Hospital Certificate was the highest level of education achieved by more participants in the comparison group compared to the intervention group as demonstrated in Table 5.5. Conversely, there were proportionally more participants with an Undergraduate Degree in the intervention group. Similar numbers in both groups attained Postgraduate qualifications. Because the Fisher's exact test was statistically significant, (p = 0.017), the intervention and comparison groups differed significantly for this variable (Field 2009b).

Table 5.5 Educational qualifications amongst study groups

Highest level of education obtained	*Intervention Group n=36 (%)*	*Comparison Group n=39 (%)*	χ^2	*Exact Sig. (2-tailed)*
Hospital Certificate	11 (27.7%)	17 (43.5%)		
Undergraduate Degree	23 (66.6%)	19 (48.7%)		
Postgraduate Degree	3 (5.5%)	3 (7.7%)		
Total	**36 (100%)**	**39 (100%)**	6.425	$p = .017$

5.3.6 Number of shifts worked per fortnight

More participants from the intervention group worked full time with more comparison group participants working six to eight shifts per fortnight (Table 5.6). The result is (p=0.109), indicating that the groups are similar in relation to the number of shifts worked per fortnight (Field 2009b).

Table 5.6 Number of shifts worked per fortnight amongst study groups

Shifts per fortnight	*Intervention Group n=36 (%)*	*Comparison Group n=39 (%)*	χ^2	*Exact Sig. (2-tailed)*
Full time	19 (52.7%)	15 (38.5%)		
6-8 shifts	17 (47.3%)	24 (61.5%)		
Total	**36 (100%)**	**39 (100%)**	2.83	p =0.109

In summary, the descriptive demographic results indicated that the general characteristics of study participants were similar in relation to area of specialty and number of shifts worked prer fortnight. However, there was limited equivalency in the majority of other demographic variables. Younger, less experienced and better educated nurses were more likely to take up the training opportunity and participate in the ***ReSKU*** program.

5.4 Baseline Data Time 1

5.4.1 Baseline data: Self-reported Use of Respiratory Skills

A Mann-Whitney *U* nonparametric test was conducted to evaluate whether the intervention group would score higher on the average than the comparison group in relation to participants' frequency of self-reported use of respiratory skills. There was a statistically significant difference between groups, as indicated in Table 5.7 for Item 4, listening for breath sounds, (z = -2.163, p = *.031*, median, 2.0 versus 1.0). There were minimal differences between groups on examination of mean ranks, sum of ranks and median scores in the self-reported use of respiratory skills for Items 1, 2, 3, 5 and 7. Table 5.7 shows the distribution and comparison of the ranked scores and median scores between groups.

Table 5.7 Mann-Whitney *U* test measures to compare differences in the self-reported use of respiratory skills between the intervention and comparison groups at Time 1

Self-reported use of respiratory skills		*Mann-Whitney U*	*Mean rank*	*Sum of ranks*	*z*	*Asymp. Sig. (2-tailed)*	*Median scores* (I)	(C
Item 1	Assessed rate, depth and rhythm of respirations	565.000	36.79 (I) 34.13 (C)	1324.50 (I) 1160.50 (C)	-.587	.557 *NS*	5	4
Item 2:	Assessed use of accessory muscles	536.500	37.60 (I) 33.28 (C)	1353.50 (I) 1131.50 (C)	-.909	.363 *NS*	3	3
Item 3:	Assessed effort of breathing	567.000	36.75 (I) 34.18 (C)	1323.00 (I) 1162.00 (C)	-.547	.584*NS*	4	4
Item 4:	Conducted palpation of chest	603.000	35.75 (I) 35.24 (C)	1287.00 (I) 1198.00 (C)	-.127	.899 *NS*	1	1
Item 5:	Conducted percussion of chest	597.000	35.90 (I) 35.07 (C)	1292.50 (I) 1192.50 (C)	-.227	.820 *NS*	1	1
Item 6:	Conducted auscultation of lungs for breath sounds	442.500	40.21 (I) 30.51 (C)	1447.50 (I) 1037.50 (C)	-2.163	*.031	2	1
Item 7:	Assessed symmetrical chest movement	568.5.000	36.71 (I) 34.22 (C)	1321.50 (I) 1163.50 (C)	-.531	.595 *NS*	2	2

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in items 1 to 7. Scores were values chosen by participants from a Likert scale, of 1-5, where 1 = none, 2 = once or twice a month, 3 = 1-3 times a week, 4 = daily, 5 = several times a day (I) Intervention group (C) Comparison group

5.4.2 Baseline data: Self-reported Beliefs and Attitudes

At the baseline level, there were minimal differences between the comparison and intervention groups for the subscale ranked scores of nurse role, scope of respiratory assessment, influence on nursing care and educational and professional preparation. The intervention group demonstrated statistically significant differences between groups for subscale 4, communication of data, (***z*** = -2.407, *p = .016,* median, 4.0 versus 5.0), and subscale 6, clinical development (***z*** = -2.906 and *p = .004,* median, 12.0 versus 16.0). The overall differences for the subscales' mean rank, sums of ranks and median scores between groups are shown in Table 5.8.

Table 5.8 Between group comparison at Time 1 for self-reported beliefs and attitudes subscales using Mann-Whitney U test measures

Subscales regarding self-reported beliefs and attitudes		*Mann-Whitney U*	*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* (I)	(C)
Subscale 1	The nurses' role (3 items)	503.50	-1.417	.156 *NS*	32.49 (I) 38.69 (C)	1169.50 (I) 1315.50 (C)	3	3
Subscale 2	Scope of respiratory assessment (3 items)	499.50	-1.330	.184 *NS*	32.38(I) 38.81 (C)	1165.50 (I) 1319.50 (C)	5	7
Subscale 3	Influence on nursing care (5 items)	462.00	-1.795	.073 *NS*	31.33 (I) 39.91 (C)	1128.00 (I) 1357.00 (C)	7	9
Subscale 4	Communication of data (3 items)	414.50	-2.407	** .016	30.001 (I) 41.31 (C)	1080.50 (I) 1404.50 (C)	4	5
Subscale 5	Educational and professional preparation (4 items)	484.50	-1.519	.129 *NS*	31.96 (I) 39.25 (C)	1150.50 (I) 1334.50 (C)	9	10
Subscale 6	Clinical development (5 items)	365.50	-2.906	**.004	28.65 (I) 42.75 (C)	1031.50 (I) 1453.50 (C)	12	16

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in subscales 1 to 6. Scores were values chosen by participants from a Likert scale of 1-5, where 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree (I) Intervention group (C) Comparison group

Although examination of subscales is a theoretically structured way of conceptualising results; closer inspection of individual items, ranked and median scores contained in the six subscales, demonstrated statistically significant differences between groups of $p < .01$ in specific results relating to survey statements. These items pertained to particular self-reported beliefs and attitudes relating to subscale 6 (items 23 and 24) shown in Table 5.9. Statistically significant differences of $p < .05$ pertaining to subscales 3 (items 5 and 6), 4 (item 9), and 5 (items 8 and 10) are also demonstrated.

Table 5.9 Between group comparison at Time 1 for self-reported beliefs and attitudes section of the survey using Mann-Whitney *U* test measures

Self-reported beliefs and attitudes		*Mann-Whitney U*	*Mean rank*	*Sum of ranks*	*z*	*Asymp. Sig. (2-tailed)*	*Median scores* (I)	(C)
Item 5	Routine respiratory assessment improves patient care	468.000	31.50 (I) 39.74 (C)	1134.00 (I) 1351.00 (C)	-1.932	* .053	1	2
Item 6	Routine respiratory assessment reduces complications	442.000	30.78 (I) 40.50 (C)	1108.00 (I) 1377.00 (C	-2.260	* .024	1	2
Item 8	Nurses should be taught respiratory assessment in a course	434.500	30.57 (I) 40.72 (C)	1100.50 (I) 1384 50 (C)	-2.403	** .016	1	2
Item 9	Nurses should always document respiratory assessment findings	442.000	30.78 (I) 40.50 (C)	1108.00 (I) 1377.00 (C)	-2.303	* .021	1	2
Item 10	It is important for nurses to practise respiratory assessment	439.000	30.69 (I) 40.59 (C)	1105.00 (I) 1380.00 (C)	-2.283	* .022	1	2
Item 11	Nurses should always take a social history	456.000	31.18 (I) 40.07 (C)	1122.50 (I) 1362.50 (C)	-1.937	* .053	1	3
Item 23	I have been given the opportunity to attend respiratory assessment related professional development activities	329.500	27.65 (I) 43.81 (C)	995.50 (I) 1489.50 (C)	-3.476	***.001	1	3
Item 24	I could access educational resources to assist me in my clinical activities related to respiratory assessment	332.500	27.74 (I) 43.72 (C)	998.50 (I) 1486.50 (C)	-3.450	**.010	1	2

***p<0.001 ** *p<0.01* * *p<0.05* *NS = Not significant* Intervention (I) or comparison (C) group

A five point Likert scale, scored response alternatives from one to five items 1 to 7. Scores were values chosen by participants from a Likert scale of 1-5, where 1= strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree

5.4.3 Baseline data: Knowledge

Chi-square analysis demonstrated no statistically significant differences in knowledge responses between the intervention and comparison groups at Time 1 based on the Pearson χ^2 test, as indicated in Table 5.10. The percentage of correct responses between the groups, comparison of the two proportions between groups and standard error of difference were also analysed. Results indicate no statistically significant knowledge differences between groups.

Table 5.10 Knowledge between groups at Time 1, using Chi-square analysis

Knowledge questions		*n=36 (I) Correct*	*n=39 (C) Correct*	χ^2	*Asymp. Sig. (2-tailed)*	*sed*	Proportions Upper	Lower
Item 1	What position would you place the patient in prior to listening to lung sounds and what procedure should be carried out prior to auscultation?	97%	100%	1.074	.300 *NS*	0.04	0.08	-0.07
Item 2	When performing a respiratory assessment it is necessary to observe the patient for:	19%	18%	1.107	.575 *NS*	0.09	0.18	-0.18
Item 3	The areas of the lung you would listen to lung sounds are:	39%	49%	1.429	.839 *NS*	0.11	0.20	-0.23
Item 4	How long should you listen at each site for?	61%	44%	3.875	.144 *NS*	0.11	0.23	-0.20
Item 5	The four normal lung sounds are:	72%	59%	1.739	.419 *NS*	0.11	0.23	-0.20
Item 6	Accessory muscles of respiration include	17%	10%	1.223	.747 *NS*	0.08	0.16	-0.15
Item 7	Wheezes are an indication of:	50%	40%	3.511	.319 *NS*	0.13	0.22	-0.21
Item 8	Name two other abnormal breath sounds and their causes	53%	44%	.290	.590 *NS*	0.12	0.23	-0.21
Item 9	What sounds would you hear for: lung consolidation, atelectasis, pulmonary oedema	61%	56%	1.365	.243 *NS*	0.13	0.22	-0.21
Item 10	Atelectasis can be minimized by:	86%	72%	1.098	.577 *NS*	0.06	0.19	-0.16

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant sed = standard error of difference*

5.5 Within group comparison across time

5.5.1 Within intervention group: Self-reported Use of Respiratory Skills

Because this section was technically focused with discrete items relating to specific respiratory assessment activities, items were examined individually rather than as a subscale component. On most items demonstrated in Table 5.11, comparing mean ranks, sum of ranks and median scores there were statistically significant differences in the expected direction and significantly, within the 1% significance level set at *p<0.01*. Item 3, (assessment of the effort of breathing), met the required conventional test statistics of 5% ($p < 0.05$). As indicated in Table 5.11, there was no statistically significant difference across time, pre-test to post-test at Time 2 (T2) compared to Time 1 (T1), in Item 4 (the conduction of chest palpation).

Table 5.11 Self-reported use of respiratory skills within the intervention group using the Wilcoxon Signed Ranks test. Time 2 compared to Time 1

Number of times respiratory skills reportedly used in past month:		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median*	
						T2	*T1*
Item 1	Assessed rate, depth and rhythm of respirations	-2.514	**.012	7.00 (T1) 11.07 (T2)	35.00 155.00	5	5
Item 2:	Assessed use of accessory muscles	-3.069	**.002	13.65 (T1) 16.00 (T2)	64.00 314.00	4	3
Item 3:	Assessed effort of breathing	-1.972	*.049	11.41 (T1) 11.75 (T2)	70.50 182.50	4.5	4
Item 4:	Conducted palpation of chest	-1.793	.073 *NS*	8.38 (T1) 8.88 (T2)	35.50 100.50	2	1
Item 5:	Conducted percussion of chest	-2.566	**.010	8.18 (T1) 10.75 (T2)	21.50 114.50	2	1
Item 6:	Conducted auscultation of lungs for breath sounds	-5.012	***.000	.00 (T1) 16.50 (T2)	.00 528.00	4	2
Item 7:	Assessed symmetrical chest movement	-4.225	***.000	11.83 (T1) 16.45 (T2)	35.50 460.50	4	2

**** p<0.001* *** p<0.01* **p<0.05* *NS = Not significant* T1 = Time 1, T2 = Time 2

A five point Likert scale, scored response alternatives from one to five in items 1 to 7. Scores were values chosen by participants from a Likert scale, of 1-5, where 1 = none, 2 = once or twice a month, 3 = 1-3 times a week, 4 = daily, 5 = several times a day

5.5.2 Within intervention group: Self-reported Beliefs and Attitudes Across Time

Participants from both groups were asked to indicate in the Beliefs and Attitudes section of the study questionnaire which point best described their beliefs and attitudes about a series of statements relating to their self-reported use and application of respiratory assessment**.** The analysis indicated that the intervention group's self-reported beliefs and attitudes pertaining to subscales improved in specific areas following attendance at the ***ReSKU*** program as indicated in Table 5.12. There was a statistically significant difference relating to educational and professional preparation at T 2 compared to T1. Comparison of mean ranks, sum of ranks and median scores shown in Table 5.12 demonstrates evidence to suggest that intervention group participants' response to subscale 5 met the required conventional test statistics of 1 % (***z*** = -3.217, $p < 0.001$, median, 8.0 versus 9.0) .

Table 5.12 Wilcoxon Signed Ranks test for subscales regarding self-reported beliefs and attitudes within the intervention group. Time 2 compared to Time 1

Subscales regarding self-reported beliefs and attitudes		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* *T2*	*T1*
Subscale 1	The nurses' role	-.115a	.909 *NS*	8.826 (T1) 7.25 (T2)	62.00 58.00	3	3
Subscale 2	Scope of respiratory assessment	-.179a	.858 *NS*	18.36 (T1) 14.06 (T2)	257.00 239.00	5	5
Subscale 3	Influence on nursing care	-1.747a	.081 *NS*	9.42 (T1) 8.00 (T2)	113.00 40.00	6	7
Subscale 4	Communication of data	-.082b	.935 *NS*	11.27 (T1) 11.73 (T2)	124.00 129.00	3	4
Subscale 5	Educational and professional preparation	-3.217	***.001	13.76 (T1) 7.70 (T2)	261.50 38.50	8	9
Subscale 6	Clinical development	-.743a	.457 *NS*	16.82 (T1) 12.18 (T2)	235.50 170.50	11.5	12

**** p<0.001* ***p<0.01*p<0.05* *NS = Not significant* T1 = Time 1, T2 = Time 2

A five point Likert scale, scored response alternatives from one to five in subscales 1 to 6. Scores were values chosen by participants from a Likert scale of 1-5, where 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree a based on positive ranks b based on negative ranks

Closer examination of ranked and median scores of individual items contained in the six subscales demonstrated statistically significant differences of $p < .01$ in specific results relating to survey statements. These items pertained to particular beliefs and attitudes relating to the use and application of respiratory assessment skills, T2 compared to T1, as shown in Table 5.13. For example, item 7 contained in subscale 3 (influence on nursing care), items 19 and 20 in subscale 5 (educational and professional preparation) and item 22 in subscale 6 (clinical development).

Table 5.13 Self-reported beliefs and attitudes within the intervention group: Wilcoxon Signed Ranks test. Time 2 compared to Time 1

Self-reported beliefs and attitudes relating to respiratory assessment.		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* T2	T1
Item 7	Routine respiratory assessment prevents complications	-2.822	**.005	9.54 (T1) 6.50 (T2)	133.50 19.50	1	1.5
Item 19	My knowledge and skills in respiratory assessment are very good	-3.255	*** 001	9.75 (T1) 7.50 (T2)	156.00 15.00	3	3
Item 20	I feel confident performing respiratory assessment	-3.144	** 002	10.76 (T1) 9.00 (T2)	183.00 27.00	3	3
Item 22	I have received timely feedback on my performance in relation to respiratory assessment	-2.674	**.008	14.42 (T1) 11.00 (T2)	274.00 77.00	3	3

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in items 1 to 26. Scores were values chosen by participants from a Likert scale of 1-5, where 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree T1 = Time 1, T2 = Time 2

5.5.3 Within the comparison group. Self-reported use of Respiratory Skills

Possible changes in the comparison group, pre to post-test questionnaire completion of the self-reported use of respiratory skills section of the survey, T2 compared to T1, using a within–group comparison, were also calculated using a WSR test as demonstrated in Table 5.14. Results were not statistically significant, indicating minimal changes in participant responses between surveys completions at T2 compared to T1.

Table 5.14 Self-reported use of respiratory skills within the comparison group: Wilcoxon Signed Ranks test. Time 2 compared to Time 1

Number of times respiratory skills self-reportedly used in past month:		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* T2	T1
Item 1	Assessed rate, depth and rhythm of respirations	-1 852	0.064 *NS*	5.00 (T1) 7.89 (T2)	20.00 71.00	4	4
Item 2:	Assessed use of accessory muscles	-.694	0.487 *NS*	9.70 (T1) 7.15 (T2)	48.50 71.50	3	3
Item 3:	Assessed effort of breathing	-.549	0.583 *NS*	10.25 (T1) 9.82 (T2)	82.00 108.00	4	4
Item 4:	Conducted palpation of chest	-1.155	0.248 *NS*	5.25 (T1) 4.50 (T2)	31.50 13.50	1	1
Item 5:	Conducted percussion of chest	-.587	0.557 *NS*	3.50 (T1) 5.50 (T2)	14.00 22.00	1	1
Item 6:	Conducted auscultation of lungs for breath sounds	-.775	0.439 *NS*	6.00 (T1) 6.86 (T2)	30.00 48.00	1	1
Item 7:	Assessed symmetrical chest movement	-.177	0.860 *NS*	11.64 (T1) 8.14 (T2)	81.50 89.50	2	2

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in items 1 to 7. Scores were values chosen by participants from a Likert scale, of 1-5, where 1 = none, 2 = once or twice a month, 3 = 1-3 times a week, 4 = daily, 5 = several times a day T1 = Time 1, T2 = Time 2

5.5.4 Within the comparison group. Self-reported Beliefs and Attitudes

Possible changes pre to post-test questionnaire completion in the comparison group, T2 compared to T1, using a within–group comparison were calculated also using a WSR test. Results were not statistically significant, indicating minimal changes in participant responses between administration of the survey T2 and survey T1 as indicated in Table 5.15.

Table 5.15 Wilcoxon Signed Ranks test for subscales regarding self-reported beliefs and attitudes within the comparison group. Time 2 compared to Time 1.

Subscales regarding self-reported beliefs and attitudes		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* T2	T1
Subscale 1	The nurses' role	-.855a	.393 *NS*	9.25 10.55	74.00 116.00	3	3
Subscale 2	Scope of respiratory assessment	-.838b	.402 *NS*	18.15 14.63	308.50 219.50	6	7
Subscale 3	Influence on nursing care	-.833b	.405 *NS*	9.77 11.86	127.00 83.00	8	9
Subscale 4	Communication of data	-1.238b	.216 *NS*	13.87 11.70	208.00 117.00	4	5
Subscale 5	Educational and professional preparation	-1.220b	.223 *NS*	12.94 13.11	207.00 118.00	10	10
Subscale 6	Clinical development	-1.680b	.093 *NS*	18.93 16.42	416.50 213.50	15	16

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in subscales 1 to 6. Scores were values chosen by participants from a Likert scale of 1-5, where 1= strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree

Examination of individual survey items within comparison group data, in Table 5.16, demonstrated a statistically significant difference in item 24, contained in subscale 6, with the statement, 'I could access educational resources to assist me in my clinical activities related to respiratory assessment' (z= -2.148, p= .032, median 3.0 versus 3.0). Comparison group participants acknowledged that the same resources were available to them as the intervention group participants who chose to attend the ***ReSKU*** program.

Table 5.16 Self-reported beliefs and attitudes within the comparison group: Wilcoxon Signed Ranks test. Time 2 compared to Time 1.

Self-reported beliefs and attitudes relating to respiratory assessment.		*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* T2	T1
Item 24	I could access educational resources to assist me in my clinical activities	-2.148	.032*	11.36 8.50	159.00 51.00	3	3

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

A five point Likert scale, scored response alternatives from one to five in items 1 to 26. Scores were chosen by participants from a Likert scale of 1-5, where 1=strongly agree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree

5.6 Between group comparison across time

5.6.1 Between groups: Self-reported Use of Respiratory Skills

Table 5.17 shows the distributions of the ranked data and median score results, comparing the self-reported use of respiratory skills between the two groups at Time 2. The Mann-Whitney *U* test evaluated whether the mean ranks, sum of ranks and median scores for the two groups differed significantly from each other. There was no statistically significant difference in Items 1 and 3. All other items showed statistically significant differences between groups as indicated in Table 5.16. Specific skills reported to have improved in the intervention group, were assessment of the use of accessory muscles and symmetrical chest wall movement, auscultation of lungs for breath sounds and conduction of palpation and percussion.

Table 5.17 Mann-Whitney *U* test measures to compare differences in the self-reported use of respiratory skills between the intervention and comparison groups at Time 2

Self-reported use of respiratory skills		*Mann-Whitney U*	*Mean rank*	*Sum of ranks*	*z*	*Asymp. Sig. (2-tailed)*	*Median scores* (I)	(C)
Item 1	Assessed rate, depth and rhythm of respirations	575.000	36.53 (I) 34.41 (C)	1315.00 (I) 1170.00 (C)	-.531	.595*NS*	5	5
Item 2:	Assessed use of accessory muscles	342.000	42.99(I) 27.57 (C)	1547.50 (I) 937.50 (C)	-3.270	**.001	4	3
Item 3:	Assessed effort of breathing	486.500	38.99 (I) 31.81 (C)	1403.50 (I) 1081.50 (C)	-1.564	.118*NS*	4.5	4
Item 4:	Conducted palpation of chest	417.500	40.90 (I) 29.78 (C)	1472.50 (I) 1012.50 (C)	-2.572	**.010	2	1
Item 5:	Conducted percussion of chest	439.000	40.31 (I) 30.41 (C)	1451.00 (I) 1034.00 (C)	-2.309	* .021	2	1
Item 6:	Conducted auscultation of lungs for breath sounds	85.000	50.14 (I) 20.00 (C)	1805.00 (I) 680.00 (I)	-6.392	**.000	4	1
Item 7:	Assessed symmetrical chest movement	263.500	45.18 (I) 25.25 (C)	1626.50 (I) 858.50 (C)	-4.201	**.000	4	2

Grouping Variable: If participants belong to the intervention (I) or comparison (C) group

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant*

Scores were values chosen by participants from a Likert scale, of 1-5, where 1 = none, 2 = once or twice a month, 3 = 1-3 times a week, 4 = daily, 5 = several times a day

5.6.2 Between group comparison: Self-reported Beliefs and Attitudes

The hypothesis stating that participants attending the ***ReSKU*** program would demonstrate improved scores regarding self-reported beliefs and attitudes relating to the use and application of respiratory assessment skills was tested using a Mann–Whitney *U* test. The difference in ranked scores between the intervention and comparison groups at T2, three months post intervention was calculated. The data were then analysed using mean ranks and sum of ranks. Table 5.18 presents the results of Mann-Whitney *U* tests for all subscales. The results of the test were in the expected direction and statistically significant for the intervention group's self-reported beliefs and attitudes in relation to subscale 3, influence on nursing care (z =

-1.924, p =.054, median 6 versus 9); subscale 5, educational and professional preparation (z = -2.652, p =.008 median, 8.0 versus 10.0), and subscale 6, clinical development (z = -2.789, p =.005, median, 11.5 versus 16.0).

Table 5.18 Between group comparison at Time 2 for self-reported beliefs and attitudes subscales using Mann-Whitney *U* test measures

Subscales regarding self-reported beliefs and attitudes		*Mann-Whitney U*	*z*	*Asymp. Sig. (2-tailed)*	*Mean rank*	*Sum of ranks*	*Median scores* (I)	(C)
Subscale 1	The nurses' role	485.50	-1.638	.101 *NS*	31.99 (I) 39.92 (C)	1151.50 (I) 1333.50 (C)	3	3
Subscale 2	Scope of respiratory assessment	514.00	-1.160	.246 *NS*	32.78 (I) 38.38 (C)	1180.00 (I) 1305.00 (C)	5	7
Subscale 3	Influence on nursing care	452.50	-1.924	*.054	31.07 (I) 40.19 (C)	1118.50 (I) 1366.50 (C)	6	9
Subscale 4	Communication of data	519.50	-1.157	.247 *NS*	32.93 (I) 38.22 (C)	1185.50 (I) 1299.50 (C)	3	5
Subscale 5	Educational and professional preparation	389.00	-2.652	**.008	29.31 (I) 42.06 (C)	1055.00 (I) 1430.00 (C)	8	10
Subscale 6	Clinical development	375.50	-2.789	**.005	28.93 (I) 42.46 (C)	1041.00 (I) 1443.50 (C)	11.5	16

Grouping Variable: If participants belong to the intervention (I) or comparison (C) group

*** *p<0.001* ** *p<0.01* * *p<0.05* *NS = Not significant*

A five point Likert scale, scored response alternatives from one to five items 1 to 7. Scores were values chosen by participants from a Likert scale of 1-5, where 1= strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree

Further examination of individual items and distribution of ranked scores contained within the six subscales, as shown in Table 5.19, demonstrated statistically significant differences of p< .05 pertaining to items 2, (subscale 1) and 6 (subscale 3). Items 1, (subscale 1), 7 (subscale 3), 19 and 20 (subscale 5) and 22, 23, and 25 (subscale 6), showed statistically significant differences of p< .01.

Table 5.19 Between group comparison at Time 2 for self-reported beliefs and attitudes section of the survey using Mann-Whitney *U* test measures

Self-reported beliefs and attitudes		*Mann-Whitney U*	*Mean rank*	*Sum of ranks*	*z*	*Asymp. Sig. (2-tailed)*	*Median scores* (I)	(C)
Item 1	Respiratory assessment is an important part of nursing practice	458.000	31.22 (I) 40.03 (C)	1124.00 (I) 1361.00 (C)	-2.467	* .014	1	1
Item 2	Nurses should be encouraged to perform respiratory assessment of their patients	465.000	31.42 (I) 39.82 (C)	1131.00 (I) 1354.00 (C)	-2.084	* .037	1	1
Item 6	Routine respiratory assessment reduces complications	458.000	31.22 (I) 40.03 (C)	1124.00 (I) 1361.00 (C	-2.121	* .034	1	2
Item 7	Routine respiratory assessment prevents complications	403.500	29.71 (I) 41.63 (C)	1069.50 (I) 1415 50 (C)	-2.685	** .007	1	2
Item 19	My knowledge and skills in respiratory assessment are very good	394.500	29.46 (I) 41.90 (C)	1060.50 (I) 1424.50 (C)	-2.879	* .004	3	3
Item 20	I feel confident performing respiratory assessment	399.000	29.58 (I) 41.76 (C)	1065.50 (I) 1420.00 (C)	-2.641	** .008	3	3
Item 22	I have received timely feedback on my performance relating to respiratory assessment	376.000	28.94 (I) 42.44 (C)	1042.00 (I) 1443.00 (C)	-2.864	** .004	3	3.5
Item 23	I have been given the opportunity to attend respiratory assessment related professional development activities	408.500	29.85 (I) 41.49 (C)	1074.50 (I) 1410.50 (C)	-2.486	**.013	2	3
Item 25	I received adequate supervision performing respiratory assessment	399.000	29.58 (I) 41.76 (C)	1065.00 (I) 1420.00 (C)	-2.586	**.010	2	3

Grouping Variable: If participants belong to the intervention (I) or comparison (C) group

**** p<0.001* *** p<0.01* ** p<0.05* *NS = Not significant*

A five point Likert scale, scored response alternatives from one to five items 1 to 7. Scores were values chosen by participants from a Likert scale of 1-5, where 1= strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree

5.6.3. Knowledge Between Groups Across Time

The percentage of correct responses between the groups demonstrated minimal statistically significant differences. Based on the Pearson χ^2 test, the *p* value for items 2 and 4 was less than .05 at .20 and .023 respectively, shown in Table 5.20? Item 7 demonstrated a *p* value less than .01 at .016. There was therefore minimal evidence of sufficient statistically significant differences to support the hypothesis that the proportion of response rates differed between groups, T2 compared to T1. The comparison of the two proportions between groups and standard error of difference were also analysed. Results indicate item 7 demonstrated a statistically significant knowledge difference between groups.

Table 5.20 Knowledge between groups, Time 2 compared to Time 1, using chi-square analysis

Knowledge	**Intervention Correct n = 36**	**Comparison Correct n = 34**	**χ^2**	**Asymp. Sig. (2-sided)**	***sed***	**Proportions Upper**	**Lower**
Item 1	97%	91%	.985	.321 *NS*	0.06	0.17	-0.05
Item 2	47%	21%	7.534	*.023	0.11	0.47	0.05
Item 3	53%	50%	1.429	.839 *NS*	0.12	0.26	-0.20
Item 4	94%	35%	8.243	*.020	0.09	0.77	0.41
Item 5	92%	56%	3.374	.185 *NS*	0.10	0.55	0.17
Item 6	28%	15%	5.134	.274 *NS*	0.10	0.32	-0.06
Item 7	95%	34%	12.173	**.016	0.11	-0.03	-0.45
Item 8	83%	42%	1.355	.508 *NS*	0.11	0.67	0.25
Item 9	97%	44%	2.492	.483 *NS*	0.09	0.71	0.35
Item 10	92%	44%	1.355	.089 *NS*	0.08	0.29	-0.03

**** p<0.001 ** p<0.01 *p<0.05 NS = Not significant sed = standard error of difference*

5.7 Conclusion

This chapter has presented the results of a study to develop and evaluate an integrated clinical learning model in the service environment to inform ongoing education for acute care nurses. The study aimed to evaluate the effectiveness of implementing the ***ReSKU*** program, using integrated teaching and learning strategies in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The ***ReSKU*** program was used as a basis for the research to inform surgical nursing practice. Results for each of the three research questions were reported. Baseline data were inconsistent between groups for the demographics sections of the questionnaire. The general characteristics of participants were not equally distributed between groups for age, educational qualifications and years of nursing experience, although there were similarities in some areas between the groups. Younger, less experienced and better educated nurses were more likely to take up the training opportunity and participate in the ***ReSKU*** program.

The results have demonstrated that attendance at the ***ReSKU*** program resulted in statistically significant differences to self-reported use of respiratory assessment skills in the intervention group. There was also evidence of statistically significant differences across time in three of the six subscales relating to self-reported beliefs and attitudes between groups regarding the use and application of respiratory assessment. There were minimal changes in knowledge scores over time in both groups and few statistically significant differences between groups. These findings related to process and attitude, suggest that the use of an integrated educational model underpinned by a robust theoretical framework in the clinical context is possibly a strong factor in participant's perceptions of the ***ReSKU*** program. These results have also identified other items that require further investigation. The possible causes, links to the theoretical framework underpinning the study and implications for surgical nursing practice will be discussed in the following chapter. Limitations of the study and recommendations will also be addressed.

Chapter 6 - Discussion

6.1 Introduction

The continuous introduction of technological innovations and research developments in the healthcare environment in the last two decades have resulted in considerable ongoing learning needs for nurses (Levett-Jones 2005; Menix 2007; Covell 2009). The significance of nurses using respiratory assessment skills and the subsequent timely intervention to the delivery of both nursing care and nurse-sensitive patient outcomes has been clearly demonstrated (Needleman et al. 2002; Cho et al. 2003; Houser 2003; Doran et al. 2006). Nonetheless, patient deterioration continues to be undetected in general wards and suboptimal care continues (Considine and Botti 2004; Hogan 2006; Scholes 2007; Lesa and Dixon 2007; Despins, Scott-Cawiezell and Rouder 2009; Odell, Victor and Oliver 2009). The contribution of continuing education to clinical practice standards, management of the deteriorating patient and reduction of adverse events remains inconclusive. The implications for future clinical practice and associated educational approaches to meet the needs of an increasingly diverse multigenerational and multicultural workforce are also not well documented (Lindeman 2000; Wharrad et al. 2002; Giddens et al. 2008). The literature suggests that barriers to implementing nursing practice changes include limited educational approaches, insufficient emphasis regarding the importance of lifelong learning and financial constraints impacting on nurse researchers' ability to conduct large-scale, longitudinal studies (Griscti and Jacono 2006; Attree 2006). Research evidence to guide organisational decision making and policy development related to continuing education is vital as financial benefits and direct impacts on patient outcomes are difficult to verify (Lundgren and Houseman 2002; Attree 2006; Covell 2009).

The aim of the research was to evaluate the effectiveness of implementing the ***ReSKU*** program, using integrated teaching and learning strategies in the context of organisational utility, on improving surgical nurses' practice in the area of respiratory assessment. The education program aimed to facilitate better awareness, knowledge and understanding of respiratory dysfunction in the postoperative clinical environment. Research questions guiding the study aimed to determine whether surgical nurses' participation in the ***ReSKU*** program increased the self-reported use of respiratory assessment skills in clinical practice and changed participants' self-

reported beliefs, attitudes and knowledge related to respiratory assessment. Importantly, whether program attendance and consequent support in the practice area improved participants' reported clinical performance relating to respiratory assessment. Data from two groups of surgical nurses (intervention and comparison) were compared using a quasi experimental pre-test, post-test non-equivalent control group design. Although similar in design and intervention to other studies, this research specifically examined the impact of an integrated clinical learning model to inform continuing education for acute care nurses. Several other studies have examined whether education programs contribute to nurses' subsequent use of physical assessment skills (Reaby 1990; Lillibridge and Wilson 1999; Milligan and Neville 2001, 2003). However, this study is the only recent research focusing specifically on respiratory education since a study conducted in 1992 indicated that over 60% of participants listened to chest sounds less than once a week or never (Lont 1992). The capacity to detect warning signals and appreciate clinical urgency in deteriorating patients is especially challenging in the complexities of current practice settings. This environment calls for continuing education strategies that enhance competence, critical thinking and capability in clinicians.

6.2 Model for continuing education

Critical thinking concepts and the four attributes of critical thinking in practice, reflection, context, dialogue and time outlined in Forneris' (2004) theoretical framework, supported the educational model for continuing education. The model operationalised critical thinking and clinical reasoning processes by the incorporation of contextual learning, scenario-based practice situations and reflective feedback. Evidence-based learner-centred educational approaches encompassed theoretical, practical and experiential components. The cognitive, affective and psychomotor domains of nursing practice were integrated by the connections between technical skills, knowledge, attitudes and values as advocated by Girot, (1993). The importance of context and the complex combinations of knowledge, skills, values and attitudes were emphasised and competence postulated as an integrated holistic approach (Gonczi 1994; Cheetham and Chivers 1996). This notion of interconnected competence recognises the salience of critical thinking attributes and professional judgement in the disparate situations health professionals encounter (Cowan, Norman and Coopamah 2005; Chabeli 2006).

6.3 Limitations of the study

This research has attempted to provide evidence on the effectiveness of continuing education using an integrated educational model underpinned by the Forneris (2004) theoretical framework. This research has not to date been attempted in continuing education settings. The study has tested Forneris' (2004) theoretical framework on acute care nurses in a regional referral hospital. The research has contributed to the general body of literature on the significance of competent respiratory assessment by surgical nurses in acute care wards. The quasi-experimental design used appropriate methodology and ensured a sound basis for conclusions and recommendations to be drawn. For the scale of a professional doctoral thesis and without significant multi-site funding, this methodology was both pragmatic and appropriate. However, there are several limitations which influence the way in which this research can be generalised. Clinical studies conducted in a healthcare setting are rarely exempt from limitations where confounding and or extraneous variables are difficult to control (Ellis, Davies and Laker 2000; Attree 2006). Possible confounding variables included the facilities, nurses' practice area, patient caseload, resources, educator and learner motivation, organisational culture and individual's expectations (Prideaux 2002; Attree 2006; Clifton, Dale and Bradshaw 2006; Gijbels et al. 2009; Watson, Thompson and Li 2010).

Participant randomisation was not feasible in the current study and may be an introduced bias in the overall results influencing generalisation. Furthermore, randomisation depends on the maintenance of blind allocation which is rarely possible in educational interventions (Norman and Schmidt 2000). Methodological difficulties are particularly emphasised in the educational context where the researcher may not be able to exercise complete control over the manipulation of variables. The complexities of learning and human behaviour in a social setting often influence the lack of research-based evidence supporting causal links between professional education and nursing practice changes (Ellis, Davies and Laker 2000; Ellis and Nolan 2005). Quasi-experimental studies are considered to be more adaptable to real-world practice settings than controlled experimental designs (Elliott and Thompson 2007). This design therefore reflects a pragmatic method to credibly answer the research question. This allows for measurement of the independent variable (the ***ReSKU*** program) against the dependent variables (the self-reported use

of respiratory assessment skills, beliefs, attitudes and knowledge), by surgical nurses in clinical practice.

A major limitation of the study was sampling bias which impacted on between group differences in age and experience. The study design using a quasi experimental pre test, post test non–equivalent control group design has flaws in that it is considered to be susceptible to bias between groups (Eccles et al. 2003). Participants had to consent to participate in the intervention, therefore were self-selecting. Random sampling of study participants was not a feasible option as attendance at a continuing education program is not compulsory in the public hospital study setting. It was ethically important to respect clinicians' autonomy regarding the right to make personal choices and not influence their decision to participate in research and the associated educational program (Coup and Schneider 2007). Clinicians needed to be facilitated to undertake the ***ReSKU*** program. Therefore the researcher was methodologically limited to working with self-defined groups. The researcher collecting study data was a senior nurse in the hospital being studied which may also have influenced participant responses.

Inter-hospital comparison may be limited by an inability to generalise the study to larger settings or to similar hospital populations. Given the lack of random sampling and possible variations in participant selection criteria, the continuing education needs of dissimilar groups and study site-specific demographics will differ. The hospital is a regional referral hospital in a large regional centre and the ward areas have specific sample demographics not representative of other surgical ward populations. Other workplaces are likely to vary in relation to nursing attrition levels, patient acuity and educational support. There was limited equivalency in the majority of between group baseline demographic variables. The descriptive demographic results indicated that the general characteristics of study participants were similar in relation to area of specialty and number of shifts worked per fortnight. There was minimal equivalency in other demographic variables. The study data demonstrated that younger, less experienced and better educated nurses were more likely to take up the educational opportunity and participate in the ***ReSKU*** program. A hospital certificate was the highest level of education achieved by more comparison group

participants compared to the intervention group, whereas possession of an undergraduate degree was more prevalent in the intervention group.

All findings were based on self-report which may have over-inflated actual practice as this method carries the risk of socially desirable responses (Lane 1997; Mulhall 2003; Timmins and McCabe 2005). The most appropriate methods to evaluate change in the clinical areas are observational studies as discrepancies between actual and reported participant behaviours are clearly determined (Jordan 2000; Griscti and Jacono 2006; Burns and Grove 2009). However, an increased probability of the Hawthorne effect, budgetary, ethical and pragmatic issues make observational studies difficult to conduct (Jordan 2000; Polit and Beck 2004a; Watson et al. 2006; Burns and Grove 2009). Subjective interpretation by the researcher may also be an issue (Mulhall 2003; Whitehead and Annells 2007). Data collection, including the questionnaire, was conducted in an uncontrolled environment where the researcher had no jurisdiction. There may also have been some contamination between study groups given the close proximity of working relationships in the surgical ward areas. Subsequently, there was a possibility of collusion between participants or use of resource information in completion of the MCQs and short answer questions. The study demonstrated limited long term sustainability in that the study's aim to evaluate the effectiveness of the ***ReSKU*** program on changing surgical nursing practice in the area of respiratory assessment was restricted to a three month time frame following the program. This specified period of time reflected the funding and scope of the project. Notwithstanding the limitations, the research does have some statistically significant results and will form the basis for further studies using Forneris' (2004) theoretical framework.

6.4 Key findings

Analysis of key research findings indicated that participation in the ReSKU program and the active engagement of nurses in a practice setting provided the basis for statistically significant findings. These conclusions included increased frequency of the use of self-reported respiratory skills in clinical practice. There was also evidence of statistically significant differences between groups, pre test to post test, of three out of six subscales in relation to the intervention group participants' self-reported beliefs and attitudes relating to use of respiratory assessment in their clinical practice. These findings, related to process and attitude, suggested that the use of an integrated

educational model underpinned by a robust theoretical framework in the clinical context was possibly a strong factor in participant's perceptions of the ***ReSKU*** program. There were limited differences in knowledge between groups across time.

A notable key finding was that significantly younger, less experienced and better educated nurses were more likely to take up training opportunities. This study finding presents an educational challenge regarding the best way to engage older nurses in future educational planning. Paradoxically, the literature suggests that the mature-aged cohort would have benefited from this experiential-based study. Participatory, peer to peer, learner-centred interactive learning, mixed-mode delivery and collaborative clinical activities are preferred by older learners as well as their younger colleagues (Weston 2001; Sherman 2006; Pincas 2007; Earle and Myrick 2009).

6.4.1 Demographics

The study used two groups of surgical nurses from three surgical wards. The groups lacked equivalence in relation to age, experience and educational qualifications, but were well matched regarding specialty area and number of shifts worked per fortnight. Proportions of age, sex and educational qualification in the entire research sample were consistent with the nursing population across the hospital (HRDSS 2007). The study data demonstrated that younger, less experienced and better educated nurses were more likely to take up the educational opportunity and participate in the ***ReSKU*** program. National statistics demonstrate that the mature-aged cohort now constitute 50% of all nurses enrolled in undergraduate courses (Australian Institute of Health and Welfare 2008). Global statistics in the United Kingdom, Canada, New Zealand and the United States support this figure, reporting the median age of nurses in the workforce to be in the mid to late 40s, with 30-40% aged over 50 (Fitzgerald 2007). Study findings presented an interesting insight that the literature suggested that this cohort would have benefited from this experiential-based study.

Studies have identified that mature-aged nurses are expert and accomplished professionals who value learner-centred, peer to peer coaching and participatory continuing education incorporating feedback mechanisms (Sherman 2006; Moseley,

Jeffers and Paterson 2008; Drury, Francis and Chapman 2009). Learners can work through clinical situations using simulation and scenario-based sessions in a safe educational environment and receive immediate performance feedback. Intergenerational interaction, discussion and reflective feedback in debriefing sessions are facilitated by the use of small groups (Forneris and Peden-McAlpine 2006; Pincas 2007). Pincas' (2007) study using an online questionnaire, demonstrated that mature-aged nurses prefer flexible ways of learning. Interactive activities and group work scored highly at 90% (Pincas 2007). Regular education updates are important for older nurses given that they have identified that their capacity to cope with job requirements are influenced by the pace of technological change (Andrews, Manthorpe and Watson 2005). Lifelong learning is valued as a way to improve their performance (Sherman 2006). However, the studies failed to address ethical issues, adequately describe the data collection and analysis process or discuss how the findings could generate further research (Letvak 2003; Cline, Reilly and Moore 2004).

The use of this study's educational model can facilitate engagement of a generationally diverse workforce and assist nurses to accomplish their career goals despite their different learning styles and preferences. Nonetheless, strategies need to be developed to specifically target older nurses, engage them in continuing education and develop their capacity for lifelong learning, as this study has demonstrated older nurses' reluctance to participate. Justification for mandatory continuing education may be warranted. However, despite NMBA's CPD requirements endorsing nurses' professional responsibility to maintain their skills and knowledge, administering punitive measures to non-compliant individuals is considered to be of questionable value as may only ensure maintenance of minimal practice standards (Griscti and Jacono 2006). Senge (1990) expounds the benefits of the implementation of the culture of a learning organisation where continuing education is perceived to be part of an individual's job rather than a means to avoid disciplinary measures.

Because the educational model used in the study involved contextual learning and multiple educational approaches, life-long learning strategies were facilitated (Wharrad et al. 2002; Forneris 2004; Notarianni et al. 2009). A collaborative and cohesive workplace was fostered by the development of an understanding of the

educational issues inherent in a multigenerational nursing workforce (Duchscher and Cowin 2004). Complementary attributes of experience, perspectives, skills and intergenerational 'know-how' in heterogeneous teams are facilitated by age diversity (Walker 2005). Intergenerational differences were resolved by encouraging coaching links between experienced nurses and new graduates (Fitzgerald 2007; Forneris and Peden-McAlpine 2009). Experienced nurses could share their practical wisdom while graduates showed seasoned nurses how to benefit from technology (Duchscher and Cowin 2004; Schloessler 2007; Johnston and Mohide 2009). The scenario-based sessions using simulation in the ***ReSKU*** program ensured that learning occurred in a safe educational environment where learners could work through clinical situations and receive immediate performance feedback (Decker et al. 2008; Giddens 2008; Shepherd 2009). The many facets of dialogue including critical thinking, clinical reasoning and reflective discussion facilitated experiential learning and the evaluation of assumptions within context (Forneris 2004; Christensen et al. 2008).

6.4.2 Self-reported use of respiratory skills in clinical practice

It was hypothesised that surgical nurses who participate in a ***ReSKU*** program will have higher scores in the self-reported use of respiratory assessment skills in clinical practice than surgical nurses who do not participate in respiratory education. Baseline results showed minimal differences between groups in the self-reported use of respiratory skills. There were statistically significant differences in five of the seven items related to reported frequency of use of respiratory skills section of the questionnaire between groups and six of the seven items within the intervention group. Results show that the hypothesis was supported. The study results support earlier studies conducted following physical assessment education programs which found increased use of assessment skills by participants, especially of the chest and abdomen (Reaby 1990; Bullock et al. 1996; Neville, Gillon and Milligan 2006). Within-group comparison also demonstrated that the intervention group demonstrated statistically significant differences for the majority of items calculating the number of times participants reported using respiratory skills in the past month, T2 compared to T1. These results further strengthen and support the hypothesis. Items demonstrated statistically significant differences across time, examining participants' self-reported frequency of use in relation to assessing patients' rate and

depth of respirations, use of accessory muscles and effort of breathing. The reported frequency of intervention group participants conducting chest percussion and auscultating chests also improved post attendance at the ***ReSKU*** program.

These results endorse a small body of earlier studies that showed a positive relationship between participation in a physical assessment education program and improved knowledge of assessment skills in their application to clinical nursing practice (Reaby 1990; Wilson and Lillibridge 1995; Bullock et al. 1996). The findings are also congruent with results from a recent study conducted by Neville, Gilligan and Milligan (2006), which examined whether participation in a health assessment course resulted in increased frequency of use of selected assessment skills. Participants in Neville et al.'s (2006) study were found to increase auscultation of lung sounds by 53% and percussion of chests by 47% after participation in a health assessment course. However, the post program information regarding participant use was obtained at 4-6 weeks and no data regarding long term skills use was obtained. There was no statistically significant difference within the intervention group in the current study, T2 compared to T1, in the frequency of chest palpation, despite evidence of a statistically significant difference between groups across time.

A possible explanation for the limited application of palpation is that inconclusive clinical information especially relating to respiratory assessment is often obtained. For example, tenderness detected during palpation may indicate pericardial or pleural inflammation or a musculo-skeletal origin, but would need to be confirmed by more diagnostically definitive criteria such as raised temperature and electrocardiograph (Finesilver 2003). Technological advances have ensured an increasing clinician dependence on magnetic resonance imaging and computerised tomography scanning which provides a fast and accurate diagnosis (Revell et al. 2010). The group may have considered palpation to be irrelevant despite this skill being useful in the detection of suspected surgical subcutaneous emphysema, lumps, tenderness, pulsations and crepitus from rib fractures (Weber and Kelley 2007). Observational studies as a non-participant observer identifying actual skills use rather than self-reported use, may have clarified this finding (Mulhall 2003; Whitehead and Annells 2007).

Studies conducted by Secrest, Norwood and duMont (2005) and Giddens (2007), demonstrated that only 25% to 30% of approximately 120 health assessment techniques were routinely used in a variety of practice settings. Giddens and Eddy (2009) suggest a disconnect has occurred between education and practice, given that a relatively small set of skills are routinely performed in clinical practice. Secrest et al. (2005) question why the full repertoire of physical assessment skills is being taught, when only selected skills are being used. They suggest that it is time that nurse educators address what specific skills are required by nurses in their clinical practice (Secrest, Norwood and duMont 2005). Tanner (2008) agrees, advocating a focus on the most relevant skills and teaching these techniques effectively. Links should also be facilitated between interpretation of assessment findings, critical thinking, clinical reasoning and judgement regarding appropriate action (Tanner 2008). It is also important to establish the reasons behind nurses not using certain skills. Lack of time, resources, heavy workloads and clinicians' perceived need or relevance are possibilities (Skillen, Anderson and Knight 2001; Schroyen et al. 2005; Neville, Gillon and Milligan 2006; Lesa and Dixon 2007). Sufficient emphasis also needs to be placed by educators on the importance of nursing surveillance, clinical judgement and detection of patient deterioration (Giddens and Eddy 2009).

These criteria for critical and clinical thinking are especially vital in relation to respiratory assessment given that changes in respiratory rate and respiratory dysfunction are important early indicators of patient deterioration (Subbe, Williams and Gemmell 2004; Goldhill and McNarry 2004). Secrest et al (2005) acknowledged the salience of nurses examining a patient's respiratory status in determining patient care. Planned care may then include encouragement of coughing, mobilising or suctioning. However, the relevance of chest percussion is questioned in the context of what this skill adds to the provision of nursing care (Secrest, Norwood and duMont 2005). For example, there are no studies contending that percussion saves lives or to suggest which skills may be omitted without consequence. Findings from studies conducted by Secrest, et al. (2005) and Giddens (2007) suggest that additional research is conducted to establish the relevant assessment techniques necessary to influence nursing practice and intervention actions.

Of particular interest in this study are the respiratory skills, supported by evidence as important, that did not demonstrate statistically significant differences between groups, T2 compared to T1. These included item 1, 'assessed rate, depth and rhythm of respirations', and item 3, 'assessed effort of breathing'. However, comparison of median scores between groups, T2 compared to T1, demonstrated improvement in response alternatives across time, especially for item 1. For example, pre-test median scores between the intervention and comparison groups, comparing differences in the self-reported use of respiratory skills, of 5.0 versus 4.0 (item 1) and 4.0 versus 4.0 (item 2). Post-test median scores were 5.0 versus 5.0, (item 1) and 4.5 versus 4.0, (item 2).These self-reported responses indicated that these particular respiratory skills were used several times a day (4.5 to 5.0 in the intervention group) or daily (4.0 in comparison group). There was no reported reduction in use in either group.

Significantly, within group comparison in the intervention group demonstrated statistically significant differences for both these items pre-test to post-test. Highlighting respiratory related nurse-sensitive patient outcomes, critical thinking skills and reflective learning during the ***ReSKU*** program, emphasised to the intervention group participants the importance of respiratory assessment. Recognition of key respiratory signs and symptoms is well within a registered nurses' scope of practice and adoption of nurse-sensitive quality indicators has the potential to facilitate an evidence base for practice change (Lichtig, Knauf and Mulholland 1999; Doran et al. 2006). These principles were clearly demonstrated in the content of the ***ReSKU*** program. The emphasis throughout the *ReSKU* program was placed on the significance of noting changes in a patient's respiratory rate and physiological function such as work of breathing, use of accessory muscles and symmetrical chest movement. The pivotal nature of nurses' role regarding the early identification of clinical indicators linked to respiratory problems, timely communication of those findings and treatment initiation was also emphasised. The efficacy of this approach is strongly supported in the literature.

Current literature supports the notion that nurses need to be more cognisant of the role they can play in the early identification of respiratory problems and initiation of preventive treatment (Wood, Douglas and Priest 2004; Cox, James and Hunt 2006; Endacott et al. 2007; Odell, Victor and Oliver 2009). Considine (2005) contended

that nurses' ability to have a pivotal role in preventing the incidence of respiratory adverse events is often diminished by a failure to be totally conversant with respiratory physiological function. A study undertaken by Kenward (2001) found that nurses' measurement of respiratory rate in the clinical setting was minimal. This finding was reflected by several papers which noted the lack of recording of respiratory rate by nurses and commented on nurses' relative ignorance of the significance and portent of this clinical oversight (Woodrow 2002; Bennett 2003; Trim 2004; Butler-Williams, Cantrill and Manton 2005; McBride et al. 2005). Other studies concluded that nurses' ritualistic action in relation to patients' vital signs infers that undertaking of clinical activities and patient systems assessment was without thought as to the patient's clinical needs or acuity level (Ford and Walsh 1995; Zeitz and McCutcheon 2002; Deutschendorf 2003; Zeitz and McCutcheon 2005).

There were no changes in the comparison group participant self-reported responses related to use of respiratory assessment skills, between T2 and T1 across all variables. This group may have viewed the use of these skills as irrelevant, time consuming or not part of their role (Wheeldon 2005). Many mature-aged nurses have not undergone training in the use of respiratory assessment or been exposed to a clinical setting that promotes the use of these skills (Milligan and Neville 2001; Schroyen et al. 2005; Lesa and Dixon 2007). The difference between groups gives support to the hypothesis that surgical nurses who participate in a ***ReSKU*** program will have higher scores in the self-reported use of respiratory assessment skills in clinical practice than surgical nurses who do not participate in respiratory education. This result is consistent with the finding that education in interactive groups changes clinician behaviour by a process of 'double loop' learning (Argyris 1992; Devitt 2004). This learning process and development of new understanding is stimulated by group reflection, probing to understand underlying problems and assumptions. The challenging of ideas in group discussion and integration of content knowledge with practical wisdom within the clinical context facilitates learners' achievement of a 'coherence of understanding' (Forneris 2004; Forneris and Peden-McAlpine 2006, 2009). These concepts were contained within the theoretical framework underpinning the educational model and the ***ReSKU*** program.

6.4.3 Self-reported beliefs and attitudes

It was hypothesised that surgical nurses who participate in the ***ReSKU*** program will have improved scores relating to self-reported beliefs and attitudes regarding the use and application of respiratory assessment than surgical nurses who do not participate in respiratory education. Survey statements were grouped into conceptually related subscale indicators pertaining to the extent to which respiratory assessment affects the self-reported:

1. nurse role
2. scope of respiratory assessment,
3. influence on nursing care
4. communication of data
5. educational and professional preparation
6. clinical development

Analysis was conducted to examine the difference between and within groups relating to self-reported beliefs and attitudes regarding the use and application of respiratory assessment. Between group data analysis indicated that the intervention group's self-reported beliefs and attitudes pertaining to subscale descriptors improved in three of the six subscales following attendance at the ***ReSKU*** program. Statistically significant differences were demonstrated in the subscale scores relating to subscale 3, (influence on nursing care), subscale 5 (educational and professional preparation) and subscale 6 (clinical development), Time 2 (T 2) compared to Time 1 (T1) for intervention group participants. Similarly, within group comparison of intervention group participants demonstrated that there was a statistically significant difference in subscale 5 relating to educational and professional preparation at T 2 compared to T1. These findings suggest that the use of an integrated educational model underpinned by a robust theoretical framework is possibly a strong factor in participant's perceptions of the ***ReSKU*** program. ***However, because this was not evident across all subscales, the hypothesis was not supported.***

Analysis of subscale indicators using factor analysis has not been attempted in similar research studies relating to physical assessment. This is possibly because of the nature of the population studied and the recommended guidelines for a sample

size of at least 300, 150 to 200 being considered adequate (DeVellis 2003; Worthington and Whittaker 2006). Research related to further psychometric testing of the instrument would therefore be valuable. Despite analysis of subscales being a theoretically structured way of conceptualising constructs, closer inspection of individual items contained in the six subscales demonstrated statistically significant differences of $p < .05$ and $p < .01$ in specific results relating to survey statements. These items pertained to particular self-reported beliefs and attitudes relating to the use and application of respiratory assessment skills, T2 compared to T1.

For example, further examination of individual items and distribution of ranked scores contained within the six subscales, demonstrated statistically significant differences between groups of $p < .05$ pertaining to item 2, (subscale 1, nurse role) and item 6 (subscale 3, influence on nursing care). Items 1, (subscale 1, nurse role), 7 (subscale 3, influence on nursing care), 19 and 20 (subscale 5, educational preparation) and 22, 23, and 25 (subscale 6, clinical development), showed statistically significant differences of $p < .01$. The possible causes of this and other results will be discussed further. Between group comparison indicated that the intervention group's self-reported beliefs and attitudes improved in three of the six subscales, T2 compared to T1, following attendance at the ***ReSKU*** program. Discussion regarding findings for self-reported beliefs and attitudes relating to each subscale follows.

6.4.3.1 Subscale 1 Nurses role 3 Items; 1, 2, 3

There were no statistically significant differences identified between or within groups in subscale 1. Examination of individual items demonstrated statistically significant differences of $p < .01$ in item 1 ('respiratory assessment is an important part of nursing practice') and $p < .05$ in item 2 ('nurses should be encouraged to perform respiratory assessment of their patients'). These results were comparable with findings from previous national and international research. The findings support Wilson and Lillibridge's (1995) study and Neville et al.'s (2006) pilot study in terms of the importance of health assessment skills. Conversely, there was no difference between groups for item 3, ('respiratory assessment is important for proficiency as a nurse'). However median scores between groups (1 versus 1) demonstrated that both groups reported to agree or strongly agree with the statement.

6.4.3.2 Subscale 2 Scope of respiratory assessment 3 Items; 11, 14, 21

There were no statistically significant differences identified between or within groups in subscale 2 or in individual items. Pre- to post-test median scores between groups indicated that both groups reported to agree or strongly agree with the statements. For example, (2 versus 2) for item 11 ('nurses should always take a social history'); (2 versus 2) for item 14 ('performing respiratory assessment of their client at least once a shift'), and (1.50 versus 2) for item 21 ('performing appropriate respiratory assessment on new clients'). Review of the questions needs to include nurse' use of critical thinking and clinical judgement skills. Given the complexity and acuity of highly dependent patients in acute care wards, provision of links between assessment findings, clinical reasoning and judgement are required by educators when teaching assessment. These issues were addressed in the ***ReSKU*** program, but need to be better reflected in the questionnaire items and subscales.

6.4.3.3 Subscale 3 Influence on nursing care 5 Items; 5, 6, 7, 15, 17

Subscale 3 demonstrated statistically significant differences between groups over time ($p < .054$) and specifically item statements that 'routine respiratory assessment reduces complications' (item 6, $p < .054$, median score: intervention group 1 versus comparison group 2), and 'routine respiratory assessment prevents complications', (item 7, $p < .007$, median score, (1 versus 2). Although items 5, 15 and 17 were not statistically significant, examination of individual item's median scores between groups, pre- to post-test, indicated that both groups reported to agree or strongly agree with the statements. For example, (1 versus 1.5), for item 5 'routine respiratory assessment improves patient care', (1 versus 2) for item 15, 'data collected during respiratory assessment should be used to guide care' and (1 versus 2) for item 17 'data collected should be used to develop a plan of care'. When Wilson and Lillibridge surveyed clinicians on health assessment in general their findings were statistically significant in all areas (Wilson and Lillibridge 1995). However, Wilson and Lillibridge's (1995) study considered all aspects of physical assessment, in contrast to this research which specifically examined the impact of an education model on respiratory assessment skills. This may also reflect the difference between focused respiratory assessment and general physical assessment in that the importance of early intervention regarding respiratory dysfunction is not well recognised by nurses (Ahern and Philpot 2002; Considine 2005b).

Findings from a systematic literature review suggested that signs that a patient's condition is deteriorating are often overlooked or poorly managed (Odell, Victor and Oliver 2009). These include patient observations not being recorded, specifically the respiratory rate; or healthcare staff not recognising patient deterioration (Subbe, Williams and Gemmell 2004; McBride et al. 2005; Endacott et al. 2007; Odell, Victor and Oliver 2009). Development of greater skills in recognising, interpreting and acting on subtle cues before a patient deteriorates require more emphasis by educators (Tanner 2006; Giddens 2007; Giddens and Eddy 2009). Failure to rescue rates, a significant safety concern in hospital settings, speak to this need (Endacott et al. 2007; Australian Commission on Safety and Quality in Health Care 2008).

6.4.3.4 Subscale 4 Communication of data 3 Items; 9, 13, 16

There were no statistically significant differences identified between or within groups in subscale 4 or in individual items pre-test to post test. Examination of median scores between groups post-test demonstrated that both groups reported to agree or strongly agree with the statements. Specifically, item 9, (1 versus 1) 'nurses should always document respiratory assessment findings', item 13, (1 versus 1) 'nurses should inform medical staff of relevant abnormal respiratory assessment findings' and item 16, (1 versus 1.5) **'**nurses should share findings related to respiratory assessment at handover'. Several studies suggest communication between health professionals needs to improve and further training in communication issues may be beneficial (Wood, Douglas and Priest 2004; Cox, James and Hunt 2006; Endacott et al. 2007; Scholes 2007; Odell, Victor and Oliver 2009). Handover was frequently cited as the most dysfunctional aspect of communication and there was inconsistency in the way handover was managed. Less experienced nurses lacked confidence in contacting senior consultants, were unsure of when to seek help or reluctant to do so without peer support (Cox, James and Hunt 2006; Endacott et al. 2007; Parker, Giles and Higgins 2009).

Pre-test, this study demonstrated statistically significant differences between groups related to subscale 4, communication of data. Median subscale scores also improved in the intervention group, pre- to post-test (4.0 versus 3.0). Conversely, the comparison group's subscale median scores remained unchanged at 5.0. The findings may indicate the time frame of three months, pre- to post-test, to fully implement

critical dialogue and reflective practice processes as advocated by Forneris' (2004) theoretical framework. There may have been insufficient time to fully operationalise critical thinking communication strategies into an information-based clinical environment. Reinforcing new learning by reflection and ongoing feedback over time in the clinical context is important to facilitate the learning experience (Forneris 2004; Dickerson 2005).

These findings also highlight the importance of documentation and communication of assessment findings and may reflect the introduction of bedside clinical handover in the practice environment six months prior to the study or ward culture. Anecdotal evidence has suggested clinician empathy in the change from traditional nursing handover and in particular, patient involvement. Observational studies and documentation audits regarding the application of respiratory assessment and associated documentation may have clarified discrepancies between actual and self-reported participant behaviours (Jordan 2000; Griscti and Jacono 2006; Burns and Grove 2009). Barriers to documentation identified in the literature include time constraints, heavy workloads, patient occupancy levels, frequent interruptions, poor chart design, staffing issues and access to training (Bucknall 2003; Cheevakasemsook et al. 2006). Other factors influencing documentation include clinicians who lacked knowledge, confidence and motivation, inadequate support and staff development needs (Kim and Park 2005 ; Cheevakasemsook et al. 2006). Nursing notes often do not reflect actual care given and exclude meaningful data. If patient care is not consistently and accurately recorded, the possible adverse effects on patient care, nursing practice and the development of nursing knowledge may be highly significant (Currell and Urquhart 2003).

Various studies discuss the significance of nurses accessing skilled work colleagues in clinical decision making and learning new skills as opposed to sourcing texts or internet based information sources (Thompson et al. 2001; Estabrooks et al. 2005; Schroyen et al. 2005). Nursing staff preference for seeking colleague advice pervades nurses' oral traditions and task oriented care, reflecting the task-based nature of nursing work and practice environment (Henderson et al. 2006). Nurse attitudes may change as more evidence of positive outcomes emerges following further application of the change and clinicians engage more with recent literature

relating to current trends (Henderson et al. 2006). The increasing influence of continuing education on nursing clinical practice may reverse the trend of oral traditions. A more balanced approach to documentation may evolve, incorporating recommendations from evidence-based literature and nursing research.

Nurses' ability to recognise, intervene and communicate a plan of care appropriately following assessment is essential to ensure both a successful patient transition through their hospital stay and positive treatment outcome. Statistically significant differences were not demonstrated by data analysis of questionnaire subscales or individual items in the current study pertaining to documentation of respiratory assessment findings and the timely communication to other health professionals. The findings reflect Wilson and Lillibridge's (1994) study where documentation was not perceived by participants to be an important component of nursing practice. The findings also mirror papers critical of nurses' unwillingness to fully adapt respiratory assessment in their clinical practice. Criticism includes lack of appropriate and timely documentation of assessment findings, resulting in delays in essential treatment (Deutschendorf 2003; Considine and Botti 2004; Considine 2005b).

The importance of nurses' respiratory assessment, interpretation and documentation of their consequent findings was emphasised by Considine 2005, who contended that nurses' recognition and interpretation of key respiratory indicators such as changes in respiratory rate, airway and breathing problems was vital to prevention of adverse events. She also asserted that most bedside nursing observations charts did not allow for nurses' documentation of dyspnoea (Considine 2005b). Nursing documentation is vital to promote effective communication and evaluation of patient care. Limited nurse confidence, competence and motivation are considered related factors influencing incomplete nursing documentation together with inadequate auditing and disregard for nurses' notes by medical officers (Cheevakasemsook et al. 2006). Nursing documentation is subsequently devalued and regarded as an unnecessary burden. A further study analysing the quality, content and modes of nursing documentation concluded that accurate documentation facilitates and legitimises nurses' knowledge and efficiency. However the authors were critical of nurses' overall ability to write professionally, as more informal modes of writing, rather than

established nursing or medical protocols for written communication were used (Irving et al. 2006).

A key to understanding this finding related to documentation may be Bloom's 1956 taxonomy of cognitive objectives whereby education and learning is viewed as a staged process, in a classification of thinking, organised by levels of complexity. In the 1990s the taxonomy was revisited by Lorin Anderson, a former student of Bloom and as result, a number of changes were made ensuring a more authentic tool for curriculum planning, instructional delivery and assessment (Pohl 2000). Higher level behaviours are those requiring complex application, analysis, evaluation or creation skills including documentation and other communication channels. Questions at the higher levels of the taxonomy are usually most appropriate for encouraging learners to think more deeply and critically, facilitating problem solving, robust discussion and stimulating students to seek information on their own (Pohl 2000; Haigh 2003). Haigh espouses the concept of 'epigenesis' where an individuals' knowledge base develops through 'interaction with the environment in which they live and practice' (Haigh 2003). This notion recognises the importance of the integration of theory and practice together with context-dependent experiential knowledge aspects which collectively contribute to higher levels of practice.

Applying this taxonomy to the current research may provide an explanation for these results. Participants would initially be engaged in lower-order thinking following attendance at the ***ReSKU*** program. Use of the learnt knowledge and skills would gradually be demonstrated in participants' clinical practice. Higher level behaviours are hypothesised to take place once confidence and competence in clinical skills are developed. These behaviours include evaluation of the individual's application of respiratory assessment skills and subsequent documentation in the patient records (Pohl 2000). Increased awareness regarding the importance of reporting of respiratory assessment findings in nursing handover and communication with other health professionals would also occur. This theory provides a possible explanation for study participants' responses to questionnaire statements concerning documentation of respiratory assessment findings and is congruent with Cheevakasemsook et al.'s (2006) study findings. Given that nurses must be able to describe and document the cognitive aspects of their practice; these findings require

further research and analysis. More emphasis regarding documentation and educational strategies to operationalise interactive critical dialogue and facilitate inter-professional communication in the acute care clinical setting is indicated.

6.4.3.5 Subscale 5 Educational and professional preparation 4 Items; 8, 10, 19, 20
Subscale 5 demonstrated statistically significant differences between groups ($p<$ .008, median score, 8 versus 10) and within the intervention group ($p<$ .001, 8 versus 9). The intervention group reported confidence in performing respiratory assessment, perceiving their knowledge and skills in respiratory assessment to be very good, pre- to post-test, in items 19, ($p<$ .004) and 20, ($p<$ .008). Items 8 'nurses should be taught respiratory assessment in a course' and 10, 'it is important for nurses to practise respiratory assessment' were not statistically significant. Median scores demonstrated by the intervention group and the comparison group, pre- to post-test, (1 versus 2) for item 8 and (1 versus 1.5) for item 10 indicated that both groups reported to agree or strongly agree with the statements. Similar positive findings relating to participant confidence post attendance at an education program were obtained in a study conducted by (Reaby 1990). Over 76% of participants reported more confidence relating to their clinical practice. Another earlier study also positively attributed participants' participation in a physical assessment education program, to improved confidence in relation to assessment skills and nursing practice (Bullock et al. 1996).

In contrast, a study of 349 nurses, in a regional Japanese hospital, which aimed to provide baseline data on nurses' knowledge and use of assessment skills found that only a small percentage were confident to teach others (Yamauchi 2001). Comparison was made between two groups of nurses, one with over 20 years nursing experience and the second with under 20 years nursing experience. The study demonstrated that assessment skills were learnt 'on the job', concluding that although 84% of all nurses were knowledgeable about auscultation many were ambivalent regarding confident application of the skill with only 41% listening to breath sounds on a daily basis. Results indicated that despite the more experienced nursing group listening to lung sounds more often, only 18% indicated they were confident to teach colleagues. The study recommended an education program relating to patient assessment to both provide knowledge and promote nurses'

confidence levels (Yamauchi 2001). Further research confirmed that use of simulated manikins in an education program facilitated both use and confidence, especially relating to nurses conducting auscultation (Yamauchi 2005).

These findings were congruent with this study's findings relating to participants self-reported confidence performing respiratory assessment. Nurses need ongoing support in both gaining and maintaining confidence and competence as new systems, technologies and interventions are continuously being implemented. Because the simulated educational strategies used in the study incorporated learning principles that supported the adult learner and fostered experiential learning, the application of clinical knowledge was facilitated (Earle and Myrick 2009; Nagle et al. 2009). Simulation concepts were also aligned with Forneris' (2004) framework which identified four attributes of critical thinking in practice; reflection, context, dialogue and time. Educational strategies were used in the study to reflect these attributes and operationalise critical thinking to achieve understanding (Forneris 2004). Important learning connections were made during the sharing of perspectives between learner and coach.

The learner's ability to synthesise knowledge was enhanced by the integration of contextual learning involving post-scenario debriefing, self-reflection and reflective feedback. Interactive participatory exercises, the use of small collaborative groups, opportunities for reflective feedback and debriefing effectively improved teamwork and knowledge transfer into clinical practice (Forneris 2004; Khan and Coomarasamy 2006; Shepherd 2009; Nagle et al. 2009). These strategies were continued in the ward environment where coaches and educators guided the how and why of specific actions within the context of the clinical setting. This ensured that participants were better able to recall what was learned and transfer the newly acquired knowledge to patient care situations. These approaches resulted in the application of theory and skills directly to the practice environment and improved clinical confidence (Forneris 2004; Yeh and Hsing-Hsia 2005; Walsh and Seldomridge 2006b; Distler 2006).

Roberts (2009), contends that nurse academics have been discussing the importance of confidence to learning for over 40 years without conclusion. Confidence has been

characterised as a complex multidimensional phenomenon central to learning, thought to be gained by coaching, discussion of common experiences and working alongside colleagues (Spouse 2005; Roberts 2009). Currie's (2008) study using grounded theory, contended that confidence is a motivational driver that influences practice, occurring as a direct result of learning and gaining knowledge and respect from colleagues. Several authors have alluded to increased confidence as an outcome of education (Kelly and Mathews 2001; Steginga et al. 2005; Meyer and Lees 2007).

This concept is contrasted with Currie's (2008) depiction of learning and confidence as a trajectory. The journey commences with education, continuing with experiential learning and personal reflection. Time taken for reflection and the subsequent interpretation of interaction with colleagues, significantly contributed to further developing participants' knowledge and abilities (Currie 2008). Study participants reported to be more confident of their knowledge base for practice which was reflected in their ability to apply knowledge. Changes in participants' patterns of self- belief meant that they then portrayed that persona when engaging with colleagues (Currie 2008). Purported links between knowledge, respect and confidence have been reinforced by other studies highlighting growing confidence, mutual respect and changing relationships between learner clinicians and their colleagues (Woods 1998; Barton 2007). Statistically significant differences have also been demonstrated in this study's findings relating to self-reported confidence, knowledge and colleague feedback relating to application of respiratory assessment skills.

Conversely, Hoffman and Elwin's (2004) study, examining critical thinking scores for two groups of graduate nurses, found that as scores on critical thinking increased, scores on confidence in decision-making decreased. Participants with higher critical thinking ability were less confident in decision-making, suggesting that they lacked confidence in decision-making or were more inclined to take time to search for answers to clinical problems (Hoffman and Elwin 2004). This finding was supported by van der Wal (2000), who considers that good critical thinkers take time to check for accuracy, review ideas, ask questions and evaluate a solution or belief. Other authors have suggested that this stance is preferable to overconfidence or prejudging clinical decision-making which may be detrimental and lead to increased errors (Paul

and Hanslip 1995; Kissinger 1998). Nurses need to develop skills in higher-level thinking to capably manage the complexities encountered in acute care settings. Encouragement of a questioning approach to decision-making supports safe practice. Contextual learning supported by reflective feedback and coach guidance facilitates the operationalisation of critical thinking and decision-making processes (Forneris 2004). These approaches were incorporated in the study and have been reflected in the study's findings of reported improvement in participant confidence, post program.

6.4.3.6 Subscale 6 Clinical development 5 Items 22, 23, 24, 25, 26

Subscale 6 demonstrated statistically significant differences between groups ($p<$ .005, median score 11.5 versus 16). Statistically significant differences between groups were demonstrated in three of the five items contained in subscale 6. For example, item 22, ($p<$ .004, 3 versus 3.5), 'I have received timely feedback on my performance in relation to respiratory assessment' item 23, ($p<$ .013, 2 versus 3), 'I have been given the opportunity to attend respiratory assessment related professional development activities' and item 25, ($p<$ .010; 2 versus 3), 'I received adequate clinical supervision performing respiratory assessment'. Median scores demonstrated by the intervention and comparison groups, pre- to post-test (2 versus 2) for item 24 'I could access educational resources to assist me in my clinical activities related to respiratory assessment' indicated that both groups reported to agree or strongly agree with the statement. Despite demonstrating lower sums of ranks, ranked and median scores, pre- to post-test (2 versus 3) for item 26, 'I have been given the opportunity to discuss my findings in relation to respiratory assessment with my preceptor/coach/educator' findings were not statistically significant (p =.071). This finding may indicate the time constraints and workloads of the clinical environment.

The inclusion of reflective feedback on an individual's actions in the educational process facilitates the development of capability and self-directed learning (Fraser and Greenhalgh 2001). With ongoing rapid changes in health care, of even more significance than the possession of knowledge and skills is the ability to transform competence into effective performance in the complex world of acute care nursing. The learner's capability is enhanced by the coach providing performance feedback. This process used in the study facilitated the clinician's ability to adapt to change,

prioritise issues, work effectively in unfamiliar contexts and solve complex problems (Fraser and Greenhalgh 2001; Hase and Kenyon 2001; Forneris 2004). Coaching included fostering connections between thinking and doing, including links between learners' past experiences and unfamiliar practice situations (Forneris 2004; Forneris and Peden-McAlpine 2007, 2009). Clinically-based coaches focused on learning relevant to the clinical context involving guided demonstration, instruction, and constructive advice. Importantly, all these learning strategies were undertaken 'in the midst of the student's doing' (Schön 1987). 'Practical wisdom' was imparted when the coach and educators engaged with the learners to operationalise critical thinking in practice using context, reflection, dialogue and time (Forneris and Peden-McAlpine 2009).

The ***ReSKU*** program participants needed to be committed to continuing to improve their respiratory assessment skills by using their learned skills with coach support. The literature supports the notion that evidence-based health care is unlikely to be incorporated into an organisation unless there is an integrated approach to clinical practice change. This needs to include strong links between theory, practice, clinical support and organisational capacity (Shanley 2004; Baxter 2007; Ehrenberg and Haggblom 2007; Henderson and Winch 2008b). Putting systems in place to support desired behaviour changes and positively influence educational outcomes by supporting ***ReSKU*** program participants when they returned to the workplace was essential. Implementing feasible strategies facilitated consolidation of scenario-based learning and ongoing application of the newly acquired knowledge and skills. However, this strategy was limited by budgetary restraints confining the timeframe of supported clinical practice to three months. Three months follow up constitutes a short timeframe to implement a culture change given that immediate knowledge transfer into practice is rare. Reinforcing new learning by reflection and ongoing feedback in the clinical context is important to facilitate the learning experience (Forneris 2004; Dickerson 2005).

Role modelling and clinical support by nurse educators or coaches skilled in the application of assessment in the clinical setting has been noted to be inadequate in previous studies. Lack of support from skilled colleagues resulted in a lack of confidence in the use and application of assessment skills (Milligan and Neville

2001; Schroyen et al. 2005). These findings were at odds with the study environment where nurse educators and clinical nurses acting in a change champion and coach capacity supported the study participants in their assessment of patients. Change champions are able to successfully debate relevant change issues, understand practice realities and are able to convince their colleagues of the benefits of change (Thompson et al. 2001; Dopson et al. 2002). The coaches in the ward areas were influential in reinforcing the consequent patient care benefits by facilitating ***ReSKU*** program participants in the use of their newly acquired respiratory assessment skills. This has been clearly demonstrated in the intervention group's reported findings.

Assumptions should not be made that improved reflective thinking skills equate to enhanced learning and improved nursing practice. Schön (1987) advocated a coaching model based on active involvement of expert role models working with learner clinicians. Other studies have demonstrated that when educators and coaches provide guidance for learners on how to be reflective, significant practice changes occur (Davies 1995; Ferry and Ross-Gordon 1998; Forneris and Peden-McAlpine 2006). The reflective process creates the potential for improving practice as the clinician becomes aware of learning deficits and addresses them with coach support (Craft 2005). Support for learning to progress is provided as well as opportunities for the learner to learn from their mistakes in a safe collaborative environment (Gielselman, Stark and Farrugia 2000). This position is endorsed by Greenwood (1998) who contends that unsupported reflective practice has the potential to reinforce a learner clinician's tendency for inappropriate action. Use of an approach where a clinician uses single loop learning and merely searches for alternatives to achieve similar outcomes could lead practitioners to do the wrong thing correctly (Burton 2000).

Double-loop learning as advocated by Argyris and Schön (1974) facilitates understanding of the clinical context by encouraging the learner to evaluate the propriety and appropriateness of a chosen action. Reflection related to the values, norms and social structure within the context of a situation is therefore taken into consideration prior to action (Greenwood 2000). Where collaborative relationships between coach and learner are fostered to encourage recognition of the value of reflective practice, clinicians learn to draw on similar clinical situations to facilitate

issue resolution and sound clinical judgements (Teekman 2000; Ruth-Sahd 2003). The learner may also be used to unquestioning deference to peers and need to be educated to a different questioning way of thinking (Schön 1983). Contemporary practice environments involve managing risk as well as ensuring safe effective patient care. Coach support facilitates the how, why and when of the learner's ability to transfer critical thinking and reflective skills into clinical practice via dialogue (Teekman 2000; Price 2004; Forneris and Peden-McAlpine 2009). Close links between theoretical learning, clinical practice and attainment of clinical skill and expertise related to respiratory assessment were highlighted during the ReSKU program. The program emphasised role modelling by more experienced clinicians and educators, as advocated by (Forneris 2004; Shanley 2004; Schroyen et al. 2005)

Continuing ambivalence and lack of confidence by nurses towards the integration of respiratory assessment skills into everyday practice was discussed by Schroyen et al, (2005). They advocated nurses taking responsibility for the initiation, appropriate communication and evaluation of interventions following competent patient assessment (Schroyen et al. 2005). The literature reinforces the importance of learning in the clinical context, appropriate role models and associated coach support (Forneris 2004; Forneris and Peden-McAlpine 2006, 2009; Croxon and Maginnis 2009). These nurse clinicians provide the catalyst to drive continuing education by energising, motivating and convincing their colleagues of the benefits of proposed changes through the use of reflection, context, dialogue and time (Forneris 2004). These concepts have both informed the study and will facilitate further research to investigate the relationship between the introduction of an education program and nurses' adoption into practice of the associated learned skills.

6.4.4 Knowledge

It was hypothesised that surgical nurses who participate in the ***ReSKU*** program will have higher scores in knowledge relating to respiratory assessment than surgical nurses who do not participate in respiratory education. Between groups' baseline knowledge pertaining to respiratory assessment demonstrated some differences in results. However, these differences were not statistically significant. Knowledge scores across time demonstrated few statistically significant differences between groups. Therefore the hypothesis cannot be supported. There are a number of ways to

interpret this finding. The sample size may reflect a Type II error in the study design**.** Findings may indicate a ceiling effect suggesting that nurses possessing good pre-test knowledge will demonstrate less knowledge acquisition than nurses with poor baseline knowledge (Considine and Brennan 2007). The tool used to test knowledge may also have been unreliable and the MCQs invalid in content or design. Alternative item formats such as short answer questions may have been a better educational choice, given that MCQs tend to reward recognition and recall rather than testing an individual's critical thinking abilities (Walsh and Seldomridge 2006b). Although MCQs are a time efficient form of written assessment, they do not necessarily assess the deep learning considered important by educators (McCoubrie 2004; Piontek 2008).

Another possibility is that respiratory knowledge in this group may have not been the issue, rather the confidence to apply the knowledge. Confidence levels relating to the use and application of respiratory skills were reported to have improved for the intervention group following attendance at the ***ReSKU*** program. The study results support similar findings established following a health assessment course, where a large proportion of participants reported to gain confidence and extend their use of assessment skills (Wilson and Lillibridge 1995; Bullock et al. 1996). However, these studies measured participants' perceived current level of knowledge relating to physical assessment skills and did not examine actual or observed knowledge levels. The impact of continuing educational programs and their relevance as change agents to empower nurses' attitudes, skills, knowledge and application to clinical practice continue to be a challenge for nurse educators. As knowledge has become more complex, it is also more difficult to transfer and replicate in the workplace (DeLong 2004). Unless the beginner works in a practice environment where direction and support in respiratory assessment skills are actively role modelled by more experienced nurses, progression to improve skill levels and apply learned knowledge, may not occur (Shanley 2004; Schroyen et al. 2005). The use of reflective processes with coach support in the clinical setting was a mechanism used in the study to operationalise critical thinking into clinical practice.

Higher order cognitive thought processes were used as the transition was made from 'knowing what to knowing how to knowing why' (Forneris 2004). The study gives

empirical support to the position taken by Levett-Jones, (2005), who discusses the significant effect of continuing education on improving patient care and the necessity for knowledgeable skilled nurses to facilitate the provision of quality care. These concepts are also emphasised by Candela and Benzel-Lindley, (2006) who discussed the advantages of credible evidence, clinical reasoning and critical thinking to facilitate nurses' use of knowledge to address decision-making in real-life contexts. Bloom's (2005) review of 26 systematic reviews relating to continuing medical education found that interactive techniques, collaborative teamwork and tailoring of interventions to meet organisational needs were the most effective strategies to facilitate knowledge transfer to clinical practice. Didactic lectures were considered the least effective because the absence of interactivity encourages rote learning resulting in limited improvement in attitudes or knowledge (Bloom 2005; Khan and Coomarasamy 2006b; McWilliam 2007).

Despite the proven nature of interactive educational strategies, use of the least effective models based around didactic delivery continues to predominate, reducing knowledge application and healthcare quality and increasing costs (Bloom 2005). Khan and Coomarasamy's (2006) systematic review of the effectiveness of teaching and learning activities also concluded that interactive and clinically integrated activities improved knowledge, skills and attitudes. They contended that where learners are actively involved in processing information, they are more likely to effectively internalise the learnt materials resulting in sustained behaviour changes (Khan and Coomarasamy 2006). Constant practice and maintenance of clinicians' skill level and knowledge on an ongoing basis are especially important in relation to patient assessment (Lesa and Dixon 2007).

Few studies have been identified that demonstrate sustainability, despite clear gaps in the literature and obvious benefits recognised (Milligan and Neville 2003; Neville, Gillon and Milligan 2006). Higher levels of learning require ongoing educational and clinical support to reinforce participant competence, confidence and expertise (Pohl 2000; Haigh 2003; Benner 2004). The importance of an educational model, underpinned by a strong theoretical framework, to facilitate learners' valuing of knowledge in terms of their own practice is highlighted (McWilliam 2007). Forneris' (2004) framework was conducive to providing a basis for an educational model to

investigate the relationship between participation in the ***ReSKU*** program and surgical nurses' self-reported use of respiratory assessment skills, attitudes and knowledge.

6.5 Conclusions

This work endorses the importance of a cohesive learner-centred model for continuing education supported by a robust theoretical framework and the active engagement of nurses in a practice setting. Integrated educational strategies supported by clinical coaches facilitated participants' assimilation of learning into their practice environment. Application of coaching strategies has assisted participants' reported use of respiratory skills and demonstrated to the ***ReSKU*** program participants their potential learning trajectory. Clinical coach support and scenario-based learning encouraged the reported use of respiratory assessment skills in the clinical context of the postoperative ward environment. Despite the limitations, the research has added to nurses' body of knowledge in the nursing literature. The research has made a meaningful contribution to developing and evaluating an educational model for use in the acute surgical wards and generated educational strategies to improve the early detection of respiratory problems.

The study demonstrated statistically significant differences between groups regarding self-reported use of respiratory skills, three months after ***ReSKU*** program attendance. Ongoing sustainability was not examined. Between group data analysis indicated that the intervention group's self-reported beliefs and attitudes pertaining to subscale descriptors improved in three of the six subscales following attendance at the ***ReSKU*** program. These findings suggest that the use of an integrated educational model underpinned by a robust theoretical framework is possibly a strong factor in some perceptions of the ***ReSKU*** program relating to attitudes and behaviour. There were minimal differences in knowledge between groups across time. Further follow up will be necessary to ensure sustainability. There have been no published studies evaluating sustainability; therefore future longitudinal studies are required to determine whether ongoing focused respiratory education of nurses facilitates continuing practice change. This will be discussed further in the final chapter, which will summarise major findings from the current study and discuss recommendations for future research, education and clinical practice.

Chapter 7 - Conclusions and Recommendations

7.1 Introduction

Development and testing of an integrated educational model for continuing education underpinned by Forneris' (2004) theoretical framework operationalising critical thinking was the major imperative driving the research. The study has positively contributed to the nursing body of knowledge by developing and evaluating an integrated clinical learning model in the service environment to inform ongoing education for acute care nurses. All three domains of learning; cognitive, psychomotor and affective, were incorporated in the educational model. The research has provided nurse clinicians and nurse educators with the basis for proposed future education programs and their application to current clinical practice in acute surgical areas. Importantly, the study has proposed guidelines for the empowerment of nurse clinicians by providing them with the requisite respiratory skills, physiological information and critical thinking concepts to prepare them for the complexity of the current fast paced healthcare environment. The study demonstrated that attendance at the ***ReSKU*** program resulted in statistically significant differences related to self-reported participant use of respiratory assessment skills in the surgical wards being studied. There was also evidence of statistically significant differences pre test to post test, of intervention group participants' self-reported beliefs and attitudes in three of the six sub scales.

These findings suggest that the use of an integrated educational model underpinned by a robust theoretical framework is possibly a strong factor in participant's perceptions of the ***ReSKU*** program. One of the most notable findings was that it was clear from study analysis, that nurses choosing not to participate were older, more experienced and less well educated. The data demonstrated that there was a barrier for training. This barrier impacted on educational strategies as this mature-aged cohort was less likely to take up educational opportunities. Further research is needed to enable examination of this group of older nurses and the best way to engage them in future educational planning.

The contemporary hospital environment has changed considerably in the two decades along with the nature and requirements for current nursing practice and

educational approaches. The unprecedented growth in both technology and knowledge has presented major challenges for the nursing profession and the educational standards and competencies underpinning the whole change process (Department of Education 2002; Levett-Jones 2005; Menix 2007; Covell 2009). Many patient care decisions are underpinned by nurses' assessment findings before being communicated to other healthcare professionals. A nurse's ability to detect and interpret warning signals of patient deterioration, prioritise and communicate to colleagues is dependent on both effective assessment and referral (Wood, Douglas and Priest 2004; Odell, Victor and Oliver 2009). The timing, urgency and priority of further involvement, hinges on nurses' clinical competency and capability, reflective learning and critical thinking (Forneris 2004; Forneris and Peden-McAlpine 2006). The provision of safe, cost-effective care is dependent on nurses maintaining conversancy with up to date knowledge and skills in an unpredictable, complex clinical environment.

Given the rapid changes in technology at a time when acuity and age of patients has increased, clinical competency and technological expertise are essential attributes that healthcare consumers demand of their provider (Levett-Jones 2005; Candela, Dalley and Benzel-Lindley 2006). Nursing education is an expensive commodity requiring skilled nurse educators and backfilling of clinicians for education time. An ignorant workforce is not an option in an environment where an adverse event becomes both a patient safety issue and a consideration for litigation. Nursing education should be viewed as an essential component of the Australian health care system requiring nurse leaders to plan proactively as a profession. Evidence-based education should be perceived as an investment and an asset for both individuals and healthcare organisations by ensuring a knowledgeable, skilled and competent nursing workforce. This then positively impacts on clinicians' early detection of patient deterioration and patient outcomes (Levett-Jones 2005; Thorne 2006).

If nurses need to be knowledge workers as contended by Drucker (2001), then nurse educators should be knowledge brokers. Nurse educators need to be equipped to prepare nurses to manage practice improvement and change. They need to communicate effectively with ward teams and demonstrate how planned continuing education, as the basis for effecting change, can illuminate current practice. Although

the study has demonstrated some positive findings, participants' self-reported increased use of respiratory assessment skills and self-reported confidence post ***ReSKU*** program constitutes the first level on the learner's knowledge and skills continuum. It is vital that the learning trajectory continues within a supportive context including the associated provision of practice opportunities, clinical reflection and performance feedback. Ongoing coach and educator support will facilitate the transition from novice clinician to competent nursing practice, including improved interpretation of documented assessment findings and timely communication of those findings to other health professionals. Hence the importance of an educational model supported by a robust theoretical framework to investigate the relationship between participation in the ***ReSKU*** program and surgical nurses' self-reported use of respiratory assessment skills, attitudes and knowledge.

7.2 Recommendations

Several recommendations are proposed to provide direction for educational practice and further research in this important area of clinical practice.

7.2.1 Further research

Further research is required to determine the implications for future clinical practice and the associated educational needs of multigenerational learners and mature-aged nurses. Improved professional opportunities and mentor training have been identified as strategies to help keep older nurses in the workforce (Trossman 2005; Wright 2006; Drury, Francis and Chapman 2009). The use of this study's educational model can facilitate engagement of a generationally diverse workforce and assist nurses to develop their capacity for lifelong learning, different learning styles and preferences. Awareness and insight into generational differences in attitudes, values and behaviours is promoted by creation of a dynamic work culture that values diversity (Earle and Myrick 2009). Ebrahimi et al (2008) contend that combining intergenerational knowledge can serve as a catalyst for a productive knowledgeable workplace. Younger nurses are viewed as translators of up to date technical knowledge and can motivate older colleagues with enthusiasm for their use. Mature-aged workers are seen as decipherers of past situations and transmitters of practical wisdom (Ebrahimi, Saives and Holford 2008).

Development of an understanding of the educational issues inherent in a multigenerational nursing workforce fosters a collaborative and cohesive workplace (Duchscher and Cowin 2004). Educational strategies should reflect the diverse nature of a multigenerational nursing workforce with varied learning styles and goals in a clinical environment of changing technology and increasing complexity (Lindeman 2000; Weston 2001; Pincas 2007). Different teaching tools and modes should be compared to examine which educational strategies facilitate clinical experiential learning, modify nurse behaviour and improve health assessment, competence and confidence. This includes the use of simulated manikins in educational programs and simulated practice computer programs depicting clinical scenarios and potential clinical situations that surgical nurses face in practice reality. This research would validate whether continuing education based on current evidence-based guidelines and using a variety of strategies, facilitates knowledge uptake by learners and improves patient care.

Observational studies in the clinical areas are considered the most appropriate method to evaluate change as observation determines participant discrepancies between actual and reported behaviours (Jordan 2000; Griscti and Jacono 2006; Burns and Grove 2009). Despite an increased probability of the Hawthorne effect and budgetary, ethical and pragmatic issues making observational studies difficult to conduct, valuable research information can be obtained (Jordan 2000; Polit and Beck 2004a; Watson et al. 2006; Burns and Grove 2009).

I therefore recommend that:

- **Further research is conducted to examine the educational needs of mature-aged nurses and the best way to engage this cohort in continuing education.**

- **Replication of the present study using an integrated clinical learning model supported by Forneris' (2004) theoretical framework, encompassing multiple sites and a comparison group in a separate clinical setting.**

- **Further examination and psychometric testing of the survey instrument using approved statistical software is conducted to develop research of an integrated learning model.**

- **Research regarding the role of organisational and system factors in relation to continuing education and sustainability of practice changes is conducted.**

7.2.2 Respiratory assessment education.

As the nature and scope of nursing practice changes to meet future challenges, many authors have highlighted the importance of ensuring patient assessment, including competent respiratory assessment, is one of the central tenets of clinical nursing practice. Patient assessment needs to be viewed as a means of gathering important data in which health risks and changes are identified (Wilson and Lillibridge 1995; Milligan and Neville 2001; Finesilver 2003; Wheeldon 2005). More emphasis regarding documentation in the acute care clinical setting is indicated. Further research should examine the effects of continuing education on the use of respiratory assessment skills and the associated communication of data. This should include documentation, clinical handover, communication to other health professionals and subsequent interventions on patient status (Considine and Botti 2004; Considine 2005b; Odell, Victor and Oliver 2009). Auditing of the actual use of respiratory assessment and associated documentation is important. Given that nurses must be able to describe and document the cognitive aspects of their practice; findings relating to communication of data require further research and analysis. Several studies suggest communication between health professionals needs to improve and further training in communication issues would be beneficial (Wood, Douglas and Priest 2004; Cox, James and Hunt 2006; Endacott et al. 2007; Scholes 2007; Odell, Victor and Oliver 2009).

The frequency of postoperative vital signs including appropriate respiratory assessment should be determined by evidence-based clinical practice, clinical guidelines and nurses' application of critical thinking and clinical judgement (Zeitz and McCutcheon 2002; Zeitz 2005). The inclusion of respiratory assessment as an

additional means of gathering data following surgery is known to facilitate early intervention to changes in a patient's health status. This ensures a comprehensive comparative analysis of clinical respiratory data, which should be documented and communicated appropriately (Considine and Botti 2004; Considine 2005b). Findings from studies conducted by Secrest, et al (2005) and Giddens (2007), advocate that additional research is conducted. This would establish the pertinent assessment techniques necessary to influence nursing practice and intervention actions (Lesa and Dixon 2007; Tanner 2008; Giddens and Eddy 2009). For example, the relevance of chest percussion is questioned in the context of what this skill adds to the provision of nursing care (Secrest, Norwood and duMont 2005).

Training equipment including video self-instruction should be made available at ward/unit level. This will facilitate self-study and practice, prevent knowledge deterioration between updates and improve competence in respiratory assessment following formal training (Yeh and Hsing-Hsia 2005). If the expectation is that surgical ward nurses should be the patients' physiological police and clinical detectives, then the requisite educational strategies and ongoing training and support should be readily available (Comer 2005). Remedial training should be provided and program content evaluated on a regular basis to ensure continuing compliance with clinicians' assessment expectations and current best practice requirements. Update sessions for nurses currently performing respiratory assessment should incorporate changes in current practice highlighting new knowledge related to physiological assessment.

A longer period of time is required to determine whether ***ReSKU*** programs and practical support in the clinical area increase nurse confidence, facilitate changes in nurses' behaviour and reinforce practice standards on a long term basis (Aylward et al. 2003; Griscti and Jacono 2006). Follow up research using longitudinal studies could evaluate whether ***ReSKU*** program participants have had the opportunity to use program information in their practice on an ongoing basis. The relative effectiveness of follow up clinical support in the ward areas should also be examined over a longer timeframe. Sustainability of future ***ReSKU*** programs will depend on the ongoing support by clinical coaches and educators in facilitating both respiratory clinical practice and culture change.

Future research should highlight to nurses and educators alike, the positive effects educational strategies endorsing comprehensive respiratory assessment have on nurse-sensitive patient outcomes and therefore its importance. Documentary evidence of nurses' earlier detection of postoperative respiratory dysfunction and nurse sensitive patient outcome data collection should be examined (Thorne 2006). Highlighting positive nurse-sensitive patient outcomes by auditing and reporting will emphasise to nurses and educators alike the importance of respiratory assessment on the patient's progression to a timely discharge. Longer term studies could address the study's capacity to capture and measure nurse-sensitive patient outcome indicators related to nurses' respiratory management post attendance at a continuing education program. Auditing of this evidence will influence future nursing resources, policies and education (Thorne 2006).

Therefore I recommend that:

- **Respiratory education skills update programs such as *ReSKU* are provided for all nurses working in an acute surgical environment**

- **Follow up on nurses' use of respiratory assessment skills post attendance at a ReSKU program is conducted to measure long-term sustainability.**

- **Regular follow up inservice sessions are conducted by educators and clinical coaches to continue to provide role modelling and ensure practice sustainability.**

- **Modify *ReSKU* program to incorporate more emphasis on timely communication of findings including documentation, clinical handover and effective referral to other health professionals.**

- **Additional research is conducted to establish the relevant evidence-based assessment techniques necessary to influence nursing practice and intervention actions.**

- **Future studies directly examine the effects of respiratory education by auditing nurse-sensitive patient outcomes.**

The research should continue to explore the current body of nursing knowledge regarding nurse use of respiratory assessment skills according to the requirements of specific patient populations such as paediatric, community, aged care and remote and rural community settings. This research would both inform clinical decisions and education programs and identify whether the change in nursing practice makes a difference to nurse-sensitive patient outcomes in these particular areas of nursing practice.

7.3 Conclusions

Substantial support exists for the contention that technologically adept nurses who also possess competent respiratory assessment skills make a difference to the respiratory care of their patients. Study results demonstrating participant's self-reported increased use of respiratory skills and some changes in self-reported attitudes post attendance at the ***ReSKU*** program support this view. This research has demonstrated the value of continuing education operationalising critical thinking principles in the acute care setting. These concepts were used in the clinically integrated educational model underpinned by a robust theoretical framework which provided the mechanism to drive the research process. The framework used educational strategies that are learner-centred and participatory. These strategies aimed to engage the clinician in dynamic thinking processes in clinical practice situations guided by coaches and educators. The educational initiative that was evaluated in this study was the result of an experienced facilitator working with coaches and clinical teams to improve practice. The inclusion of positive role modelling and ongoing practice to maintain skill levels, supported by feedback mechanisms in the practice context were vital to facilitate open discussion and shared decision making.

Further research to examine a focused education model's impact on patient care, including the management of patient deterioration and the incidence and severity of adverse events is warranted. Given that nurses provide a 24 hour patient surveillance, their skilled vigilance is vital to early recognition and communication of relevant changes in patient condition. Few healthcare providers would dispute the necessity for competent skilled assessment in today's high acuity, technological healthcare

environment where patients are living longer and requiring more care. Further research has the potential to both influence health policy by generating a proactive solution to the early detection of respiratory problems postoperatively and enhance more specific areas of nursing practice. This would ensure that nurse researchers have strong valid evidence to argue convincingly for educational approaches that will shape the nursing body of knowledge and have a meaningful impact on the future role and function of multigenerational learners in the nursing workforce. Similarly, the implications for future clinical practice and the associated diverse educational needs of mature-aged learners are not well documented. Evidence-based practice together with continuing education rhetoric will increasingly shape resource allocation and hospital policies. Therefore, nurses' conversancy with these concepts is essential and should be guided by nurse educators preparing today's clinicians for tomorrow's challenges. Findings will inform nursing practice by contributing new insights and increase understanding of postoperative acute nursing care.

Appendices

Appendices

Appendix A Definition of Terms

These terms will form the basis for the parameters included in the study's outcome measures. Respiratory assessment is the collection of data through the four processes of inspection, palpation, percussion and auscultation of the thorax and lungs. A brief description of these processes and other respiratory investigations follow to inform the reading of the study.

Inspection

Inspection involves observation of the patient's posture, skin colour, temperature and moisture. The shape, synchrony and symmetry of chest wall configuration and movement are also examined. Chest wall movement should be symmetrical, bilateral and equal (Ahern and Philpot 2002). Normal parameters of respiratory rate are between 10-17 breaths per minute (Moore 2007). The mechanisms, effort and audibility of breathing assist the nurse to ascertain any deviations from normal such as the asymmetrical rise and fall of chest seen in a pneumothorax or flail chest (Jarvis 2008). Other observations include the rhythm, depth, pattern and work of breathing including accessory muscle use, intercostal recession and nasal flaring which is associated with pneumonia and extreme respiratory distress in adults (Jarvis 2008). Normal inspiratory breathing is performed by contraction of the diaphragm and external intercostals. Normal expiration is mostly passive, occurring with relaxation of the diaphragm and intercostal muscles (Weber and Kelley 2007). Concurrent observation of the work of breathing, use of accessory muscles and sounds of breathing including wheezing, coughing, stridor and production of sputum may indicate other physiological issues requiring intervention (Finesilver 2003).

Accessory muscle use and substernal and intercostal muscle retraction occurs when increased amounts of air are required, respiratory distress or respiratory dysfunction. The development of accessory muscle hypertrophy is best demonstrated in patients with bronchospasm, airways obstruction, chronic lung disease and restrictive lung disorders such as emphysema and fibrosis (Finesilver 2003). The scalene, sternocleidomastoid, trapezius and pectoralis major muscles across the side of the neck, shoulders and vertebrae are then brought into action during inspiration (Weber and Kelley 2007; Wilson and Giddens 2009). The rectus abdominis, transverse abdominis and the external and internal oblique muscles operate during expiration when there is increased work of breathing (Finesilver 2003). The patient commonly uses an over bed table or adapts a

tripod position to stabilise the arms to increase the antero-posterior diameter of the chest and facilitate breathing (Weber and Kelley 2007; Wilson and Giddens 2009).

Palpation

The thoracic area is palpated using the palmar surface of the hand and fingertips to detect tenderness, pulsations and crepitus from rib fractures or vibrations produced during speech. Tactile or vocal fremitus is a vibration resulting from speech. The flat of the hand is systematically placed over the left and right lung fields from apices to bases, while asking the patient to recite one-two-three or ninety-nine. Fremitus is decreased in emphysema, pleura effusion or pulmonary oedema and increased in pneumonia or tumour when lung tissue is congested or consolidated (Simpson 2006; Wilson and Giddens 2009). Surgical emphysema, respiratory expansion and any paradoxical movement that may occur following multiple fractured ribs, resulting in a flail lung segment, can also be detected (Weber and Kelley 2007; Wilson and Giddens 2009).

Percussion

Percussion assesses the size, borders, consistency and density of underlying lung structures. The finger of one hand is used as a hammer while striking the top surface of the opposite hand's finger briskly on the interphalangeal joint. The non-dominant hand, with fingers slightly spread is placed on the patient's chest. Percussion sounds are soft over solid areas such as ribs and resonant over organs containing air such as lungs (Jarvis 2008). The primary limitation of percussion is that deeper lesions are not detected because vibrations are transmitted from tissues only at depths of 5-7 centimetres, also influencing percussion of obese patients (Weber and Kelley 2007). Separate studies conducted by Secrest, Norwood and duMont (2005) and Giddens (2007), demonstrated that only 25% to 30% of approximately 120 health assessment techniques were routinely used in a variety of practice settings. The results demonstrated a dichotomy between skills taught and skills actually practiced. Regularly used respiratory skills included inspection for chest symmetry and auscultation of lung sounds (Secrest, Norwood and duMont 2005). Chest palpation for lumps and tenderness and percussion of lung fields was conducted monthly or occasionally. Secrest et al (2005) questioned the relevance of teaching chest percussion in the context of what this skill adds to the provision of nursing care. Nurses work within many different populations and adaptability is necessary as some skills are necessary to certain practice areas that are superfluous to others (Lesa and Dixon 2007). For example, percussion and palpation skills may be

useful in remote and rural areas where healthcare facilities lack ready twenty-four hour access to medical imaging technology. Patient history and health assessment provide specific information, guiding treatment measures prior to the availability of information from diagnostic tests (Finesilver 2003).

Auscultation

Lung auscultation evaluates the movement of air through the lungs providing critical information regarding the condition of lungs and pleura. A systematic approach is adopted, assessing apex to base, upper, mid and lower lung segments, anterior, posterior and lateral aspects with symmetrical comparison. The diaphragm of the stethoscope is used for high frequency sounds and murmurs, as opposed to the bell of the stethoscope, being normally used for low and medium frequency sounds (3M Healthcare 2006). The patient is asked to take deep breaths to enable the examiner to assess breath sounds during one whole cycle of both inspiration and expiration, in each auscultated area. The three categories of normal breath sounds: bronchial, broncho-vesicular and vesicular are classified according to the pitch, intensity, location and duration (Weber and Kelley 2007).

Bronchial sounds are loud, relatively high pitched, have equal inspiratory and expiratory sounds and are heard anteriorly over the manubrium, near the trachea and large airways. Broncho-vesicular sounds are heard near the main stem bronchi, over the first and second rib interspaces anteriorly, between the scapulae posteriorly and have relatively equal inspiratory and expiratory sounds with medium intensity and pitch. Vesicular sounds are soft, low pitched and characterised by longer lasting inspiratory sounds heard over most of the peripheral lung fields (Lehrer 2002). Chest auscultation findings are used by nurses to determine required interventions which may include encouraging coughing, mobilising the patient, suctioning or seeking early interdisciplinary input (Finesilver 2003; Wheeldon 2005; Secrest, Norwood and duMont 2005)

Significance of abnormal clinical findings

Absent or inaudible sounds reflect reduction in airflow to a specific lung segment or air leakage to the pleural space as in a pneumothorax, or over inflation with emphysema (O'Neill 2003). Bronchospasm, inflammation of the bronchioles and secretion of viscous mucous into the airways greatly increase airway resistance producing the well recognised asthmatic wheeze (Connolly 2004). Atelectasis is a more frequent

phenomenon in patients undergoing upper abdominal surgery, but occurs to different degrees in all patients experiencing surgery because of a reduction in lung inflation and diaphragmatic action, consequent to a prolonged recumbent position on the operating table (Grap, Glass and Constantino 1994; Kremer 1998). If broncho-vesicular sounds are heard in other lung areas, the clinician will suspect that a normal air filled lung has been either replaced by fluid or solid lung tissue as in consolidation following pneumonia (Weber and Kelley 2007). Thromboembolism and pneumonia may also be exacerbated by an enforced supine position and reduced functional reserve capacity (volume of air remaining in the lungs after a normal exhalation), secondary to decreased chest wall and lung compliance (Keller 1999).

Further investigations

Other useful respiratory investigations include spirometry, arterial blood gases, chest radiography and pulse oximetry. Spirometry tests examining lung function include forced expiratory volume in one second, forced vital capacity and peak expiratory flow. Recorded values of individual patients are compared to normal values depending on age, sex, height and race (Simpson 2006). Information regarding acid-base balance, the delivery of oxygen to the tissues and adequacy of ventilation is provided by arterial blood gases. Chest radiography demonstrates the severity and spread of respiratory disease (Simpson 2006). Continuous non-invasive monitoring of oxygen saturation by calculating the percentage of oxyhaemoglobin in arterial blood is obtained by pulse oximetry (Moore 2007). Pulse oximetry does not provide information regarding the patient's ventilatory status, but is commonly used by nurses as an adjunct to respiratory assessment. Hypoxaemia can be detected before the patient demonstrates obvious symptoms (Moyle 2002). Correlation with the patient's heart rate is important to establish accuracy. Blood pressure needs to be recorded on the patient's opposite arm as cuff inflation causes imprecise readings because of interrupted blood supply (Moore 2007). The device may be inaccurate with saturations below 70-85% and is compromised in severe anaemia and where peripheral circulation is poor in critically ill patients (Doherty 2002; Considine 2005a; Wilson and Giddens 2009). These investigations will be included in components of the education program. However, the study's primary focus will be testing an educational model using interactive and clinically integrated teaching and learning activities for sustainability of learning in the acute care environment.

Appendix B ReSKU Program Objectives

The program comprised three components, theoretical, practical and experiential including, a self directed learning module, a one day education program and supported clinical practice and competency assessment of study participants for three months following the program. The study applied a combination of educational theory and best practice principles which advocated that the best context-dependent clinical learning is achieved through the integration of theoretical, practical and experiential knowledge (Haigh 2003; Distler 2006; Baxter 2007). The theoretical component of the ***ReSKU*** program was based on a self directed learning module on respiratory assessment, airway and oxygenation which was developed as a statewide educational initiative for acute care RNs. ***ReSKU*** program participants learned the salient respiratory assessment strategies embedded in the surgical ward environment of current postoperative nursing practice. The crucial part that nurses can potentially play by early intervention in the nursing care of the deteriorating patient, prevention of adverse events and respiratory dysfunction was emphasised using current best evidence.

The concept of nurses taking responsibility for the patient's physiological safety was highlighted, as well as the importance of nurses performing an accurate respiratory assessment. Emphasis was given to the links between the respiratory assessment process, nurses' critical thinking abilities, reflective practice and the application to postoperative patient care. Potential problems relating to the deteriorating patient were contextualised to the clinical postoperative setting. Clinical scenarios were simulated using manikins and the associated equipment. The interactive educational sessions included discussion, demonstration and practice relating to oximetry, chest x-rays, arterial blood gases and spirometry interpretation. Pertinent clinical examples, reinforcement of critical thinking and reflective practice were applied throughout the program: in the learning module, during the ***ReSKU*** program and reflective feedback following clinical practice. These educational strategies were continued for three months in the surgical ward areas where participants were supported by clinical coaches and nurse educators.

Content objectives:

i) Review respiratory system physiology, including major structures and functions of the upper and lower respiratory tract

ii) Describe the process for normal gas exchange and gas transport process

iii) Discuss conditions that are characterised by an increase in resistance and decrease in compliance

i) Discuss factors influencing changes in clinical parameters relating to a patient's work of breathing and collaborative management

iv) Discuss the respiratory changes which occur with age

v) Describe the key aspects of the history required to assist collection of data including strategies to overcome barriers to clinical history taking and respiratory assessment

vi) Demonstrate the different techniques required when performing and documenting an effective assessment of a patient's respiratory system

vii) Identify patients at risk of developing atelectasis, pneumonia, pulmonary emboli and respiratory failure and discuss strategies to minimise occurrence in the clinical setting

viii) Perform basic and systematic interpretation of a patient's chest x-ray

ix) Identify normal range values for arterial blood gas components and acid base disturbances in relation to an arterial blood gas

x) Outline methods used to administer oxygen therapies, including the complications of oxygen therapies

xi) Describe and demonstrate the indications, principles, waveforms and potential sources of inaccuracy relating to pulse oximetry

xii) Discuss humidification measures for a patient receiving supplementary oxygen

xiii) Demonstrate the different techniques required to assess lung function using spirometry

Process objectives:

i. Highlight respiratory related nurse-sensitive patient outcomes in relation to post-operative patients

ii. Discuss importance of development of critical thinking skills and reflective practice

iii. Facilitate an evidence base for practice change

iv. Encourage active engagement of clinicians

v. Develop new understanding by stimulating group reflection and challenging ideas in group discussion

Appendix C Pocket Cue Card

Guidelines for Patient Documentation

RESPIRATORY ASSESSMENT

Resp rate/ pattern, breath sounds, normal, equal

Symmetrical chest movement, Work of breathing

SOB on exertion, Accessory muscle use,

Chest expansion, cyanosis,

(central, lips/peripheral/nail beds)

SpO_2, O_2 Therapy, Expiratory noises:

Cough, sputum, stridor, wheeze

ASSESS pt condition	**DOCUMENT**
PLAN of management	**DOCUMENT**
IMPLEMENT pt plan	**DOCUMENT**
EVALUATE pt outcome	**DOCUMENT**

WILL MY DOCUMENTATION TELL

THE WHOLE STORY IN 3 YEARS

TIME

Good Documentation	**Good Defence**
Poor Documentation	**Poor Defence**
No Documentation	**NO defence**

Appendix D Session Plan/Clinical Assessment Tool

Workshop Topic: Demonstrate the ability to assess the patient with respiratory dysfunction
Location: Clinical Training Room
Competency Standard: Sunshine Coast & Cooloola Health Service District Clinical Competency 2007
Date/Time: Tuesday, 8th MAY 2007, 0830 - 1630
Participants: Registered Nursing Staff **No. of Participants:** 36

TIMING	CONTENT/KEY POINTS	METHODS/STRATEGIES	RESOURCES
10	**Introduction** Housekeeping, fire and emergency issues Overview of content and process of sessions. Learning outcomes	Establish if participants have prior experience in **respiratory** nursing	Self directed learning module
60 90 30 30 30 60 60	**Body** 1. Explanation of terms 2. Anatomy & Physiology of **respiratory** tract 3. Collating a **respiratory** history 4. Normal breath sounds –where to listen, characteristics of adventitious breath sounds 5. Methods to assess oxygen saturation 6. Identifying oxygen transport regulation and tissue oxygen consumption 7. Significance of the oxyhaemoglobin disassociation curve 8. Airway humidification 9. Hypoventilation and Carbon Dioxide narcosis, COAD and oxygen 10. CXR interpretation 11. Troubleshooting spirometry	Discussion/presentation/questions answered Watch section of DVD Demonstration/ interactive practice session/debriefing and feedback Discussion/presentation/questions answered Discussion/presentation/questions answered Discussion/presentation/questions answered Discussion/presentation/questions answered Demonstration/ interactive practice session	PowerPoint Presentation DVD Anatomy model Stethoscopes Simulated manikins PowerPoint Presentation Scenarios PowerPoint Presentation PowerPoint Presentation PowerPoint Presentation Example X-rays PowerPoint Presentation Spirometry equipment
20	**Conclusion** Recap major points Answer any questions	Evaluation Form for participants	Pocket Cue cards
REVIEW Clinical support, competency assessment in ward area for three months following ***ReSKU*** program by clinical coaches and educators			

Respiratory Assessment Clinical Assessment Tool

Person-centred Evidence Based Nursing Education

Observed Performance	Observed	Learning Opportunity Identified
Identifies indication		
Demonstrates knowledge of the patients underlying condition for admission		
Applies principles of infection control i.e. hand hygiene and personal protective equipment (PPE)		
Provides privacy for patient		
Explains the procedure to the patient and instructs him/her to breathe normally		
Positions the patient either sitting on the edge of the bed or sitting up at 90 degrees (if able), leaning forward slightly with arms resting comfortably on lap		
Asks the patient to cough and then breathe normally through an open mouth		
Identifies: Patient's work of breathing status • Accessory muscle use • Increased or decreased respiratory rate • Cough –productive or non-productive • Sputum –amount, colour, and consistency • Ability to talk – can patient complete sentences • Stridor or wheeze – is it audible, is it inspiratory or expiratory • Assesses for fatigue		
Systematically auscultates all areas of the lung fields, anteriorly and posteriorly, - Posteriorly from the apices at C7 to the bases (around T10) and laterally from the axilla down to the 7th or 8th rib - Anteriorly, commences at apices and ends with bases		
-Auscultates lung fields from the apices in the supraclavicular areas down to the sixth rib working from left to right or vice versa		
Listens to at least one full respiration in each location and compares one side to the other		
Does not place stethoscope directly over the female breast but displaces the breast and listens directly over the chest wall		
Describes the findings gained from the auscultation of breath sounds		
Differentiates between crackles and wheezes		
Observes oxygen saturation in relation to the condition of the patient		
Discusses nursing interventions to improve respiratory function i.e. position, deep breathing and coughing, oxygen therapy, nebuliser		
Discusses oxygen delivery options – nasal prongs, Venturi, Hudson, non-rebreather		
Reports abnormal findings, any concerns or changes to the shift coordinator / team leader / medical officer		
Discusses ongoing management		
Documents findings in progress notes		

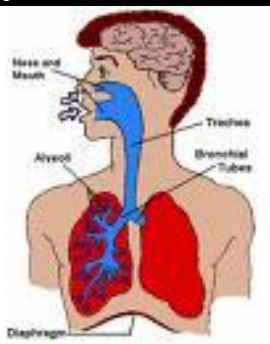
Assessment Result		
Competent ☐	**Learning Opportunity Identified** ☐	Date
Assessee:	**Signature:**	
Assessor:	**Signature:**	

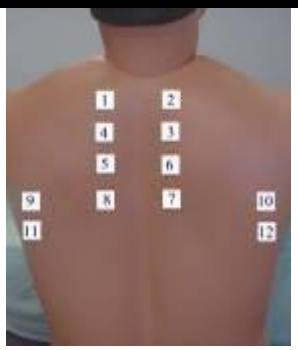
Plan for Further Learning

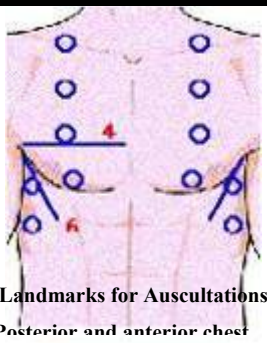
Indications

As part of physical assessment for all patients

Anatomy







Risk

Minimal risk for this procedure

Ongoing Care

Maintains upright position to facilitate optimal lung expansion
Discusses the risk of sedation in relation to narcotic administration
Assesses appropriate frequency of observations - work of breathing
Continually assesses the need for oxygen therapy
Administer bronchodilators, steroids, antibiotics as ordered
Discusses IV medication versus oral i.e. steroids and antibiotics if ordered
Discusses oxygen delivery systems
Discusses oxygen needs versus oxygen demands
Documents exercise tolerance and the type and amount of sputum
Discusses hypoxia versus hypercarbia in relation to oxygen therapy
Collaborates clinical diagnostic results with current condition (x-rays, pathology results)

References

Tollefson J, 2007. Clinical Psychomotor Skills 3rd Edition, Thomson Learning, Melbourne.
Weber, J. and Kelley, J.H. 2007. Thoracic and Lung Assessment. *Health Assessment in Nursing.* Philadelphia, Lippincott, Williams, and Wilkins: 297-328.
G:\Common\StaffCommunication\Nurse Education\Physical assessment workshops\Respiratory.
Oxygen Administration – Adults
DVDs: An Insight into Lung sounds, 2004, Assoc Prof Charles Mitchell (UQ)
Clinical Respiratory Medicine, 2002, acb media (Blackwell Publishing)
Video: Physical Examination of the Thorax & Lungs, Heart, Abdomen, Ears, (2001), School of Nursing, Christchurch Polytechnic Institute of Technology, New Zealand.
Transition to Medical/Surgical Nurse Education Program, Respiratory Assessment module, (2006), Queensland Health
http://qheps.health.qld.gov.au/sunshine/documents/Policy_Pro/cc0220_02.pdf
Images of Lung Fields :
http://www.google.com.au/search?hl=en&ei=lZr8Stpfx5RBeXm0IEH&sa=X&oi=spell&resnum=0&ct=result&cd=1&ved=0CAgQBSgA&q=lung+auscultation&spell=1
Obstructive versus restrictive lung disease
http://www.lakesidepress.com/pulmonary/books/breathe/Secth.htm
Audio of lung sounds
http://solutions.3m.com/wps/portal/3M/en_US/Littmann/stethoscope/education/heart-lung-sounds/

Appendix E: Scenarios and Possible Debriefing Questions

Scenario 1

54 year old male experiencing shortness of breath, productive cough, fever, intercostal recession and chest wall pain.

1. What clinical signs and symptoms do you expect to see? (subjective and objective data)
2. Where do you palpate?
3. How and where do you percuss?
4. What do you expect to hear on percussion?
5. Positions for auscultation
6. What do you expect to hear on auscultation?

Scenario 2

32 year old female sitting in tripod position is experiencing shortness of breath, speaking in broken sentences, intercostal recession and chest tightness.

1. What clinical signs and symptoms do you expect to see? (subjective and objective data)
2. Where do you palpate?
3. How and where do you percuss?
4. What do expect to hear on percussion?
5. Positions for auscultation
6. What do you expect to hear on auscultation?

Scenario 3

A tall, thin 18 year male presents to the emergency department with sudden onset of chest pain, shortness of breath, dry cough and mediastinal shift.

1. What clinical signs and symptoms do you expect to see? (subjective and objective data)
2. Where do you palpate?
3. How and where do you percuss?
4. What do you expect to hear on percussion?
5. Positions for auscultation
6. What do you expect to hear on auscultation?

Scenario 1

Answer: Pneumonia

1. Colour – flushed (fever), Cough – productive colour of sputum, Effort – increased respiratory rate and increased work of breathing, intercostal recession, Chest wall pain from coughing and increased work of breathing, Respiratory rhythm – regular or irregular, SpO2
2. Anterior and posterior listening sites
3. Anterior and posterior listening sites
4. Dullness = consolidation
5. Anterior and posterior
6. Moist crackles

Scenario 2

Answer: Asthma

1. Colour - ? person is cyanosed, Cough – dry, Effort- Increased respiratory rate, increased work of breathing, intercostal recession, speaking in broken sentences, Chest tightness from narrowing of airways. Respiratory rhythm – shallow, regular or irregular, SpO2
2. Anterior and posterior listening sites
3. Anterior and posterior listening sites
4. Nil abnormal findings
5. Anterior and posterior
6. Wheeze and decreased air entry- High pitched wheeze, severe narrowing of airways. – Low pitched wheeze wider airways, wheeze on inspiration more severe, airflow obstruction

Scenario 3

Answer: Spontaneous Pneumothorax

1. Colour - ? person is cyanosed, cough – dry. Effort – shallow respiratory rate, splinted breathing, chest pain from collapse, Respiratory rhythm – shallow, regular or irregular, SpO2
2. Anterior and posterior listening sites
3. Anterior and posterior listening sites
4. Hyperresonance
5. Anterior and Posterior
6. Decreased or absent air entry to collapsed lobe

Possible Debriefing Questions

- What went well in the session?
- What didn't go so well?
- What do I need to be aware of, or think about next time I see a patient?
- How did you feel about it?
- What factors influenced your thinking?
- What sources of knowledge influenced/should have influenced your thinking?
- What are the significant background factors that contributed to this experience?
- What cues lead you to draw that conclusion?
- What was your rationale for the action you chose?
- Are there any patterns that you should have paid attention to?
- What would you change, if anything, in the future?
- What would you do differently if you had the opportunity?
- What are some of the reasons this didn't work as well as you had hoped?
- What behaviours do you plan on continuing in the clinical setting?
- What were the positive and negative aspects of the interaction?
- How did the interaction make you feel?
- Did we work as a team?
- How can you better promote inclusion of all team members?
- How will this experience impact your future practice?

Adapted from Argyris and Schön, 1996, Myrick and Yonge, 2002, Dickerson, 2005, Walsh and Seldomridge, 2005, Lasater, 2007, Giddens, 2006, Forneris and Peden-McAlpine, 2006.

Appendix F: Clinical Response Verification Tool

Place a tick in column when a response is observed

Response	Observed	Response	Observed
Talk Introduces self to patient Asks questions related to symptoms Reassures patient/encourages to relax Checks progression of symptoms		**Actions** Checks oxygen and suction Helps patient to reposition/sit upright Discusses care plan with other nurse/ medical officer Observes effect of IV diuretic, measures urine, listens to lung sounds) Stops/turns off IV	
Observations Temperature Respiratory rate Pulse Oximetry Blood Pressure Checks intravenous (IV) rate Checks IV against current order Checks IV site Assesses pain level Assesses wound		**Oxygen** Administers via nasal prongs Administers via Hudson mask Administers via Venturi mask Administers via non-rebreathing mask Correct flow rate for device used Administers incorrect flow rate for device Identifies need to alter flow rate Identifies need to change delivery device	
Respiratory Assessment Assesses ability to talk/quality of speech Effort of breathing/chest movements Use of accessory muscles Auscultates using stethoscope Identifies audible respiratory sounds Identifies difference between left and right lung sounds Identifies hypoxia (e.g.; irritability, confusion) Colour of skin, nail beds, mucous membranes		**Charting** Checks care plan Checks medication order Checks post-op order Checks fluid balance chart Checks previous observations Changes observation schedule Records observations Updates basic care on care plan Records on medication chart Documents in patient history	
Identification Development of cough Characteristics of cough Change in cough characteristics Sputum production Characteristics of sputum Change in sputum characteristics Deterioration in patient Verbalises improvement in signs and symptoms		**Help** Reports to team leader/other senior nurse Calls doctor using Situation Background Assessment Recommendation (SBAR) format Requests urgent assistance Initiates Medical Emergency Team (MET) call Makes referral to allied health staff Identifies need for further assistance	
Suggested Prompts Can you ask the patient how they are feeling? What do you notice about the noises the patient is making? Who will you notify about the patient's condition? What effect has the diuretic had?		**Comments:**	

Place a tick in performed column for each piece of information conveyed during handover to another staff member

Response	**Observed**	**Chest X-Ray**	**Observed**
Increased heart rate Increased blood pressure Increased respiratory rate Decreased O2 saturations Difficulty with talking (Short of breath) Using accessory muscles Has signs and symptoms of hypoxia Confusion and agitation Pale skin Blue nail beds and lips Has developed a cough Cough is productive- white frothy sputum Has coarse crackles in both lungs		More white areas in recent X-ray White areas probably extra fluid X-ray shows pulmonary oedema	
		Comments:	

Adapted from Shepherd et al, 2007.

Appendix G: Permission For Using Study Instrument

From: Dr Michael Wilson <mickey9552001@yahoo.com.au>
To: Beverley Duff <Beverley_Duff@health.qld.gov.au>
Date: 11/7/05 6:50pm
Subject: Re: Hi Michael

HI Beverley

You are more than welcome to use the instrument. I am currentlyoverseas undertaking a consultancy but yu are more than welcome to contact me. If you have any queries. If you want an elctronic copy of the instrument (in teeform) please contact Kathryn Creme. Please send my regards to Glenn.

Regards

Michael
Beverley Duff <Beverley_Duff@health.qld.gov.au> wrote:
Hi Michael

I am a nurse educatur working in the Surgical Services of Nambour General Hospital (Sunshine Coast Health Service District) in Queensland. I am enrolled in the Doctorate of Health Science at QUT in Brisbane. (I got your name from Kathryn Creme, your PA at Southern Health, who provided your email details). Professor Glenn Gardner , my supervisor suggested I contact you to seek your approval to use an adaption of the instrument you used in your 1995 study of RN's knowledge and skill levels pertaining to health assessment.

My study is an evaluation of respiratory assessmemt competencies for surgical nurses using a quasi experimental pre test, post test approach.

Thank you for consideing my request and I look forward to hearing from you.

Cheers

Bev Duff

Bev Duff
Nurse Educator- Surgical Services (Nambour General Hospital)
Sunshine Coast Health Service District
PO Box 547
Hospital Road
Nambour Q4560
Queensland

(07) 5470 6834 or (07) 5470 6800
Pager 834

Beverley_Duff@health.qld.gov.au

Appendix H: Wilson And Lillibridge (1994) Study Instrument

Questionnaire developed for original proposal
used to collect data for Phase one pre and post -test study

No_____

QUESTIONNAIRE
HEALTH ASSESSMENT

The attached questionnaire is designed to ascertain the amount and type/s of health assessment you are involved in, as part of your nursing practice. All questionnaires will be treated confidentially. The questionnaire should take about 15 minutes to complete. Please answer **all** questions and return it as soon as possible. Thank you for your participation.

Please read the following instructions:

1. answer all questions

2. only circle one response

3. do not place circles between responses

4. please return the questionnaire as soon as possible

Documentation of responses:

Each item in the tool has an accompanying Scale rated ***Strongly Agree*** to ***Not Sure***
Only circle one response per question.

Position_____ **Gender** M__ F__

Tick the following area that applies to your employment.

Acute Medical	__	Acute Surgical	__	Specialty Area e.g. Coronary Care	__
Midwifery	__	RDNS	__	Community Health Centre	__
Paediatrics	__	Other	__		

Years of Experience_____

0-5 yrs __ 5-10 yrs __ 10-15yrs __

15-20 yrs__ >20 yrs __

Are you employed full/part time?
If part-time _____**hour/week?**

Qualifications_____

What is your highest qualification?_____

Part A

1. Health assessment is an important part of my nursing practice.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

2. Nurses should routinely do physical assessments of patients.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

3. It is important to collect both medical and nursing data.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

4. Nurses should only collect nursing data.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

5. Only doctors should do health assessment.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

6. The quality of care improves if nurses routinely assess their patients.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

7. Patients have less complications if nurses routinely assess them.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

8. Complications can be prevented if nurses routinely assess their patients.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

9. All nurses should be taught health assessment skills in their training.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

10. I always document my health assessment findings.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

11. It is important to practice health assessment skills.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

12. I always take the patient's social history.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

13. I only assess vital signs.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

14. I inform the doctor of my health assessment findings.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

15. I assess my patients at least once every shift.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

16. I use the information I have collected from health assessment to guide the care of the patient.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

17. In handover, I share the health assessment findings of patients in my care with other nurses.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

18. Health assessment is an important component to being a clinically proficient practitioner.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

19. The health assessment data I collect is used as the basis of the patient's care plan.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

20. Physical examination is an important skill that nurses need to have to be considered clinically proficient.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

21. I assess the patient in consultation with the doctor.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

22. My knowledge and skills of health assessment is very good.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

23. I do not feel confident performing health assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

24. I always complete a general assessment of new admissions/clients.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

25. My work environment encourages nurses to do health assessment.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

Part B

1. I feel comfortable doing respiratory assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

2. I feel comfortable doing neurological assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

3. I feel comfortable doing cardiac assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

4. I feel comfortable doing peripheral vascular assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

5. I feel comfortable doing gastro-intestinal assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

6. I feel comfortable doing nutritional assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

7. I feel comfortable doing urological assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

8. I feel comfortable doing renal assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

9. I feel comfortable doing musculoskeletal assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

10. I feel comfortable doing skin assessments.

Strongly Agree *Disagree* *Strongly Disagree* *Not Sure* [ ]

11. I feel comfortable doing family assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

12. I feel comfortable doing reproductive assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

13. I feel comfortable doing paediatric assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

14. I feel comfortable doing head and neck assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

15. I feel comfortable doing eye assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

16. I feel comfortable doing ear assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

17. I feel comfortable doing psychological assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

18. I feel comfortable doing mental health assessments.

Strongly Agree *Agree* *Disagree* *Strongly Disagree* *Not Sure* [ ]

Part C

1. I spend ____ mins/hrs each shift doing health assessment.

2. I spend ____ mins/hrs each shift documenting my health assessment findings.

3. I am best at doing _____ (e.g. neurological) assessment.

4. My weakest area of assessment is _____.

MW/JL/93

Appendix I: Section of Conference Paper demonstrating five classifications on Attitudes and Beliefs regarding Health Assessment (Wilson and Lillibridge, 1994)

Royal College of Nursing, Australia

Third National Nursing Forum, 1994
Conference Papers

Darwin, 24 & 25 May 1994

Frontiers of Nursing

Results & Analysis

Demographic data collected included position held, gender, practice area, years of experience, employment status and qualifications. Over ninety percent of participants held either a grade 1 or 2 position, and had less five years experience. Ninety nine percent of participants were female, and most worked in acute care settings. Twenty five percent worked in specialist nursing areas such as, intensive care. Forty nine percent were RN's whose highest qualification was a hospital certificate qualification, twenty seven percent possessed a post basic specialist nursing certificate and twenty three percent were diploma graduates. Most diplomates choose to accept advanced standing and are therefore exempt from this subject.

Perceived Attitudes of Registered Nurses towards the role of health assessment in nursing practice.

Part A of the instrument contained items which were grouped into five (5) classifications: the role of the nurse in health assessment, the scope of nursing health assessment, influence of health assessment on nursing care planning, action and outcomes, communication of health assessment findings, and professional and educational preparation for health assessment.

TABLE 1 Mean Scores on Attitudes and Beliefs regarding Health Assessment		
The role of the nurse	Pre-test	Post-test
Item 1	4.6	4.5
Item 5	1.8	1.4**
Item 18	4.4	4.4
Item 20	4.0	4.2
Item 25	3.4	3.1
Scope of health assessment		
Item 2	4.4	4.3
Item 3	4.2	4.2
Item 4	2.7	2.2**
Item 12	3.9	3.9
Item 13	2.2	1.9*
Item 15	4.1	4.0
Item 21	3.2	3.0
Item 24	3.6	3.6
Influence on nursing care		
Item 6	3.5	4.5**
Item 7	4.0	4.2
Item 8	3.9	4.2*
Item 16	4.1	4.2
Item 19	4.3	4.3
Communication of data		
Item 10	4.1	3.6**
Item 14	3.2	3.6**
Item 17	4.2	4.2
Educational & Professional Preparation		
Item 9	4.4	4.6*
Item 11	4.3	4.5**
Item 22	2.8	3.3**
Item 23	2.8	2.7
Asterisks indicate statistical significance of pre - post change * = $p < 0.05$; ** = $p < 0.01$		

The results indicate that registered nurses enrolled in the subject perceive health assessment to be a central component of their nursing practice. Many believed that the scope of their nursing assessment is broader than just collecting subjective data and assessing vital signs and wounds. They also indicated that health assessment needs to encompass the collection of both medical and nursing data and that the data should be used to guide nursing care because it contributes to improving the quality of patient care. Respondents also stressed the importance of communicating health assessment findings to other nurses and health care professionals either verbally or through documentation. The majority of respondents expressed a desire for formal educational preparation in health assessment and that continuous practice is essential to maintain skill level.

Knowledge and skills level

Part B of the instrument, items 1(a) - 18 (a) measured perceived knowledge and skill levels of health assessment as listed in Table 2. A common stem was used for all items in Part B of the instrument: "I feel comfortable doing ... assessment". A one tailed paired t-test was administered to establish if there was a statistical difference in perceived knowledge and skill level in the listed areas.

Appendix J: ReSKU Questionnaire

Queensland Government
Queensland Health

QUT

Nambour General Hospital
Sunshine Coast & Cooloola Health Service District

RESEARCH TITLE:
AN EVALUATION of RESPIRATORY ASSESSMENT COMPETENCIES FOR SURGICAL NURSES

The following questionnaire is part of a research project conducted by Beverley Duff, a Queensland University of Technology (QUT) doctoral student.

Currently I am enrolled in the Doctorate of Health Science at QUT. As a requirement of this course I am undertaking a research project which involves an evaluation of respiratory assessment competencies for surgical nurses. The study is supervised by Professor Glenn Gardner who holds a joint appointment at QUT as Professor of Clinical Nursing and Director of the Centre for Clinical Nursing at Royal Brisbane and Women's Hospital and Dr. Margaret Barnes, Senior Lecturer in Nursing, Faculty of Science, Health and Education, University of the Sunshine Coast.

I am interested in how respiratory assessment skills are perceived and utilised by nurses working in surgical wards. This research has developed from previous studies of nurses undertaking health assessment education in Australia, New Zealand and the USA.

Participation in this research is entirely voluntary. The questionnaire is anonymous. I do not wish to know your name. The questionnaire is not related to any individual's performance, or to any evaluation carried out in Nursing Education.

Completion of this questionnaire means you are giving consent and agreeing to participate in this study. You may withdraw your consent at any time.

Please tear off this top page and keep it as your reference for the study.
If you would like further information about this research please phone:

Beverley Duff	(07) 5470 6600	Pager 834	External calls
	6834	Pager 834	Internal calls

Thank you for your participation in this research.

Respiratory Assessment Questionnaire

Part 1

Please note that you do not need to include your name on this questionnaire.
Please write in the space or tick "✓" in the box which best describes your situation.

1. Age: 1☐ 20-29 2☐ 30-39 3☐ 40-49 4☐ 50 and above

2. Sex: 1☐ Female 2☐ Male

3. Number of years of nursing experience:

   1☐ Less than 6 years 2☐ 6-9 3☐ 10-15 4☐ 16-20
   5☐ 21-25 6☐ 26-30 7☐ 31-35 8☐ Over 36

4. Length of time practising as a surgical nurse:

   1☐ Less than one year 2☐ 1 but less than 3 years
   3☐ 3 but less than 6 years 4☐ 6 but less than 9 years
   5☐ 9 but less than 12 years 6☐ 12 years or more

5. Area of speciality or major interest:

   1☐ General Surgical 2☐ Colorectal Surgery 3☐ Orthopaedics
   4☐ Gynaecology 5☐ Urology 6☐ Ear, Nose and Throat
   7☐ Other

6. Highest level of education obtained:

   1☐ Hospital Certificate 2☐ Graduate Certificate 3☐ Bachelor degree
   4☐ Graduate diploma 5☐ Masters degree 6☐ PhD

7. Previous respiratory education, courses/workshops completed:

   1☐ Yes 2☐ No

   If yes, give details

   _____

   _____

   _____

8. Number of shifts worked per fortnight:

   1☐ Full time 2☐ 6-8 shifts 3☐ 2-5 shifts 4☐ Less than 2 shifts

Respiratory Assessment Questionnaire

PART 2

Please "✓" the ☐ to indicate the number of times you have used the following respiratory assessment skills over the past month.

In the past month:

	None	Once or twice a month	1-3 times a week	Daily	Several times a day
1. Assessed rate, depth and rhythm of respirations	1☐	2☐	3☐	4☐	5☐
2. Assessed use of accessory muscles	1☐	2☐	3☐	4☐	5☐
3. Assessed effort of breathing	1☐	2☐	3☐	4☐	5☐
4. Conducted palpation of chest	1☐	2☐	3☐	4☐	5☐
5. Conducted percussion of chest	1☐	2☐	3☐	4☐	5☐
6. Conducted auscultation of lungs for breath sounds	1☐	2☐	3☐	4☐	5☐
7. Assessed symmetrical chest movement	1☐	2☐	3☐	4☐	5☐

Respiratory Assessment Questionnaire

Part 3

Below are a series of statements about respiratory assessment. Please circle the point which best describes your belief about each statement.

For example: **1 = strongly agree** **5 = strongly disagree**

		Strongly Agree				Strongly Disagree
1.	Respiratory assessment is an important part of nursing practice	1	2	3	4	5
2.	Nurses should be encouraged to perform respiratory assessment of their patients	1	2	3	4	5
3.	Respiratory assessment is important for proficiency as a nurse	1	2	3	4	5
4.	Only doctors should do respiratory assessments **Deleted**	1	2	3	4	5
5.	Routine respiratory assessment improves patient care	1	2	3	4	5
6.	Routine respiratory assessment reduces complications	1	2	3	4	5
7.	Routine respiratory assessment prevents complications	1	2	3	4	5
8.	Nurses should be taught respiratory assessment in a course	1	2	3	4	5
9.	Nurses should always document respiratory assessment findings	1	2	3	4	5
10.	It is important for nurses to practise respiratory assessment	1	2	3	4	5
11.	Nurses should always take a social history	1	2	3	4	5
12.	Nurses should assess vital signs only **Deleted**	1	2	3	4	5
13.	Nurses should inform medical staff of relevant abnormal respiratory assessment findings	1	2	3	4	5
14.	Nurses should perform respiratory assessment of their client at least once a shift	1	2	3	4	5
15.	Data collected during respiratory assessments should be used to guide care	1	2	3	4	5
16.	Nurses should share findings relating to respiratory assessment at hand over	1	2	3	4	5

		Strongly Agree				Strongly Disagree
17.	Data collected should be used to develop a plan of care	1	2	3	4	5
18.	Nurses should perform respiratory assessment in collaboration with a doctor	1	2	3	4	5
19.	My knowledge and skills in respiratory assessment are very good	1	2	3	4	5
20.	I feel confident performing respiratory assessment	1	2	3	4	5
21.	Nurses should do appropriate respiratory assessments on new patients	1	2	3	4	5
22.	I have received timely feedback on my performance in relation to respiratory assessment	1	2	3	4	5
23.	I have been given the opportunity to attend respiratory assessment related professional development activities	1	2	3	4	5
24.	I could access educational resources to assist me in my clinical activities related to respiratory assessment	1	2	3	4	5
25.	I received adequate clinical supervision performing respiratory assessment	1	2	3	4	5
26.	I was given the opportunity to discuss my findings in relation to respiratory assessment with my preceptor / resource person / educator	1	2	3	4	5

Respiratory Assessment Questionnaire

Part 4 **CIRCLE CORRECT ANSWER / S**

1. What position would you place the patient in prior to listening to lung sounds and what procedure should be carried out prior to auscultation?

   a. The patient is placed in the prone position for anterior and posterior auscultation after doing a Valsalva manoeuvre
   b. The patient lies flat and is asked to breathe through their nose
   c Examine both the front and back of the chest with the person in a sitting position after asking the patient to cough and breathe at a slightly increased rate and dcpth, through an open mouth
   d The patient is placed in a sitting position and asked to hold her/his breath for one minute

2. When performing a respiratory assessment it is necessary to observe the patient for :

   a. Colour, fingernail shape and symmetrical chest movement
   b. Cough, dsypnoea and sputum
   c. Use of accessory muscles, breathing mode and tracheal position
   d. Skeletal changes, abdominal pain, turbulent and obstructed air flow
   e. a, b and c

3. The areas of the lung you would listen to lung sounds are:

   a. Rib interspaces and between the scapulae
   b. Lung bases, over manubrium and trachea
   c. Apices, lobes and over diaphragm
   d. a and b

4. How long should you listen at each site for?

   a. A full minute
   b. Five full minutes
   c. Five full breaths
   d. One full breath

5. The four normal lung sounds are:

   a. Musical, vibratory, bronchial and tracheal
   b. Tracheal, bronchial, broncho-vesicular and vesicular
   c. Adventitious, tympanic, tracheal and vesicular
   d. Creps, rhonchi, rales and scales

6. Accessory muscles of respiration include:

   a. External intercostals
   b. Internal intercostals, diaphragm
   c. Scalene, sternocleidomastoid, trapezius
   d. Pectoralis major

7. Wheezes are an indication of:

   a. Poor level of patient fitness,
   b. Bronchospasm, bronchial secretions
   c. Oedema of the bronchial mucosa
   d. a and b

8. Name two other abnormal breath sounds and their causes

_____

_____

_____

9. What sounds would you hear for:

   a Lung consolidation

_____

_____

   b. Atelectasis

_____

_____

   c. Pulmonary oedema

_____

_____

10. Atelectasis can be minimized by:

   a. Deep breathing techniques and inadequate lung expansion
   b. Incentive spirometry, positioning and early mobility
   c. Continuous positive airways pressure and avoidance of coughing
   d. Shallow breathing and prolonged bed rest

Thank you for completing this survey.
Please return to Bev Duff c/- Nursing Education

Appendix K: Questionnaire Information Poster

SUNSHINE COAST & COOLOOLA HEALTH SERVICE DISTRICT

Queensland Government
Queensland Health

QUT

Beverley Duff
RN RM BN MHM
Cert. Coronary Care
Surgical Services Education

Nambour General Hospital
P.O. Box 547
NAMBOUR Qld 4560
Phone: (07) 5470 6834
Fax: (07) 5470 5421
Pager: (07) 5470 6600 page 834
Email: beverley_duff@health.qld.gov.au

You are invited to complete the attached Questionnaire relating to Respiratory Assessment Competencies for Surgical Nurses. This pilot study is part of research being conducted by me as part of my professional doctorate studies at the Queensland University of Technology. Your participation is much appreciated.

Your input is valued because of the importance of obtaining accurate results. It's only by hearing from nearly everyone that I can be sure the results are truly representative.

The survey takes under 10 minutes to complete. Remember for Part 4; just write the first answer that comes into your head.
Thanks once again for helping with this valuable study.

Sincerely

Bev Duff

Suggestions for ways to improve the survey format are welcome.
Please comment on misleading or ambiguous questions, any typographical and grammatical errors or sections that are hard to understand.

_____
_____
_____
_____
_____

Appendix L: Study Poster

Queensland Government
Queensland Health

QUT

Have Your Say!

All Surgical Registered Nurses!

Be *part* of this STUDY

Thank you for taking part in this research study

I really value your input
evaluating our respiratory practice

I invite you to:

Complete the survey form, place it in the envelope supplied and return to me ASAP

Bev Duff
Nurse Educator
Surgical Services
(07) 5470 5103
Nambour General Hospital
Sunshine Coast & Cooloola Health Service District

Appendix M: Respiratory Assessment Questionnaire Content Validity

Evaluation Tool

This study is part of research being conducted by me as part of my professional doctorate studies at the Queensland University of Technology. Your opinion as a member of an expert panel formed to provide advice and guidance is valued.

Please review the attached questionnaire and rate each item according to the following criteria:

1 = not relevant,

2 = somewhat relevant

3 = quite relevant

4 = highly relevant

PART 2				
	1	2	3	4
Part 2 Q1				
Part 2 Q2				
Part 2 Q3				
Part 2 Q4				
Part 2 Q5				
Part 2 Q6				
Part 2 Q7				
PART 3				
	1	**2**	**3**	**4**
Part 3 Q1				
Part 3 Q2				
Part 3 Q3				
Part 3 Q4				
Part 3 Q5				

PART 3 Cont	1	2	3	4
Part 3 Q6				
Part 3 Q7				
Part 3 Q8				
Part 3 Q9				
Part 3 Q10				
Part 3 Q11				
Part 3 Q12				
Part 3 Q13				
Part 3 Q14				
Part 3 Q15				
Part 3 Q16				
Part 3 Q17				
Part 3 Q18				
Part 3 Q19				
Part 3 Q20				
Part 3 Q21				
Part 3 Q22				
Part 3 Q23				
Part 3 Q24				
Part 3 Q25				
Part 3 Q26				

PART 4				
	1	2	3	4
Part 4 Q1				
Part 4 Q2				
Part 4 Q3				
Part 4 Q4				

Part 4 Cont	1	2	3	4
Part 4 Q5				
Part 4 Q6				
Part 4 Q7				
Part 4 Q8				
Part 4 Q9				
Part 4 Q10				
Part 4 Q11				
TOTAL CVI				

Suggestions for ways to improve the survey format are welcomed.

Please comment on misleading or ambiguous questions, typographical and grammatical errors or sections that are hard to understand.

_____

_____

_____

_____

_____

_____

Thank you for taking the time to evaluate this questionnaire.

Bev Duff,

Nurse Educator Surgical Services

Appendix N: Ethical Permission

Royal Brisbane & Women's Hospital Health Service District
Office of the Human Research Ethics Committee

13 December 2004

Queensland **Health**

Enquiries to: Sharon Pavey
Phone: 07 3636 5490
Fax: 07 3636 7600
Our Ref: 2004/112
E-mail: Jennifer.Loxton@health.qld.gov.au

Dr Margaret Barnes
School of Nursing
QUT
Victoria Park Road
KELVIN GROVE QLD 4059

Dear Dr Barnes

PROTOCOL 2004/112: A CASE STUDY EVALUATION OF RESPIRATORY ASSESSMENT COMPETENCIES FOR SURGICAL NURSES

At a meeting of the Royal Brisbane & Women's Hospital Human Research Ethics Committee held on 23 August 2004, the Committee reviewed the above Protocol. The Royal Brisbane & Women's Hospital Human Research Ethics Committee is duly constituted, and operates and complies with the National Health and Medical Research Council's 'National Statement on Ethical Conduct in Research Involving Humans and Supplementary Notes, 1999'. The Chairman of the HREC reviewed your further correspondence on 2 December 2004.

It is advised that on the recommendation of the Human Research Ethics Committee, the Executive Director of Medical Services, Royal Brisbane & Women's Hospital has approved your request for ethical approval of the following:

- ***Patient Information and Consent Form Version dated June 2004***
- ***Protocol dated June 2004***

During the conduct of the study you are required to adhere to the following conditions:

- All forms required when submitting reports to the HREC are accessible on the Herston Intranet. In the first instance please access the Commencement Form and return to this office when the study commences. Please contact the Coordinator if you do not have access to this site.
- In accordance with RBWH Policy 72005: Clinical Trial Documentation, all medical records of research participants must contain documentation regarding the patient's involvement in the trial.
- All investigations must be carried out according to the "Declaration of Helsinki 2000" as subsequently modified and the latest statement by the National Health and Medical Research Council on Human Experiments and on Scientific Practice. Should a copy of the 'Declaration of Helsinki 2000' as subsequently modified be required, please request a copy from the Coordinator, Human Research Ethics Committee.
- Attachment I is a letter listing some matters specified by the National Health and Medical Research Council to which you as the research worker must adhere.
- Attachment II gives the Committee composition with specialty and affiliation with the Royal Brisbane & Women's Hospital.

Appendix O: Study Consent Form

Does participation in a respiratory education program influence a change in respiratory assessment practice amongst surgical nurses?

Researcher: Beverley Duff, 9 Lindeman Avenue, Buderim, Qld; 4556.
(Student: Doctor of Health Science, School of Public Health, QUT). (07) 5443 7324
Associated Researchers: Dr Glenn Gardner, Professor of Clinical Nursing, School of Nursing, Faculty of Health, Queensland University of Technology and Director of the Centre for Clinical Nursing, RB&WH Service District, (07) 3864 5487, Dr Margaret Barnes, School of Nursing, University of Sunshine Coast, (07) 54.59 4686

I agree to participate in the above named project and in signing below acknowledge that:

1. I have read the attached study information sheet outlining the nature and purpose of the project and the extent of my involvement, and have had these details explained to me. I have had the opportunity to ask further questions and am satisfied that I understand.

2. I am aware that, although the project is directed to the expansion of knowledge generally, it may not result in any direct benefit to me

3. I have been informed that I may withdraw from the project at my request at any time, without comment or penalty.

4. I have been advised that the District Manager, on recommendation from the Chairman of the Royal Brisbane & Women's Hospital Human Research Ethics Committee, has given approval for this project to proceed.

5. I am aware that I may request further information from the research team about the project as it proceeds and can contact the Secretary of the Royal Brisbane & Women's Hospital Human Research Ethics Committee, (07 3636 5490 if I have concerns about the ethical conduct of the project.

6. I understand that in the event of any results of the study being published, I will not be identified in any way

Name _____ **Witness** _____

Signature_____ **Signature** _____

Date _____ / _____ / _____ **Date** _____ / _____ / _____

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