# Emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients.

**Wayne Varndell**

**BSc (Nursing) Hons, PGDip (Anatomy and Physiology), PGCE, PGCert (Systemic Psychotherapy)**

**Submitted for the degree of**
**Master of Nursing (Research)**
**University of Technology, Sydney**

**February 2014.**

# Certificate of Original Authorship

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature of Student:

Date:

# Acknowledgement

This thesis has involved numerous people to whom I am deeply grateful. This work is dedicated to my family, especially my wife, Belinda, who despite many challenges was my staunchest supporter. My children, Caitlyn, Elliott and Rohan who were born during the course of this thesis, buoyed me along at every turn. I sincerely thank my supervisors, Professors Margaret Fry and Doug Elliott who offered endless guidance, encouragement, comment and support. I am grateful to them for allowing me the latitude to accomplish my goals and their never-ending patience; this thesis is as much theirs as it is mine. And to Priya Nair, administrator guru, without whom I would have been lost in a sea of paperwork - thank you for navigating me through.

I would like to thank the participants of this study for their time and generosity in sharing their clinical experiences, and those who enabled them to attend. To my manager, Elizabeth Ryan, thank you for your generous support, especially in the latter stages of completing this thesis.

Family extends beyond blood relatives; so many friends and colleagues have encouraged me, and I thank each and every one of them. This study would not have been possible without the financial support of The Edith Cavell Trust, who generously provided funds to enable the completion of this thesis.

This dissertation carries one name, but it is the work of many.

# Table of Contents

# List of Tables



# List of Figures

# List of Abbreviations

| | |
|---|---|
| ABC | Airway, Breathing, Circulation |
| Abx | Antibiotics |
| ATS | Australasian Triage Scale |
| BIS | Bispectral Index |
| BP | Blood Pressure |
| BPM | Beats Per Minute |
| CDA | Central District Ambulance |
| CNC | Clinical Nurse Consultant |
| CNE | Clinical Nurse Educator |
| CNS | Clinical Nurse Specialist |
| CNUM | Clinical Nurse Unit Manager |
| ED | Emergency Department |
| ENA | Emergency Nurse Association |
| $ETCO_2$ | End-Tidal Carbon Dioxide |
| $FiO_2$ | Fraction of Inspired Oxygen |
| GCS | Glasgow Coma Score |
| $H_20$ | Water |
| HREC | Human Research Ethics Committee |
| ICU | Intensive Care Unit |
| LMR | Limb Motor Response |
| LOC | Level Of Consciousness |
| LOS | Length Of Stay |
| MAAS | The Motor Activity Assessment Scale |
| MAP | Mean Arterial Pressure |
| mg | Milligram |
| mls | Millilitres |
| MO | Medical Officer |
| MVR | Mechanical Ventilation Rate |
| NE | Nurse Educator |
| NM | Nurse Manager |

| | |
|---|---|
| NSR | Normal Sinus Rhythm |
| PEEP | Peek End-Expiration Pressure |
| PIVC | Peripheral Intravenous Catheter |
| PSc | Pain Score |
| RASS | The Richmond Agitation and Sedation Scale |
| RN | Registered Nurse |
| RR | Respiratory Rate |
| RSI | Rapid Sequence Intubation |
| RSS | Ramsey Sedation Scale |
| SAS | Sedation-Agitation Scale |
| SBP | Systolic Blood Pressure |
| SIMV | Synchronised Intermittent Mandatory Ventilation |
| $SpO_2$ | Saturation of Peripheral Oxygen |
| TISS-28 | Therapeutic Intervention Scoring System-28 |
| USA | United States of America |
| $^{\circ}C$ | Degrees Centigrade |

# Anthology of Publications

## Publications

**Varndell, W**., Fry, M. & Elliott, D. 2011, 'Emergency nurses' practices in assessing and monitoring continual intravenous sedation for critically ill adult patients: a retrospective audit' (Abstract) *Australasian Emergency Nursing Journal*, vol. 14, no. S1, pp. 15-16.

# Abstract

**Background:** Between 2008 and 2012, the number of critically ill patients presenting to public Emergency Departments (EDs) in Australia increased by 34% (ATS 1 & 2, n=156,490); far higher than any other patient group. ED nurses are increasingly relied upon to assess and manage critically ill patients, some of whom require continuous intravenous sedation. While 'balancing' this sedation is a highly complex activity within a time-sensitive and highly pressured environment, there is little evidence within international literature relating to how ED nurses manage continuous intravenous sedation for the critically ill.

**Aims:** The aim of this study was to explore emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients.

**Method:** A two-phase sequential explanatory mixed methods study design incorporated a retrospective chart audit and semi-structured interviews.

**Ethical Approval**

Ethical approval was obtained from university and health institutional ethics committees. Written informed consent was obtained from each participant prior to the commencement of data collection. All data were de-identified and anonymised. All data were stored in accordance with university and health institutional policies.

**Results:** In Phase 1, the 12-month chart audit identified 55 patients received ongoing intravenous sedation within the ED. Median ED length of stay was 3.4 hours (range 0.8-11.3hrs), 59% were aged under 65 years and 68% male. Nursing documentation demonstrated that over 60% of patient assessments had respiratory rate, oxygen saturation, heart rate and blood pressure assessed hourly. Conversely, levels of consciousness, pain and end-tidal carbon dioxide were recorded in less than 10% of cases. Adverse events were documented in 21% of cases, with the majority drug administration related (16%).

In Phase 2, 15 semi-structured interviews were conducted. Participants were predominantly female (n=12, 80%) and clinical nurse specialists (n=8, 53%) with at least 7 years (range 3-20 years) experience in the resuscitation area. The qualitative analysis yielded five themes: 'becoming the resuscitation nurse', how ED nurses transition into the resuscitation area; 'the basics', which outlined the knowledge, skills and expertise required as the resuscitation nurse; 'becoming confident as the resuscitation nurse', gaining confidence as the resuscitation nurse; 'communicating about continuous sedation' in the ED, how physicians and resuscitation nurses shared information about the use and titration of continuous intravenous sedation; 'visual cues', which outlined how nurses were prompted by the patient to alter sedation, and 'the vanishing act', the resuscitation nurse on their own.

**Conclusion:** The study identified that the emergency nurse was responsible for the continuity of patient care, and optimisation of sedation and pain control for critically ill sedated patients. Emergency nursing practice often occurs in geographical isolation due to geographical layout of the resuscitation area and workload demands. While managing continuous intravenous sedation for critically ill patients in the ED was common, training, communication between medical staff and the resuscitation nurses about sedation was inadequate. Methods used to assess patients' needs of sedation, including pain relief, were poor. There is a need to develop Australian guidelines to assist emergency nurses in assessing, monitoring and titrating sedation for the critically ill patient. By using guidelines, the safety and effectiveness of continuous intravenous sedation for the critically ill adult patient in ED is dependent on the skill, knowledge and decision-making abilities of the nurse if adverse events are to be minimised and safety and comfort enhanced.

# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

Within Australasia the first person to assess the critically ill patient on arrival to the ED is the triage nurse (Hodge et al. 2013). On arrival a patient is assessed by the triage nurse, who will conduct a brief physiological assessment, assign a triage category and allocate the patient to a clinical area within the emergency department that has the capabilities to provide the appropriate care and management (Curtis & Ramsden 2011). The triage nurse assessment generally lasts no longer than five minutes; balancing speed and thoroughness of assessment so that delivery of appropriate and timely care is not impeded (Australasian College for Emergency Medicine 2010). Early recognition of critically ill patients at triage ensures patients are appropriately allocated to a sufficiently resourced emergency department (ED) area.

The triage nurse usually allocates a patient to one of four main clinical areas in an ED, each designed and equipped differently to reflect the level of patient care provided (New South Wales Health 2012a). These four areas are the resuscitation bay, acute area, sub-acute area and fast track (New South Wales Health 2012a). The resuscitation bay is where critically ill patients are allocated; a minimum of a one-to-one nurse-patient care ratio is provided and it is equipped with advanced monitoring systems, airway equipment, mechanical ventilators and defibrillators to manage acutely life-threatening medical emergencies such as resuscitation and trauma (New South Wales Health 2012a). The acute area typically receives patients presenting with potentially unstable or complex conditions that may require cardiac monitoring, frequent observation, specialised interventions and/or a higher-level care (Australasian College for Emergency Medicine 2007). The sub-acute area provides for low acuity ambulant patients with few co-morbidities not requiring an acute bed or cardiac monitoring, such as minor injuries and ailments (New South Wales Health 2012a). Fast track typically manages non-acute ambulant patients who have no co-morbidities, who present with

minor complaints amenable to rapid assessment and management (New South Wales Health 2012a).

Critically ill patients triaged to the resuscitation bay require immediate assessment, haemodynamic monitoring (e.g. blood pressure, heart rate and rhythm etc.) and urgent intervention. Advanced clinical assessment skills are essential for emergency nurses working in this area, as it is important that critically ill patients are evaluated thoroughly and continuously so as to manage and respond with appropriate care interventions (Nguyen et al. 2000a). Historically, physical assessment and interpretations of findings has been the remit of medical staff (Watson 2006). With the rapid changes seen in emergency healthcare, the introduction of early patient deterioration detection systems (Clinical Excellence Commission 2007) and standardised training programs (New South Wales Health 2002), emergency nurses increasingly conduct physical assessments, interpret clinical findings and implement/titrate therapies to optimise the care and welfare of critically ill patients in the resuscitation bay.

Critically ill patients can require continuous intravenous sedation for injury prevention purposes, and to facilitate medical and humanistic goals (Barr, Leitner & Thomas 2004; Consortium for Spinal Cord Medicine 2008; Young et al. 2000). Injury prevention purposes arise when patients if left without adequate sedation may lead to causing injury to themselves or others such as co-patients and staff. A further example would be to prevent the patient from removing their endotracheal tube when being mechanically ventilated leading to airway obstruction (Barr et al. 2013). The second reason relates to managing extremely aggressive patients under the influence of psycho-stimulants that pose an immediate risk of injuring themselves, staff or co-patients (Quensland Health 2008; Spain et al. 2008). Providing continuous intravenous sedation can facilitate the promotion of better mechanical ventilator compliance, controlling cardiopulmonary function (Dennis & Mayer 2001), lowering of intracranial pressures and cerebral metabolic demands to prevent cerebral hypoxia, ischaemia and oedema (Scalea 2005). Finally, continuous intravenous sedation can be provided for humanistic purposes to prevent mental suffering, such as maintaining patients unaware of the

distressing situation of being medically paralysed to prevent worsening of injuries such as spinal fractures (McCann et al. 2002).

### 1.1.1 *Statement of the problem*

Adequate sedation and analgesia is paramount in optimising patient comfort, pain control and wellbeing of critically ill patients, who are inflicted with a barrage of noxious stimuli and invasive procedures such as insertion of endotracheal tubes, central venous catheters, indwelling urinary catheters and monitoring devices. Critically ill or injured patients require deep levels of sedation balanced with their needs and physiological tolerances (Bahn & Holt 2005; Miner et al. 2005). Within the ED, emergency nurses are increasingly responsible for managing sedation of critically ill patients, yet to date, how emergency nurses determine depth of sedation depth and when pain relief is required are unclear.

### 1.1.2 *Purpose of the study*

The purpose of this study was to examine how emergency nurses' assess, monitor and manage continuous intravenous sedation for critically ill adult patients.

### 1.1.3 *Research questions*

I. What are emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients?

II. What factors influence emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients?

III. What are emergency nurses' practices in administering continuous intravenous sedation for the critically ill patient?

IV. How do emergency nurses document assessment, monitoring and managing continuous intravenous sedation for critically ill patients?

### 1.1.4 *Significance of the study*

This study was designed to fill a gap within the prevailing emergency practice literature concerning sedation. This gap is evident from the comprehensive literature review presented in the following chapter. Research evaluating the use of sedation within the ED setting has focused upon ED physician safety outcomes in administering conscious sedation and pharmaceutical choice. The role of emergency nurses in managing continuous intravenous sedation in high-risk patient cohorts such as critically ill or injured patients has, to date, remained unexamined. This thesis generates new knowledge that provides insight into how emergency nurses assess, monitor and manage continuous sedation in the critically ill patient.

### 1.1.5 *Thesis structure*

This thesis comprises seven chapters. Chapter Two presents a comprehensive review of the literature. Chapter Three presents the methodology which includes mixed methods study design, data integration and analysis. Chapter Four presents the methods used in Phase 1 and two and includes data storage and management strategies, integration and mixed methods data analysis, rigour of the study and ethical considerations. Chapter Five presents the 12-month medical record audit findings (Phase 1). Chapter Six presents the findings of the 15 semi-structured interviews (Phase 2). Chapter Seven presents a discussion and the meta-inference interpretation of the integrated findings and the identified literature. This is then followed by the implications for emergency nursing practice, education, future research and policy based on the findings of this study.

## 1.2 Summary

This chapter has introduced the purposes and significance of this study, and has further discussed the structure of this thesis. The thesis presented here generates new knowledge and deeper insight into how emergency nurses undertake their role in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Introduction

The following literature review provides an overview of the development of emergency departments (ED) in Australia and identifies how critically ill adult patients requiring continuous intravenous sedation are managed. Sedation and its role in the management of the critically ill patient is presented. In particular the role of the emergency nurse in assessing, monitoring and administering continuous intravenous sedation for the critically ill adult patient is explored. In addition, current evidence of sedation policies and guidelines for nursing will be explored.

### 2.1.1 *Databases accessed*

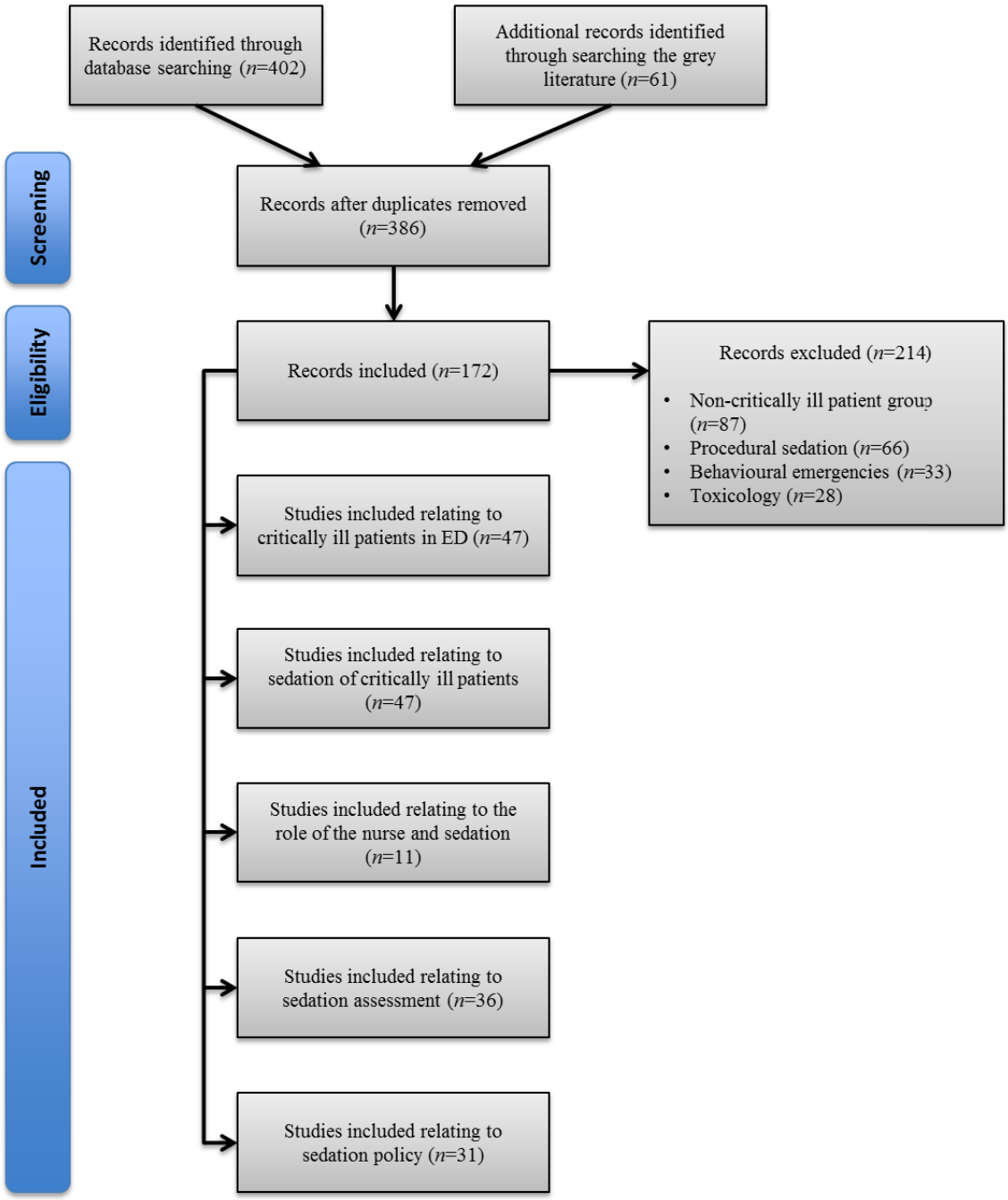
A comprehensive literature search was conducted using the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), EMBASE, Medline, ProQuest and Science Direct. The Cochrane Library and the National Institute of Clinical Excellence databases were also searched. The review was supplemented with a manual search of reference lists from relevant research studies and grey literature. Grey literature included organisational and professional associations related to emergency, sedation or critical care and Google Scholar. The grey literature was explored for policies, guidelines and recommendations relating to sedation.

### 2.1.2 *Review search strategy*

The search covered the period from 1946 to 2013. No date or language restrictions were applied. Several search terms were used to identify potential studies concerning the assessment, monitoring and administering continuous intravenous sedation for the critical ill adult (>16 years) patient in ED: 'assessment AND sedation AND emergency department', 'sedation AND emergency department', 'continuous sedation', 'emergency OR nurse AND sedation', 'measuring sedation' and 'sedation scale'. A total of 463 articles were initially identified using the above search terms. After removing duplicate records ($n$=77) 386 articles remained. Of the 386 articles, 214

(55%) were excluded as they lacked relevance to any aspect of the research questions. Of the total articles (*n*=386) identified, 172 (45%) were incorporated and comprehensively examined using the Critical Appraisal Skills Program '*Making Sense of Evidence Tools'* (Critical Appraisal Skills Program UK 2011) (Figure 1).

**Figure 1: Search results**



## 2.2 Australian Emergency Departments: a historical perspective

In Australia, while designated EDs began in the early 1970s they functioned mainly as an after-hours hospital entry point where patients were cared for and monitored by ward nurses until the on-duty physician arrived. Emergency medicine and nursing have developed into a recognised clinical speciality as patient presentations increased, demand for emergency care grew, technological advancements were achieved and resuscitation procedures were optimised (Fry 2007).

EDs today specialise in delivering care for a range of minor, acute and critically ill patients. Consequently, EDs provide initial treatment for a broad spectrum of patient conditions, illnesses and injuries, which range from the most minor to immediately life-threatening conditions. EDs are classified according to the services they provide with Level 6 tertiary EDs operating 24-hours a day all year through, although staffing levels may be varied to match patient presentation and volume, and are state-wide referral centre providing definitive care for all levels of emergency (The Independent Hospital Pricing Authority 2009). The ED is the only clinical area of the hospital where any number of patients can be admitted and held, compared to hospital wards (Redfern, Brown & Vincent 2009), and has come to be viewed as the main 'doorway' into the hospital (Australasian College for Emergency Medicine 2007).

By the mid-1980s, the expectation to provide specialised emergency care led both nursing and medical staff to become highly trained and permanently based in the ED. As a result, over the last four decades, emergency nursing knowledge and clinical expertise has expanded (Bennett 1995; Whyte 2000). Today, emergency clinicians typically manage many patients simultaneously, in much greater variety, age range (e.g. paediatric patients), complexity and increased numbers than in other hospital clinical care areas. Emergency nurses now provide highly skilled care across the lifespan; blending theoretical knowledge, experience, insight and highly developed communication and leadership skills to prioritise, assess, diagnose, treat and evaluate patients presenting to the ED (Fry 2007).

From 2008 to 2012, the number of patients presenting to Australian public hospital EDs had increased by nearly 800,000 (n=797,680; 14%). Hospitals in New South Wales had the most presentations (n=1,958,834; 35% and n=2,174,611; 34% for 2008 and 2012 respectively) compared to other states and territories (Table 1).

**Table 1: Number of patient presentations to public hospital EDs between 2008 and 2012**

| ***State/Territory*** | **2008** | **2012** | **Difference (N/%)** |
|---|---|---|---|
| New South Wales | 1,958,834 (35) | 2,174,611 (34) | 215,777 (11) |
| Victoria | 1,317,635 (24) | 1,479,491 (23) | 161,856 (12) |
| Queensland | 1,063,074 (19) | 1,209,948 (19) | 146,874 (14) |
| Western Australia | 558,896 (10) | 715,890 (11) | 156,994 (28) |
| South Australia | 352,464 (6) | 422,037 (7) | 69,573 (20) |
| Northern Territory | 121,828 (2) | 140,799 (2) | 18,971 (16) |
| Tasmania | 125,136 (2) | 135,998 (2) | 10,862 (9) |
| Australia Capital Territory | 101,531 (2) | 118,304 (2) | 16,773 (17) |
| **Total**[a] | **5,599,398 (100)** | **6,397,078 (100)** | **797,680 (100)** |

[a]*Includes emergency presentations for which a triage category was not reported. Source: Australian Institute of Health and Welfare (2013).*

Over the same time period, the number of critically ill patients admitted to EDs also increased by over 25% (ATS 1 and 2, *n*=111,887; 26%). Explanations for this increase have included: limited inpatient bed capacity, case-mix, access block, surge, resource availability and an ageing population (Forero & Hillman 2008; Hargrove & Nguyen 2005; Lambe et al. 2002; Nguyen et al. 2000b; Richardson 2009). Access block specifically relates to the availability of an inpatient bed, for example, in the Intensive Care Unit (ICU). However, the timing of ED critically ill patient transfers to ICU is often also dependent on factors that include patient physiological status, the need for definitive diagnostic imaging and staff availability (Nguyen et al. 2000a; Svenson, Besinger & Stapczynski 1997).

Patients that require transfer to ICU are considered critically ill. Critical care is defined as the assessment and treatment of unstable or potentially unstable cardiovascular, respiratory, metabolic and neurological processes (Crouch 2003) requiring constant assessment and titration of therapies, such as drug administration (Cowan & Trzeciak 2005). Critically ill patients that present to ED with life-threatening conditions require immediate resuscitation or emergency life-saving interventions. The Australasian Triage Scale (Australasian College for Emergency Medicine 2002) is used to assist decision-making at triage by categorising a patient's level of urgency and need for immediate resuscitation or emergency life-saving interventions (Table 2).

**Table 2: Australasia Triage Scale and response times**

| ATS category | Response time |
|---|---|
| 1 (Immediately life- threatening) | Requires immediate intervention |
| 2 (Imminently life-threatening) | Requires intervention within 10 minutes |
| 3 (Potentially life-threatening) | Should be seen within 20 minutes |
| 4 (Potentially serious) | Should be seen within 60 minutes |
| 5 (Less urgent) | Should be seen within 120 minutes |

*Source: Australasian College for Emergency Medicine (2013)*

The Australasian Triage Scale (ATS) is a five-point scale of urgency ranging from one to five and linked to ED response times. Each ATS triage category is defined by criteria that include key medical history findings, signs and symptoms, and potential urgent diagnoses (e.g. possible ectopic pregnancy).

In 2012, the majority ($n$=2,874,304; 45%) of patients presenting to EDs in Australia had semi-urgent conditions (Table 3), while the the largest increase ($\Delta$=155,307, +31%) in patient urgency was triage category 2 (Australian Institute of Health and Welfare 2008, 2013).

**Table 3: Number of patient presentations between 2008 and 2012 by ATS category**

| ATS | Number of patient presentations in 2008 (%) | Number of patient presentations in 2012 (%) | Difference (N/%) |
|---|---|---|---|
| 1 (Resuscitation) | 41,245 (1) | 42,428 (1) | 1,183 (3) |
| 2 (Emergency) | 499,350 (9) | 654,657 (10) | 155,307 (31) |
| 3 (Urgent) | 1,809,074 (32) | 2,186,157 (34) | 377,083 (21) |
| 4 (Semi-urgent) | 2,559,509 (46) | 2,874,304 (45) | 314,795 (12) |
| 5 (Non-urgent) | 687,755 (12) | 642,421 (10) | -45,334 (-7) |
| **Total**[a] | **5,596,933 (100)** | **6,399,967 (100)** | **803,034 (61)** |

[a]*Excludes emergency presentations for which the triage category was not reported. Source: Australian Institute of Health and Welfare (2013).*

Across Australasia critically ill patients are triaged as category one or two (Australasian College for Emergency Medicine 2002), and allocated to the resuscitation bay as they require immediate assessment and lifesaving interventions.

## 2.3 The resuscitation emergency nurse and managing the critically ill patient

The literature provides evidence that part of the routine role of emergency nurses is the care of the critically ill patient receiving continuous intravenous sedation in the resuscitation bay (Emergency Nurses Association 2008). Initial resuscitation and stabilisation of the critically ill or injured patient is a core component of emergency nurses role when allocated to the resuscitation bay. In the resuscitation bay patients undergo lifesaving procedures, often at a crucial phase in their care (Nguyen et al. 2000a; Rivers et al. 2002; Trzeciak et al. 2006).

Critically ill patients' haemodynamic status can change minute-by-minute, and therefore require close nursing assessment and monitoring specifically of their physiological state (vital signs) (Varndell et al. 2013). The term vital signs is generally

used to describe a set of physiologic measures that includes heart rate, blood pressure, respiratory rate, temperature, peripheral oxygen saturation, pain severity/level and level of consciousness). The frequency by which patient vital signs are assessed, as Krauss (2008) opined relates to patient depth of sedation as patient depth of sedation increases the frequency of vital signs assessment should increase. Further, as patient depth of sedation increases, monitoring patient vital signs moves from being episodic to being continually evaluated and graphed in real time (Table 4).

**Table 4: Monitoring guidelines for levels of sedation**

| Sedation level | Monitoring | Frequency |
|---|---|---|
| Minimal | LOC | Frequently observed |
| | HR, RR | Recorded every 15 mins |
| | BP | Recorded every 30 mins |
| | $SpO_2$ | Monitored continuously |
| | | Recorded every 15 mins |
| Moderate | LOC | Constantly observed |
| | HR, RR | Monitored continuously |
| | | Recorded every 10 mins |
| | BP | Monitor attached |
| | | Recorded every 15 mins |
| | $SpO_2$ and $ETCO_2$ | Monitored continuously |
| | | Recorded every 10 mins |
| Deep | LOC | Constantly observed |
| | HR, RR | Monitored continuously |
| | | Recorded every 5 mins |
| | BP | Monitor attached |
| | | Recorded every 15 mins |
| | $SpO_2$ and $ETCO_2$ | Monitored continuously |
| | | Recorded every 5 mins |
| General anaesthesia | LOC | Constantly observed |
| | HR, RR | Monitored continuously |
| | | Recorded every 5 mins |
| | BP | Monitor attached |
| | | Recorded every 15 mins |
| | $SpO_2$ and $ETCO_2$ | Monitored continuously |
| | | Recorded every 5 mins |

Key: LOC, level of consciousness; HR, heart rate; RR, respiratory rate; BP, blood pressure, $SpO_2$, peripheral oxygen saturation; $ETCO_2$, end-tidal carbon dioxide.

*Source: Krauss (2008)*

Patient vital signs are commonly used by nurses as a means of providing objective information about a patient's response to sedation (Riess et al. 2002). Vital signs are measured and recorded electronically through monitors attached to the patient, and displayed in a continuous real-time on monitors located at each patient's bed space. While emergency nurses rely on vital sign information to regulate and manage critically ill patients requiring sedation, research suggests that other physiologic indicators of sedation are also important.

Young (2000) argued that the depth of sedation must be individualised to the patient's injuries or condition and sedation needs. If the indication for sedation is one of injury prevention, a lighter state of sedation may be aimed for to allow the patient to communicate with staff (Calver, Bulsara & Boldy 2006). If the indication for sedation is to facilitate an individual clinical goal, the sedation level may need to be somewhat deeper (Young et al. 2000). For the emergency team achieving and maintaining a specific depth of sedation without jeopardising patient or staff safety, requires significant on-going nursing vigilance (Olson, Thoyre & Auyong 2007).

Patients' responses to sedation can be unpredictable; not only within and between patient populations, but also within a single hospital stay for an individual patient (Australian and New Zealand College of Anesthetists 2010; Coté et al. 2009; Mehta, McCullagh & Burry 2009; Rowe & Fletcher 2008; The American Society of Anethesiologists 2009). Hence, the challenge for emergency nurses in maintaining an appropriate depth of sedation suitable to the critically ill patient's needs and metabolic capabilities also requires on-going monitoring of the patient's neurological status (Shehabi et al. 2013). Emergency nurses therefore require expert skill and knowledge to respond to events such as drug accumulations, minute-by-minute changes in the patient's physiological status, changes in renal, liver and endocrine function and the synergistic or drug-to-drug interactions to increase or decrease the effectiveness of sedation.

In this way emergency nurses need to be able to determine and manage the required and appropriate depth of sedation for critically ill patients (Reschreiter, Maiden & Kapila 2008; Shehabi et al. 2013; Young et al. 2000). However, how emergency nurses assess, monitor and manage the sedation of critically ill patients remains unclear within the literature, as will be shown next.

### 2.3.1 *Preparing and managing procedures in the resuscitation area*

The emergency nurse is required to prepare, administer and manage continuous infusions of both a sedative and an analgesic agent for critically ill patients. However, within the literature the manner in which these agents are prescribed varies across sites, as they can be mixed together (e.g. morphine and midazolam) or infused separately. When medications are mixed together, the emergency nurse's ability to independently control pain and depth sedation is made more difficult (Rex 2006). More importantly, there is evidence to suggest that when mixed together there is a greater risk of adverse patient events. Many authors have provided evidence of increased frequency of life-threatening complications due to the synergistic effect generated by concurrently administering sedatives with analgesics (Barr et al. 2013; Bhananka et al. 2006; Jacobi et al. 2002).

Of note, continuous intravenous sedation has been associated with higher levels of patient mortality, ranging from 30% to 52% (Barr et al. 2013; Rodrigues & do Amaral 2004). Excessive administration of intravenous sedation can depress protective airway reflexes such as coughing and gagging, and thereby increase the risk of passive regurgitation and aspiration of gastric contents. Complications and adverse events have been noted to arise from maintaining patients at deeper sedation levels than necessary (Shehabi et al. 2013). It is therefore critical that emergency nurses ascertain whether it is sedation that needs to be deepened or further analgesia to relieve pain. To date it is unclear within the literature how emergency nurses determine sedation depth and or when pain relief is required.

The emergency nurse must assist in, prepare or undertake numerous other clinical activities for critically ill patients while working within the resuscitation area. A recent study by Green et al. (2009) examined the impact of critical care procedures conducted in the ED and patient length of stay. The retrospective ED medical record audit of critical care patients (*n*=178) identified that the majority (80/125, 64%) of procedures related to endotracheal intubation, insertion of central venous (3/10, 30%) and arterial (14/99, 14%) catheters, and chest tube insertion (4/8, 50%). Green et al. concluded that while critically ill patients were managed in the ED for a considerable length of time (mean 6.5h, median 4.9h, range 1.4-28.2h), critical care ED procedures conducted did not impact on overall patient length of stay. This finding was consistent with other authors (Clark & Normile 2007; Fromm et al. 1993; McCaig & Nawar 2006; Meggs, Czaplijski & Benson 1999).

A study by O'Connor et al. (2009) and colleagues calculated nursing care time using the Therapeutic Intervention Scoring System-28 (TISS-28) based on documented resuscitation area clinical interventions. In the retrospective medical record audit of critically ill ED patients (*n*=69), the median TISS-28 score for patients was 19 (range 9-34). One TISS-28 point equates to 10.6 minutes of each eight hour nurses' shift. Therefore, the range of nursing care time per patient was 95-360 minutes (1.6-6h), with a median value of 201 minutes (3.4h). The total demand on nursing care time for patients was 13,356 minutes (222h, or 9.25 days). Comparatively, in a time-and-motion study examining the impact of critically ill patients (*n*=50) and emergency physician workload, Graff et al. (1993) calculated that the median time demand was 32 minutes (0.5h) of doctors' time per patient.

Importantly, ED physicians rely on emergency nurses allocated to the resuscitation bay to assess, monitor and initiate care to maintain patient safety and welfare, and consultative input from intensive care medical specialists (Graham 2009). In the ED, emergency physicians are unable to provide continuous care to critically ill patients given that they manage the needs of other patients. Therefore, management of critically ill patients and the role of the emergency nurse in providing care is essential to

optimising patient outcome and survival (Bur et al. 1997; Nguyen et al. 2000a; Rady, Rivers & Nowak 1996). Nonetheless, there is a paucity of published research of how emergency nurses undertake care practices within the resuscitation area for critically ill patients.

Emergency nurses manage critically ill patients for increasing lengths of time in the resuscitation bay until they transfer the patient to ICU (Nguyen et al. 2000a; Rose & Gerdtz 2007). In Australia, Carter et al. (2010) retrospectively explored the relationship between ED length of stay (LOS) for critically ill patients ($n$=48,803) and ICU mortality across 45 hospitals. It was noted that the majority ($n$=39,530, 81%) of severely ill patients had a median LOS of 3.9hrs (IQR 2.0-6.8) in ED, with nearly one fifth ($n$= 9273; 19%) of patients spending longer than 8 hours in the ED prior to transfer to the ICU. In a later prospective study conducted in Brazil, Cardosa et al. (2011) found a significant ($p$=0.002) increase in mortality for patients delayed in being admitted to ICU. The mortality risk attributable to ICU delay was 30% (95% CI: 11.2-44.8%), with each hour of delay independently associated to an increased risk of ICU death of 1.5% (hazards ratio: 1.015; 95% CI 1.006 to 1.023; $p$=0.001). These studies demonstrate that critically ill patients are staying longer in ED and so increasing the importance of the role of the emergency nurse given that they provide much of the on-going care while the patient waits to be transferred to ICU.

Many patients while awaiting transfer to an ICU require on-going assessment by emergency nurses to determine care needs. More specifically, emergency nurses will reassess the patient to determine the on-going need for intravenous sedatives, analgesics and or paralysing agents. The literature suggests that the nurse's use of sedatives, analgesics and paralysing agents is to ensure the comfort and stability of the patient and interventions such as mechanical ventilation (Aitken et al. 2009; Rose & Gerdtz 2007). Hence, emergency nurses are relied on to frequently assess for and manage continuous intravenous sedation infusions. The emergency nurse is essential to ensuring the safe management of the critically ill patient receiving continuous intravenous sedation

infusions in the ED until the patient is transferred to ICU (Hole & Klepstad 1999b; Smally & Nowicki 2007).

Balancing procedures, medical therapies with pharmacological agents in the presence of patient haemodynamic instability and limited physiological reserves, is highly complex (Aitken et al. 2007). Yet, this is part of the emergency nurses role when working in the resuscitation area (Emergency Nurses Association 2008). The continuing care of the critically ill patient remains the responsibility of the emergency nurse until the patient is transferred to an ICU.

### 2.3.2 *Sedation assessment by emergency nurses*

Aiken (2007) suggested that the physiological data gathered by emergency nurses enables them to make a determination about the type and quantity of pharmacological agents to support care practices. Typically, sedation assessment involves gathering information, both physically and physiologically (Rose & Gerdtz 2007). Physical information can alert the emergency nurse that the patient requires an alteration in sedation treatment. Examples include: head thrashing and pulling at invasive lines/devices such as intravenous cannula or indwelling urinary catheter. Physiological data provides the means for understanding different components of consciousness that create a more comprehensive overall picture of the patient's sedation level and requirements. Physiological information includes: increased breathing rate, cardiac changes, radiographic data and laboratory findings. The emergency nurses' sedation management is highly complex. Undertaking sedation management demonstrates advanced skill and knowledge for understanding how physiological changes may reflect sedation and analgesic patient need (Aitken et al. 2007). While emergency nurses gathered physiological data to assist in sedation decision-making, no observational sedation-scoring assessment instruments were identified in the literature as being used within Australasian EDs by emergency nurses. However, there is growing evidence to suggest that observational sedation-scoring assessment tools may enhance nursing management of sedation of critically ill patients receiving continuous sedation.

## 2.4 Sedation tools used to assess the critically ill patient

The literature review identified 26 observational sedation-scoring assessment tools developed and tested with varying degrees of validity, reliability and responsiveness in the critically ill patient population (Appendix 1). Observational sedation assessment tools have been developed by various authors, and are similar in form and format. The tools are used to rate the level of sedation based upon a single direct observation and interaction with the patient such as in response to applying a noxious stimulus.

There was little published evidence that sedation tools have been developed or tested within the ED setting. Within the literature the only common tool used within the ED was Glasgow Coma Scale (GCS) (Teasdale & Jennett 1974b). However, the tool was not developed to measure sedation but was designed to objectively measure and quantify the prognosis of a brain injured patient (Gill, Reiley & Green 2004; Kelly 2005; Proehl 1992; Skinner, Driscoll & Earlam 1996; Teasdale & Jennett 1974a). While the GCS is used erroneously in the ED to quantify and deliver sedation this was not the design of the tool (Bion 1988; Ely et al. 2003; Gabbe, Cameron & Finch 2003; Hole & Klepstad 1999a; Lewin III et al. 2008; Pasero & McCaffrey 2002; Riker & Fraser 2005; Sessler 2004; Watson & Kane-Gill 2004; Westcott 1995). Within the literature there was evidence of reliable and valid observation sedation tools, which better measure sedation needs for the critically ill patient.

In the critical care literature observational sedation-scoring tools that had been validated were commonly cited. These tools are commonly used by ICU nurses and rely on observational methods of sedation assessment to determine when and how to adjust sedative dosages. Dose adjustment was indicated for agitation, pain and or ability to respond to physical auditory stimulus (Jacobi et al. 2002). In a recent multicentre (n=41), bi-national (Australian and New Zealand) point prevalence study (Elliott et al. 2013) of ICU patients (n=569) and the assessment and management of analgesia, sedation and delirium, four observational sedation-scoring scale tools were commonly

used: Ramsey Sedation Score, Sedation-Agitation Scale, Motor Activity Assessment Scale and the Richmond Agitation and Sedation Scale.

### 2.4.1 ***Ramsay Sedation Scale***

The Ramsay Sedation Scale (RSS), first published in 1974, is a single-item tool frequently used in ICU to measure consciousness across three levels in critically ill patients who are awake and three levels in patients who are judged to be asleep (Ramsay et al. 1974). Concern has been raised, however, that the levels of sedation described are not clear or mutually exclusive (Cowan & Trzeciak 2005). Despite these concerns in the literature, the RSS continues to be the most widely used observation sedation-scoring assessment tool for evaluating sedation levels in ICUs and other critical care areas (Reschreiter, Maiden & Kapila 2008).

While researchers widely cite the usefulness of the RSS observational sedation tool there has been little psychometric testing (Devlin et al. 1999; Gill, Green & Krauss 2003; Jacobi et al. 2002; Soliman, Mélot & Vincent 2001). The first reliability study was completed in the late 1990s after the original study had been published, and observed a high inter-rater reliability ($\kappa_w$=.88, p<.001). Subsequent assessments have demonstrated similarly high inter-rater reliability levels ranging from .85 (Brandl et al. 2001) to a weighted kappa of .94 (Schulte-Tamburen et al. 1999).

Initial construct validity of the RSS was first demonstrated by Carrasco et al. (Carrasco et al. 1992) and colleagues when comparing it with the Newcastle Sedation Scale. Several others studies have since demonstrated the construct validity of the RSS by comparing it with changes in patient's audio evoked potentials ($\tau$=.71, p<.05) in response to sedation (Schulte-Tamburen et al. 1999) and changes in patient sedation as measured by the Harris Sedation Scale (Riker, Fraser & Cox 1994; Riker, Picard & Fraser 1999) which demonstrated a high correlation coefficient of .83 (p<.001). Within the literature the RSS remains one of the most widely accepted and validated tools for assessing sedation in critically ill patient.

### 2.4.2 *The Sedation-Agitation Scale*

The Sedation-Agitation Scale (SAS) is a single-item seven point scale developed by Riker and colleagues (Riker, Fraser & Cox 1994) and commonly used within ICU. Scores ranged from one, indicating the lowest level of responsiveness (deep sedation), to a maximum of seven, (severe agitation). Each score had a primary category designation and a description.

In 2002, the SAS tool was demonstrated to have good inter-rater reliability (κ=.91, $p$=<.001) between five raters independently assessing 192 critically ill patients across several ICUs (Sessler et al. 2002). The SAS was the first observational sedation-scoring tool to be validated against bispectral index evaluations of patient depth of sedation. A series of studies comparing BIS with SAS assessments of depth of sedation in ICU patients found moderate to high correlation, that ranged from $r^2$=.48 (Epstein et al. 2012) to above 0.7 (Dahaba et al. 2006; Deogaonkar et al. 2004; LeBlanc et al. 2005).

Initial construct validity of the SAS was evaluated against the Richmond Agitation and Sedation Scale (Sessler et al. 2002) and the Agitation-Calmness Evaluation Scale (Battaglia et al. 2003). There appears to be no published evidence that the SAS has been used within the ED setting.

### 2.4.3 *The Motor Activity Assessment Scale*

The Motor Activity Assessment Scale (MAAS), is a single-item tool with seven response-defined categories of behaviour, which originated from the SAS and is therefore structurally similar to the SAS (Devlin et al. 1999). Initial reliability testing of the MAAS was undertaken by Devlin et al. (1999) in a prospective randomised control study involving 25 critically ill patients, culminating in 400 independent pair-wise assessments. Devlin et al. (1999) examined MAAS using simple linear regression to explore the relationship of MAAS and a 10cm visual analogue scale. The authors' reported high inter-rater reliability (κ=.83). The investigators concluded that the MAAS was superior to the Luer Sedation Scale (Luer 1995) based upon the observation that MAAS scores were less variable ($r$=.75-.94, vs. $r$=.37-.94 respectively). However, the

study conducted by Devlin (1999) and its subsequent conclusions had two major flaws. First, the authors failed to recognise the nearly identical inter-class correlation scores of MAAS ($r$=.81) and Luer ($r$=.79), and second, what the authors referred to as the Luer Sedation Scale was not published as a sedation tool, but was rather the description of a protocol for adjusting sedation. The MAAS, while used in numerous ICUs, has not had adequate psychometric evaluation (Sessler 2004; Stawicki 2007). Currently, there is insufficient evidence to warrant use of the MAAS as a new method of evaluating critically ill patients requiring sedation. Within Australasian EDs there was no evidence of its use by emergency clinicians.

### 2.4.4 *The Richmond Agitation and Sedation Scale*

The Richmond Agitation and Sedation Scales (RASS) is a single-item scale that has ten levels of response, which range from minus five to plus four. The RASS requires the nurse to complete a three-step assessment process. In a study by Sessler et al. (2002), the RASS demonstrated high ($\kappa_w$=.73-.96) inter-rater reliability. Sessler et al. also compared RASS scores to the subjective assessments by nurses using a visual analogue scale (VAS), SAS, RSS and GCS to measure construct validity. All correlations were positive and statistically significant (VAS $r$=.84, $p$=<.001; SAS $r$=.78, $p$=<.001; RSS $r$=.78, $p$=<.001; GCS [total score] $r$=.79, $p$=<.001). Similarly, other studies have reported high ($\kappa_w$=.91) levels of inter-rater reliability (Ely et al. 2003) and construct validity with BIS (Deogaonkar et al. 2004; Turkman et al. 2006) and SAS and VAS (Rassin et al. 2007) and the Sedic Scale (Binnekade et al. 2006).

The RASS is the only commonly used tool that has been examined for responsiveness, the degree by which a tool detects small but clinically important changes in a patient's status (Elliott 2007). Ely et al (2003) compared RASS depth of sedation scores to sedative plasma levels. The RASS was statistically ($r$=.31, p<.001) sensitive to change in patient depth of sedation up to eight hours after the initial dose of sedation. The RASS has had some testing of psychometric properties, reliability and validity ($n$=10

vs. $n$=6 respectively). Within Australasian EDs there was no evidence of its use by emergency clinicians.

### 2.4.5 *Outcome of sedation-scoring assessment tool use*

Use of sedation-scoring assessment tools has been demonstrated to improve nurse assessment and titration of sedation (Guttormson et al. 2010). Additionally, nurses' attitudes towards the efficacy of sedation for mechanically ventilated patients were observed to positively correlate with nurses' report of their sedation practices (rs =0.28, $p$=<0.001), and their intent to administer sedation ($p$=<0.001). A key factor that differentiated between those utilising assessment scale tools, utilising protocols and level of nursing qualification ($p$=<0.01), addressed quality of communication between the nurse and physician. Additionally, nurses that used an assessment scale tool more strongly agreed that physicians considered the nursing assessment when determining the patient's sedative needs ($p$=0.03).

A survey of critically ill patient sedation practices was conducted by the American Association of Critical Care (De Jong et al. 2005). Adult ICU nurse clinicians completed the survey and of those sampled ($n$=1250), 423 (34%) respondents identified that sedation-scoring assessment scale tools improved confidence in sedation administration compared to those who did not use any sedation assessment scale tools ($p$=0.001).

This review identified that observational sedation-scoring assessment tools have been beneficial in assessing critically ill patients receiving intravenous continuous sedation. However, varying levels of validity and reliability have been reported for the most commonly used sedation-scoring assessment tools. Nonetheless, the use of observational sedation-scoring assessment tools in conjunction with physiologic data may provide more information for nurses about the level of sedation then either tool or physiological monitoring of patient's vital signs alone (Avramov & White 1995; Olson, Thoyre & Auyong 2007). Unfortunately to date, there is no evidence that emergency nurses utilise sedation-scoring assessment tools to manage sedation in critically ill

patients. The only tool evident in ED clinical practice was the GCS and this was never tested nor designed to measure sedation.

## 2.5 Pharmacological interventions used to sedate the critically ill patient

Within the literature the sedation of critically ill ED patients focused on a host of pharmaceutical interventions that included sedatives, vasopressors, vasodilators, paralytics, analgesics, antibiotics, thrombolytics and anticoagulants. It has been demonstrated that early pharmaceutical interventions and administration in the management of ED trauma (Cowan & Trzeciak 2005) and septic patients (Intensive Care Society of Ireland 2006) have minimised avoidable patient deaths. Therefore, both emergency physicians and nurses require high levels of skill, knowledge and experience in the administration and continuous use of pharmaceutical agents to optimise the critically ill patient's safety and welfare.

Sedation is achieved using a variety of pharmacological agents and techniques. Terms such as, 'conscious sedation', 'moderate sedation', 'opiate-induced sedation', or 'procedural sedation' are used interchangeably in literature to refer to the intent or approach taken in employing sedation (American Society of Anesthesiologists 2009; Australasian College for Emergency Medicine 2003; Nisbet & Mooney-Cotter 2009). Within Australia, the term 'procedural sedation' is used to describe the administration of sedation to achieve "… a state … of tolerance of uncomfortable or painful diagnostic or interventional medical, dental or surgical procedures. Lack of memory for distressing events and/or analgesia are desired outcomes, but lack of response to painful stimulation is not assured." (Australian and New Zealand College of Anesthetists 2010, p. 1-2). Sedation, as Jacobi (2002) described it, is part of a continuum of decreasing levels of consciousness, caused by the effect of drugs on the brain, which can be divided into four levels: minimal, moderate, deep, and general anaesthesia.

Minimal sedation levels would only be employed when needing to reduce anxiety for a patient. This level is achieved typically through the use of benzodiazepines that can be administered orally or intramuscularly but rarely intravenously (Marchesi et al. 2004). Moderate sedation (procedural sedation) is commonly used in the resuscitation bay, when needing to briefly lower a patient's awareness and anxiety levels in order to conduct a non-life-threatening procedure such as cardioversion (Bahn & Holt 2005; Burton & Asher 2006; Hohl et al. 2008; Innes et al. 1999; Miner et al. 2005). To achieve moderate sedation short-acting intravenous hypnotic agents such as propofol are given as a pre-calculated bolus, alongside quantities of ketamine or fentanyl (Shehabi et al. 2013).

Patients requiring life-saving interventions such as mechanical ventilation need to be deeply sedated (Rowe & Fletcher 2008). Deep sedation reduces the negative physiological effects of the stress response when being mechanically ventilated and can reduce psychological issues patients may face after critical illness (Reschreiter, Maiden & Kapila 2008). Deep sedation levels require a patient's airway and respiratory effort to be supported similar to that of a patient undergoing surgery (Gehlbach & Kress 2005; Mehta, McCullagh & Burry 2009; Weinert & McFarland 2004). Deep continuous intravenous sedation is essential to minimise discomfort and anxiety, and facilitates interventions such as mechanical ventilation and other essential life-saving procedures being undertaken within the resuscitation area.

Inadequate sedation can lead to agitation, decreased patient safety and increased risk of injury. Patient agitation may result in unplanned self-extubation, increased oxygen consumption, hemodynamic instability, injury to self or others, and an inability to participate in therapeutic interventions (e.g. mechanical ventilation). Agitation is described as excessive restlessness, characterised by non-purposeful mental and physical activity due to internal tension and anxiety (Jacobi et al. 2002; Sessler, Grap & Brophy 2001). Agitation occurs often in the critically ill or injured patient as a result of inappropriate pain and sedation management (Carrion et al. 2000; Riker, Picard & Fraser 1999). Sedation and/or analgesia may therefore ameliorate some of the effects of

anxiety and reduce the concomitant effect of anxiety leading to and or adding to agitation (De Jong et al. 2005).

To date, the risk of complications and adverse events in relation to critically ill or injured patients receiving on-going intravenous sedation in the ED is largely unknown in Australia. Critically ill patients, with reduced capacity to independently maintain optimal homeostasis, are vulnerable to deterioration in the presence of improperly managed pharmacological interventions. Unplanned self-extubation, over-sedation, agitation, pain and ventilator dysynchrony are potentially avoidable with careful titration of sedation and analgesic infusions by the emergency nurse. The assessment, monitoring and resuscitation skills of the emergency nurses are therefore critical to maintaining appropriate sedation levels for critically ill patients (Dawson 2010).

The specialised skills, abilities and knowledge necessary to safely care for critically ill or injured patients receiving continuous sedation in the resuscitation bay remain unclear. To date, no Australian literature was identified that explored methods of and for assessing, monitoring and managing ED patients with regards to the administration of continuous intravenous sedation.

## 2.6 Sedation policies and guidelines for nurses

The American Nurses Association (1991) recommended that registered nurses who administer and monitor procedural sedation and analgesia be able to identify and differentiate the various levels of sedation; demonstrate the acquired knowledge of anatomy, physiology, pharmacology, cardiac dysrhythmia recognition; detect complications related to moderate analgesia and sedation and appropriately intervene; demonstrate competence in pre-procedural, procedural, and post-procedural nursing care from the initial patient evaluation to patient discharge; anticipate, recognize, and address potential complications during the process; and, understand the medico-legal aspects of procedural analgesia and sedation.

There is however no evidence of any Australian emergency nursing policies and standards of practice unlike, the USA (American Association of Nurse Anaesthetists 2008; Emergency Nurses Association 2008) and Canada (Innes et al. 1999; National Emergency Nurses Affiliation 2009). Conversely, medical guidelines have been published in Australia (Australian and New Zealand College of Anesthetists 2010), the UK (The Association of Anaesthetists of Great Britain and Ireland 2007; The Royal College of Anaesthetists 2006), Canada (Innes et al. 1999) and the USA (American Association of Nurse Anaesthetists 2008; American College of Emergency Physicians 1997, 2005; American Nurses Association 1991; American Society of Anethesiologists Task Force 2002; Emergency Nurses Association 2008) to ensure that sedation is performed with optimal safety for the patient and to diminish risks for medical clinicians.

## 2.7 Summary

To date, limited literature was found that related specifically to Australasian emergency nursing safety, assessment, monitoring and methods of management for the on-going intravenous sedation of patients. However, balancing the critically ill patient's sedation level appears to be a highly complex activity that is regularly undertaken by ED nurses in a time-sensitive and highly pressured environment. While international tools, policies and guidelines exist to optimise sedation practices, these appear not to be used within Australian emergency settings. Whilst numbers of ED patients receiving continuous sedation has increased, it remains unclear how Australian emergency nurses manage continuous intravenous sedation in the critically ill patient. To date no Australasian policy or guidelines articulate the specific role of emergency nurses in managing sedation in the critically ill patient. Yet, it is the emergency nurse that is responsible for the on-going assessment sedation practices for the critically ill patient.

It is therefore important to explore ED nursing assessment, monitoring and management practices for the critically ill patient receiving on-going intravenous sedation. The following chapter details a sequential explanatory mixed methods design selected as the

best research approach to enable a deeper understanding of how ED nurses assess, monitor and manage critically ill patient receiving on-going intravenous sedation.

# CHAPTER 3: METHODOLOGY

## 3.1 Introduction

A mixed methods approach was selected as an appropriate research framework to explore how ED nurses assess, monitor and manage critically ill patients receiving on-going intravenous sedation. This chapter details the research methodology used in the study and is divided into two sections. Section 1 provides an understanding of mixed methods research and includes the history and emergence of the research approach and research design selected for the study. Section 2 details the framework for integrating both quantitative and qualitative data. This section also details a theoretical framework used to guide data interpretation.

## 3.2 Mixed Methods

Mixed methods research is a research design and approach with unique philosophical assumptions and inclusive methods of inquiry (Creswell & Plano Clark 2010). As a methodology, it incorporates philosophical assumptions that guide the direction of data collection and analysis, and specifically the mixture of qualitative and quantitative approaches throughout the phases of the research process. As a method, it focuses on collecting, analysing and mixing both quantitative and qualitative data, within a single study or series of studies, to enable a breadth and depth of understanding about the area of investigation and corroboration of findings.

Historically, mixed methods research has been referred to by an array of labels, including: 'multi-method', 'integrated', 'hybrid', 'combined', and 'mixed-methodology research' (Creswell & Miller 2000). This notion of integrating methods and/or data in a study is however not new (Campbell & Fiske 1959). From a contemporary perspective, mixed methods research incorporates many diverse viewpoints. As Creswell and Plano Clark (2010) and Bergman (2008) described, the core characteristics, and therefore the definition of mixed methods research, flows from the researcher and is reflected in their actions in conducting the study: the researcher selects and analyses persuasively and

rigorously both qualitative and quantitative data as they pertain to the research question, and then decides upon how the data are integrated thus reflecting the priority of each strand's data in answering the research question.

Mixed methods research is therefore more than a combination of quantitative and qualitative methods/data in an ad hoc fashion in a single study (Andrew & Halcomb 2006). The approach incorporates a distinct set of ideas and practices that separate it from other research paradigms, although debates concerning its methodological foundations continued, escalating to what is now referred to as the 'paradigm wars' (Lincoln & Guba 1985).

### 3.2.1 *The history and emergence of mixed methods research*

The history of mixed methods developed around the 1970s and 1980s where the positivist (quantitative research) paradigm was criticised by social scientists supporting the more holistic view of qualitative research and proposing constructivism (or variants thereof) as an alternative worldview (Reichhardt & Rallis 1994). Therefore, as Smith (1983) earlier asserted at the height of the these epistemological wars, combining the two paradigms as proposed in mixed methods research would be incommensurable. This belief enforced the notion that the two paradigm families were mutually exclusive and in opposition (Valsiner 2000).

Today, methods of data collection and their associated philosophical assumptions are not as tightly bound. In their overview of qualitative research methods, Denzin and Lincoln (2005) highlighted a shift towards accepting different types of methods being associated with different types of philosophies or worldviews.

In mixed methods, three paradigmatic stances of marked philosophical distinction have been proposed to address arguments about incompatibility of paradigms and their associated methods: 1) dialectical pluralism that stands at the nexus of the constructivist and post-positivist paradigms (Greene & Hall 2010), 2) the transformative paradigm (Mertens 2003) and 3) the pragmatic paradigm (Biesta 2010). Of the three paradigms,

pragmatism has been adopted as the philosophical stance for the purposes of this study. Pragmatism, the belief that multiple paradigms can be used to address research problems (Rossman & Wilson 1985), is orientated 'to solving practical problems in the "real world"' (Feilzer 2010 p. 8) rather than on assumptions about the nature of knowledge, and forms the basis of this study for several reasons. Importantly, this approach is well suited to exploring clinical practice and the everyday work of emergency nurses.

First, emergency nursing practice and research are both diverse and pluralistic in roles, settings, applications, and in knowledge that is generated and applied across paradigmatic boundaries and disciplinary lines (McCready 2010). Second, emergency nursing practice is founded upon the principle of best evidence, using diverse sources of knowledge to discern what works best to improve patient safety and well-being. Similarly, pluralism, the hallmark of pragmatism takes an all-inclusive approach which is open to multiple sources of knowledge; operating on the principle of 'best-available evidence' (Talisse & Aikin 2008). Third, nursing research/practice and pragmatism have a shared goal: the social-moral-ethical imperative towards considering and bettering others in determination of 'usefulness' and in actions based on best available knowledge (Australian Nursing & Midwifery Council 2008a, 2008b; Talisse & Aikin 2008). Emergency nurses are, like all nurses, in the business of caring, healing, helping and bettering the lives of those we care for; these characteristics are inherently and essentially nursing (Nightingale 1860). Finally, a universal ideology of pragmatism reflects the interconnectedness and iterativeness of theory and practice, where 'what works' (i.e. truth) informs and revises practice and visa-versa. Likewise, a comparable theory-practice link exists within nursing, which is essential in continuously optimising patient care and safety by adding to and reshaping knowledge that supports the care delivered to patients (Doane & Varcoe 2005; Rawnsley 2000). A mixed methods approach is, therefore, well suited to exploring nursing practice.

Pragmatism's core contribution to mixed-method research has been two-fold. First, it provides a rationale for combining methods from diverse paradigms (Johnson &

Onwuegbuzie 2004), and second, it promotes the use of diverse research approaches to best answer the research question. As Tashakkori and Teddlie explained:

> *'Study what interests and is of value to you, study it in the different ways that you deem appropriate, and utilize the results in ways that can bring about positive consequences within your value system' (Tashakkori & Teddlie 2003 p. 30)*

While pragmatism has gained considerable support as a philosophical framework for mixed methods research (Feilzer 2010; Maxcy 2003; Morgan 2007; Onwuegbuzie & Leech 2004), it has not gone without criticism. During its infancy, Russell (1910, 1945) argued that pragmatism equated truth with utility, that is truth is what works, and ignored the antecedent conditions which informed the researcher's set of methods. Greene and Caracelli (1997) and Bergman (2011), echoing Russell's earlier concern, stressed that in order to assess the appropriateness of the methods selected and the manner in which they have been used, researchers must be explicit when and how each is used. Bergman goes on to emphasize that the choice of data collection and analysis methods is crucial to how we make sense of study findings, as each alters the 'landscape of meaning' (Bergman 2011 p. 99). Johnson and Onwuegbuzie (2004) suggested, by selecting methods that best 'fit' with the research question, aims, and/or objectives; considering the purpose and nature of the study; and understanding what the type of information or data is required that best describes the phenomena under investigation.

The inherent complexity of human phenomena that has arisen from vast variation in human demography, culture, politics, values, mores, spirituality, as well as the material conditions of human existence has been conceptualised and engaged with in different ways (Greene & Hall 2010). Paradigms serve as philosophical frameworks that guide researchers in their approach to examining human phenomena, and assist in the identification and clarification of their beliefs with regard to ethics, reality, knowledge and methodology (Feilzer 2010). The differing philosophical assumptions associated with qualitative and quantitative research have had a major influence on discussions to

date (Morgan 2007; Sale, Lohfield & Brazil 2002), however the underlying philosophical positions of qualitative and quantitative methodologies are not necessarily so distinct or controversial as the stereotypes suggest (Maxwell 2010).

Mixed methods research has developed from the fact that neither a qualitative or quantitative method may not be sufficient to capture the details of the studied situation comprehensively (Ivankova, Creswell & Stick 2006b; Onwuegbuzie & Leech 2004). Qualitative and quantitative research methods can be used to investigate and examine a variety of situations and interactions to best understand the phenomena under investigation. Both qualitative and quantitative methods have strengths and weaknesses, which can be ameliorated by combining and synergistically integrating the most appropriate quantitative and qualitative techniques together. Moreover, by combining quantitative and qualitative techniques, the scope or breadth of research can be expanded to deepen the researcher's understanding of the phenomena under investigation (Creswell & Plano Clark 2010; Punch 1998). Today, while some disagreement remains over the reconciliation of paradigms (Giddings 2006; Holmes 2006), the focus has appropriately shifted to mixed methods research designs when addressing complex questions.

### 3.2.2 *Mixed Methods Research Designs*

There were four mixed method research designs presented in the literature: convergent, embedded, exploratory and explanatory. Convergent designs are the most common approach to mixing methods (Creswell et al. 2003), and use multiple complementing methods, methodologies, theories and data to address the quantitative and qualitative research question and validate findings (Maxwell 2010). Embedded designs incorporate additional quantitative and qualitative strands within a traditional quantitative or qualitative design, for the purposes of informing or investigating an aspect (e.g. post interventional study) of the encompassing study (Tashakkori & Teddlie 2010). Exploratory designs typically involve two phases, and seek to test or generalise Phase 1 findings using quantitative methods (Creswell & Plano Clark 2010). Explanatory

designs comprise of two distinct interactive phases, with the intent of explaining and expanding upon Phase 1 quantitative findings using qualitative methods (Bergman 2008). Several authors have also attempted to explain mixed methods research designs using four dimensions of integration, priority, timing and mixing (Creswell & Plano Clark 2010; Doyle, Brady & Byrne 2009; Tashakkori & Teddlie 2010; Teddlie & Tashakkori 2009). The four dimensions give shape to all mixed methods research designs. The level of integration relates to the degree the datasets interact with each other (Greene 2007). An independent level of integration occurs when the quantitative and qualitative strands are implemented independent of each other. Mixing of the two strands, at this level of interaction, occurs only when drawing conclusions during the overall interpretation at the end of the study. Conversely, the two strands can be fully integrated throughout the study at different points and in different ways, with data from both strands being analysed together and interactively prior to conclusion of the study.

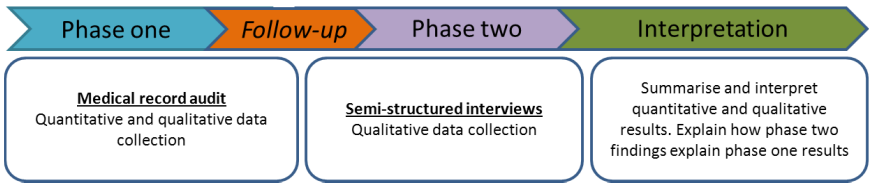
Priority refers to the relative significance or weighting of the quantitative and qualitative methods in relation to answering the study's questions (Creswell & Plano Clark 2010). There are three possible weighting options for a mixed methods design: equal priority, where both quantitative and qualitative strands play an equal role in addressing the research problem; quantitative priority where a greater emphasis is placed on the quantitative methods to address the research problem, with qualitative methods used in a secondary role; or, qualitative priority where a greater emphasis is focused on the qualitative methods and the quantitative methods are used in a secondary role to address the research problem (Tashakkori & Teddlie 2010).

Timing can be classified in one of three ways: concurrently, when both the quantitative and qualitative strands during single phase of the research study are implemented; sequentially, where implementation of the strands occurs in two distinct phases and leads to the collection and analysis of one type of data occurring after the collection analysis of the other type; or, in the case of multi-phase combination mixed methods research designs, multiple phases are implemented sequentially and/or concurrently across a broad programme of study (Creswell 2007).

The final dimension, mixing, is the explicit interrelating of the study's quantitative and qualitative strands. This can occur at four possible points during the research process; at: design, data collection, data analysis and/or interpretation, using mixing strategies that directly relate to these points of interface. Four mixing strategies have been proposed: merging of two datasets, connecting from the analysis of one set of data to the collection of a second set of data, embedding one form of data within a larger design, or using a framework to bind together the datasets (Morse & Niehaus 2009).

For the purposes of this study a sequential explanatory mixed methods design was adapted from the Tashakkori and Teddlie (2003) typology of multi-strand mixed methods research; and is an approach commonly used by other researchers exploring nursing practices (Cameron 2009; Gulmans et al. 2007; Nastasi et al. 2007; O'Cathain et al. 2004). The overall purpose of a sequential explanatory mixed methods design is to use qualitative data to explain or build upon quantitative results in an iterative process (Creswell et al. 2003). Sequential explanatory mixed methods designs have been emphasised in most writings about mixed methods research designs, and have been labelled as sequential model (Tashakkori & Teddlie 2010) sequential translation (Morse 1991) and iteration design (Greene 2007). Although these terms apply to any sequential two-phase approach, irrespective of beginning quantitatively or qualitatively, the explanatory design typically begins with a quantitative strand in Phase 1, and is followed up on specific results with a qualitative strand in Phase 2. This arrangement has also been called a qualitative follow-up approach (Morgan 1998) and is presented in Figure 2.

**Figure 2: Sequential explanatory mixed methods design**




A number of advantages and challenges associated with using a sequential explanatory mixed-method design have been widely discussed in the literature (Creswell & Plano

Clark 2010; Creswell et al. 2003; Greene & Caracelli 1989; Greene 2007). Advantages include the straightforward nature of the design, and the opportunities it provides to explore quantitative results in more detail, especially useful when unexpected results arise (Morse 1991). Additionally, the design is strongly orientated towards quantitative data collection methods and analysis, which may favour quantitative research problems, and may be more acceptable to quantitative-based audiences (Collins & O'Cathain 2009; Teddlie & Yu 2007). Its two-phase structure simplifies the data collection process as only one type of data is collected at a time, which negates the need for a team of researchers. The challenges of the design concern the lengthy time and feasibility of resources to complete two phases of data collection and analysis (Ivankova, Creswell & Stick 2006b), deciding which data to use when designing the next phase of the study, who to sample and what criteria to use for participant selection in Phase 2 of the design (Andrew & Halcomb 2006). The modified explanatory sequential design is well suited to exploring clinical practice and enables deeper understanding of the phenomena of interest.

Within explanatory study designs, and more broadly across mixed methods studies, when phenomena are unknown, researchers have used chart audit methods to obtain objective information and identify patterns, trends and areas of interest. Auditing patient medical records is a relatively inexpensive approach to research and the readily accessible existing data can enable hypotheses to be generated and then tested prospectively (Gearing et al. 2006). Recent studies incorporating chart audits include: assessing organisational performance (Clinical Excellence Commission 2012b), quality assessment and improvement (New South Wales Health 2012b), clinical research (Knott & Isbister 2008) and professional education and training (Clinical Excellence Commission 2012a). To expand on chart audit data understanding and thereby build a deeper and richer understanding of the phenomenon, a mixed methods approach will then implement a further study phase. To develop additional insights and reveal typical or unique experiences or understandings (Kvale & Brinkman 2009; Silverman 2012b), interviews, focus groups or surveys have been undertaken (Cronholm 2011). More

specifically, semi-structured interviews have been shown to enable deeper insight into phenomena than a chart audit alone would provide (Kvale, 2006; Melia, 2000; Silverman, 2005; Streubert, 1999).

## 3.3 Mixed Methods Data Integration and Analysis

The integration and analysis of quantitative and qualitative data is central to a mixed methods study; importantly merely including the two types of data within a single study does not meet the criteria for a mixed methods study (Creswell & Plano Clark 2010; Onwuegbuzie & Johnson 2006). Data integration and analysis in mixed methods can take multiple forms and can also occur at any stage throughout the study. Mixed methods data integration and interpretation broadly consists of analytic techniques being applied to both the quantitative and qualitative data, as well as mixing the data concurrently or sequentially (Onwuegbuzie & Johnson 2006). Building upon the work of Onwuegbuszie and Teddlie (2003), Bazeley (Bazeley 2009, 2012) is credited with bringing forward the discussion about mixed data analysis in mixed methods research designs. Bazeley, in discussing data analyses in mixed methods research, highlighted several emerging ways in which mixed methods data integration and analysis were being considered: 1) to serve a common holistic or ideological purpose; 2) for typology development, whereby results of one analysis are used in approaching the analysis of another form of data; 3) by synthesising data from several sources for the purposes of joint interpretation; 4) by data transformation, that is, "quantitizing" qualitative data and "qualitizing" quantitative data (Teddlie & Tashakkori 2009, p. 271); or, 5) through iterative analyses involving multiple, sequenced phases where the conduct of each phase arises out of or draws on the analysis of the preceding phase. This last approach to mixed data integration and analysis specifically forms the basis of sequential explanatory mixed method study design.

Within sequential explanatory mixed method studies data analysis occurs in a sequential manner prior to integration and interpretation of data. First, quantitative data are collected and analysed quantitatively using analytic approaches best suited to the

quantitative research question. Second, the researcher decides what results need to be explained. Based upon this and other findings drawn from the analysis of the quantitative data, the qualitative strand is then designed and the qualitative data collected. Following qualitative data collection, the data are analysed qualitatively using analytic approaches best suited to the qualitative and mixed methods research questions. Data integration and interpretation within sequential explanatory mixed methods studies occurs once all data collection has been completed, findings analysed and conclusions, referred to as "inferences", (Teddlie & Tashakkori 2009, p. 300) are drawn. Inferences from each study, as well as across the quantitative and qualitative data are then integrated and interpreted to form "meta-inferences" (Teddlie & Tashakkori 2009, p. 300). This process is influenced by the research purpose in conducting a mixed methods study (Greene & Caracelli 1989). Greene and Caracelli (1989) identified five purposes for conducting a mixed methods study: triangulation, initiation, development, expansion and complementarity.

One of the most common purposes for mixing methods within a sequential design examining complex multifaceted practice is complementarity (Greene 2007; Onwuegbuzie & Collins 2007). By using different methods to tap into different aspects or dimensions of the same complex phenomenon for the purpose of complementarity, the researcher gains a broader, deeper and more comprehensive understanding of the phenomenon by measuring overlapping but also different facets of the phenomenon (Greene & Caracelli 1989). Results from the different methods elaborate and enhance the overall interpretations and meta-inferences of the study. To further enhance mixed data integration, interpretation and understanding, Caelli et al. (2003) advocated that an analytical lens be incorporated into the mixed methods study design.

### 3.3.1 *Analytical lens of the study*

Donabedian's (2003) quality and safety framework was used as the analytical lens to guide data interpretation. The quality and safety framework has been applied to problems both broad and narrow, such as examining clinical practice in healthcare

(Battles & Lilford 2003), clinician communication (Sayer 2010), evaluating healthcare technology (Ancker et al. 2012), and designing nurse educational programs (Liu, Edwards & Courtney 2011). The framework is comprised of three elements: Structure, Process and Outcome. Each element has an effect or direct influence on the next (Donabedian 1980). For the context of this study, structure was comprised of the department characteristics, nurse characteristics and patient characteristics, which gives direction to the provision of health care (Wubker 2007). The geographical layout of the ED (e.g. setting) and nursing characteristics, which include the capacity of the department, policies, available patient care technologies and skill mix of the nursing staff (e.g. education, critical care experience) were conceptualised as factors that interact with clinician practice to affect the health outcomes of patients (Mitchell, Ferketich & Jennings 1998). The second element of Donabedian's framework, process, was conceptualised by the clinical interventions performed within the clinical arena, co-operation within and between clinicians. Finally, the third element within the Donabedian's framework, outcome, was conceptualised as changes in patient (Wubker 2007), for example depth of sedation, behaviour/response to sedation and/or analgesia (e.g. under or over-sedation).

## 3.4 Summary

This chapter detailed how mixed methods methodology evolved as a result of the complexity of research problems today, in contexts where qualitative or quantitative methods alone are unable to capture the details of a studied situation. Mixed methods study designs are well suited to exploring emergency nursing, as clinical practice is complex, outcome-orientated, practical and realistic in its pursuit to improve patients' health and wellbeing. The theoretical underpinnings of pragmatism embedded within mixed methods research makes it well suited to understanding clinical phenomena. The sequential explanatory designed study assists to compare and contrast data sets from which new knowledge can be generated. Through the approach of complementarity adopted within the interpretative phase, findings can be elaborated on, enhanced by and clarified between different data sets and the literature.

# CHAPTER 4: METHODS

## 4.1 Introduction

This chapter details the research methods for Phase 1 and 2, to explore how emergency nurses assess, monitor and manage continuous intravenous sedation for the critically ill patient. Approaches to data storage and management in both phases are then presented. The following section then details the framework used to integrate Phase 1 and two data. This is then followed by the methods employed to maintain the integrity and rigour of this mixed methods study.

## 4.2 Phase 1: retrospective medical record audit

Phase 1 involved a 12-month retrospective medical record audit to explore how emergency nurses' documented their practices for assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients. A description of the study site setting, resuscitation bay, development and testing of study instruments, sampling and procedures, data collection, secondary data and data analysis are provided below.

### 4.2.1 *Setting and staff*

Phase 1 was conducted at a 35-bed metropolitan tertiary referral ED in Sydney, Australia. Annually, the department manages approximately 47,000 patient presentations with an average occupancy rate in excess of 90%. The department's acute bed-base of 25 is divided between resuscitation bays ($n$=3), acute ($n$=12) and sub-acute areas ($n$=10), with a further 10 beds allocated for non-acute short-term care in its emergency medical unit. The ED is supported by a 12-bed tertiary referral intensive care unit (ICU), and is the designated ED for spinal trauma in New South Wales.

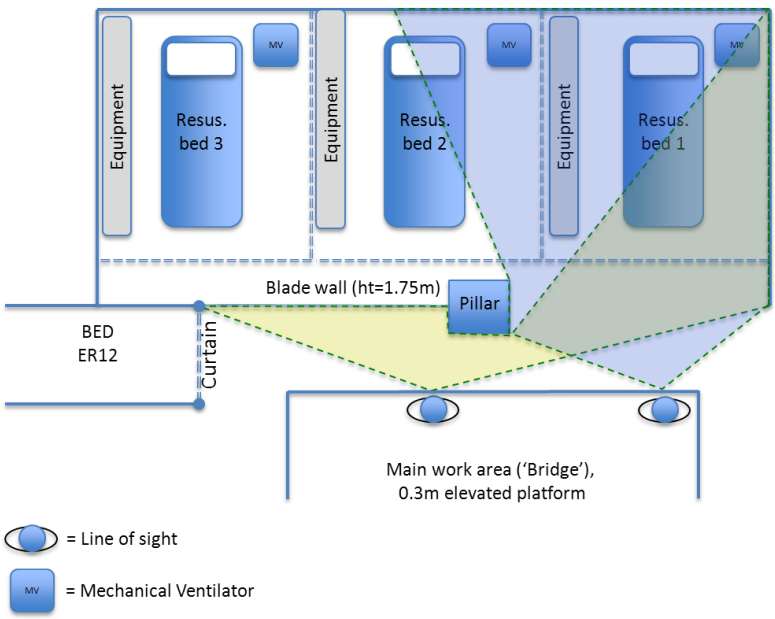
The ED is located in a 571 bed hospital with 30,000 annual hospital patient admissions, and services a local community of 131,714 (Randwick City Council 2011). In 2012 there were 47,931 new presentations to the ED, of which 16,345 (34%) patients were

admitted. Of those patients admitted, 818 (5%) were admitted to the hospital's ICU (Standard Performance and Reporting Collaboration 2012). At the time of the study, there were 106 registered nurses employed at the study site: a nurse manager, clinical nurse unit managers ($n$=5), a nurse educator, a clinical nurse consultant, clinical nurse specialists grade one ($n$=16) and registered nurses ($n$=82) (see Appendix 2 for a description of the nursing positions). For the purposes of this study, a total of 72 (69%) nursing staff were classified as experienced resuscitation nurses.

### 4.2.2 *The resuscitation bay*

Within this study site, critically ill patients are cared for in a dedicated resuscitation bay prior to ICU admission. The three-bed resuscitation bay adjoins the ED's acute area. Both areas have an open plan design, although resuscitation beds two and three are partially obstructed from view by a low blade wall at a height (ht) of 1.75 metres and a floor-to-ceiling square pillar 1.2m wide (see below). Only resuscitation bed one is therefore visible from the elevated main workstation for clinical staff (Figure 3).

**Figure 3: Phase 1 site resuscitation bay layout with line-of-sight from main work area**




Each resuscitation bay is divided by floor to ceiling curtains and equipment trolleys stationed to the left of every resuscitation bed, and all power points and cardiac

arrest/emergency call bells are located at the back of each bay. Each resuscitation bay is equipped with a wide range of immediate life-saving medical devices for intubation, cardiac resuscitation, intravenous infusions and mechanical ventilation.

### 4.2.1 *Sample and Procedures*

All critically ill patients requiring ICU admission that presented to the ED from January 1st 2009 to December 31st 2009 were included in the retrospective medical record audit. The 12-month audit examined the medical records of patients who received continuous intravenous sedation in ED and were admitted to ICU. Inclusion criteria were: evidence of presentation via ED, documented evidence of intravenous continuous sedation and mechanically ventilated. Records were excluded if the patient was aged less than 16 years of age or if no continuous intravenous sedation was administered.

At the study site, nursing and medical staff documented their clinical care across several forms. Emergency nursing staff documented patient assessment findings, care delivered and general progress of the patient at the bedside using a double-sided A3 pre-printed nursing progress form. Physiological observations (i.e. vital signs) were documented in one section of this nursing progress form. The patient observation section is constructed using one large table divided into three sections, of which one third is dedicated to the recording of patient's physiological observations. This section of the form is made up of ten horizontal rows labelled: heart rate, blood pressure, respiratory rate, end-tidal carbon dioxide, peripheral oxygen saturations, pain score, temperature, GCS, pupil light response and limb motor assessment. For the purposes of graphing, the patient physiological observations are documented horizontally from left to right. In addition, the form contained areas for documenting nursing care. Medical officers documented using double-sided A4 loose-leafed progress notes, which may occur at the patient's bedside or at the department's main workstation away from the patient. After medical officers completed documenting on the progress note, it is placed inside the medical records kept at the patient's bedside.

Pharmacological agents required, such as for rapid sequence intubation, were charted by the medical officer on the front of the patient's medication chart, in the area labelled 'Stat Medications / Once Only'. Intravenous agents needed to maintain the critically ill patient sedated and comfortable were prescribed on a separate intravenous fluid infusion prescription chart. Within the resuscitation bay area, all progress notes, forms and charts are assembled and secured inside the patient's medical record.

### 4.2.2 *Data collection*

Critically ill patients most likely to have received continuous intravenous station whilst in the ED (Ivankova, Creswell & Stick 2006a; Way et al. 1994) were identified by searching the study site's ED electronic patient medical record system FirstNet (Cerner Corporation 2009) for patients admitted to ICU between January 1st 2009 and December 31st 2009. Corresponding paper medical records of patients identified as being admitted to ICU were then retrieved from the study site's Medical Records Department. These paper medical records were then manually searched by the researcher for evidence of continuous intravenous sedation being commenced in the ED. Data were obtained from the nursing progress notes, referral consultation notes and physiological observation (i.e. vital signs) notes, the medical progress notes, medication and intravenous infusion prescription notes.

The following data were collected: date and time of arrival, time from arrival to registration and triage, age, gender, triage category, disease classification, diagnosis, ED length stay, the amount and frequency of intravenous pharmacological sedatives and paralysing agents, time from commencement of continuous intravenous sedation to transfer to ICU, patients' heart and respiratory rate, level of consciousness, temperature, peripheral oxygen saturation, end-tidal carbon dioxide levels and pain score. Numerical data obtained from the above notes were transcribed verbatim into an Excel (Microsoft 2010a) spreadsheet. In addition to patient physiological variables and prescription chart information, patient medical records also provided textual data in the form of medical and nursing clinical documentation. Textual data were collected and transcribed

verbatim into NVivo (QRS International Pty Ltd 2012) from nursing and medical notes, referral consultation notes, medication and intravenous infusion prescription notes relating to the care of the critically ill patient. A data collection form was designed to guide data collection, and was structured to match the arrangement of information within patients' medical records (Webb, Sweet & Pretty 2002).

#### *4.2.2.1 Development of the documentation audit tool*

A documentation audit tool was developed to guide data collection. Initial tool development was informed by previously conducted studies (Green & Yealy 2009; Innes et al. 1999) exploring procedural sedation and intubation practices in the ED. In addition, several international policies and professional recommendations (Academy of Medical Royal Colleges 2001; American Association of Nurse Anaesthetists 2008; American College of Emergency Physicians 1997, 2005; American Society of Anesthesiologists 2008, 2009; American Society of Anethesiologists Task Force 2002; Australasian College for Emergency Medicine 1998, 2003; Australian and New Zealand College of Anesthetists 2006, 2010; British Society of Gastroenterology 2003) concerning the sedation of patients in diagnostic and acute and critical care environments were examined. This literature identified several key elements in achieving safe assessment, monitoring and administration of intravenous sedation to adult patients experiencing life-threatening injuries or illnesses. The above evidence supported development of the tool.

The audit tool comprised of 24 items. Quantitative items included patient demographics, type of induction and sedation agents used and number of boluses of pharmacological agents used to alter patient sedation, pre-sedation vital signs, sedation agent selection, dose and frequency of use, and frequency of patient vital signs monitoring. Documentation by clinicians describing the patient's condition and care delivered, textual data, were treated qualitatively. Qualitative items of the documentation audit tool consisted of: indication for sedation, any reported complications, sedation management plans, and written documentation pertaining to

patient assessment and monitoring by nursing, medicine and allied health. The draft tool was tested for its suitability and data collection accuracy by an expert panel prior to being pilot tested on 20 randomly selected patient medical records (Appendix 3). The following section describes these two strategies and how they were applied in this Phase.

#### *4.2.2.2 Piloting of the documentation audit tool*

A small expert panel of emergency clinicians was convened to evaluate the documentation audit tool. The panel consisted of the researcher's two supervisors and one independent emergency nursing Clinical Nurse Consultant (CNC). Panel members critiqued the audit tool for its ability to collect suitable data from patient medical records sedation, and assessed for feasibility and credibility. Following receipt of the expert panel's critique and feedback, the final documentation audit tool was then piloted to evaluate its reliability and validity to consistently and systematically retrieve the data required to answer the research question.

The researcher then audited 20 (11%) consecutive patient medical records using the documentation audit tool. To verify data integrity, a medical record clerk not associated with the project shuffled the audited paper medical records, which were then re-audited by the researcher (Committee on Ensuring the Utility and Integrity of Research Data in a Digital Age & National Academy of Sciences 2009). On comparing the data obtained, no anomalies were found. The researcher made notes in their research journal regarding their experience of using the tool. Once each medical record had been audited twice, the data collected was compared for any discrepancies.

Conducting a pilot study on a new tool is considered best practice to identify any inherent problems prior to the main study (Burgess 2011). Pilot testing enabled the tool to be validated and to be tested in order to ensure its design was fit for purpose (Baker 1994; Schneider 2013), realistic and workable (van Taijlingen & Hundley 2002). Importantly, in piloting the data collection tool, the researcher gained experience in

implementation of the proposed tool and how it facilitated meeting the research plan/question (Burgess 2011; Polit & Totana Beck 2010).

### 4.2.3 *Secondary data*

Secondary data were examined to provide contextual understanding of the role of the emergency nurse within this study site. This included the educational material used to orientate emergency nurses to the resuscitation bays. The secondary data included: the resuscitation nurse development program including competency assessment handbook (Prince of Wales Hospital Emergency Department 2009b) and patient sedation policy (Prince of Wales Hospital Emergency Department 2009a). The educational material was developed and delivered by the ED CNC and NE.

The secondary data sources provided insight and understanding of the role of the nurse and supported the interpretative stage of this mixed methods study. The educational material specifically provided the researcher with the opportunity to augment, compare and contrast data findings and therefore broaden understanding of phenomena under investigation (Schensul, Schensul & LeCompte 1999).

### 4.2.4 *Data analysis*

The retrospective medical record audit collected both numerical and textual data. Numerical data were treated quantitatively, and textual data were managed qualitatively. Descriptive statistics were used to first describe the numerical data and the sample. Descriptive statistics included testing of the range, inter-quartile range and median for age. Patient gender was coded numerically (e.g. male = 0, female = 1) to facilitate analysis and expressed in frequencies and percentages. Patient ATS category was analysed using frequency and percentage. Time of arrival to ED, ED length of stay, and time of drug administration were analysed using frequency, median, range and inter-quartile range. Patient physiological data (i.e. vital signs) were organised into one of four categories as defined by the work of Jacques et al. (2006): 1) normal, within normal limits; 2) abnormal, reduced or elevated outside of normal limits but inside

limits demarcating early deterioration; 3) early deterioration, and 4) late deterioration. Tests for normal distribution were performed using Levine's test for normality (Pallant 2007). Parametric and non-parametric techniques were used when comparing sedated and non-sedated critically ill patient data where appropriate. Chi-square ($\chi^2$) testing was used for patient gender. Mann-Whitney U, a non-parametric test, was used to test for differences in patient age, ATS category of urgency and total ED length of stay between sedated and non-sedated patient cohorts. In all statistical comparisons, a *P*-value of $<.05$ was considered significant. Descriptive statistical analysis was conducted using SPSS (IBM 2011, California), including generating data tables, histograms and bar graphs.

As noted earlier, textual data, in the form of nursing and medical clinical narratives, were transcribed verbatim into NVivo (QRS International Pty Ltd 2012, Burlington) and verified against the originating medical record entry. At the conclusion of data collection and transcription, thematic analysis of the data was then conducted. Thematic analysis followed the five step systematic process suggested by Braun and Clarke's (2006). First, the researcher became immersed in the narrative data, through multiple (re-)readings of the transcripts, until data familiarity was achieved. During this process interesting data features were highlighted and initial impressions explored. Second, the data underwent a two-step process: data segmentation and coding (Graneheim & Lundman 2004). Data were segmented into smaller units, such as sentences, groups of words or phrases that contained particular aspects related to sedation practices. The researcher then read the newly formed data segments and labeled (i.e. coded) them according to the essence identified from the unit of data (Graneheim & Lundman 2004). Following on from this, the researcher collated the initial codes according to a commonality or relationship within a group of codes (Graneheim & Lundman 2004). Third, the researcher then reviewed each group of codes to identify its structural meaning, connection to the purpose of the study; providing a suitable name that reflected the overall concept expressed by the grouped code, thus generating an initial theme (Ryan & Bernard 2003). Fourth, the researcher reviewed each theme and its associated codes. To reduce researcher bias, the

researcher's supervisors (*n*=2) also reviewed each theme and its associated codes (Mehra 2002) and the organisation of themes which generated an interpretative thematic 'map'.

## 4.3 Phase 2: semi-structured interviews

Phase 2 of the study involved qualitative data obtained from semi-structured interviews. These data provided for a richer, deeper and more credible understanding of the everyday practice of emergency nurses caring for critically ill patients requiring continuous sedation. The following section describes the study site setting, resuscitation bay, development and testing of study instruments, sampling and procedures, data collection, secondary data and data analysis.

### 4.3.1 ***Setting and staff***

Phase 2 was conducted in a 50-bedded metropolitan tertiary referral ED in Sydney, Australia. The ED provides emergency care for both adult and paediatric patients with a combined annual presentation rate of over 60,000, and is one of three major trauma centres in New South Wales. The ED bed-base is divided between resuscitation bays (*n*=3), acute (*n*=14) and subacute (*n*=12), paediatric (*n*=6), and fast track areas (*n*=4), senior assessment streaming zone (*n*=2), safe assessment room (*n*=1), and the emergency medical unit (*n*=10).

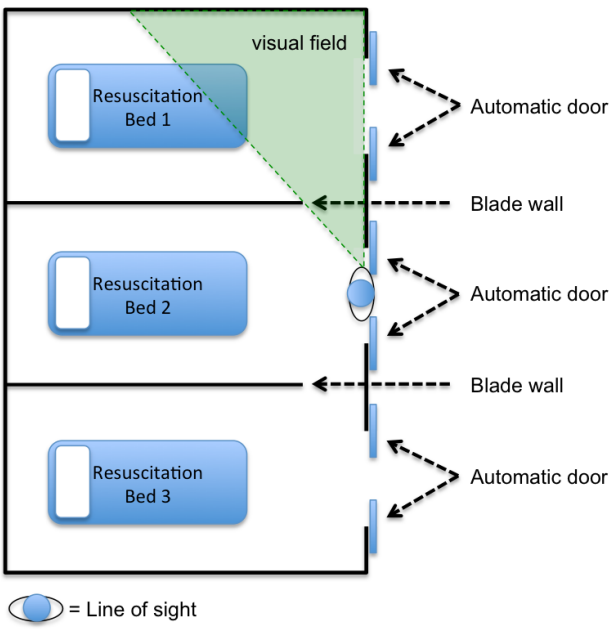
This ED was located in a 547-bed hospital with over 50,000 patient admissions annually. The hospital provides treatment for over 800,000 outpatients each year, and services more than 250,000 residents within the local health district. In 2010, there were a total of 66,084 new ED patient presentations, with over 80% (*n*=53,783; 81%) aged 16 and over. Only a small number of patients (*n*=334; 1%) were admitted to ICU. At the time of the study, there were 127 registered nurses on the staff establishment; one nurse manager, clinical nurse unit managers (*n*=5), one clinical nurse educator, nurse educator, clinical nurse consultant (*n*=1), nurse practitioners (*n*=4), clinical nurse

specialists grade one ($n$=28) and two ($n$=4) and registered nurses ($n$=82). At the time of the study, a total of 81 (63%) nursing staff were experienced resuscitation nurses.

### 4.3.2 *The resuscitation bay*

The study site had a three-bed resuscitation bay situated around a corner from the acute area, and directly opposite the ambulance airlock entrance to the department. The resuscitation bay is a closed design with three automatic sliding doors and no windows or glass panels from which to view in or out. Access into a resuscitation bay is made via one of three automatic sliding doors. Three-quarter length floor-to-ceiling blade walls divide the resuscitation bay into three bays. Due to the use of 3.7m long blade walls that ran floor to ceiling, line-of-sight is obstructed with no direct visibility of the patient from the adjacent bay (Figure 4).

**Figure 4: Phase 2 site resuscitation bay layout with line-of-sight from centre doorway**




### 4.3.3 *Sample and procedures*

Emergency nurses working within ED were invited to participate in the study. Participants were recruited randomly using specific inclusion criteria to identify

information rich participants (Creswell & Plano Clark 2010). Inclusion criteria included: working in the role as a Clinical Nurse Specialist (CNS) or having four or more years of experience within the specialty of emergency nursing as a Registered Nurse (RN); and employed at the study side for at least 12-months. Additionally, all participants were required to have cared for a critically ill patient receiving continuous intravenous sedation in the last 6 months. Determining the appropriate sample size for the semi-structured interviews with experienced resuscitation nurses was guided by available literature and data saturation.

From the literature, sample size recommendations ranged from 10 (Fontana 2004) to 15 (Mason, citing Bertaux 1981) for in-depth interviews. As interviews were occurring within a live clinical environment with senior experienced emergency nurses (Ritchie, Lewis & Elam 2003), there was a potential risk of participants needing to return to the clinical floor, which could limit the amount and quality of data obtained. For this reason a sample size of 12-15 interviews was considered appropriate to achieve data saturation and ensure integrity and reliability of the data.

In order to recruit and interview potential participants, several steps were followed. First, the researcher sent a formal letter outlining the study to the CNC, Nurse Manager and ED Director of Research. A follow-up meeting with each of the above senior staff was then arranged. The meeting lasted one hour and took place two months before the planned start date to provide ample opportunity for consideration of the study, build positive relationships and identify a suitable timeframe to recruit for interviews. Third, following site approval to conduct the study (Appendix 4), the CNC displayed the study poster (Appendix 5) on the staff notice boards where potential participants had easy access, and spoke of the study during nursing in-service sessions in order to invite them to participate. Emergency nurses willing to participate were invited to leave their name with the CNC. Fourth, the CNC scheduled interviews with identified participants at a time convenient to the nurse and department. Fifth, the researcher met with participants at the prearranged interview date and time in a neutral location within the ED.

### 4.3.4 ***Data collection***

Each interview began with ensuring that the participant had familiarised themselves with the participant information sheet (Appendix 6), consent form (Appendix 7) and revocation of consent form (Appendix 8). The researcher then discussed the aims of the study and the interview process, including the audio recording of the interview. Participants were reminded that they could remove themselves from the study at any time, including any data they had provided. After this had been explained the researcher sought consent from the participant. All interviews were conducted in a private and quiet room adjacent to the clinical area so that, if participants were required to urgently return they could do so easily.

Before each interview the researcher ensured that the room made available was clean, tidy, well lit and chairs were available and arranged. A visible sign was affixed to the door to ensure that other staff members were aware that interviews were being conducted, to reduce disruptions. Each interview lasted no more than 45 minutes. Interviews were conducted using conversational style interviewing techniques to optimise participant understanding of the topic area (Anderson & Jack 2013; Kelly 2011), and to promote engaging discussion regarding participants' clinical experiences of managing critically ill patients receiving continuous intravenous sedation. Open–ended questions were used to allow a deeper and more enriched telling of the participant's clinical experiences by not restraining or confining their responses (Heaton 2004; Silverman 2012a). This interviewing style and use of open-ended questions allowed participants to describe their clinical experiences, as it was meaningful to them, whilst obtaining narrative rich with contextual insights and clinical experiences.

To facilitate building rapport with the participants, the researcher wore plain civilian clothing and introduced themselves as a research student. Throughout the interview, if a participant became distressed, the interview was stopped and comfort measures initiated (e.g. glass of water, tissues). The participant would then be directed to the organisation's employer assistance program. As an added measure, the social worker

attached to the ED was briefed on the study prior to the commencement of interviewing, and was readily available should assistance be required.

Interviews were arranged in batches to minimise intrusion and disruption within the ED but supported the researcher's time spent in the field collecting data (Creswell & Plano Clark 2010; Ivankova, Creswell & Stick 2006a; Way et al. 1994). All interviews were audio-recorded to enable the researcher to remain focussed and engaged with participants. To improve accuracy and rigor each audio-recording was transcribed the same day and assigned a study code. The semi-structured interviews were guided by an interview schedule.

#### *4.3.4.1 Development of Interview schedule*

An interview schedule was developed using findings from Phase 1 and the literature. A total of 26 open-ended questions were initially developed and grouped into one of seven categories: use of sedation ($n$=2 items), management of sedation ($n$=9), titration of sedation ($n$=4), patient agitation ($n$=2), describing sedation ($n$=3), instructions/plans of sedation ($n$=3) and complications ($n$=3). The interview schedule was then evaluated by the researcher's supervisors ($n$=2) and input from an external ED CNC not associated with the study. All panel members had over ten years' experience in the field of emergency and/or critical care nursing. Panel members were asked to critique the developed interview schedule in relation to the research question and findings of Phase 1. Prior to finalising the interview schedule, it was piloted with the researcher's principal supervisor and again with an independent ED Clinical Nurse Consultant, to assist in estimating the time involved, as well as in pre-empting any problems that may arise during the actual interviews (Strydom & Delport 2002).

The final interview schedule (Appendix 9) consisted of 16 questions and two sections. Section one sought to obtain participant demographic information: age, gender, educational background, period of time working as the resuscitation nurse. Section two comprised of ten open-ended questions and six self-rating questions exploring the clinical experiences of assessing, monitoring and managing continuous intravenous

sedation for critically ill adult patients. Using open-ended questions enabled participants to respond in their own words, and to enable freedom to describe their everyday experiences with as much detail as needed. While controversial (Maxwell 2010), fixed-response questions in the form of a 1-10 Likert scale were used as a means to quantify the participant's level of confidence in relation to the previous open-ended question (1=no confidence and 10=highly confident). The responses were then used to describe the sample and highlight any divergent cases.

The interview schedule questions described as follows demonstrates one element of how the mixed methods approach was used within the study. Question one invited participants to describe what they viewed as the role of continuous intravenous sedation for critically ill patients in ED. The impetus for this initial question was to focus the participant to the topic of study (Bernard 2006), and secondly to expand upon the reasons documented within the medical record audit in Phase 1 of the study. Responses to this question one were expanded upon to explore what participants attributed to the role of continuous intravenous sedation from their experiences of caring for critically ill patients in the ED. Question two built upon question one and positioned the participant to consider the role of the resuscitation nurse and how important it may be in managing the continuously sedated critically ill patient. In Phase 1, nursing documentation was examined. Emergency nurses documented their assessments and/or observations of patient behaviour, physiological measurements (e.g. blood pressure) and the administration/augmentation of sedation. The purpose of question two was to expand upon what direct and indirect care emergency nurses provided to the critically ill sedated patient. Following on, question three then invited participants to outline what knowledge a resuscitation nurse would require, in order to safely care for a critically ill patient receiving continuous intravenous sedation.

In Phase 1, emergency nurses made reference to technological and physiological nursing care of the critically ill sedated patient in forming judgements about the patient's haemodynamic stability and tolerance of sedation. Question four then asked participants to outline what skills they thought an emergency nurse would require, in

order to safely care for a critically ill patient receiving continuous intravenous sedation. From searching the Australian literature, no recommendations were found regarding pre-requisite knowledge and skills emergency nurses needed to work in the resuscitation bay and manage the critically ill sedated patient. Given the lack of available evidence, question three and four were added to the interview schedule to explore what experienced emergency nurses thought as essential knowledge and skills needed to be mastered by nurses transitioning in to the resuscitation bay and to care for critically ill sedated patients. Question five then asked participants to rate their level of confidence in relation to managing continuous intravenous sedation for critically ill patients.

Question six asked participants to describe how medical staff informed nursing staff about sedation requirements for the critically ill patient. From Phase 1 findings, very little documentation was found regarding how sedation was to be controlled, augmented or targeted. The purpose of this question was therefore to explore other forms of communication and processes that may potentially occur between care team members. Following this, question seven asked participants to describe the level of support medical staff provided to emergency nurses when caring for a continuously sedated critically ill patient. From the audit, it was identified in the nursing documentation that resuscitation nurses often sought direction from the treating medical officer when needing to alter a patient's continuous intravenous sedation infusions or when signs of clinical deterioration were noted. Nurses also documented telephoning or using the personal ED address system to summon medical assistance to the patient's bedside when needed. In light of this, a question exploring the support medical officers provided to the emergency nurse managing the critically sedated patient was included.

Question eight, built upon question seven, and asked participants to describe the types of sedated patients that were easier or harder to manage. From Phase 1 findings, emergency nurses documented needing to use increasing amounts of sedative agents, often given as a bolus, to patients demonstrating high levels of agitation. It was also identified that emergency nurses supported decisions to implement sedation when patient or staff safety was threatened, by overt patient agitation. With this in mind, a

question aimed at exploring what types of patients nurses felt were easiest and/or hardest to manage sedation for was included. The researcher then compared and contrasted the participant's answer to question seven, to explore for processes of gaining assistance at the patient's bedside when managing patients identified as being difficult. Question nine then asked participants to quantify their level of confidence when managing difficulties associated with the types of patients identified as being harder to maintain sedation for. Posing this question after participants had discussed the types of patients they identified as being challenging, the availability of support at the patient's bedside orientated the researcher to issues that may potentially impact on emergency nurses' confidence when assessing, monitoring and managing continuous intravenous station. Question ten then asked participants to indicate their level of confidence (1 = no at all confident, 10 = extremely confident) in relation to managing a critically ill patient receiving continuous intravenous sedation.

In Phase 1, both nurses and medical officers when documenting their assessments and care delivered, infrequently described patient depth of sedation. In view of this finding, question ten asked participants to describe how they quantified and described patient's depth of sedation. Question eleven then asked participant's to indicate what observations assisted them to determine the adequacy of patient sedation. In question twelve, participants were asked to then indicate their level of confidence in altering sedation for their patient on a scale from one to ten.

From Phase 1, a variety of pharmacological agents were identified to sustain or improve patient comfort. However, it was noted that resuscitation nurses frequently selected pharmacological agents that were currently being infused to the patient when administering a bolus to improve patient comfort. Data analysis from Phase 1 identified that the majority of boluses involved agents that had no analgesic properties. Hence, question thirteen was developed to open up the conversation with participants as to what agents they thought improved a patient's pain control while sedated. Following this, participants were invited to indicate their level of confidence in initiating intravenous analgesia in question fourteen.

Similar to the development of question thirteen, on examination of the nursing and medical progress note data (Phase 1), it was identified that the majority of pharmacological agents administered to agitated patients had no anxiolytic properties. A question was added to explore what emergency nurses thought were appropriate pharmacological agents to lessen patient agitation. Question fifteen asked participants what pharmacological agents they might advocate if they thought their critically ill sedated patient were agitated. Again, at the conclusion of exploring what participants thought were suitable pharmacological agents to ameliorate patient agitation, question sixteen asked participants to rate their level of confidence in administered anxiolytic drugs for the agitated sedated patient.

#### *4.3.4.2 Researcher preparation for interviews*

Preparation involved the researcher undertaking three mock interviews with their supervisor, and then an independent ED CNC. Each mock interview began with ensuring the interview room was tidy and clean and that the chairs were arranged to facilitate maximum engagement with the participant. The researcher then introduced the research topic and provided an overview of how the interview would be conducted. The researcher then ensured that all necessary participant information had been read and understood, prior to seeking written consent to conduct the interview. The researcher also rehearsed providing a detailed overview concerning confidentiality, participant's rights and the manner in which they could revoke their initial consent.

The interview preparation strategy improved the interview process, enabling the researcher to become familiar with the delivery of the interview questions. This awareness enabled the researcher to practise blending introduction of the next question with the participant's evolving story, thus sustaining engagement and flow of communication and in-depth discussion. Each mock interview lasted no longer than 45 minutes. In piloting the interview schedule, the researcher was able to gain a sense of the ideal flow and pace for delivering interview questions to ensure and sustain engagement with participants while maximising data collection.

### 4.3.5 ***Secondary data***

Similar secondary data sources were used in Phase 2 as in Phase 1. Phase 2 secondary data sources included the ED resuscitation and trauma workbook and related policies. The resuscitation and trauma workbook, written by the CNC and NE of the department, was used to guide the progression of emergency nurses into the role of the resuscitation nurse. Examination of the workbook enabled the researcher to become familiar with how emergency nurses were educated and orientated to work in the resuscitation bay in this site. Further, it provided the an opportunity for the researcher to augment, compare and contrast Phase 1 findings and therefore broaden the researcher's understanding of the phenomena under study (Schensul, Schensul & LeCompte 1999); this can provide a researcher with an alternative view of the phenomena being investigated and stimulated new ideas to be explored at interview (Elliott 2003).

### 4.3.6 ***Data analysis***

There were two main steps for data analysis: data preparation and a thematic analysis. The process of data preparation was initiated by transcribing verbatim the recorded spoken works taped during interview into text using Word (Microsoft 2010b, Redmond). On completion of the transcript, the Word document files were imported into NVivo (QRS International Pty Ltd 2012). After data transcription and importation into NVivo was completed data were then analysed using the same method as Phase 1. Thematic analysis comprised the five steps suggested by Braun and Clarke (2006). First, the researcher familiarised themselves with the data by reading and re-reading interview transcripts until an understanding of the data was achieved. Second, a two-step process was undertaken to generate initial codes. Initially, textual data were segmented into smaller units: groups of words, sentences or paragraphs that contained particular aspects related to the purposes of the study (Graneheim & Lundman 2004). After that, each data segment was (re-)read and coded according to the essence identified from the unit of the data; allowing data to be thought of in new and different ways (Graneheim & Lundman 2004). Third, the researcher clustered codes to begin

generating themes. Codes were first grouped together according to a commonality or relationship within a group of codes (Graneheim & Lundman 2004). In this study, the commonality was informed by some considerations, such as the interview question, meaning expressed within data segments and the patient's journey in ED (Ryan & Bernard 2003). After codes were categorised, the researcher reviewed each cluster of codes in order to confirm patterns and meaning that accurately connected and expressed the grouped codes and thereby generating an initial theme (Ryan & Bernard 2003). An example of data segmentation, coding and theme generation is presented in Table 5.

**Table 5: Example of data segmentation, coding data and theming**

| Textual data | Data segmentation | Code | Theme |
|---|---|---|---|
| *'Sedation is important, patients have to be properly sedated. You can't have patients thrashing around pulling lines out or their tube ... or so overly sedated that their BP [blood pressure] drops* (CNS1/#6). | Risks to patient when sedation is not optimal. | Under sedation | Navigating the balance |
| | Risks to patient if overly sedated. | Over sedation | |

During this fourth step, the researcher reviewed all themes, codes and supporting interview narratives to ensure that these were logically developed. Themes, codes and supporting narratives were then reviewed and discussed by the researcher in consultation with two supervisors to ensure the integrity of the data analysis. This process assisted to increase credibility and trustworthiness of the study (Mehra 2002). Finally, the themes generated and captured provided sufficient description to ensure that codes and supporting narratives were appropriately captured by each theme's definition and essence (Ryan & Bernard 2003).

## 4.4 Data storage and management

A variety of data collection methods were used in this mixed methods study, and data were stored and managed in the following ways. In Phase 1, data were collected from both electronic and paper medical records, transcribed by the researcher, de-identified

and required saving into appropriate data formats that were compatible with SPSS (IBM 2011) and NVivo (QRS International Pty Ltd 2012). Quantitative data were transcribed and stored directly in an Excel (Microsoft 2010a) spreadsheet. Qualitative data were transcribed initially into a Word (Microsoft 2010b) document, before being imported and stored in an NVivo (QRS International Pty Ltd 2012) project data file. All data files were passphrase-protected (Microsoft 2012) and stored on a restricted-access computer in the researcher's secure office. Written notes made by the researcher when examining the data were coded to the medical record to which they pertained and stored securely in a locked filing cabinet within the researcher's office. A master list matching study codes to medical record numbers was stored separately and securely in a locked filing cabinet.

In Phase 2, interview data collected was de-identified with each participant allocated a unique study code. The study code was used to identify the interview audio recording, transcript and consent form. Each interview was transcribed into a Word (Microsoft 2010b) document by the researcher the same day, and imported into a NVivo (QRS International Pty Ltd 2012, Burlington) project data file. Project data files were then passphrase protected and stored on the researcher's computer. Written notes made by the researcher during the course of conducting the interviews were labelled only with the participant's study code, as was the audio recording and transcript of the interview. Participant consent forms, research notes, interview audio recordings and transcripts were then stored securely in a locked filing cabinet within the researcher's office.

### 4.4.1 ***Ensuring the right to confidentiality and privacy***

Considerable effort was taken to ensure that this mixed methods study adhered to the University of Technology, Sydney *HREC Guidelines for Undergraduate and Postgraduate Students* (2013) and the *Australian Code of the Responsible Conduct of Research* (National Health and Medical Research Council 2007a). Further, all data were recorded and managed in accordance with the principles as set out within the Privacy

and Personal Information Protection Act (1998) (NSW) and the Health Records and Information Privacy Act (2002) (NSW).

Due to the size of the two organisations involved in this study, additional care was taken to ensure that the data obtained from patient's medical records, participating nurses and individual departments could not be identified when discussing the findings. Participant confidentiality and privacy was maintained during the transcription process of medical records and audio-recorded interviews, by substituting all participants' names for their professional title (e.g. RN, CNS etc.). Further, names of other employees and departments mentioned during interviews were referred to only by their professional title (e.g. CNS, MO etc.) or a generic name (e.g. ED, ICU).

## 4.5 Integration and mixed methods data analysis of qualitative and quantitative data

Integrative analysis and interpretation of qualitative and quantitative data occurred on several levels within this study, and involved managing naturally occurring mixed data and transformed quantitative and qualitative data. According to Teddlie and Tashekori's (2009), when a single source (e.g. the medical record, participant etc.) gives rise to both qualitative and quantitative data, it is intrinsically mixed and therefore integrated. In Phase 1, clinicians documented and used both quantitative data (i.e. vital signs) and qualitative data (e.g. patient symptom/medical histories) during the natural course of managing critically ill sedated patients and when forming clinical judgements. Similarly, in Phase 2, both qualitative and quantitative data were collected at interview from experienced resuscitation nurses regarding their clinical experiences of managing sedated critically ill patients.

Analysing and interpreting this mixed methods quantitative and qualitative data was guided by the work of Onwuegbuzie and Teddlie (2003). First, the data was analysed separately as outlined in Chapter Three, before being mixed. Second, quantitative data were presented in tables and histograms, with qualitative data displayed using charts

(Onwuegbuzie & Dickinson 2008). The third stage, data transformation, involved 'qualitizing' quantitative data and 'quantitizing' qualitative data (Tashakkori & Teddlie 1998, p 128). The former was achieved through modal profiling (Tashakkori & Teddlie 1998), with narratives generated around the most frequently (i.e. modal) occurring attributes, events and characteristics of critically ill sedated patients identified in the quantitative data. The latter involved transforming qualitative codes into numerical variables (Caracelli & Greene 1993), with the clinician medical record entries and interview data that described patients quantitized as being over-sedated (1) or under-sedated (-1). Following data transformation, the transformed study data was combined into a new data set. Fourth, in order to obtain a fuller description of the phenomena under investigation (Bryman 2007), the researcher compared and contrasted the quantitative data with quantitized qualitative data, and the qualitative data with the qualitized quantitative data; producing blended variables and meta-inferences. Lastly, in forming discussions about how the integrated data addressed the research question, the connections and disconnections between the two data collections methods was realised (Bryman 2007).

## 4.6 Rigour of the study

In order to contribute new knowledge, research must be scholarly and trustworthy, therefore all research, irrespective of design or approach, must address the issues of rigour (Jackson, Daly & Chang 2003). An expert panel consisting of the researcher's two supervisors and an external CNC not associated with the study was convened to provide guidance to the researcher and to ensure scholarly conduct and rigour. To further enhance the study rigour and trustworthiness in its findings, the unified validation framework for mixed methods research (Dellinger & Leech 2007) was used in this sequential mixed methods study. The unified validation framework is comprised of five elements: the foundational element, the construct validation element, the inferential consistency element, the utilization/historical element and the consequential element. Study rigour was improved demonstrated by addressing the five elements of this framework in the following ways.

The foundational element refers to grounding of the study in existing research and theory (Dellinger & Leech 2007). In establishing the foundational element, the researcher conducted a comprehensive review of the theoretical and empirical literature relating to the assessment, monitoring and administration of continuous intravenous sedation for critically ill adult patients. Dellinger (2005) recommends that rigorous and defensible criteria be used explicitly when evaluating studies from which to base mixed methods research upon. For this study, following the screening and eligibility processes, the researcher evaluated all identified literature using an internationally developed critical appraisal tools (Critical Appraisal Skills Program International 2013). A flowchart was produced depicting the flow of information throughout the different phases of evaluation, and placed into the final report (Figure 1, p.7). From this comprehensive literature review, the researcher developed a critical understanding of the phenomenon under investigation from which to situate the purpose of this mixed methods study, data collection methods, findings and inferences (Beach, Becker & Kennedy 2006).

Construct validation refers to the validity of qualitative, quantitative and mixed methods employed within the study. Several strategies were used to enhance quantitative validity and rigour in Phase 1. First, content validity of the documentation audit tool was established through expert panel review (Polit & Totana Beck 2010). Second, to identify any potential problems the researcher pilot tested the documentation audit tool (Strydom & Delport 2002). During pilot testing, the researcher re-audited 20 randomly selected medical records to evaluate consistency and accuracy of the audit tool and data collection processes. No inconsistencies were noted. Third, threats to external validity, the drawing of "incorrect inferences on the sample data to other persons, other settings, and past or future situations" (Creswell et al. 2003, p.171), was minimised by including within the thesis a limitations section reminding readers to use caution in applying the results of this study to other contexts.

Fourth, in addition to collecting quantitative data, the documentation audit tool also collected qualitative data, thereby providing clinical context and reducing the abstract

nature of the quantitative data (Onwuegbuzie & Leech 2004) and promoting transferability of findings (Dellinger & Leech 2007). Fifth, in further improving the transferability of Phase 1 findings, analysis and interpretation of both data sets obtained in Phase 1 occurred in tandem with the expert panel (Dellinger 2005). Sixth, credibility of Phase 1 qualitative findings was established by maintaining an audit trail using NVivo (QRS International Pty Ltd 2012); demonstrating the origins of theme development in the data (Shenton 2004). Finally, each question that formed part of the interview schedule for Phase 2 was linked to findings (dependability) from the literature and/or Phase 1 results (Creswell 2007), and then evaluated by the expert panel to reduce researcher bias (confirmability) (Joacobsen 2011).

Similar strategies were used to enhance the validity and rigour of Phase 2. First, to reduce researcher bias, the researcher randomly sampled participants using strict inclusion criteria rather than purposeful sampling, thereby distributing unknown influences evenly across the sample (Preece 2000). Second, the researcher read and re-read all interview transcripts in conjunction with listening to the original audio-recording for accuracy, thereby further building upon the credibility and dependability of findings (Lincoln & Guba 1985). Third, the researcher met with their principal supervisor, an expert in qualitative data analysis to discuss analysis throughout the study and to debrief. Debrief meetings were conducted in a manner consistent with Sandelowski's (1998) conceptualization of outside experts as a resource as opposed to validating findings. These meetings were conducted to explore and minimise researcher biases, and to clarify the basis of interpretation to ensure confirmability in relation to coding and theming of the data (Lincoln & Guba 1985). Meetings lasted from 90 to 120 minutes, and were audio-recorded to allow for immediate recall of ideas and personal reflection. Fourth, thick descriptions of the setting in Phase 1 and two was provided to establish the context for transferability (Lincoln & Guba 1985). Lastly, building on transferability, the researcher presented (Varndell, Fry & Elliott 2011, 2013) preliminary findings from this study for peer scrutiny, to assess the extent to which the findings resonated with emergency nurses practicing in similar settings (Shenton 2004).

Feedback from peers was noted within a reflexive diary and discussed with the researcher's principal supervisor.

In addition to the traditional criteria for validating quantitative and qualitative methods, as discussed above, validating mixed methods research has increasingly focused on the quality of the study design, and the integration of the quantitative and qualitative data (Tashakkori & Teddlie 2010). The mixed methods research design adopted here was consistent with Tashakkori and Teddlie's (2010) typology of mixed methods designs. Further, using a sequential explanatory mixed methods study design to examine complex nursing practice phenomena, was consistent with other published peer-reviewed studies (Cameron 2009; Gulmans et al. 2007; Morgan 1998; Nastasi et al. 2007; O'Cathain et al. 2004). Further, sampling across two metropolitan tertiary referral ED sites enhanced the design quality and legitimation (Dellinger & Leech 2007) of the study and its findings, and was consistent with current mixed methods sampling strategies (Onwuegbuzie & Collins 2007) and published research (Byrne et al. 2013; Jones, Benbow & Gidman 2014; Scherer & Lane 1997). Quantitative and qualitative data were integrated sequentially in a systematic manner (Onwuegbuzie & Teddlie 2003) to form meta-inferences, thereby improving inferential consistency of the study (Dellinger & Leech 2007).

The utilization/historical element refers to data and inferences that can be used in various circumstances (Dellinger & Leech 2007), whereas the consequential element refers to the resulting changes from the study, such as changes in practice, behaviour or processes. These final two elements were addressed as one. The data collection methods and findings were developed within a unique practice situation, the resuscitation bay of the ED. In extending the utilisation of the study findings, the researcher included in this final thesis an implications section detailing recommendations on how to expand upon the findings within different contexts.

### 4.6.1 *Positioning of the researcher*

As an instrument for data collection, the characteristics of the researcher positioned in the research influence the data (Pezalla, Pettigrem & Miller-Day 2012). The values, attitudes and biases of the researcher can therefore shape the design, conduct, selection and interpretation of data (Silverman 2012b). In this sequential explanatory mixed methods study, the researcher adopted a reflexive stance for three reasons. First, in enhancing the scientific value and integrity of the knowledge produced, a reflexive stance was adopted to maintain awareness of and critically reflect upon how prior knowledge, experiences and skills (Beach, Becker & Kennedy 2006; Brannick & Coghlan 2006; Harré 2004) could alter the 'context of discovery' (Hesse-Biber 2010, p. 188) and ultimately the object of the research.

The second reason was because the researcher was the CNC for a nearby metropolitan ED and was interviewing emergency nurses about their clinical experiences in an ED often compared to the researcher's own. It was therefore important to remain aware of the researcher's presence in the research, the possible influence and power brought to bear upon the interview, and how the participant was represented within text (Bott 2010).

Finally, a research degree is about more than completing this research project, it is about equipping the researcher with a set of transferable skills. Recording such professional change and growth, tracking decisions about data analysis and interpretation accords well with the concept of promoting and understanding of the self in context (Rolfe & Freshwater 2001). To these ends, the researcher maintained a reflective diary to recall and evaluate actions, reactions, thoughts and feelings when conducting the retrospective audit and face-to-face interviews, data analysis, generating inferences and when being debriefed (Kleinsasser 2000; Polit & Totana Beck 2010).

## 4.7 Ethical considerations

Phase 1 of the study received primary ethical approval from the local Human Research Ethics Committee (LNR/10/POWH/151), and was subsequently ratified by the University of Technology, Sydney (UTS) ethics committee (UTS HREC 2011-317R). Phase 2 received primary ethics approval initially from the local HREC (LNR/12/POWH/202), then at the selected study site (LNR/SSA/12/STG/155), and ratified by the UTS ethics committee (REF NO. 2013000112). All data will be kept secure in accordance with the local HREC and University of Technology, Sydney expected standards for five years (National Health and Medical Research Council 2007b).

## 4.8 Summary

This chapter presented the research methods used in the study. The study used a sequential explanatory mixed methods design combining two phases. The combination of both qualitative and quantitative approaches was developed to provide a deep and rich understanding of emergency nursing practice. More specifically, the selected methods enabled the generation of new knowledge about how emergency nurses assess, monitor and manage continuous intravenous sedation for the critically ill patient. The Phase 1 medical record audit involved concurrent collection and analysis of qualitative data offsetting the abstract nature of the quantitative data collected, and thereby enhanced the validity and rigor of the findings presented in this thesis.

The second phase used semi-structured interviews with experienced emergency nurses. Phase 1 findings and available literature informed development of an interview schedule to guide the interview process. An expert panel reviewed the interview schedule and assisted in piloting the schedule to identify any potential issues that could jeopardise the quality of data collected. To further enhance the validity and rigor of Phase 2 findings, data analysis involved two main steps: data preparation and a thematic analysis.

The following Chapter describes the results from Phase 1 of the sequential explanatory research design. Findings presented are based on the 12-month medical record audit. Findings from the semi-structured face-to-face interviews (Phase 2) are then presented in Chapter 6.

# CHAPTER 5: RESULTS PHASE 1

## 5.1 Introduction

This chapter presents analysis of the 12-month medical record audit from Phase 1, with findings presented in three parts: 1) demographic and clinical profile of the critically ill patient population between January to December 2009 and study sample; 2) quantitative findings of the retrospective medical record audit; and 3) qualitative descriptive analysis of nursing and medical documentation contained within the patient medical records.

## 5.2 Demographics

A total of 48,868 patients presented to the ED between January 1st and December 31st 2009. Of these patients, over one-third (*n*=16,981; 35%) were admitted to non-critical care wards, and had largely presented to the department with potentially life-threatening symptoms (ATS 3 *n*=10,027; 59%). Patients admitted directly to the ICU from ED (*n*=229; 1%) were mostly male (*n*=118; 51%), and presented with immediately life-threatening (ATS 1 *n*=45; 80%) symptoms. Only one patient admitted to ICU was initially triaged as non-urgent (ATS 4). Of the 229 critically ill patients admitted to ICU, 188 (82%) medical records were available for auditing. Forty-one medical records (18%) were unavailable for review due to being listed as either 'off-site' (*n*=30; 13%), in possession of the state coroner's office (*n*=5; 2%) or missing (*n*=6; 3%).

The critically ill patients (*n*=188) managed in the ED with medical records available had a median length of stay of 14 hours (range 0.2-56h, IQR 5h), with 55 (29%) patients receiving continuous intravenous sedation. Distribution of patient gender ($\chi^2$=0.31, df=1; *p*=.12), age (Z=0.977; *p*=.31) and diagnoses (Z=-7.254; *p*=.41) between the non-sedated and sedated patient groups, were not statistically significant. Both groups were predominantly male (62% vs. 64% respectively), with both patient groups aged in their late 50s (median 59 vs. 58 years, respectively). When ED length of stay and ATS category allocation were explored, a statistically significant (Z=-3.715; p<0.001) difference between the two patient groups was evident. Critically ill patients (*n*=55;

29%) requiring endotracheal intubation and continuous intravenous sedation had more immediate life-threatening symptoms (ATS 1 *n*=45; 80% vs. *n*=32; 24%), and spent less time (median 3.5h vs. 6.4h) in the ED compared to the non-sedated patient group. While the sedated patient group (*n*=55) spent less time in the ED compared to non-sedated patients (*n*=133) admitted to ICU, over half (*n*=32, 57%) stayed in the ED for over four hours before accessing a critical care inpatient bed (Table 6).

**Table 6: Critically ill patients admitted to the ICU from ED**

| **Characteristic** | **Non-sedated (*n*=133)** | | **Sedated (*n*=55)** | |
|---|---|---|---|---|
| | *N* | *%* | *N* | *%* |
| Gender | | | | |
| Male | 82 | 62 | 35 | 64 |
| Female | 51 | 38 | 20 | 36 |
| Age | | | | |
| Median | 59 | | 58 | |
| Range | 16-92 | | 18-93 | |
| IQR | 39 | | 41 | |
| ATS category | | | | |
| 1 | 32 | 24 | 44 | 80 |
| 2 | 45 | 34 | 7 | 13 |
| 3 | 55 | 41 | 4 | 7 |
| 4 | 1 | 1 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 |
| ED Length of stay | | | | |
| Median | 6.4h | | 3.5h | |
| Range | 0.2-21.2h | | 0.75-11.3h | |
| IQR | 3.2h | | 2.5h | |
| <4hrs | 36 | 27 | 23 | 43 |
| >4hrs | 97 | 73 | 32 | 57 |

Patients (*n*=188) transferred to ICU from ED, whether receiving sedation or not, were mainly diagnosed with injury and poisoning (*n*=47; 25%), disorders of the circulation system (*n*=31; 16%), respiratory system (*n*=30; 16%), and ill-defined illnesses such as 'collapse with unknown cause' (*n*=29; 15%). Similarly, for the critically ill patients (*n*=55; 29%) that required endotracheal intubation and continuous intravenous sedation, approximately a quarter of patient admissions each were for injury and poisoning (*n*=16; 29%), disorders of circulation (*n*=14; 27%) or ill-defined illness (*n*=10; 18%) such as 'seizure of unknown cause'. On comparing disease classifications of patients, there was no statistical difference (*Z*=.427; *p*=.670) between the two groups (Table 7).

**Table 7: Summary of medical diagnosis by ICD-9 classification for sedated and non-sedation patient groups admitted from ED to the ICU.**

| ICD-9 Classification | Non-sedated group (n/%) | Sedated group (n/%) | Total (n/%) |
|---|---|---|---|
| Injuries and poisoning | 31 (23) | 16 (29) | 47 (25) |
| Diseases of the circulation system | 16 (12) | 14 (27) | 31 (16) |
| Diseases of the respiratory system | 25 (19) | 5 (9) | 30 (16) |
| Ill-defined illness, symptoms and signs | 19 (14) | 10 (18) | 29 (15) |
| Endocrine | 12 (9) | 2 (4) | 14 (7) |
| Diseases of the digestive system | 11 (8) | 1 (2) | 12 (6) |
| Infectious and Parasitic | 7 (5) | 1 (2) | 8 (4) |
| Diseases of the nervous system | 3 (2) | 3 (5) | 6 (3) |
| Diseases of genitourinary system | 4 (3) | 1 (2) | 5 (3) |
| Diseases of the skin | 2 (2) | 0 (0) | 2 (1) |
| Diseases of the blood and blood forming organs | 2 (2) | 0 (0) | 2 (1) |
| Health related influences | 1 (1) | 0 (0) | 1 (1) |
| Mental disorders | 0 (0) | 1 (2) | 1 (1) |
| **Total** | **133 (100)** | **55 (100)** | **188 (100)** |

### 5.2.1 *Rapid sequence intubation and sedation of critically ill patients*

The majority of patients (*n*=46; 84%) had physiological observations documented in accordance with departmental policy prior to rapid sequence intubation (RSI) in the ED. Most patients (*n*=45; 80%) had at least one late sign of clinical deterioration documented, predominantly diminished levels of consciousness (*n*=38; 68%). Table 8 presents the frequency of physiological observations documented by nursing staff prior to commencing RSI. Over half of the patients had heart rates (*n*=34; 61%) or respiratory rates (*n*=28; 50%) outside of normal limits, despite relatively normal systolic blood pressures (*n*=38; 68%), peripheral oxygen saturations (*n*=40; 78%), and normal thermoregulation (*n*=29; 59%).

**Table 8: Summary of physiological observations taken immediately prior to patient rapid sequence of intubation and sedation.**

| Physiological observation parameters | N of patients (%) | Not recorded (%) |
|---|---|---|
| Glasgow Coma Scale score | 55 (100) | 0 (0) |
| Normal (15/15) | 6 (11) | |
| Abnormal (12-14/15) | 5 (11) | |
| Early deterioration (9-11/15) | 6 (11) | |
| Late sign of deterioration (≤8/15) | 38 (68) | |
| Heart rate | 55 (100) | 0 (0) |
| Normal (50-99/min) | 23 (41) | |
| Abnormal (100-120/min) | 15 (27) | |
| Early deterioration (40-49 or 121-140/min) | 13 (23) | |
| Late sign of deterioration (<40 to >140/min) | 5 (9) | |
| Systolic blood pressure | 55 (100) | 0 (0) |
| Normal (>100 and <181mmHg) | 38 (68) | |
| Early deterioration (80-100 or 181-240mmHg) | 11 (21) | |
| Late sign of deterioration (<80 or >240mHg) | 6 (11) | |
| Respiratory rate | 51 (91) | 4 (9) |
| Normal (10-17/min) | 23 (45) | |
| Abnormal (18-30/min) | 18 (35) | |
| Early deterioration (5-9 or 31-40/min) | 9 (18) | |
| Late sign of deterioration (<5 or >40/min) | 1 (2) | |
| Peripheral oxygen saturations | 50 (91) | 4 (9) |
| Normal (>95%) | 40 (78) | |
| Early deterioration (≥90-95%) | 2 (6) | |
| Late sign of deterioration (<90%) | 8 (16) | |
| Temperature | 49 (88) | 6 (13) |
| Normal (≥35.5 or ≤37.5) | 29 (59) | |
| Abnormal (<35.5°C or >37.5°C) | 20 (41) | |
| Pain score | 4 (7) | 51 (93) |
| Nil (0/10) | 4 (100) | |
| Mild (1-4/10) | - | |
| Moderate (5-7/10) | - | |
| Severe (8-10/10) | - | |

The majority (*n*=50; 91%) of the critically ill patients that received continuous intravenous sedation were intubated in the ED. Five patients (9%) were intubated in the community by intensive care paramedics prior to ED arrival. The administration of induction and/or paralysing pharmacological agents as part of RSI varied between patients. Of the 55 intubated and continuously sedated critically ill patients, the majority (*n*=48; 87%) were sedated and paralysed prior to intubation. Most (*n*=35; 73%) were administered the rapid short acting barbiturate thiopentone prior to intubation. Opiate and/or hypnotic agents were used in over a third (*n*=22; 40%) of patient cases as alternatives to thiopentone-based sedation; this was commonly (*n*=14; 25%) documented for patients with a toxicology element to their neurological impairment.

The rapid short-acting neuromuscular blocking agent suxamethonium was largely (*n*=32; 67%) administered in cases (*n*=48; 87%) where muscle paralysis was desired prior to intubation. Over a third (*n*=14; 44%) of patients initially paralysed with suxamethonium then required a further bolus (range 1-4, IQR 1) of rocuronium post-intubation. Commencement of continuous intravenous analgesia and sedation post-intubation varied between paralysed patients, and was statistically significant (p=<.001). Patients paralysed with rocuronium during RSI or immediately following intubation (*n*=19; 44% and *n*=9; 21% respectively) commenced continuous intravenous sedation less promptly (mean 41 minutes, SD 4 minutes and mean 47 minutes, SD 7 minutes respectively), compared to patients paralysed with suxamethonium alone (*n*=13; 30%, mean 15 minutes, SD 4 minutes). Similarly, patients paralysed with rocuronium during RSI or post-intubation (*n*=7; 28% and *n*=9; 36% respectively) commenced continuous intravenous analgesia later (mean 48mins; SD 8mins and mean 49mins; SD 8mins respectively) compared to patients (*n*=9; 36%) paralysed with suxamethonium (mean 20mins; SD 8mins).

*5.2.1.1 Continuous intravenous sedation*

Four pharmacological agents were commonly administered for continuous sedation of these patients: midazolam (*n*=30; 54%), propofol (*n*=25; 45%), morphine (*n*=24; 44%) or fentanyl (*n*=9; 16%), and often in combination. Over half (*n*=28; 51%) of all patients were prescribed one intravenous pharmacological agent, compared to patients who received two (*n*=24; 44%) or more (*n*=3; 5%). For patients continually sedated using a single pharmacological agent, morphine, an opioid analgesic, was commonly (*n*=12; 43%) prescribed and administered, compared to lower rates for the hypnotic agents propofol (*n*=9; 32%) or midazolam (*n*=7; 25%). Patients prescribed and administered two or more pharmacological agents concurrently, frequently received midazolam (*n*=20; 74%) in conjunction with propofol (*n*=9; 33%), morphine (*n*=8; 30%) or fentanyl (*n*=3; 11%).

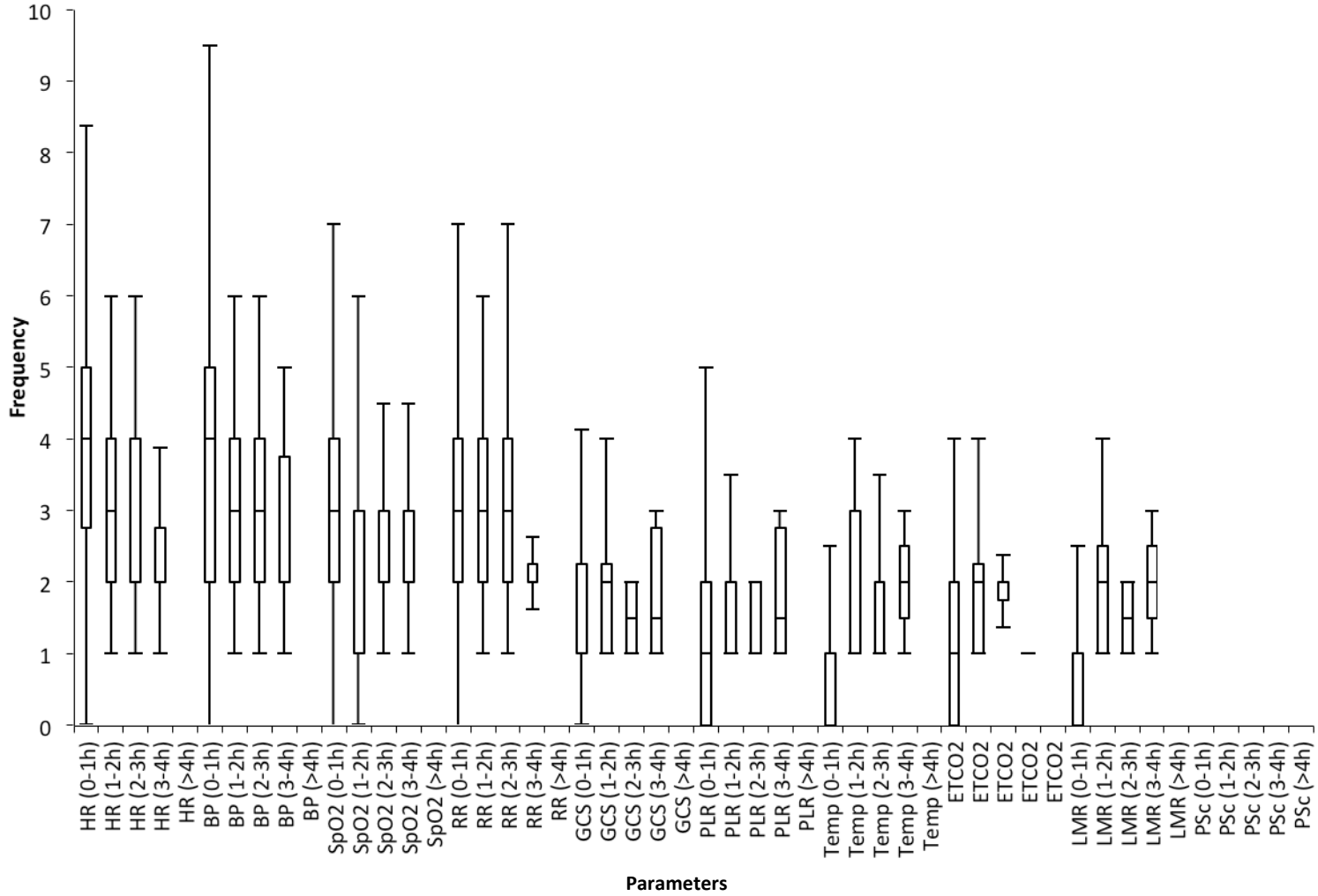
While a variety of drugs were prescribed, whether singularly or mixed with another agent to maintain patient sedation, the use of analgesic agents occurred less often compared to agents with amnesic or hypnotic properties (*n*=31; 56% versus *n*=43; 78% respectively). The simultaneous use of an analgesic and sedative (i.e. analgosedation) occurred in only a third (*n*=18; 33%) of patients. Similarly, when administering a bolus dose of medication, nearly one-third (*n*=17; 31%) of critically ill sedated patients received additional (median 2, range 1-8, IQR 1) aliquots of hypnotics such as midazolam (f=24; 55%) or propofol (f=15; 34%), while few patients (*n*=5; 9%) were administered analgesia.

### 5.2.1 *Frequency and types of physiological observations documented during continuous intravenous sedation*

Patients receiving continuous intravenous sedation were more frequently assessed during the first hour of being sedated than at any other time. On average, emergency nurses documented assessing eight (median, range 0-10, IQR 6) out of ten physiological parameters at least 20 times (median, range 0-84, IQR 15) during the patient's first hour of sedation. Of the 55 continuously sedated and mechanically ventilated patients in the

ED, nurses documented heart rate (22%), blood pressure (19%), peripheral oxygen saturation (17%) and respiratory rate (14%) more frequently, compared to Glasgow Coma Scale score (8%), pupillary light response (6%), temperature (5%), limb motor response (5%), end-tidal carbon dioxide levels (4%) or pain severity (1%). Despite an observed decline in the occurrence of documented patient's physiological observations after the first of continuous sedation, heart rate, blood pressure, peripheral oxygen saturation and respiratory rate remained the most frequently assessed vital signs, compared to assessing patients' level of consciousness (GCS), pupillary light response, temperature, end-tidal carbon dioxide levels, limb motor response and pain (Figure 5).

**Figure 5: Frequency and types of patient physiological parameters assessed by emergency nurses from commencement of continuous intravenous sedation up to ICU admission.**




**Key**: HR = Heart Rate; BP = Blood Pressure; SpO2 = Saturation of Peripheral Oxygen; RR = Respiratory Rate; GCS = Glasgow Coma Scale; PLR = Pupil Light Response; Temp = Temperature; ETCO2 = End-Tidal Carbon Dioxide; LMR = Limb Motor Response and PSc = Pain Score.

## 5.3 Thematic findings

This section presents the thematic findings from the qualitative descriptive analysis of the audited medical and nursing progress notes, medication chart and intravenous fluid infusion prescription chart located in the patient's medical record. The medical record narrative provided context and insight into the documentation practices of ED clinicians caring for and managing critically ill patients requiring continuous intravenous sedation.

As noted earlier, all 55 medical records for the patients receiving continuous sedation in the ED contained nursing and medical documentation relating to the delivery of care, but only twenty-one (38%) records contained narratives describing the assessment, monitoring and administration of the sedation. Four themes were identified: 'Setting the scene', 'Maintaining sedation', 'Directionless-directions' and 'Navigating the balance'. Each of the themes are introduced, described and supported by direct quotes from the medical records.

### 5.3.1 ***Setting the scene***

The theme 'Setting the scene' identified the medical and nursing staff roles involved in the care of the critically ill sedated patient, including ED clinicians and intensive care medical staff. The first clinician to assess, monitor and manage the critically ill patient identified in the audit was the triage nurse, who ascertained their level of clinical urgency. All documentation by the triage nurse contained a brief concise history of the patient's presenting complaint, along with any signs and symptoms. The following quote illustrates a typical triage note. To illustrate:

> *'GCS 3, found face down in a swimming pool- submersion time brief (witnessed by a passer-by to swim a lap & then stop), p[atien]t smells strongly of etoh [alcohol]. RR 12/min, HR 153/BPM [beats per minute], 126sbp [systolic blood pressure]' (RN/#5).*

When the triage nurse concludes assessing a patient, they assign one of five ATS triage urgency categories and allocate them to a clinical treatment area. Patients with potential

life-threatening illness or injury were allocated directly to a resuscitation bed, for example:

> *'Patient mottled, thready radial pulse. Unable to speak. Tachypnoeic. Minimal air movement. Taken straight to resus[citation bay] 1.' (RN/#13).*

Similarly, when patients deteriorated in other clinical treatment areas of the ED, they would be re-allocated to a resuscitation bed for management, as illustrated below:

> *'P]atien]t found to be unresponsive at 03:50 and transferred into resus[citation area] .,. as reduced LOC [level of consciousness], tachycardic.' (RN/#32).*

When a patient is (re)allocated to a resuscitation bed, the escorting nurse provides handover of the patient's condition to the resuscitation nurse. Resuscitation nurses routinely acknowledged accepting responsibility of ongoing care and management of a critically ill patient, for example:

> *'Care taken over. Patient brought to resus[citation area] as reduced LOC, drowsy, ? [query] overdose on benzos[diazepines].' (RN/#3).*

After the resuscitation nurse accepts responsibility for the critically ill patient from either the triage or bedside nurse, they undertake their own initial assessment of the patient's condition, documenting contemporaneously the minute-by-minute changes in the patient's condition, plans of care, or sentinel pathology results (e.g. arterial blood gas results). For example:

> *'[10:11] ABG demonstrates metabolic acidosis, lactate 9.6, p[atien]t for CT [computer tomography] abdo[minal scan] with contrast, ?[query] mesenteric emboli' (RN/#11).*

Then 20 minutes later,

*'[10:32] CT [computer tomography] abdo[minal scan] delayed, need formal creatinine clearance level reported prior to administration of IV contrast' (RN/#11).*

A structured approach was evident when documenting patient assessments and associated findings, principally using the primary and secondary survey approach with an A-J acronym format: airway, breathing, circulation, disability, exposure and environment, full set of vitals, give analgesia, head-to-toe assessment, inspect posterior surfaces and jot down findings (i.e. document). Medical record #22 is a typical exemplar of this:

*'A: intubated, size 8, 22cm [centimetres] at the teeth. B: SIMV [synchronised intermittent mandatory ventilation] VT [tidal volume] 450mls, MVR [mechanical ventilation rate] 12BPM [breaths per minute], PEEP [peak end expiratory pressure] 5cmH2O [centimetres of water], equal air entry to all lung fields. ET [endotracheal tube] suctioned – nil secretions noted. CXR [chest x-ray] confirms ET placement and depth. ETCO2 [end-tidal carbon dioxide] 44mmHg [millimetres of mercury], VBG [venous blood gas] taken for acid/base comparison. C: warm, well perfused peripheries, CRT [capillary refill time] <3secs, HR [heart rate] 89/min, NSR [normal sinus rhythm]. ECG [electrocardiogram] attended. D: Well sedated. E: nil other injuries noted. F: Vitals recorded, see observation chart. G: Morphine 10mg IV given by CDA [Central District Ambulance], pain now 2/10 H: nil new changes noted.' (RN/#22).*

In addition, episodic entries relating to changes in the patient's condition were noted, along with system-focused assessments (e.g. respiratory, skin integrity) and/or summaries of care, as illustrated in the following medical record entry:

*'Patient remains sedated. pH 7.49, reduced MVR [mechanical ventilation rate] to 8 [breaths per minute]. Pressure area care attended to, nil breakdown noted.' (RN/#4).*

Medical officer (MO) documentation demonstrated similar entries pertaining to patient physical assessments, planned investigations or referrals, with bullet-point management plans including goals of sedation and episodic reviews of patient progress, as reflected in the following exemplar:

> *'A: intubated, size 7 tube, 22cm at the teeth. Clear view, MP [Mallampati] 1. B: CXR [chest X-ray] confirms placement, nil pneumothorax evident. Commenced SIMV [synchronised intermittent mechanical ventilation] at 550mls Tv [tidal volume], MVR [mechanical ventilation rate] 12, PEEP [Peak end expiratory pressure] 7cmH20, Fi02 [fraction of inspired oxygen] 50% – reduce as necessary. C: SBP [systolic blood pressure] on arrival 80/40, resolving with fluid resuscitation. Abx [antibiotics] in progress. PIVC [peripheral intravenous cannula] x 2 (18g), for central line. D: Noted reduced LOC [level of consciousness] at nursing ? [query] time of onset. Reflexes present on arrival, nil gag or guarding evident. E: nil gross limb deformity, mass, bruising or bleeding. PR –ve [per rectum negative] for blood. F: Aim to keep MAP [mean arterial pressure] >65mmHg, G: Started on Morphine and Fentanyl infusion as charted.' (MO/#18).*

And

> *'R/V [review] Patient continues self-ventilating on SIMV. Plan: For neuro[ology team] review this morning. Awaiting admission to ICU this afternoon. Keep patient sedated. For Abx [antibiotics].' (MO/#18).*

These and similar MO notes reflected that once patients were stabilised, the emergency nurse allocated to the resuscitation bay retained ongoing responsibility for assessment, monitoring and management of the critically ill sedated patient. The MO would leave the patient to be monitored and managed by the nurse and would be alerted if medical assistance was required. Medical record #44 highlights this team approach:

*'[12:36] Patient becoming more rousable, doctor informed on bridge [elevated main workstation in front of the resuscitation bay in ED], state will attend in a few minutes' (RN/#44).*

Then

*'[12:45] Patient continues to be restless, prevented from pulling out ET tube, over-headed [used Tannoy system to call] doctor to attend' (RN/#44).*

The emergency nurse working in the resuscitation bay for the shift had continuing responsibility for providing care to the sedated critically ill patient, and continued this role until the patient was transferred to the ICU, as demonstrated below:

*'P[atien]t ready for transfer to ICU, handover given to ICU via telephone, bed ready' (RN/#19).*

Part of the resuscitation nurse's role was to arrange and ensure the safe transport of the patient to ICU, as reflected below:

*'P[atien]t becoming aggitated [sic] whilst en route to ICU, 5ml bolus of propofol given' (RN/#42).*

From the audit, emergency nurses provided a handover to the intensive care nurse, a summary of the history and presenting problem of the patient, including an update of the patient's progress and current management. Handover of the continuously critically ill sedated patient either occurred once the patient had arrived in ICU or by phone prior to transferring the patient,

Documentation of patient assessments demonstrated that emergency nurses remained alert for changes and or deterioration in the patient's condition, and often it was necessary to manage the administration of sedation or acquire medical assistance.

### 5.3.2 ***Maintaining sedation***

The second theme involved the role of the emergency nurses in maintaining sedation for critically ill patients. Within the resuscitation room the nurse had responsibility to maintain adequate sedation for the critically ill patient through ongoing intravenous administration of sedation and analgesic pharmacological agents. Sedation administration was guided by the MO's (either the ED MO or ICU staff specialist) plan of patient care documented within the patient's medical record and infusion prescription charts. All medications used to continually sedate the critically ill patient were prescribed by ED MOs. This documentation provided emergency nurses with information relating to the type and concentration of the sedative agents to be administered. Sedation was prescribed in one of two ways: fixed or variable prescribed medications, with the former most common (*n*=54; 98%); for example:

> *'Propofol 500mg/50mls @ 10mls/hr' (Rx/#2).*

If greater sedation and/or analgesia was required to maintain the patient in a comfortable state, the emergency nurse would need to summon the MO to the patient's bedside as record #12 highlights:

> *'P[atien]t agitated, moving around the bed, MO over-headed to attend as P[atien]t needs more sedation' (RN/#12).*

In contrast to the above, the MO could (uncommonly) prescribe sedation with an annotation authorising the emergency nurse to vary the infusion rate (*n*=2; 4%). Varying the sedation infusion rate then relied on knowledge of the emergency nurse in assessing the needs of the patient. Medication prescription chart of patient #8 demonstrates this:

> *'Propofol 500mg/50mls 0-20mg/hr' (Rx/#8).*

Emergency nurses documented adjusting the infusion rates of sedatives, or provided aliquots of sedatives or paralysing agents as boluses, in order to continue meeting the needs of their sedated patient. The regulation of infusion rates was attended to without a

medical officer present, with reasons documented for altering infusion rates or administering boluses of sedatives and/or paralysing agents; such as changes in the patient's behaviour (e.g. agitation) or physiological stability (e.g. low blood pressure):

> *'Midazolam increased from 1ml/hr to 7mls/hr, as patient agitated.' (RN/#7).*

And

> *'BP low … propofol ceased and fentanyl increased to 8mls/hr'(RN/#21).*

And again

> *'P[atien]t given 5mg propofol bolus for agitation.' (RN/#33).*

When subsequent changes to a patient's sedation and management by the resuscitation nurse occurred notations were documented in nursing notes. While nurses administered continuous intravenous sedation, adjusting and supplementing current sedatives and/or analgesic regimes based on patient assessment, not all patients were required to be kept sedated. Instead 4 (7%) of the 55 patient medical records contained documentation recorded by the ICU staff specialist to wean the patient off the intravenous sedatives, thereby allowing the patient to return to a normal cognitive state. This responsibility to wean or cease sedation was also undertaken by the resuscitation nurse:

> *'Aim for extubation if GCS improved.' (ICU/#29).*

And

> *'Wean sedation in morning' (ICU/#42).*

Critically ill patients receiving continuous intravenous sedation were therefore highly dependent upon the skills and knowledge of the emergency nurse. The resuscitation nurse provided continuity of care and was responsible for regulation and management of sedatives and/or analgesic agents. This titration of sedative agents was important

given the potential for over and under-sedation and the impact on patient comfort and haemodynamic stability.

### 5.3.3 ***Directionless-directions***

The theme directionless-directions highlighted perceptions of the reliance of the MO on the expertise of the emergency nurse to manage and maintain critically ill patients in a comfortable and pain-free state. The care plan within the medical progress note and annotations documented on the patient's infusion prescription chart provided the emergency nurse with some directions regarding the use of sedation, but the level of support did vary. The medical progress notes also illustrated the directions from the ED MO or ICU staff specialist which resuscitation nurses used to guide their delivery of sedation and analgesia to the critically ill patient. However, this documentation was often ambiguous and binary in nature. No entries for example described to what depth of sedation patients were to be maintained at, or made reference to any criteria to indicate adequate sedation had been achieved or not. The following medical record entries are typical:

*'Maintain sedated' (MO/#2).*

And

*'Maintain sedation +/- paralyse as necessary' (MO/#17).*

Directions relating to the use of sedation were very occasionally ($n$=3; 5%) documented on the patients' infusion prescription charts where instructions relating to the administration/titration formed part of the prescription, but this was also ambiguous as illustrated:

*'Propofol 10mg/ml titrate as per sedation' (Rx/#31).*

The administration of continuous intravenous sedation and/or analgesic agents to patients relied upon nurses' expertise, knowledge and ability to interpret directions documented by MO or ICU staff specialist. While in some instances resuscitation

nurses were able to adjust sedation and therefore the patient's depth of sedation, for the majority of critically patients, this was not the case.

### 5.3.4 ***Navigating the balance***

The role of the emergency nurse in managing continuous intravenous sedation is to balance the administration of sedation and/or analgesia, with the needs of the patient. The audit identified how nurses navigated safely between under and over-sedation to ensure patients remained pain free. The balancing of sedation and/or analgesia was also important to ensure that the patient remained tolerant to invasive procedures, calm and physiologically stable. To these ends, the audit identified that nurses adjusted the administration of sedation against alterations in patients' behaviour and/or physiological status:

> *' ... biting on tube & moving head ... bolus [of sedation] given' (RN/#3).*

Documentation identified that nurses also attempted to balance the administration of sedation specifically to achieve greater patient-ventilator synchrony. Within the patient records, eight (14%) of the 55 medical records contained evidence that when sedation was optimised and balanced to the needs of the patient, patients were less restless and more tolerant of mechanical ventilation, as the following exemplars demonstrated:

> *'Patient settled post IV sedation' (RN/#6).*

And

> *'Bolus given ... p[atien]t tolerating the [mechanical] ventilator' (RN/#13).*

Emergency nurses identified patients requiring more sedation through the monitoring of patient's physiological signs and behaviours. One patient behaviour, agitation, reflected under-sedation. Documentation of observed patient agitation ranged from moving around in the bed, to extreme behaviour such as attempting to pull out invasive equipment such as peripheral intravenous cannulas, indwelling urinary catheters or endotracheal tubes. For example:

*'P[atien]t becoming more rousable, moving all limbs' (RN/#8).*

And

*'Propofol infusion continues @ [at] 30mls/hr, increased due to p[atien]t fighting tube' (RN/#2).*

On recognising agitation, emergency nurses sought to deepen the patient's level of sedation, documented as either an increase to the sedation infusion rate or additional boluses of intravenous sedatives. To demonstrate:

*'Midazolam increased from 1ml/hr to 7mls/hr.' (RN/#17).*

Or

*'P[atien]t becoming more rousable moving limbs small amounts bolus propofol given' (RN/#11).*

Agitation was perceived to represent under sedation and was the most common sign documented by emergency nurses. On recognition of under sedation nurses would quickly act, to restore the balance and a patient's well-being. In contrast, evidence of over-sedation within documentation identified that it can have significant consequences for patient outcome. Over-sedation was recognised in seven (13%) patient records. Emergency nurses recognised over-sedation by changes in patient blood pressure:

*'BP 96/58, propofol infusion reduced to 25mls/hr' (RN/#2).*

And

*'BP ↓↓ [downwards] to 38/23 post sedation' (RN/#30).*

And again

*'Patient needing frequent [intravenous] fluid boluses as BP [blood pressure] low. Propofol turned down.' (CNS/#2).*

Nurses documented responding to these events in one of several ways, in tandem with alerting the MO, by: reducing the infusion rate sedatives were being administered; ceasing the administration of a given sedative; and / or supporting the haemodynamic status of the patient with intravenous fluid resuscitation. For example:

> *'BP [blood pressure] low ... MO advised to remove propofol and increase fentanyl' (RN/#21).*

And

> *'Hypotensive post sedation ... IV fluid bolusing ... MO aware' (RN/#52).*

Balancing the administration of sedation for critically ill patients relied upon emergency nurses remaining vigilant for and the interpretation of patient's physiological or physical behaviour. Emergency nurses, at the bedside, were the first to idenitfy and respond to changes in the patient's physical or physiological status. The quality of sedation and pain control experienced by the critically ill patient therefore relied upon the knowledge and expertise of the emergency nurse.

## 5.4 Summary

This Chapter has detailed the retrospective audit of Phase 1 of this study. The results of the medical record audit identified how sedation practices were managed within a busy metropolitan adult tertiary referral ED, and more specifically, the role of the emergency nurse in assessing, monitoring and managing sedation to critically ill patients. The role of the emergency nurse was demonstrated to be important in maintaining safety and continuity of care for patients while in the resuscitation bay.

The thematic analysis illustrated the way emergency nurses maintained patient's depth of sedation; ensuring the comfort of the patient and a tolerance for invasive procedure equipment. The safety and quality of sedation and pain control experienced by the patient was determined by the skill and ability of emergency nurses in recognising under or over sedation, and interpreting directions documented in the medical record or

prescription chart. While there were moments of patient under or over-sedation identified in this audit, documentation demonstrated that emergency nurses were the first to identify and respond to changes in the patient's physical or physiological status; navigating the patient towards safer levels of sedation and/or physiological stability and well-being.

The purpose of this retrospective medical record audit was to make visible the everyday practices of emergency nurses managing the critically ill adult patient. In particular, how emergency nurses' use their knowledge, skills and expertise to assess, monitor and administer continuous intravenous sedation for critically ill adult patients. The following chapter details the findings from the semi-structured interviews conducted in Phase 2.

# CHAPTER 6: RESULTS PHASE 2

## 6.1 Introduction

This chapter presents the findings of semi-structured interviews conducted in Phase 2 of the sequential explanatory mixed methods study. Findings are based on 15 interviews conducted with experienced emergency nurses from a metropolitan tertiary hospital in Sydney. The interviews provided for a richer and more insightful understanding of how emergency nurses cared for and managed critically ill patients requiring continuous intravenous sedation. The chapter presents the demographic data of participants followed by the themes derived from analysis.

## 6.2 Participant demographics

A total of 15 experienced registered nurses were interviewed from one metropolitan tertiary referral ED (Table 9). The majority of participants were female ($n$=12; 80%), and had worked at the study site for an average of nine years (range 1-25yrs, IQR 3yrs). Eight participants were classified as clinical nurse specialists (53%) while 11 held post-graduate qualification or above in emergency nursing (73%). All had worked in the resuscitation nurse role for an average of seven years (range 3-20yrs, IQR 4yrs). While six (40%) participants had previously worked in critical care areas managing critically ill sedated patients, the majority ($n$=9, 60%) were first exposed to caring for critically ill patients requiring continuous intravenous sedation in ED in the resuscitation bay.

**Table 9: Demographic characteristics of interview participants.**

| Characteristics | N (%) |
|---|---|
| Gender | |
| Female | 12 (80) |
| Male | 3 (20) |
| Grade | |
| CNS 2 | 2 (13) |
| CNS 1 | 6 (40) |
| Registered Nurse | 7 (47) |
| Time worked in Resuscitation bay | |
| 1-5 years | 8 (53) |
| 6-10 years | 5 (33) |
| >10 years | 2 (14) |
| Highest qualification | |
| Post-Graduate Certificate | 11 (73) |
| Masters of Nursing | 1 (7) |
| None | 3 (20) |

Each interview was completed without interruption within the ED in less than 45 minutes (median 32mins, range 29-44mins).

## 6.3 Thematic findings

Seven themes emerged from Phase 2 data analysis: 'Becoming the resuscitation nurse', 'The basics', 'Becoming confident as the resuscitation nurse', 'Visual cues of sedation', 'Communicating about continuous sedation in the ED' and 'The vanishing act'. Each theme is introduced, described and supported by findings from the thematic analysis of the transcribed interviews.

### 6.3.1 ***Becoming the resuscitation nurse***

The theme 'Becoming the resuscitation nurse' describes how participants prepared and transitioned into the resuscitation nurse role to care for critically ill patients. As noted earlier, critically ill patients are triaged to a resuscitation bay for immediate assessment and stabilisation. In order to safely assess and manage undiagnosed critically ill patients, participants described needing to gain clinical experience and competency in managing general emergency presentations in adult and paediatric minor injuries and conditions, and acute and chronic diseases by first working in acute and sub-acute areas and paediatrics care areas. The length of time prior to progressing into the resuscitation nurse role varied between participants. Generally, nurses new to working in the ED would take up to one year gaining experience in the acute, sub-acute and paediatric areas before being orientated in the resuscitation nurse role:

> *'... just natural progression through the department. As in, acute, sub-acute, then you go to paed[iatric]s' (CNS1/#3).*

As nurses progressed through each of the clinical areas of the ED, 'clinical booklets' were provided that outlined key clinical competencies, knowledge and patient care skills associated with that clinical area, such as the resuscitation bay. For example:

> *'I had to read this clinical booklet ... and just read through like the airway, breathing, circulation [emergencies], and a little bit of pathophysiology of traumas in adults – both adults and children. And like your major presentations.' (RN/#11).*

In addition to completing the clinical workbook, emergency nurses orientating to the resuscitation nurse role worked alongside the CNC or NE for three clinical shifts *'going through the various equipment and various procedures ... and putting it into practice when ... [a] patient arrives'* (CNC2/#9). Becoming familiar with the layout of the resuscitation bay and location and use of equipment was associated with increasing confidence of nurses when caring for critically ill sedated patients. However, time was needed for this to occur as one participant described:

*'At the start I did not like it. Hated it. I just needed time. But after that, it was fun ... I think once you get familiarised with the staff, with the equipment and the resus[citation area] ... you just feel a bit more confident ... It's just a matter of knowing where the stuff ... and [where] the emergency equipment [is kept].' (RN/#12).*

During resuscitation orientation, the CNC and/or NE's role was to assist nurses in consolidating the knowledge and skills necessary to safely manage the critically ill patient in the resuscitation bay. Historically however, this was not always the case. One experienced (>20 years) emergency nurse discussed a time before orientation programs were used to transition emergency nurses into the resuscitation nurse role, whereby nurses were simply rostered to the resuscitation bay irrespective of experience or confidence:

*'...training was not as well organised as it is now. We used to just get dumped into it. (RN/#3).*

Emergency nurses progressing toward working in the resuscitation bay were first required to develop broad emergency knowledge and skills across all areas of the ED. Training and development was provided by the department, and consisted of clinical supervision and completion of clinical work booklets. In some instances, nurses with previous relevant clinical experience could transition to working in the resuscitation bay sooner. Gaining familiarity with the location of emergency equipment, staff and having a program of education to support transitioning into new areas, were seen as positive factors in increasing nurse confidence.

### 6.3.2 ***The basics***

The theme 'The basics' developed from what participants viewed as essential basic knowledge, abilities (i.e. skills) and attitudes needed by nurses to safely and effectively care for critically ill sedated patients in the resuscitation bay. In exploring the fundamentals to be mastered, participants conveyed that the resuscitation bays and

resuscitation nurses should be prepared and ready to act at all times. This was informed by participants' discussions concerning the basics of working in the resuscitation bay. At commencement of each shift, nurses checked all equipment to ensure it was present and working. Where possible, resuscitation nurses were expected to prepare equipment and medications/intravenous fluids required to initially manage a patient, prior to their arrival into the resuscitation bay. This sense of being ready is further captured in participant three's response:

> *'I'd expect the [resuscitation nurse] to know where all the resus[citation] equipment is, how to test it and use it beforehand ... to be [able] to assess the patient, obtain a history, mechanism of injury, allergies, medications given en route to ED if they've come in by CDA [Central District Ambulance], perform a head-to-toe assessment, cannulate, operate the syringe driver, [mechanical] ventilator and bag-valve mask. They need to know about the patient. They are often seeing and managing the patient before the [MO] arrives.' (CNS1/#3).*

Participants went on to describe the importance of airway management skills, as the patients' ability to spontaneously protect their airway and breathe is absent while paralysed. Participants emphasised the importance for the resuscitation nurse to be knowledgeable in advanced life-saving skills, familiar with a wide range of pharmacological agents, their preparation and pharmacodynamics used during RSI and post-intubation. Further, resuscitation nurses had to be able to detect and manage adverse pharmacological events:

> *'Okay, so going to the beginning, I suppose, if you were the airway nurse, during an intubation, knowing what equipment's needed, ... ability of doing cricoid pressure during the intubation, bagging [ventilating the patient by hand] the patient, auscultating the chest to make sure they're ventilating adequately, interpreting and/or hooking up and interpreting the end-tidal CO2 [carbon dioxide], monitoring, performing ventilation obs[ervations]*

*ensuring that patient's ventilating adequately, [making sure the ventilator's] pressure is not too high or too low, and blood gases to make sure that they're adequately ventilating.' (CN2/#1).*

And

*'I'd expect them to know what the medication is and what the side effects are, what the adverse effects and what to do to reverse it, reduce it, or increase it.' (RN/#9).*

And again

*'... you need some advanced life support skills definitely, [you need] to understand ... haemodynamics and body systems. You need to be familiar with the actual medications that we do use for intubation [RSI] because there're so many ... the different options in case one of them is causing adverse [effects] – so if ever they become hypertensive with one, they can be changed to another one. Importantly, you need to know the difference between sedative and paralysing agents.' (CNS2/#12).*

Importantly, while critically ill patients requiring continuous intravenous sedation were cared for using highly technical equipment undergoing complex procedures, three of the experienced participants (>6 years in ED rostered as a resuscitation nurse) viewed basic nursing care as being more important than technical proficiency; ensuring a patient was comfortable, clean and warm is reflected in the following exemplars:

*'I'd like to know that they're comfortable and that they've got a [sic] knowledge to look for that not just to look at the syringe.' (RN/#12).*

And

*'... essentially you just need your basic nursing care stuff ... making sure that [the patient is] comfortable, that they're clean, that they're warm ...*

*not exposed at all points in time. Making sure the patient is warm is always the bane of my existence <laughs>.' (CNS1/#6).*

Participant #7 further emphasised that the resuscitation nurse should maintain a human connection with the sedated critically ill patient:

*'... talk to the patient, you feel stupid, but they can sometimes hear you' (RN/#7).*

Emergency nurses working in the resuscitation bay required a wide range of knowledge, skills and expertise to safely manage critically ill patients and sedation. While participants referred to the level of clinical practice, knowledge and skills as being 'basic', the data suggests that nurses working in the resuscitation area required high levels of complex knowledge encompassing emergency science (e.g. anatomy, physiology, effects of trauma etc.), pharmacology, and expertise in a wide range of life-saving and technical skills in order to safely manage a spectrum of critically ill patient presentations. In addition to emergency nurses being able to respond at a highly complex and technical level, recognising the importance of compassion, comfort, warmth and human contact in caring for critical patients was also an important standard of nursing care.

### 6.3.3 ***Becoming confident as the resuscitation nurse***

This theme reflected the clinical experiences of participants in developing confidence in the management of critically ill patients, particularly those receiving continuous intravenous sedation. In discussing the readiness to work as the resuscitation nurse, participants relayed their anxiety and lack of confidence when initially caring for their first critically ill sedated patient. They went on to highlight that while the current education and support provided when transitioning into the resuscitation bay was sufficient to manage common patient emergencies, they felt less confident when caring for the range of critically ill sedated patients. Participants explained:

*'... reading is fine ... but it just prepared you for the basics. You don't really know until you get there. Like, it's really when you get a patient you took care of ... that you learn' (RN/#12).*

And

*'I think that some of the junior staff are very unconfident [sic] with doing it and it does help to do rotation in places that use sedation frequently ... like ICU, to build up a little more knowledge and confidence' (CNS1/#10).*

Findings also highlighted that when transitioning from being supported by a senior experienced nurse to having to manage a critically ill patient on their own, participants felt uneasy, anxious and wanted senior staff support. The following participant's description summarised this.

*'... It's only when you get your first patient, it's just like, you know, crap. And your [nurse] educator's not there. And it depends who your back up is ... well, if they have a bit more experience or senior.' (RN/#13).*

It appeared from the interviews that while the education and support provided during the initial three-day orientation into the resuscitation bay was sufficient at a knowledge and skill building level, it was not sufficient in building participants' confidence to manage critically ill sedated patients independently. While findings suggested that nurses' confidence developed with increasing exposure over time, it was preceded by a period of being insecure and anxious. For some participants ($n$=6), initial exposure to critically ill patients occurred prior to the ED, and this appeared to enhance confidence in the care of the critically ill sedated patient in the emergency resuscitation setting.

On average nurses new to working in the ED spent 12-months gaining general patient critical care skills, prior to being orientated to the resuscitation bay. However, for some ($n$=6; 40%), this length of time was reduced because of their previous critical care experience (Table 9, p.90). The following is a typical exemplar:

*'I was fast tracked because I [had] come from a critical care background. So, [they] pretty much gave me the package to do, which was the booklet and then I just went in there. And, I think, I had an orientation day and that was it.' (RN/#11).*

These participants commented that by combining their previous experience with the resuscitation orientation, they felt more confident and better able to manage critically ill sedated patients in the resuscitation bay.

*'... I did [an ICU placement] and I felt more comfortable. And with that experience and with completing the packages like ... non-invasive and even attending in-services regarding cardiogenic shock ... sort of prepared me' (CNS2/#8).*

And

*'I have some anaesthetic and ICU experience so it wasn't so full [on] as some other people have experienced.' (CNS1/#10).*

All participants rated their level of confidence in managing the critically ill patient receiving continuous intravenous sedation. Those with previous critical care experience (*n*=6), reported higher (median 8, range 8-10, IQR 8) levels of confidence, albeit marginally, compared to those participants without any previous critical care experience (*n*=9, median 7, range 6-10, IQR 7). All participants then provided a rationale for their choice of score. Seven (78%) participants without previous critically ill clinical experience highlighted a need to gain critical care experience before being orientated to the resuscitation bay in order to be more confident, as identified in Participant's #7 response:

*'My personal opinion, I would probably say six. It's just because I'd like to have a little bit more hands-on experience with ventilators, to really know the ins-and-outs and really be able to tweak that. As an emergency nurse, you don't get that so often in ICU where you program with CPAP*

*[Continuous Positive Airway Pressure] and BiPAP [Bi-level Positive Airway Pressure] and all of that.' (RN/#7).*

Compared to Participant #14:

*'Eight out of ten ... I wasn't particularly confident with sedation and ventilation, but I did a rotation through ICU and it was after that that I felt particularly – that I came back much more confident ... I definitely wouldn't have said that before I'd done that. I just know from my own practice it made a big difference. I only had three months, but it made a big difference' (CNS1/#4).*

Becoming confident in managing critically ill patients in the resuscitation bay related to the amount of time they were supported by senior experienced emergency nurses and exposure to critically ill patients. However, slightly higher levels of confidence were perceived by those nurses that had gained previous experience in the intensive care environment prior to transitioning into the role of the resuscitation nurse. Nurses with no prior experience in caring for critically ill patients reported feeling less confident in managing patients requiring continuous sedation and mechanical ventilation. Further, the data suggested that the benefits of the clinical booklets, in relation to confidence, were of limited use in preparing nurses to undertake the resuscitation role.

### 6.3.4 ***Communicating about continuous sedation in the ED***

The theme 'Communicating about continuous sedation in the ED', developed from participants' perceptions of how patient sedation was communicated between ED medical and nursing staff and recorded within the medical records. Findings reflected that critically ill patients were cared for by a number of clinicians with different roles during the initial resuscitation and stabilisation phase. For example:

*'... when the patient arrives, they're assessed by the doctor [ED MO], depending on the mechanism, we would go through the primary survey and hook up the monitors. More doctors may be in [the resuscitation bay] if*

*intubation is required … and then there's radiography to do a chest x-ray to check the [endotracheal] tube. ICU doctors may also be there, but they quickly leave. [Resuscitation] nurses draw up and give medications, fluids, do ECGs, collect blood samples, control the vent[ilator], monitor the patient' (RN/#9).*

During initial assessment, physical examination findings and instructions for tests to be ordered or medications to be administered were commonly communicated verbally to resuscitation nurses. Participant #9 added that in some instances, a nurse may be designated as the scribe nurse to document patient vital signs, assessment findings, and what medication was being prescribed/administered such as sedatives. However, if no additional nurses were available to scribe, the resuscitation nurse would have to balance providing direct patient care and documentation:

*'We may have a scribe to document patient [vital signs], any drugs requested such as sedation or Morphine … they would be written on the resus[citation] drug order sheet and signed by the [ED MO] afterwards … but if not, you're juggling between getting medications started and writing up things afterwards' (RN/#9).*

As a patient stabilised, additional nursing and medical staff would leave the resuscitation bay, such as the scribe nurse; leaving the resuscitation nurse alone:

*'Initially, we always have a scribe, but as you go on, the more controlled [the patient] is, the less [staff] are present, so by the time they're up to sedation, it's just you. So you would [provide care] and then write. You can't write and then do because the patient or doctor might need something quickly' (RN/#6).*

Documenting verbally exchanged information accurately in the resuscitation bay between different clinicians while attending to the critically ill patient was viewed as difficult, and became more difficult as the noise level increased. Participant #10

highlighted that when noise escalated in the resuscitation bay, it became harder to hear what was being said, and to be certain of the information being communicated verbally, nurses had to double-check the information with other clinicians:

> *Sometimes I find it hard to hear everything that is said … there's a lot of chatter, alarm noises … I notice the doctors verbally tell you things a lot of the time, the noise can make it hard to understand what is being said. You have to ask them to repeat it often, and then have to double-check with someone else that you heard it correctly' (RN/#10).*

However, the challenge of trying to hear medical communication was not any easier for nurses dedicated as the scribe nurse, as highlighted below:

> *'If you're scribing during an intubation, it can be hard to hear what is being said and by who, especially when you're also checking medications' (CNS1/#1).*

When specifically exploring how information regarding administration of continuous intravenous sedation was recorded and communicated between medical and nursing staff, all participants agreed that while medical staff documented the sedative agents to be administered to the patient on the prescription chart, information about titration was normally expressed verbally to the resuscitation nurse. Further insight was provided by two of the participants into how medical staff typically communicated:

> *'I've noticed that it's a lot of verbal [communication]… The drugs are written on the prescription chart, but that's it … There's no documented plan of "This patient must be kept to a sedation level of this." Understandably, if you're sedating the patient you want them to be less than eight, pretty low on the GCS [Glasgow Coma Score], and depending on where on the care continuum they are. I've seen such orders as "wake", and you go "Well, how often do you want me to wake them or how often do you want me to, like, reduce their sedation to the point where they can open*

*their eyes and understand what I'm saying?" So a lot of it is verbal. That's the main part, so most of the time they'll say "Well, just keep them sedated until we get them to ICU." Yeah, right, okay. So I'll just bong them [heavily sedated them], and that's one level until such point in time that you drop their blood pressure or their something and you go, "Okay."' (CNS1/#5).*

Essentially, information was commonly communicated verbally:

*'What I'm used to is if a doctor say, "Okay, I'm gonna [sic] go." I usually say to them, "Okay the sedation is running at this. Are you happy if I give a purge and then let you know?' (RN/#3).*

For the majority of the time, medical staff verbally provided resuscitation nurses with directions as to the administration and titration of sedation. However, if medical staff did document instructions, it was inconsistently located in the medical records:

*'... It's not a lot of times when doctors document the order. They'll document on the flow order sheets but not in their [medical progress] notes.' (CNS2/#8).*

Further, instructions were provided to resuscitation nurses when prompted about titrating sedation:

*'When we ask the doctors about adjusting sedation, they just say, "Titrate sedation as per patient."' (CNS2/#8).*

Participants perceived that less prompting was required with senior ED medical staff who did provide more direction in how to administer and titrate sedation. The quality and detail of instructions communicated by more junior medical staff was however varied; for example:

*'Usually not very well, it depends on the level of the [ED] medical staff I think, the more senior they are they'll give more direction like the staff*

*specialist tends to give more direction on sedation use, but the registrars you have to prompt … ICU teams are better - better at documenting about sedation and that sort of stuff than the ED registrars, I think, probably because they deal with it all of the time.' (CNS/#10).*

There were 62 instances were resuscitation nurses made reference to the GCS when quantifying patient depth of sedation. No other scales, tools or instruments were reported to measure patient depth of sedation:

*'I usually write, "GCS 3' (RN/#8).*

And

*'I'd document, "GCS equals three" if the patient was sedated' (RN/#9).*

And again

*'We just use the GCS scale, if the patient is sedated, they're a GCS three' (RN/#10).*

While participants identified use of the GCS, they also preferred to document more qualitative descriptions, indicating that the patient was suitably sedated, comfortable and stable. Further, in maintaining a contemporaneous record of care and therapy delivered, resuscitation nurses would also document vital signs, mechanical ventilator settings and current rates and doses of medications being administered:

*'I usually write, "sedated" and with that, I'll put the ventilator [settings]… I tend to write more of an observation' (RN/#11).*

In addition, when documenting assessment of patient sedation, there was a preference to be as descriptive as possible, so as to detect if the patient had deteriorated:

*'I use descriptive language throughout my clinical notes, for example, "Patient receiving 10 ml of propofol per hour. Patient appears comfortable. Resp[iration] rate 16. No signs of agitation or clenching of*

*the teeth or any muscular movements." So I guess I'm quite descriptive ... just [in case] something happens and patient deteriorates I can see it' (CNS1/#4).*

However, being able to document sufficiently with depth and clarity depended upon time. On exploring participants' views concerning how resuscitation nurses document, participants ($n$=6) with ICU experience commented about the challenge of having enough time to document fully about care provided, while continually managing other competing clinical demands:

*'... all those beautiful streams of notes [in ICU] on your one patient that you've had all day. You don't show that you've [had] the time to write that [in ED].' (RN/#5).*

And

*'Keeping up with documentation is hard. You have a lot to manage, different people asking you for stuff, running to CT [computed tomography], controlling the ventilator, watching the sedation ... Without any documentation you can't see what the patient's doing, where they've been or what they're potentially going to be doing in the future ... sometimes you don't have enough time, you just get as much done as possible' (RN/#2).*

During the initial stage of resuscitation, information regarding managing the critically ill patient was predominantly communicated verbally, including ordering of sedation and/or analgesia. While sedatives and/or analgesics were prescribed on patients' prescription charts, resuscitation nurses had to frequently prompt doctors for additional directions relating to titrating patient analgesia/sedation. Medical staff infrequently documented instructions within patients' medical records concerning sedation titration to enable resuscitation nurses to meet critically ill patients' needs. Directions relating to adjusting sedation and/or analgesia were commonly prompted by resuscitation nurses, and then provided verbally by the ED MO. While resuscitation nurses' assessed patient

depth of sedation using the GCS, describing narratively what critically ill patients' responses were to the analgesia/sedation being administered was preferred. As part of documenting patients' responses to sedation/analgesia, nurses would document signs indicating that patients needed additional sedation or pain relief. However, documenting care practices while providing direct patient care was challenging due to a perceived lack of time.

### 6.3.5 ***Visual cues of sedation***

The theme 'Visual cues of sedation' was generated from participant descriptions of how resuscitation nurses adjusted sedation by visually observing sedated critically ill patients, relying on visual cues as to whether the patient was adequately sedated. The types of visual cues could be divided into two categories: physical or physiological.

Physical cues related to patients' movements such as '*biting on the tube*' (RN/#13), whereas physiological visual cues related to changes in patients' vital signs such as becoming '*hypertensive or tachycardic*' (CNS1/#1). Participants described observing an array of specific behaviours indicating a patient was in pain or agitated, with some overlap demonstrated (Table 10).

**Table 10: Visual cues described by participants to identify critically ill sedated patients experiencing pain or agitation.**

| Type of visual cue | Indicating 'pain' | Indicating 'agitation' |
|---|---|---|
| *Physical* | *'... moving in the bed' (CNS1/#4).* | *'... restless in the bed, moving arms and legs.' (RN/#2).* |
| | *'... chewing on the* [endotracheal] *tube' (RN/#7).* | *'Biting down on the* [endotracheal] *tube' (RN/#9).* |
| *Physiological* | *'Tachycardic ...' (CNS1/#2).* | *'Tachycardia, hypertension ...' (RN/#1).* |

Despite overlapping cues, all participants indicated that they would respond by adjusting sedation administration. All participants voiced the importance of analgesia in maintaining the critically ill patient as pain-free as possible, however this could be challenging. Assessing critically ill patients for pain relied upon resuscitation nurses subjectively interpreting patients' behaviours, such as '*moving* [in the bed] *or scrunching up their face'* (RN/#9). On detecting patients in pain, participants described first checking patients' prescription charts for instructions to increase sedation or analgesia. However, as noted earlier, prescription charts often lacked sufficient instructions to allow titration of sedatives and/or analgesics; thus resolution of the patient's pain as highlighted by the following participants' responses:

> *'... there might be some annotations to the drugs that say, "Increase if necessary" If not then you would have get hold of the doctor [ED MO]' (RN/#12).*

And

> *'Once the doctors leave, you have to make a judgement call ... I just increase [the infusion] a little bit, they don't really give you parameters to work with, it can take a while to get someone and all the while your intubated patient is thrashing around' (RN/#6).*

Participants voiced their reliance upon parenteral sedatives and analgesics being prescribed with sufficient directions so as to allow nurses to increase/decrease the rate or concentration of the infusion when needed. To this end, participants highlighted the importance of checking that all documentation and potential patient-related needs such as additional sedation and/or analgesia were discussed prior to the medical team leaving the resuscitation bay. One participant reflected upon the structural isolation of the resuscitation bay in relation to providing care:

> *'Before the doctors leave you have to make sure everything that you are going to need has been documented or discussed … You have to prompt the doctor for what you might need, so sometimes I ask, "What drugs are we going to keep using, because it may not be written down?" Once the doctors leave, you're on your own … the resuscitation bay is isolated from the main ED areas. While you can also call for help if needed, I like to be able to do things when the patient needs them' (CNS1/#3).*

On exploring what pharmacological agents participants would administer or advocate to be administered to reduce patient pain, morphine was the most frequently (*n*=7; 47%) stated agent, compared to fentanyl (*n*=4; 27%), intravenous paracetamol (*n*=3; 20%) or ketamine (*n*=2; 13%). Participants recognised that trying to adequately control pain in the critically ill patient was largely '*trial and error, hit or miss*' (CNS1/#2), which required the patient to be continually reassessed to gauge the effectiveness of the analgesia administered.

Participants described needing to be vigilant in observing patient behaviour, either physical or physiological to indicate when more or less analgesia was required. Participants acknowledged that striking the right balance between under and over-administration of analgesia was '*difficult, [and a] balancing act*' (RN/#6) between improving patient comfort or '*making things worse'* (CN1/#3). As such, participants were cautious in the use of some analgesics, particularly morphine as it may affect a

patient's blood pressure, or '*take a long time to wear off in the elderly patient*' (CNS1/#5).

Additionally, participants highlighted the risk that administering increasing amounts of opiates could impede the early detection of patient deterioration, especially neurologically:

> *'Morphine can sedate as well; so you don't want to be over- sedating them either because you might want to sort of see what their neurological status is. Too much, and you won't see anything' (CNS1/#5).*

Participants characterised agitation in a critically ill patient as "*moving around in the bed*" (RN/#12), "*reaching for the* [endotracheal] *tube*" (RN/#8) or "*fighting the ventilator*" (e.g. patient-ventilator dysynchrony). In order to prevent an agitated patient from harming themselves by removing vital equipment or invasive lines, participants would increase the amount of sedation administered to deepen the patient's level of sedation. The following is a typical exemplar:

> *'Agitated patients can pull out [intravenous/intra-arterial] lines, [endotracheal] tubes if they're agitated, I would just increase their sedation' (CNS1/#1).*

However, while participants would increase sedation for patients appearing to be agitated, observing differences between agitation and a patient's reactions to pain was difficult:

> *'Well I'll determine if I still thought they were agitated rather than just in pain ... by looking at the [patient], but it's difficult sometimes' (RN/#8).*

Over half of the participants (*n*=8; 53%) identified midazolam as the agent of choice in reducing patient agitation, compared to propofol (*n*=2; 13%). Regardless of choice of sedative, a prescription is required and/or a verbal order by the attending MO:

*'Being able to do something for your patient relies on what the doctors' document or tell you, which is fairly poor. When they have exited the [resuscitation bay], you have to make a judgement about what your patient needs, and if they haven't written anything, you then have to call them back in and say, "I feel that they need a bit of an extra purge because they're agitated ... their [blood] pressure is going up, and suction hasn't been effective, and you can see their sedation level is lightening", and they [MO] say, "Ok"' (RN/#11).*

Despite the common need to prompt medical staff for additional instructions on managing sedation, the majority of participants (*n*=8; 53%) felt supported by the ED MO. However, this was very much dependent upon the seniority and familiarity of the ED MO:

*'Most of the time, it just depends on who medical-officer-wise you're working with' (CNS1/#3).*

And

*'Nine out of ten cases I feel supported, but it depends on who the medical officer is ... it can make a big difference. The less experienced ED doctors just don't know, they've had little contact with continually sedated patients, they don't have guidelines that they can quickly just say, "Oh this is what we do here with this particular sedation." They'll often ask us' (RN/#10).*

Emergency nurses relied upon visual cues in the form of changes in patients' behaviour or physiology as indicators of pain or agitation. From the data, emergency nurses' interpretations of particular patient behaviours and alteration in physiology (e.g. increased heart rate) indicating pain or agitation frequently overlapped. In conjunction with the knowledge, skills and experience of emergency nurses working in the resuscitation bay, critically ill patients were also reliant upon the experience of the physician attending them. However, as suggested by the data, if the medical officer was

junior, nurses had to regularly prompt them as to what course of action should to be taken.

### 6.3.6 ***The vanishing act***

The final theme 'The vanishing act' emerged from participants' clinical experiences of being left alone to manage critically ill patients in the resuscitation bay following intubation and primary stabilisation. Participants described medical staff appearing to suddenly leave the resuscitation bay after initial patient stabilisation. In anticipation of this, participants described needing to ensure that sufficient information had been documented or discussed to manage the patient after medical staff leave the resuscitation area. Participants highlighted titration of analgesia/sedation as key priorities for discussion. However, in the majority of instances, after the patient had been stabilised, the delivery of critical therapies such as mechanical ventilation and sedation to critically ill patients was reliant upon the experience and judgement of the resuscitation nurse:

> *'You turn around, and everyone has just <surprise look, gesturing> vanished! You are left on your own to manage. You have to make sure everything is written up, the drugs etcetera to keep the patient sedated. I often ask the doctors "Should I increase the sedation if they wake up?" before they leave [the resuscitation bay]. While you can call the doctors back if needed, you want to be able to care for your patient as much as possible' (CNS2/#5).*

And

> *'Sometimes it's hard because you feel like you're a little bit alone in [the] resus[citation area] looking after the patient and you're on your own and you're just like "Oh!" you know, they're gone ... you just use your judgement and carry on. If something changes, you can call the doctors back' (RN/#13).*

Further, the importance of the resuscitation nurse's role in providing continual care and management of the critically ill patient, and the ability to influence and optimise the delivery of sedation, was recognised by all participants. This is summarised in one participant's response:

> *'I think the [resuscitation] nurse is the most important because we're the ones that are continually monitoring the patient's sedation, mechanical ventilation and their parameters [i.e. vital. signs] after medical staff leave. Without the [resuscitation] nurse there, you can't [catch] the early signs and symptoms to say that the patient is in distress or deteriorating. We basically influence what happens' (CNS1/#1).*

As noted above, after critically ill patients were intubated and stabilised, ED medical staff would leave the resuscitation bay to attend to new or current patients within the department, or to discuss or follow-up diagnostic test results. While resuscitation nurses could summon ED medical staff to the patient's bedside should further input be required, they provided the continual care for critically ill patients, assessing, monitoring and adjusting therapies to optimise patient comfort, safety and wellbeing until transferred into ICU:

> *'All too often you see the doctors disappear within five minutes after an intubation has been done ... they're often in their office, planning ... going through pathology results, seeing new patients or following up on current patients… you're left caring for the patient on your own in [the] resus[citation area], sometimes for hours or just before the patient is transferred to ICU' (RN/#9).*

In contrast, emergency nurses with previous ICU experience, such as Participants #1 and #2, were comfortable with doctors leaving the resuscitation bay. These participants were able to confidently manage critically ill sedated patients without the presence of the medical officer. Of note, these nurses preferred a patient's bedside to be less cluttered, providing space to organise the patient, bed space and invasive equipment:

*'The less clutter the better. I can spend time focusing on the patient, they are more important … sedated patients are challenging but [I am] used to it' (CNS1/#1).*

And

*'I like it, I can get my [intravenous] lines all sorted, straighten the patient up, clean them, tidy the sheets … I'm used to managing these types of patients' (RN/#2).*

Continuity of care, specifically optimisation of patient comfort and pain control in the critically ill patient relied upon the emergency nurses. Post-intubation sedation and analgesia relied upon nurses prompting medical officers prior to leaving the resuscitation bay. From the data, following intubation and stabilisation, critically ill patients were dependent upon the knowledge, skills and expertise of the nurse for their comfort, safety and wellbeing. For, it was the emergency nurse in the resuscitation bay who was frequently left alone to manage the ongoing care of critically patients. The data suggested that experienced emergency nurses would optimise therapies (e.g. mechanical ventilation, sedation and analgesia) to maintain patient comfort and safety, while waiting for the ED MO to attend.

## 6.4 Summary

This chapter presented the findings of 15 semi-structured interviews exploring emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill patients. Patient continuity of care, including optimisation of comfort and pain control relied upon the knowledge, skills and expertise of the emergency nurse allocated to the resuscitation bay. Emergency nurses transitioning into the resuscitation nurse role did so through a department designed education program in the form of workbooks and supervised practice. For many emergency nurses, managing critically ill sedated patients occurred for the first time in the resuscitation bay. The study identified that while instructions communicated by

MOs was often inadequate, nurses titrated sedation and analgesia by interpreting changes in patient behaviour and physiological status. In this study, changes in patient behaviour and/or physiological status were interpreted as meaning either pain or agitation. However, interpretations frequently overlapped and varied between nurses.

The following chapter presents a discussion of the sequential explanatory mixed methods study and specifically the interpretation and meta-inferences of the study. The following discussion chapter will present meta-inference findings, strengths and limitations of the study and implications for emergency nursing practice, education, future research and policy are then presented.

# CHAPTER 7: DISCUSSION

## 7.1 Introduction

This sequential explanatory mixed methods study explored emergency nurses' practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients. A mixed methods approach, underpinned by pragmatism, was selected to enhance and enrich our understanding of how emergency nurses undertake everyday activities in the role of the resuscitation nurse. This chapter initially presents a discussion of the interpretation and meta-inferences of the study findings and conclusions. The following section then presents the strengths and limitations of the study and implications for emergency nursing practice, education, future research and policy.

### 7.1.1 *Statement of key findings*

The safety and quality of sedation and pain control experienced by critically ill sedated patients in ED was the responsibility of emergency nurses. Emergency nurses, in managing sedation for the critically ill patient, administered sedation and analgesia in response to changes in patient's behaviour, balanced against the patient's physiological tolerance. Nurses' interpretation of observed patient behaviours as indicating either pain or agitation varied, and occasionally overlapped. These nurses were further guided by directions documented or verbalised by the ED MO, but these directions relating to the use of sedation and analgesia post-intubation were often ambiguous, restrictive or absent. Emergency nurses therefore frequently prompted the ED MO for clarification of, or instructions for, the administration and titration of sedation and analgesia for critically ill patients. Largely these directions were communicated verbally to resuscitation nurses.

Emergency nurses with critical care experience were more confident and familiar with managing sedation and felt comfortable in adjusting infusing sedatives and analgesics, or administering a bolus of either to improve patient comfort and/or pain control while

awaiting further input from the ED MO. However, for emergency nurses without previous critical care experience, transitioning into the resuscitation bay marked the first time they had come into contact with critically ill sedated patients. Education of nurses without previous experience and familiarity with managing sedation for critically ill patients, using self-directed clinical workbooks and supervised clinical practice, were insufficient to prepare nurses and build confidence for the spectrum of critically ill patients and managing continuous intravenous sedation. A number of barriers affecting the assessment, monitoring and management of continuous intravenous sedation for critically ill patients in the resuscitation bay, were identified: commencing sedation and analgesia, communication and resuscitation bay design. The following sections expand upon the above key findings.

### 7.1.2 *Emergency nurse assessment, monitoring and administration of continuous intravenous sedation*

The primary aims of nursing critically ill patients are to provide comfort, detect and prevent secondary complications and promote recovery. Central to this process in the ED setting is the resuscitation nurse. In line with findings of Walker and Gillen (2006), this study identified that the judgement and behaviour of resuscitation nurses was a key determinant in the adequate provision and assessment of analgesia and sedation. Assessment of patient sedation, that is the evaluation of the effects of all treatments intended to reduce pain, anxiety, movement and consciousness, includes monitoring a combination of physiologic and behavioural responses of intubated patients (Australian and New Zealand College of Anesthetists 2008, 2010; Jacobi et al. 2002), was exclusively undertaken by the resuscitation nurse.

In this study, resuscitation nurses predominantly relied on interpreting patient behaviour and physiological changes when assessing the need to administer or adjust sedation and / or analgesia. Assessing and monitoring sedation and pain in the critically ill patient by observing for changes in physiological parameters alone can however be misleading. Changes to patients' physiological parameters may occur as a result of emergent

physiologic or pathological conditions, homeostatic changes, and medications. Phase 1 study results identified that the majority of critically ill patients managed by resuscitation nurses had at least one late sign of clinical deterioration. One study (Jacques et al. 2006) examining changes in physiological variables in patients (n=3,046) prior to death, identified that patients with late signs of clinical deterioration are at high risk (<1 hour) of death and often require intensive therapy to correct physiological instability. This was supported by this study, which reflected the intensity of assessments by resuscitation nurses (Phase 1), where physiological stability of critically ill patients can be highly variable from minute-to-minute. Therefore, relying solely upon physiological changes to guide administration of sedation may lead to under or over-sedation. This study demonstrated inconsistency between resuscitation nurses' interpretations of changes in patients' physiological baselines in relation to indicating pain or agitation. Possible underlying pathological causes of physiological changes may also go unnoticed or undertreated. While there was limited evidence that supports the use of vital signs as a single indicator of pain, any change in physiological measures should be considered a cue to begin further assessment for pain or other stressors, while examining for possible pathological causes (Foster, 2001).

Descriptions of pain-related patient behaviours include grimacing, frowning, wincing or increased muscle tone (Pasero & McCaffrey 2002). However, interview findings (Phase 2) showed that agreement between nurses on the interpretation of patient behaviours was inconsistent. In Phase 1 results, the first assessment of a patient's pain was assessed by asking the patient to rate their pain on scale of 0 to 10 (0= no pain, 10 = worst pain ever) pre-intubation, either at triage or on transfer to the resuscitation bay by the resuscitation nurse. While scoring pain in this way has been validated in critically ill patients, even when delirious (Ahlers et al. 2008; Puntillo et al. 2009), and is currently advocated in national standards for assessing acute pain in ED (National Health and Medical Research Council 2011), it does not meet the needs of nonverbal paralysed critically ill patients. From the literature, a number of instruments have been developed and validated to assess pain (Aïssaoui et al. 2005; Gelinas et al. 2009), patient depth of

sedation and agitation (Riker, Picard & Fraser 1999; Sessler et al. 2002) in the intubated critically ill patient. However, these have only been trialled in the ICU setting (Botha & Le Blanc 2005; Margery 1997; Martin et al. 2007; Mehta, McCullagh & Burry 2009; Reschreiter, Maiden & Kapila 2008; Soliman, Mélot & Vincent 2001).

In clinical areas where these tools are incorporated into the management of intubated critically ill patients, they have led to greater precision of dosing, reduced medication side effects and improved communication between clinicians (Walker & Gillen 2006). Misunderstanding and conflict between nurses and physicians can occur when communication of explicit and shared goals for analgesia and sedation are absent (Weinert, Chlan & Gross 2001). Similar to Egerod (2002) and Sun and Weissman (1994), this study also found that MO directions in relation to the administration of sedation and analgesia, whether written or verbalised, were frequently inadequate. This can result in a mismatch between the intended and actual depth of sedation and poor patient outcomes.

The use of protocols to enable emergency nurses to respond to changes in patient depth of sedation, pain or agitation using a validated and reliable assessment tool (e.g. sedation-scoring assessment tool, pain assessment tool), may be one possible approach to improving patient outcomes and reduce variation in medical and nursing practices in assessing, monitoring and managing sedation. A series of studies (Brattebo et al. 2002; Jacobi et al. 2002; Kollef et al. 1998; Kress & Hall 2001; Sessler 2008) have evaluated protocols, commonly in the form of decision-making flowcharts, and patient outcomes. In general, protocols provided for more a systematic approach (Ibrahim & Kolleff 2001) to responding to patient sedation needs, and reduced variations in practice between clinicians (Kollef et al. 1998; Nasraway et al. 2002). This study has highlighted that further research is required to identify the most appropriate sedation-scoring assessment tool and protocol to guide the emergency nurses' assessment, monitoring and administration of sedation and analgesia in ED.

### 7.1.3 *Maximising comfort and pain control of critically ill patients in the resuscitation bay*

Across Australasian EDs, management of comfort and pain in critically ill patients occurs on a daily basis. In this study, critically ill patients were commonly managed by the resuscitation nurse using continuous infusions and/or boluses of pharmaceuticals with hypnotic properties post-intubation. This was often done in isolation, as critically ill patients were managed in dedicated resuscitation bays out of sight of other clinical areas. Critically ill sedated patients remain in the ED for extended periods of time, due the escalating demand for intensive care beds (Nguyen et al. 2000a; Richardson 2002). As a result, the resuscitation nurse was required to manage the critically ill patient for longer periods of time, which included the ongoing administration of sedation and/or analgesia.

To date there is little evidence published regarding how emergency nurses assess and manage comfort and pain control in the critically ill intubated patient. The findings of this study identified that only one in four critically ill patients received continuous infusions of both a sedative and an analgesic (i.e. analgosedation) pharmacological agent following intubation. Additionally, when selecting a pharmacological agent for bolus administration to improve patient tolerance toward noxious stimuli (i.e. pain), only one in 11 patients were administered an analgesic. A previous study (Chao, Huang & Pryor 2006) also identified that among intubated ED trauma patients, less than half received analgesics. This was in line with other findings (Bonomo et al. 2008; Wood & Winters 2011).

In Phase 1 and 2 of this study, it was identified that resuscitation nurses commenced and adjusted sedation and/or analgesia largely in reference to patients' physical behaviour. As such, commencement or adjustment of sedation/analgesia may have only occurred once a paralysing agent was no longer in effect and patients could move or show signs of distress. In Phase 1 of this study, critically ill patients paralysed with rocuronium during RSI or immediately post-intubation, received sedation or analgesia less promptly

than patients paralysed with suxamethonium. Whereas the effects of suxamethonium lasts less than six minutes, rocuronium can last for up 40 minutes (MIMSOnline 2103a, 2103b). While the sedating effect of induction agents used for RSI may have provided for a period of sedation and, depending on the dose, a level of analgesia, this effect is unlikely to last beyond 10-20 minutes (MIMSOnline 2013a, 2013b). It is therefore reasonable to assume that up until patients were able to physically indicate being in pain or agitated, patients may have been conscious; a situation many patients place second only to death (Macario et al. 1999). On examining the literature, comparative studies (Patanwala, Stahle & Sakles 2011; Perry et al. 2008) between rocuronium and suxamethonium have historically focused on the induction process itself, intubation conditions and success rates. This study is the first to consider these two paralytics from the perspective of post-intubation care, the role of the emergency nurse in an Australian ED setting, and clearly further research is warranted.

### 7.1.4 ***Preparation of emergency nurses for the resuscitation nurse role.***

This study identified that emergency nurses regularly care for and manage critically ill patients. The emergency nurse resuscitation role has evolved as a consequence of advancing science and resuscitation knowledge. The findings of this study provide a deeper understanding into how emergency nurses are prepared for and transitioned into the resuscitation nurse role.

Transitioning, the process of assuming and developing into a new role, is commonly experienced by emergency nurses throughout their careers as they achieve certain levels of experience, expertise and competence (Creasia & Parker 2001). Study findings identified that prior to transitioning into the resuscitation nurse role, nurses gained general emergency care knowledge and skills as they moved through the different clinical areas (sub-acute, acute and paediatrics) of the ED, supported by locally developed education packages. Nurses then went on to complete additional competencies during orientation to the resuscitation bay. There is currently no

Australasian literature evident detailing resuscitation nurse competencies, knowledge and or skills.

The findings of this study, similar to Aitken et al. (2009), demonstrated that the degree of knowledge and skills to safely manage critically ill patients are highly complex. From Phase 2, resuscitation nurse knowledge was conceptualised as knowing the location and use (i.e. technical know-how) of non-invasive and invasive equipment (e.g. mechanical ventilators, arterial lines and syringe drivers), being able to interpret and integrate diagnostic and physiological examination results into clinical decision-making, have a detailed understanding of the role and use of a broad range of pharmacological agents such as sedatives, analgesia, paralysing agents and anticipating and prioritising life-threatening medical problems with limited information and resource management. Resuscitation nurse skills were conceptualised as being able to communicate highly complex information, assess and assist with airway management interventions, operate non-invasive and invasive emergency care equipment, conduct detailed physical assessments on critically ill patients and be able to provide compassionate care in an unpredictable and often emotionally charged environment.

Developing resuscitation knowledge, skills and expertise therefore demands specialised training and education above that which is provided at a pre-registration level. While a review of the literature identified standardised state-based education programs to support nurses transitioning into emergency nursing practice (New South Wales Department of Health 2011b), Triage (Department of Health and Ageing 2009), and the Clinical Initiatives Nurse role (New South Wales Department of Health 2011a), no Australian or state-based education programs or professional standards have been published relating to preparing emergency nurses for the role of resuscitation nurse and the critically ill sedated patient.

Historically, EDs have developed educational programs to assist nurses to undertake various clinical roles in the absence of formal training programs (Auditor General for Western Australia 2002; Department of Education Science and Training 2002; Garling

2008; New South Wales Department of Health 2012). This was supported within the findings of this study, which identified that emergency nurses transitioning into the resuscitation nurse role were provided with a clinical booklet (self-directed learning) and underwent three supervised shifts. Self-directed learning and supervised practice are common approaches used in clinical education to help transitioning practitioners assimilate and apply clinical concepts to new patient care situations (National Nursing and Nursing Education Taskforce 2006; Nursing Education Review Secretariat 2002). However, such informal approaches are constrained and variable (Billet 2002; Nehring & Lashley 2004).

This study found that while self-directed learning and supervised practice provided resuscitation nurses with a fundamental level of knowledge and skill, it was insufficient to prepare emergency nurses for the spectrum of critically ill patients and continuous intravenous sedation. In addition, nurses without previous critical care experience to draw upon, reported being less confident in managing critically ill patients requiring continuous intravenous sedation. Transitioning into a new work role has long been identified as a difficult process (Kramer 1974), and more recent research demonstrates the process remains daunting (Leigh, Howarth & Devitt 2005). In addition to developing sufficient levels of knowledge, skills and expertise, developing confidence is a process that requires time and the ability to apply the knowledge, skills and decision-making in an applicable setting (Decker et al. 2008). In line with the survey findings of Weinert et al. (2001) and Guttormson et al. (2010), results of this study suggest that before transitioning into the role of the resuscitation nurse, gaining experience in a critical care area was associated with being more confident in managing critically ill patients, and in managing and adjusting sedation and analgesia.

Clinical education is one of the signature pedagogies in the discipline of nursing that provides exposure to nursing practice in action (Shulman 2005). The meta-inference of the study has suggested that while novice-to-expert theory (Benner 2001) describes nurses' development in the practice discipline, nurses are also on a developmental trajectory as learners. At the lowest part of this trajectory nursing practice is dependent

upon factual recall. Advancing clinicians within specialist settings need clinical experiences that scaffold learning as their knowledge, understanding and practice deepens. Phase 2 study findings suggested that current informal learning strategies are misaligned for the level of complex learning required to fully enable transitioning resuscitation nurses to meet the needs of critically ill sedated patients in the resuscitation bay.

As the works of van Merriënboer (van Merriënboer, Kester & Paas 2006; van Merriënboer & Kirschner 2007; van Merriënboer & Sweller 2005) have identified, supporting clinicians to develop, integrate and apply highly complex cognitive skills and advanced knowledge, requires clinical education models that incorporate multiple different learning strategies to augment the learner's understanding in a myriad of contexts and settings. Such models (Herdich & Lindsay 2006; Jones, Mims & Luecke 2001; Nielsen et al. 2013; van Merriënboer, Kester & Paas 2006; van Merriënboer & Kirschner 2007) have been proposed within the literature, but have not been explored with regards to training and developing resuscitation nurses.

From re-examining the literature in view of this study's findings, nurse educators (Cato & Murray 2010; Decarlo et al. 2008) in similar critical care environments have incorporated simulation (both high and low fidelity) into education programs in order to increase nurses' exposure to clinical situations, and to improve nurses' competency, skills and self-confidence. The role of simulation in training and development of resuscitation nurses could be explored to offer nurses the means to build upon complex knowledge, skills and decision-making capabilities in preparation for managing critically ill sedated patients.

Additionally, the possibility of emergency nurses gaining and consolidating critical care experiences in ICU prior to transitioning into the resuscitation nurse role should be explored. Further, clinical education models/programs should be standardised to limit potential variability between individual EDs. Findings from this study could be used to (re-)design resuscitation nurse clinical education models.

### 7.1.5 *Barriers to effective assessment, monitoring and managing of continuous sedation for critically ill patients*

Findings of this study suggest several barriers to emergency nurses' assessing, monitoring and managing continuous intravenous sedation for critically ill patients in ED. These barriers related to post-intubation delay in commencing analgesia and sedation; communication, both written and verbal, and resuscitation bay design.

Practice barriers exist that prevent timely provision of sedation and analgesia post-intubation. Resuscitating and stabilising critically ill patients requires considerable human and physical resources. In this study, resuscitation nurses identified juggling provision of direct patient care and obtaining medications from a controlled access cabinet, finding and setting up appropriate equipment to infuse the sedative/analgesic and programme an infusion pump. This study also highlighted that decisions around the use and titration of sedation and analgesia occurred when the patient showed signs of being conscious following intubation. Presently, no systematic approach inclusive of decision-making algorithms such as protocols regarding the use and titration of sedation and analgesia in critically ill patients is used within the ED setting. Based on the findings of this study, the approach should include prompts for sedation and analgesia to be made ready for use immediately following intubation.

A further barrier to effective management of patient comfort and pain control concerned communication. This study identified that transfer and communication of information about the use of continuous sedation in relation to its administration and adjustment by medical staff to the resuscitation nurse was poor. Disjointed communication reduces teamwork effectiveness to continually meet physiological and psychological needs (World Health Organisation 2009). Caring for patients with increasing acuity in time-sensitive multitasking environments such as ED, requires high quality and clearly defined information to be communicated between clinicians (Kilner & Sheppard 2010). The quality of information communicated between clinicians is crucial in determining the direction and quality of patient care (Australian Commission on Safety and Quality

in Health Care 2012; Eisenberg, Murphy & Sutcliffe 2005). Whilst sedatives were prescribed on patients' prescription charts, it was the resuscitation nurse that instigated and led the discussion around patient sedation as they relied upon the directions given by the ED MO to prepare, administer and titrate sedation and analgesia.

An additional barrier identified concerned the design of the resuscitation area and its impact upon nurses' confidence and access to support. The design of both resuscitation bays in Phase 1 and two was such that it reduced or obstructed the ease by which clinicians, patients and visitors could see or hear anything from within or from outside the area. Current recommendations (Australasian College for Emergency Medicine 2007) advocate for maximum auditory and visual privacy for occupants of the resuscitation bay and those around them. The design of the resuscitation bay in site two differed in that it was totally isolated from the rest of the department by three security doors. Study participants felt isolated and less supported when working in the resuscitation bay, which was found to negatively impact upon clinical confidence. Feeling isolated was then compounded when medical staff left the area after initial patient stabilisation. In times of high pressure, clinicians preferentially turn to each other for information and decision-making support, rather than searching through policies or guidelines (Coiera 2000; Coiera & Tombs 1998; Coriera et al. 2002; Covell, Uman & Manning 1985). Other studies found that with increasing separation between clinicians, both physically and visually, limits opportunities to share information, co-ordinate, collaborate, model behaviour (Allen 1977; Becker 2007a, 2007b; Kraut, Egido & Galegher 1990). This can result in reduced levels of confidence when undertaking new roles (Decker et al. 2008; Leigh, Howarth & Devitt 2005). This research identified similar issues, with experienced resuscitation nurses reporting difficulties in co-ordinating care, communicating and implementing timely interventions to critically ill sedated patients because of the design of the resuscitation bay.

This section has provided detail on the meta-inferences of this sequential explanatory mixed methods study. Through comparing and contrasting the integrated findings of this study and the literature, this study has contributed new knowledge and

understanding of how emergency nurses assess, monitor and administer continuous intravenous sedation for critically ill patients. The detailed synthesis provided key findings that have made visible the knowledge, skills and expertise of and proposed potential strategies for improving emergency nursing practice, education, confidence and decision-making.

### 7.1.6 ***Strengths and limitations***

This mixed methods study had several strengths, which demonstrate the value of combining qualitative and quantitative studies. First, this study used a well-established sequential explanatory mixed methods model underpinned by pragmatism, which provided new understanding of sedation and analgesic practices for the critically ill patient and the role of the emergency nurse. Second, sampling across two metropolitan tertiary referral EDs with onsite ICU support and frequent exposure to managing critically ill sedated patients in the resuscitation bay, increased the quality and depth of data collection, analysis, integration and generation of meta-inferences (Onwuegbuzie & Collins 2007). Third, by using an expert panel in the development of the documentation audit tool and interview schedule, data analysis, theme generation and findings were strengthened. Fourth integrity and rigour of the transcription process enhanced the findings of Phase 1 and two of this study and was evident by the audit process. The audit process involved the random selection of medical records and interview transcripts which strengthened the study's rigour and validity. While the audit was a lengthy process, it was important to ensure the accuracy of data collection and analysis (Committee on Ensuring the Utility and Integrity of Research Data in a Digital Age & National Academy of Sciences 2009). Finally, the range of clinical experience of participants, in Phase 2, strengthened the study and ensured that the findings would resonate with emergency nurses.

The strength of this study was based on the mixed methods approach which enabled comparison of multiple data sources thereby broadening our understanding of clinical practice. The mixed methods research approach led to a richer and more detailed

description of the context of practice and more specifically the everyday work of caring for critically ill patients by emergency nurses. This approach and the research processes undertaken, as presented in this thesis, enhanced the rigor and validity of the study.

There are a number of methodological limitations when considering this mixed methods study. The study was conducted at two metropolitan adult tertiary referral EDs in Sydney, Australia, and findings may not translate to critically ill sedated patients from small rural and regional hospital settings or international ED contexts. Similarly, results may not translate to other care situations involving critically ill sedated patients such as aeromedical retrieval. The second limitation was that Phase 2 participants were experienced resuscitation nurses. Therefore, the clinical experiences presented in this thesis may differ when compared to emergency nurses with less experience in the resuscitation bay. Legibility as well as scope of documentation in the patients' medication charts was limited and occasionally difficulty to read. However, given the life-threatening situations being managed at the time of documenting assessment findings, decision-making and interventions, this was expected and in part accounted for the rigorous audit process.

## 7.2 Implications for clinical practice, education, future research and policy

This study highlighted the pivotal role of emergency nurses' assessing, monitoring and managing continuous intravenous sedation for critically ill patients in ED, and gave insight into the knowledge, skills and expertise required to optimise patient comfort, pain control and safety. There are a number of implications that can support and strengthen practice, the experience of caring for critically ill patients in ED, and the safety of patient care. Five specific areas emerged from the study findings: clinical practice, education, future research and policy.

### 7.2.1 *Implications for clinical practice*

When considering practice implications it is important to recall that Phase 2 of this study was conducted at a single setting chosen because of its similarity to Phase 1. Hence, the following implications for emergency nursing clinical practice are made.

First is the importance of having a multidisciplinary approach centred on patient's needs of sedation and pain control, communication that is centred on the patient's needs of sedation and pain control, and that it enables emergency nurses to respond dynamically and independently to patients' needs. The structure could be in the form of a protocol or flowchart that guides the administration and titration of sedation, analgesics and anxiolytics. Further, the protocol or flowchart should incorporate the ability for emergency nurses to adjust or bolus infusing sedatives, anxiolytics and/or analgesics in relation to patient's needs and physiological tolerances. The development of a formalised structure would provide the opportunity to build familiarity and discussion around continuous sedation and critically ill patient care between emergency clinicians, but may also inform the development of clinical competencies. Further, the use of protocols or flowcharts would provide the opportunity to audit and monitor the quality of care and decision-making around the administration and titration of continuous sedation in critically ill patients.

Second, emergency nurses should incorporate into their practice the use of evidence-based sedation-scoring assessment tools, when assessing depth of sedation of patients receiving continuous sedation. Evidence-based assessment tools measuring agitation and pain in sedated critically ill patients should also form part of emergency nurses' armamentariums when caring for this high-risk patient cohort. Identified evidence-based assessment tools measuring patient depth of sedation, agitation and pain should then be standardised across EDs to promote continuity and consistency of patient assessment and care practices.

### 7.2.2 *Implications for education*

From this mixed methods study two major implications emerged that related to both nursing education and team communication. First, the findings of this study highlighted that emergency nurses transitioning into the resuscitation nurse role require highly complex knowledge, skills and expertise to ensure continuing safety and optimisation of therapies for critically ill sedated patients. Further, this study highlighted that education and training of emergency nurses is unique to each ED and no standardised education and/or accreditation framework exists within Australia. To improve standardisation and transferability of knowledge, skills and expertise, a state-wide education framework, supported by the findings of this study, needs to be developed to support the transitioning of emergency nurses into the resuscitation nurse role. Further, to increase emergency nurses' confidence in the management of the critically ill sedated patient, the state-wide education should include a rotation to ICU. At a local level, a mentorship program may support and enhance confidence levels for nurses starting in the resuscitation role.

The second implication related to multidisciplinary communication within the resuscitation bay. Specifically, the communication between clinicians regarding the use of prescribed pharmaceuticals used to optimise patient comfort and pain control. To this end multidisciplinary education opportunities incorporating simulation care need to be developed to promote communication, critical thinking and teamwork. In this way resuscitation team members would better manage the spectrum of critically ill patients and their sedation and analgesic needs.

Given the importance of the emergency nurses' role in optimising patient sedation, pain control and providing continuity of care, education programs should be expanded to include standing orders which accommodate independent sedation and analgesic management of critically ill patients by nurses. This implication would be further informed by the development of policies or protocols outlining standards of care expected in assessing, monitoring and administering continuous intravenous sedation

for critically ill patients within the department, and the agreed upon assessment tools by which to evaluate patient depth of sedation and pain control, documentation of sedation, analgesia and anxiolytics and their titration.

### 7.2.3 *Recommendations for future research*

There are important implications for future research examining emergency nursing practices in assessing, monitoring and managing continuous intravenous sedation for critically ill adult patients. Assessing patient sedation by physiological variables and unique patient behaviours has limited value in ensuring optimal sedation and pain control in the critically ill patient. As identified in the literature review presented in this thesis, several reliable and validated sedation-scoring assessment tools have been developed to aid in assessing and monitoring sedation in critically ill patients. However, none have been trialled within an ED setting. Future studies should include the testing of a range of sedation-scoring assessment tools across multiple sites to examine the tool(s) most appropriate for the ED context.

Future investigations of clinician behaviour in relation to the assessment, monitoring and administration of continuous intravenous sedation for critically ill adult patients would be better informed through the use of video-ethnography. Finally, future research should test different educational models (curriculum content, teaching methods and accreditation) to determine the best way to prepare the emergency nurse to undertake the resuscitation role.

### 7.2.4 *Recommendations for policy*

From this study two major policy implications emerged. First, this study identified that additional training and education beyond that of pre-registration nursing education is required in relation to the assessment, monitoring and administration of continuous intravenous sedation for critically ill patients. Second, this study highlighted that orientation to the resuscitation role is developed locally. Based on these findings a state-wide policy is required to outline the expected minimum standards of care for the assessment, monitoring and administration of continuous intravenous sedation for

critically ill patients if consistency in practice is to be enhanced. The policy needs to detail the expected standards of education and credentialing of emergency nurses working in the highly complex role of resuscitation nurse. More importantly emergency professional colleges should develop standards of care, tools and a credentialing framework for emergency clinicians in relation to the assessment, monitoring and administration of continuous intravenous sedation for critically ill patients in the ED.

The study highlighted how emergency nurses routinely optimise patient sedation and pain control. This needs to be formally recognised within policies and more specifically standing orders. Standing orders would provide the visibility of this important work already undertaken independently but largely hidden by resuscitation nurses. Practice, patient outcomes and care activities would be enhanced and improved with the development of standing order policies that enable the resuscitation nurse to independently, safely and in a timely way deliver sedation and analgesia for the critically ill patient.

Based upon the findings of this study, several implications have been described in relation emergency nursing practice, education, future research and policy development. This chapter has also provided a discussion of the study's key findings and the limitations and strengths of a sequential explanatory mixed methods research design.

## 7.3 Conclusion

This sequential explanatory mixed methods study has generated new knowledge and will therefore contribute to the body of emergency nursing knowledge. This study has for the first time exposed a detailed and rich description of the complexity of the resuscitation nurse role in the assessment, monitoring and administration of continuous intravenous sedation and analgesia for critically ill ED adult patients. This study identified that emergency nurses are increasingly responsible for optimising patient sedation and pain control based upon their level of knowledge, skill and expertise. In addition, the study identified several gaps within emergency nursing practice in relation to the assessment and quantification of patient depth of sedation and pain in the

intubated critically ill patient. Sedation-scoring assessment tools have been identified within the critical care literature that may be suitable for integration into the ED setting. Implications have also been presented for emergency nursing practice, education, research and policy, based on this research. This mixed methods study has provided a way forward to better prepare nurses to undertake the resuscitation role and the activities needed to ensure safe, appropriate and timely patient care.

# CHAPTER 8: REFERENCES


Academy of Medical Royal Colleges 2001, *Implementing and ensuring safe sedation practice for healthcare procedures in adults.*, London, UK.

Ahlers, S., van Gulik, L., van der Veen, A., van Dongen, H., Bruins, P., Belitser, S., de Boer, A., Tibboel, D. & Knibbe, C. 2008, 'Comparison of different pain scoring systems in critically ill patients in a general ICU', *Critical Care*, vol. 12, no. 1, p. R15.

Aïssaoui, Y., Zeggwagh, A., Zekraoui, A., Abidi, K. & Abouqal, R. 2005, 'Validation of a behavioral pain scale in critically ill, sedated, and mechanically ventilated patients', *Anesthesia and Analgesia*, vol. 101, no. 5, pp. 1470-1476.

Aitken, L., Marshall, A., Elliott, R. & McKinley, S. 2007, 'Critical care nurses' decision making: sedation assessment and management in intensive care', *Journal of Critical Nursing*, vol. 18, pp. 36-45.

Aitken, L., Marshall, A., Elliott, R. & McKinley, S. 2009, 'Critical care nurses' decision making: sedation assessment and management in intensive care.', *Journal of Critical Nursing*, vol. 18, pp. 36-45.

Allen, T. 1977, *Managing the flow of technology*, MIT Press, Massachusetts.

American Association of Nurse Anaesthetists 2008, *Scope and standards for nurse anesthesia practice*.

American College of Emergency Physicians 1997, 'Rapid sequence intubation', *Annals of Emergency Medicine*, vol. 29, p. 573.

American College of Emergency Physicians 2005, 'Clinical policy: procedural sedation and analgesia in the emergency department', *Annals of Emergency Medicine*, vol. 45, no. 2, pp. 177-196.

American Nurses Association 1991, *Endorsement of position statement on the role of the registered nurse (RN) in the management of patients receiving IV conscious sedation for short-term therapeutic, diagnostic, or surgical procedures*, ANA, USA.

American Society of Anesthesiologists 2008, *Position on monitored anesthesia care*, American Society of Anesthesiologists.

American Society of Anesthesiologists 2009, *Distinguishing monitored anesthesia care ("MAC") from moderate sedation/analgesia (conscious sedation)*, American Society of Anesthesiologists.

American Society of Anethesiologists Task Force 2002, 'Practice guidelines for sedation and analgesia by non-anesthesiologists', *Anesthesiology*, vol. 96, pp. 1004-1017.

Ancker, J., Kern, L., Abramson, E. & Kausal, R. 2012, 'The triangle model for evaluating the effect of health information technology on healthcare quality and safety', *Journal of the American Medical Infomatics Association*, vol. 19, pp. 61-65.

Anderson, K. & Jack, D. 2013, 'Learning to listen: interview techniques and analyses', in S. Gluck & D. Patai (eds), *Women's words: the feminist practice of oral history*, Routledge, London.

Andrew, S. & Halcomb, E. 2006, 'Mixed methods research is an effective method of enquiry for woring with families and communities', *Contemporary Nurse*, vol. 23, pp. 145-153.

Auditor General for Western Australia 2002, *Performance examination: a critical resource: nursing shortages and the use of agency nurses.*, Western Australian Government, Perth, Australia.

Australasian College for Emergency Medicine 1998, 'Use of intravenous sedation for procedures in the emergency department', *Emergency Medicine*, vol. 10, pp. 63-64.

Australasian College for Emergency Medicine 2002, 'The Australasian Triage Scale.', *Emergency Medicine*, vol. 14, no. 3, pp. 335-336.

Australasian College for Emergency Medicine 2003, *Statement on clinical principles for procedural sedation*, Australasian College for Emergency Medicine.

Australasian College for Emergency Medicine 2007, *Guidelines on emergency department design*.

Australasian College for Emergency Medicine 2010, *Training and examination handbook*, Australasian College for Emergency Medicine, <http://www.acem.org.au/media/training/Handbook.pdf>.

Australasian College for Emergency Medicine 2013, *Guidelines for the implementation of the Australasian Triage Scale in emergency departments*, ACEM.

Australian and New Zealand College of Anesthetists 2006, *Recommendations on monitored care by an anaesthetist*, ANZCA.

Australian and New Zealand College of Anesthetists 2008, *Guidelines on sedation and/or analgesia for diagnostic and interventional medical or surgical procedures*, Australia and New Zealand College of Anaesthetists.

Australian and New Zealand College of Anesthetists 2010, *Guidelines on sedation and/or analgesia for diagnostic and interventional medical, dental or surgical procedures*, ANZCA.

Australian Commission on Safety and Quality in Health Care 2012, *National Safety and Quality Health Service Standards*, ACSQHC, Sydney.

Australian Institute of Health and Welfare 2008, *Australian hospital statistics: 2008-2009*, Canberra.

Australian Institute of Health and Welfare 2013, *Australian hospital statistics: 2011-2012*, Canberra.

Australian Nursing & Midwifery Council 2008a, *Code of ethics for nurses in Australia*.

Australian Nursing & Midwifery Council 2008b, *Code of professional conduct for nurses in Australia*, ANMC.

Avramov, M. & White, P. 1995, 'Methods for monitoring the level of sedation. ', *Crit Care Clin*, vol. 11, no. 4, pp. 803-826.

Avripas, M.B., Smythe, M., Carr, A., Begle, R.L., Johnson, M.H. & Erb, D.R. 2001, 'Development of an intensive care unit bedside sedation scale', *Ann Pharmacother*, vol. 35, pp. 262 - 263.

Bahn, E. & Holt, K. 2005, 'Procedural sedation and analgesia: a review and new concepts', *Emergency Medical Clinics of North America*, vol. 23, pp. 503-517.

Baker, T. 1994, *Doing social research*, 2nd edn, McGraw-Hill, New York.

Barr, J., Fraser, G., Puntillo, K., Ely, E., Gelinas, C., Dasta, J., Davidson, J., Devlin, J., Kress, J., Joffe, A., Coursin, D., Herr, D., Tung, A., Robinson, B., Fontaine, D., Ramsay, M., Riker, R., Sessler, C., Pun, B., Skrobik, Y. & Jaeschke, R. 2013, 'Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the Intesive Care Unit', *Critical Care Medicine*, vol. 41, no. 1, pp. 263-306.

Barr, W., Leitner, M. & Thomas, J. 2004, 'Self-harm patients who take early discharge form the accident and emergency department: how do they differ from those who stay.', *Accident and Emergency Nurse*, vol. 12, pp. 108-113.

Battaglia, J., Lindborg, S., Alaka, K., Meehan, K. & Wright, P. 2003, 'Calming versus sedatie effects of intramuscular olanzapine in agitated patients.', *American Journal of Emergency Medicine*, vol. 21, no. 3, pp. 192-198.

Battles, J. & Lilford, R. 2003, 'Organizing patient safety research to identify risks and hazards', *Qualitiy and Safety in Health Care*, vol. 12, no. Suppl 2, pp. 2-7.

Bazeley, P. 2009, 'Integrated data analysis in mixed methods research [editorial]', *journal of Mixed Methods Research*, vol. 3, no. 3, pp. 203-207.

Bazeley, P. 2012, 'Integrative analysis strategies for mixed data sources', *American Behavioral Scientist*, vol. 56, no. 6, pp. 814-828.

Beach, K., Becker, B. & Kennedy, M. 2006, 'Constructing conclusions', in C. Conrad & R. Serlin (eds), *The Sage Handbook for research in education*, Sage, Thousand Oaks, CA.

Becker, F. 2007a, 'Offices at work: uncommon workspace strategies that add value and improve performance'.

Becker, F. 2007b, 'Organizational ecology and knowledge networks', *California Management Review*, vol. 49, no. 2.

Benner, P. 2001, *From novice ro expert excellence and power in clinical nursing practice*, 2nd edn, Prentice Hall, New Jersey.

Bennett, M. 1995, 'Nursing education in restraining universities: report of the National review of nurse education in the higher education sector 1994 and beyond.', *Collegian*, vol. 2, no. 2, pp. 18-20.

Bergman, M. 2008, *Advances in mixed methods research*, SAGE, London.

Bergman, M. 2011, 'The politics, fashions, and conventions of research methods', *Journal of Mixed Methods Research*, vol. 5, no. 2, pp. 99-102.

Bernard, H. 2006, *Research methods in anthropology: qualitative and quantitative approaches*, Altamira, Oxford.

Bhananka, S., Posner, K., Cheney, F. & al., e. 2006, 'Injury and liability associated with monitored anesthesia care: a closed claims analysis.', *Anesthesiology*, vol. 104, no. 228-234, p. 228.

Biesta, G. 2010, 'Pragmatism and the philosophical foundations of mixed methods research.', in A. Tashakkori & C. Teddlie (eds), *Sage handbook of mixed methods in social and behavioral research*, 2nd edn, SAGE, California, USA.

Billet, S. 2002, 'Toward a workplace pedagogy: guidance, participation, and engagement', *Adult Education Quarterly*, vol. 53, no. 1, pp. 27-43.

Binnekade, J., Vroom, M., de Vos, R. & de Haan, R. 2006, 'The reliability and validity of a new and simple method to measure sedation levels in intensive care patients: a pilot study', *Heart & Lung: The Journal of Acute and Critical Care*, vol. 35, no. 2, pp. 137-143.

Bion, J. 1988, 'Sedation and analgesia in the intensive care unit.', *Hospital Update*, vol. 14, pp. 1272-1286.

Bion, J., Logan, B., Newman, P., Brodie, M., Oliver, J. & Aitchison, T. 1986, 'Sedation in intensive care: morphine and renal function', *Intensive Care Med*, vol. 12, pp. 359-365.

Bonomo, J., Butler, A., Lindsell, C. & Venkat, A. 2008, 'Inadequate provision of postintubation anxiolysis and analgesia in the ED', *The American Journal of Emergency Medicine*, vol. 26, pp. 469-472.

Botha, J. & Le Blanc, V. 2005, 'The state of sedation in the nation: results of an Australian survey', *Critical Care & Resuscitation*, vol. 7, pp. 92-96.
Bott, E. 2010, 'Favourites and others: reflexivity and the shaping of subjectivities and data in qualitative research.', *Qualitative Research*, vol. 10, no. 2, pp. 159-173.
Brandl, K., Langley, K., Riker, R., Dork, L., Qualis, C. & Levy, H. 2001, 'Confirming the reliability of the sedation-agitation scale administered by ICU nurses without experience in its use.', *Pharmcotherapy*, vol. 21, pp. 431-436.
Brannick, T. & Coghlan, D. 2006, 'Reflexivity in management an business research: what do we mean?', *The Irish Journal of Management*, vol. 27, no. 2, pp. 143-160.
Brattebo, G., Hofoss, D., Flaatten, H., Muri, A., Gjerde, S. & Plsek, P. 2002, 'Effects of a scoring system and protocol for sedation on duration of patients' need for ventilator support in a surgeical intensive care unit', *British Medical Journal*, vol. 324, pp. 1386-1389.
Braun, V. & Clarke, V. 2006, 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, vol. 3, pp. 77-101.
British Society of Gastroenterology 2003, *Guildelines on safety and sedation during endocopic procedures*, BSG, United Kingdom.
Bryman, A. 2007, 'Barriers to integrating quantitative and qualitative research.', *journal of Mixed Methods Research*, vol. 1, no. 1, pp. 8-22.
Bur, A., Mullner, M., Sterz, F., Hirschl, M. & Laggner, A. 1997, 'The emergency department in a 2000-bed teaching hospital: saving open ward and intensive care facilities.', *European Journal of Emergency Medicine*, vol. 4, no. 1, pp. 19-23.
Burgess, R. 2011, *New principles of best practice in clinical audit*, 2nd edn, Radcliff Medical PR, London.
Burton, J. & Asher, S. 2006, 'Update on Emergency Department procedural sedation and analgesia', *Emergency Medicine & Critical Care Review*, pp. 14-16.
Byrne, M., Daw, C., Pietz, K., Reis, B. & Petersen, L. 2013, 'Creating peer groups for assessing and comparing nursing home preference', *American Journal of Managed Care*, vol. 19, no. 11, pp. 933-939.
Caelli, K., Ray, L. & Mill, J. 2003, "Clear as mud': toward greater clarity in generic qualitative research.', *International Journal of Qualitative Methods*, vol. 2, no. 2, pp. 1-23.
Calver, J., Bulsara, M. & Boldy, D. 2006, 'In-patient hospital use in the last years of life: a Western Australian population-based study.', *Australian and New Zealand Journal of Public Health*, vol. 30, pp. 146-146.
Cameron, R. 2009, 'A sequential mixed model research design: design, analytical and display issues', *International Journal of Multiple Research Approaches*, vol. 3, pp. 140-152.
Campbell, D. & Fiske, D. 1959, 'Convergent and discriminant validation by the multirait-multimethod matrix.', *Psychological Bulletin*, vol. 56, no. 2, pp. 81-105.
Caracelli, V. & Greene, J. 1993, 'Data analysis strategies for mixed-method evaluation designs', *Educational Evaluation and Policy Analysis*, vol. 15, no. 2, pp. 195-207.
Cardosa, L., Grion, C., Matsuo, T., Anami, E., Kauss, I., Seko, L. & Bonametti, A. 2011, 'Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study', *Crtical Care* vol. 15, pp. 1-8.
Carrasco, G., Molina, R., Costa, J., Soler, J., Paniagua, J. & Cabre, L. 1992, 'Usefulness of sedation scales in ICU. A comparative randomized study in patients sedated

with proposol, midazolam or opiates plus benzodiazepines.', *Intensive Care Med*, vol. 18 (Suppl 2), p. 158.
Carrion, M., Ayuso, D., Marcos, M. & al., e. 2000, 'Accidental removal of endotracheal and nasogastric tubes and intravascular catheters.', *Critical Care Medicine*, vol. 28, no. 63-66, p. 63.
Carter, A., Pilcher, D., Bailey, M., Cameron, P., Duke, G. & Cooper, J. 2010, 'Is ED length of stay before ICU admission related to patient mortality?', *EMergency Medicine Australasia*, vol. 22, pp. 145-150.
Cato, D. & Murray, M. 2010, 'Use of simlation training in the intensive care unit', *Critical Care Nurse*, vol. 33, no. 1, pp. 44-51.
Cerner Corporation 2009, Kansas City, MO.
Chao, A., Huang, C. & Pryor, J. 2006, 'Analgesic use in intubated patients during acute resuscitation', *Journal of Trauma*, vol. 60, no. 3, pp. 579-582.
Clark, K. & Normile, L. 2007, 'Patient flow in the emergency department: is timeliness to events related to length of hospital stay?', *Journal of Nursing Care and Quality*, vol. 22, no. 1, pp. 85-91.
Clinical Excellence Commission 2007, *Between the Flags: project overview*, Clinical Excellence Commission, viewed January 2013 <http://www.cec.health.nsw.gov.au/__documents/programs/between-the-flags/rmdp_overview.pdf>.
Clinical Excellence Commission 2012a, *Between the flags*, viewed January 11th 2013 <http://www.cec.health.nsw.gov.au/programs/between-the-flags>.
Clinical Excellence Commission 2012b, *Sepsis Kills*, viewed January 27th 2013 <http://www.cec.health.nsw.gov.au/programs/sepsis>.
Coiera, E. 2000, 'When conversation is better than computation', *Journal of American Medical Informatics Association*, vol. 7, no. 3, pp. 277-286.
Coiera, E. & Tombs, V. 1998, 'Communication behaviour in a hospital setting: an observational study', *British Medical Journal*, vol. 316, pp. 673-676.
Collins, K. & O'Cathain, A. 2009, 'Ten points about mixed methods research to be considered by the novice researcher', *International Journal of Multiple Research Approaches*, vol. 3, pp. 2-7.
Committee on Ensuring the Utility and Integrity of Research Data in a Digital Age & National Academy of Sciences 2009, *Ensuring the Integrity, Accessibility, and Stewardship of Research Data in the Digital Age*, National Academies Press, New York.
Consortium for Spinal Cord Medicine 2008, 'Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals', *Journal of Spinal Cord Medicine*, vol. 31, no. 4, pp. 403-479.
Coriera, E., Jayasuriya, R., Hardy, J., Bannan, A. & Thorpe, M. 2002, 'Communication loads on clinical staff in the emergency department', *Medical Journal of Australia*, vol. 176, pp. 415-418.
Coté, G., Hovis, R., Ansstas, M. & al., e. 2009, 'incidence of sedation-related compications with propofol use during advanced endoscopic procedures.', *Clinical Gastroenterology and Hepatology*, vol. 8, pp. 137-142.
Covell, D., Uman, G. & Manning, P. 1985, 'Informational needs in office practice: are they being met?', *Annal of Internal Medicine*, vol. 103, pp. 596-605.
Cowan, R. & Trzeciak, S. 2005, 'Emergency department overcrowding and the potential impact on the critically ill', *Critical Care*, vol. 9, pp. 291-295.
Creasia, J. & Parker, B. 2001, *Conceptual foundations: the bridge to professional nursing practice.*, 3rd edn, Mosby, Toronto.

Creswell, J. 2007, *Qualitative inquiry and research design: choosing among five approaches*, 2nd edn, Sage, London.
Creswell, J. & Miller, D. 2000, 'Determining validity in qualitative inquiry', *Theory into Practice*, vol. 39, no. 3, pp. 124-130.
Creswell, J. & Plano Clark, V. 2010, *Designing and conducting mixed methods reseach*, 2nd edn, Sage, London.
Creswell, J.W., Tashakkori, A., Jensen, K.D. & Shapely, K.L. 2003, 'Teaching mixed methods research: practices, dilemmas, and challenges.', in A. Tashakkori & C. Teddlie (eds), *Handbook of mixed methods in social & behavioural research.*, Sage, Tousand Oaks, CA, pp. 619-637.
Critical Appraisal Skills Program International 2013, *Making sense of evidence*, Critical Appraisal Skills Program International,, viewed April 2013 <http://www.caspinternational.org/>.
Critical Appraisal Skills Program UK 2011, *Making sense of evidence*, CASP, viewed October 2012 <http://www.casp-uk.net/>.
Cronholm, S. 2011, 'Experiences from sequential use of mixed methods', *The Electronic Journal of Business Research Methods*, vol. 9, no. 2, pp. 87-95.
Crouch, A. 2003, 'Critical care and emergency medicine', *Critical Care Clinics*, vol. 19, no. 2, pp. 271-278.
Curtis, K. & Ramsden, C. (eds) 2011, *Emergency nursing triage*, Elsevier, Sydney.
Dahaba, A., Lischnig, U., Kronthaler, R., Bornemann, H., Georgiev, V., Rehak, P. & Metzler, H. 2006, 'Bispectral-index-guided versus clinically guided remifentanil/propofol analgesia/sedation for intervention radiological procedures: an observer-blinded randomized study.', *Anesth Analg*, vol. 103, no. 2, pp. 378-384.
Dawson, R. 2010, 'Sedation assessment using the Ramsey scale', *Emergency Nurse*, vol. 18, no. 3, pp. 18-20.
De Jong, M.J., Burns, S.M., Campbell, M.L., Chulay, M., Grap, M.J., Pierce, L.N.B. & Simpson, T. 2005, 'Development of the American Association of Critical-Care Nurses' sedation assessment scale for critically ill patients', *American Journal of Critcal Care*, vol. 14, no. 6, pp. 531 - 544.
De Jonghe, B., Cook, D., Griffith, L., Appere-de-Vecchi, C., Guyatt, G., Théron, V., Vagnerre, A. & Outin, H. 2003, 'Adaptation to the Intensive Care Environment (ATICE): Development and validation of a new sedation assessment instrument', *Crit Care Med*, vol. 31, no. 9, pp. 2344 - 2354.
De Lemos, J., Tweeddale, M. & Chittock, D. 2000, 'Measuring quality of sedation in adult mechanically ventilated critically ill patients: the Vancouver Interaction and Calmness Scale', *Journal of Clinical Epidemiology*, vol. 53, pp. 908 - 919.
de Wit, M. & Epstein, S.K. 2003, 'Administration of sedatives and level of sedation: comparative evaluation via the sedation-agitation scale and the bispectral index', *American Journal of Critcal Care*, vol. 12, no. 4, pp. 343 - 348.
Decarlo, D., Collingridge, D., Grant, C. & Ventre, K. 2008, 'Factors influencing nurses' attitudes toward simulation-base education', *Simulation in Healthcare*, vol. 3, no. 2, pp. 90-96.
Decker, S., Sportsman, S., Puetz, L. & Billings, L. 2008, 'The evolution of simulation and its contribution to competency', *Journal of Continuing Education in Nursing*, vol. 39, no. 2, pp. 74-80.
Dellinger, A. 2005, 'Validity in the review of literature', *Research in the Schools*, vol. 12, no. 2, pp. 41-54.

Dellinger, A. & Leech, N. 2007, 'Toward a unified validation framework in mixed methods research', *journal of Mixed Methods Research*, vol. 1, no. 4, pp. 309-332.

Dennis, L. & Mayer, S. 2001, 'Diagnosis and management of increased intracranial pressure', *Neurology India*, no. 49 Suppl 1, pp. S37-50.

Denzin, N. & Lincoln, Y. (eds) 2005, *The SAGE handbook of qualitative research*, 3rd edn, SAGE, California, USA.

Deogaonkar, A., Gupta, R., Degeorgia, M., Sabharwal, V., Gopakumaran, B., Schubert, A. & Provencio, J. 2004, 'Bispectral Index monitoring correlates with sedation scales in brain-injure patients.', *Crit Care Med*, vol. 32, pp. 2403-2406.

Department of Education Science and Training 2002, *National review of nursing education 2002: nurse education and training*, Canberra.

Department of Health and Ageing 2009, *Emergency Triage Education Kit*, viewed January 2013 <http://www.health.gov.au/internet/main/publishing.nsf/Content/casemix-ED-Triage+Review+Fact+Sheet+Documents>.

Detriche, O., Berré, J., Massaut, J. & Vincent, J.-L. 1999, 'The Brussels sedation scale: use of a simple clinical sedation scale can avoid excessive sedation in patients undergoing mechanical ventilation in th einteisve care unit.', *British Journal of Anaesthesia*, vol. 83, no. 5, pp. 698-701.

Devlin, J., Boleski, G., Mlynarek, M., Narenz, D., Peterson, E., Jankowski, M., Horst, H. & Zarowitz, B. 1999, 'Motor activity assessment scale: a valid and reliable sedation scale for use with mechanically ventilated patients in an adult surgical intensive care unit.', *Crit Care Med*, vol. 27, pp. 1271-1275.

Doane, G. & Varcoe, C. 2005, 'Toward compassionate action: pragmatism and the inseparability of theory/practice.', *Advances in Nursing Science*, vol. 28, no. 1, pp. 81-90.

Donabedian, A. 1980, *Explorations in quality assessment and monitoring: the definition of quality and approaches to its assessment.*, Health Administration Press, Ann Arbor.

Donabedian, A. 2003, *An introduction to quality assurance in health care*, Oxford University Press, New York.

Doyle, L., Brady, A.-M. & Byrne, G. 2009, 'An overview of mixed methods research', *Journal of Research in Nursing*, vol. 14, no. 2, pp. 175-185.

Egerod, I. 2002, 'Uncertain terms of sedation in ICU: how nurse and physicians manage and describe sedation for mechanically ventilated patients', *Journal of Clinical Nursing*, vol. 11, pp. 831-810.

Eisenberg, E., Murphy, A. & Sutcliffe, F. 2005, 'Communication in emergency medicine: implications for patient safety', *Communication Monograph*, vol. 72, pp. 390-413.

Elliott, D. 2003, 'Searching literature sources', in S. Schneider, D. Elliott, G. Wood-LoBiondo & J. Haber (eds), *Nursing research*, 2nd edn, Mosby, Brisbane, Australia.

Elliott, D. 2007, 'Assessing measuring instruments', in Z. Schneider (ed.), *Nursing and midwifery research: methods and appraisal for evidence-based practice.*, 3rd edn, Elsevier Health, Sydney.

Elliott, D., Aitken, L., Bucknall, T., Seppelt, I., Webb, S., Weisbrodt, L., McKinley, S., Australian and New Zealand Intensive Care Society Clinical Trials Group & George Institute for Global Health 2013, 'Patient comfort in the intensive care unit: a multicentre, binational point prevalence study of analgesia, sedation and

delirium management.', *Critical Care and Resuscitation*, vol. 15, no. 3, pp. 213-219.

Ely, E.W., Truman, B., Shintani, A., Thomason, J.W.W., Wheeler, A.P., Gordon, S., Francis, J., Speroff, T., Gautam, S., Margolin, R., Sessler, C.N., Dittus, R.S. & Bernard, G.R. 2003, 'Monitoring sedation status over time in ICU patients: Reliability and validity of the Richmond Agitation-Sedation Scale (RASS) ', *JAMA*, vol. 289, no. 22, pp. 2983 - 2991.

Emergency Nurses Association 2008, *Procedural sedation consensus statement*, Emergency Nurse Association, viewed August 2010 <http://www.ena.org/about/position/jointstatements/pages/default.aspx>.

Epstein, S., Huckins, D., Liu, S., Pallin, D., Sullivan, A., Lipton, R. & Camargo, C. 2012, 'Emergency department crowding and risk of preventable medical errors', *Internal and Emergency Medicine*, pp. 1-8.

Feilzer, M. 2010, 'Doing mixed methods research pragmatically: implications for the rediscovery of pragmatism as a research paradigm.', *journal of Mixed Methods Research*, vol. 4, pp. 6-16.

Fontana, J. 2004, 'A methodology for critical science in nursing', *Advances in Nursing Science*, vol. 27, no. 2, pp. 93-101.

Forero, R. & Hillman, K. 2008, *Access block and overcrowding: a literature review*, Australasian College of Emergency Medicine, viewed May 20th 2010 <http://www.acem.org.au/media/media_releases/Access_Block_Literature_Review_08_Sept_3.pdf>.

Fromm, R.J., Gibbs, L., McCallum, W., Niziol, C., Babcock, J., Gueler, A. & Levine, R. 1993, 'Critical care in the emergency department: a time-based study.', *Critical Care Medicine*, vol. 21, pp. 970-976.

Fry, M. 2007, 'Overview of emergency nursing in Australasia', in K. Curtis, C. Ramsden & J. Friendship (eds), *Emergency & Trauma Nursing*, 1st edn, Mosby, Sydney.

Gabbe, B., Cameron, P. & Finch, C. 2003, 'The status of the Glasgow Coma Scale', *Emerg Med*, vol. 15, pp. 353-360.

Garling, P. 2008, *Special commission of inquiry: acute care services in NSW public hospitals*, <http://www.lawlink.nsw.gov.au/acsinquiry>.

Gearing, R., Mian, I., Barber, J. & Ickowicz, A. 2006, 'A methodology for conducting retrospective chart review in child and adolescent psychiatry', *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, vol. 15, no. 3, pp. 126-134.

Gehlbach, B. & Kress, J. 2005, 'Pain control, sedation, and use of muscle relaxants', in J. Hall, G. Schmidt & L. Wood (eds), *Principles of Critical Care*, 3 edn, London.

Gelinas, C., Harel, F., Fillion, L., Puntillo, K. & Johnston, C. 2009, 'Sensitivity and specificity of the critical-care pain observation tool for the detection of pain in intubated adults after cardiac surgery', *Journal of Pain and Symptom Management*, vol. 37, no. 1, pp. 58-67.

Giddings, L. 2006, 'Mixed-methods research: positivism dressed in drag?', *Journal of Research in Nursing*, vol. 11, no. 3, pp. 195-203.

Gill, M., Green, S. & Krauss, B. 2003, 'A study of the bispectral index monitor during procedural sedation and analgesia in the emergency department.', *Annals of Emergency Medicine*, vol. 41, no. 2, pp. 234-241.

Gill, M., Reiley, D. & Green, S. 2004, 'Inter-rater reliability of Glasgow Coma Scale scores in the emergency department.', *Ann Emerg Med*, vol. 43, pp. 215-223.

Graff, L., Wolf, S., Dinwoodie, R., Buono, D. & Mucci, D. 1993, 'Emergency physician workload: a time study', *Annals of Emergency Medicine*, vol. 22, pp. 1156-1163.
Graham, C. 2009, 'Critical care in emergency medicine', *European Journal of Emergency Medicine*, vol. 16, p. 295.
Graneheim, U. & Lundman, B. 2004, 'Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness', *Nurse Education Today*, vol. 24, pp. 105-112.
Green, R. & MacIntyre, J. 2009, 'Crtical care in the emergency department: an assessment of the length of stay and invasive procedures on critically ill ED patients', *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, vol. 17, p. 47.
Green, S. & Yealy, D. 2009, 'Procedural sedation goes Utstein: the Quebec guidelines', *Ann Emerg Med*, vol. 53, no. 4, pp. 436-438.
Greene, J. & Caracelli, V. 1989, *Advances in mixed methods evaluation: the challenges and benefits of integrating diverse paradigms*, Jossey-Bass, San Francisco.
Greene, J. & Caracelli, V. (eds) 1997, *Advances in mixed-method evaluation: the challenges and benefits of integrating diverse paradigms: new directions for evaluation, No. 74*, Wiley.
Greene, J. & Hall, J. 2010, 'Dialectics and pragmatism: being of consequence.', in A. Tashakkori & C. Teddlie (eds), *Sage handbook of mixed methods in social and behavioral research*, 2nd edn, SAGE, California, USA.
Greene, J.C. 2007, *Mixed methods in social inquiry*, Jossey-Bass, San Francisco.
Gulmans, J., Vollenbroek-Hutten, M., Van Gemert-Pijnen, J. & Van Harten, W. 2007, 'Evaluating quality of patient care communication in integrated care settings: a mixed method approach', *International Journal for Quality in Health Care*, vol. 19, no. 5, pp. 281-288.
Guttormson, J., Chlan, L., Weinert, C. & Kay, S. 2010, 'Factors influencing nurse sedation practices with mechanically ventilated patients: a U.S national survey.', *Intensive and Critical Care Nursing*, vol. 26, pp. 44-50.
Hargrove, J. & Nguyen, H. 2005, 'Bench-to-bedside review: Outcome predicitons for critically ill patients in the emergency department', *Critical Care*, vol. 9, no. 4, pp. 376-383.
Harré, R. 2004, 'Staking our claim for qualitative psychology as science', *Research in Psychology*, vol. 1, no. 1, pp. 3-14.
Heaton, J. 2004, *Reworking qualitative data*, SAGE, London.
Herdich, B. & Lindsay, A. 2006, 'Nurse residency programs: redesigning the transition into practice', *Journal for Nurses in Staff Development*, vol. 22, no. 2, pp. 55-62.
Hernández-Gancedo, D., Pestaña, N., Royo, C., Pérez-Chrzanowska & Criado, A. 2006, 'Monitoring sedation in critically ill patients: bispectral index, Ramsey and observer scales', *European Journal of Anaesthesiology*, vol. 23, pp. 649-653.
Hesse-Biber, S. 2010, 'Feminist approaches to mixed methods research: linking theory and praxis', in A. Tashakkori & C. Teddlie (eds), *SAGE Handbook of Mixed Methods in Social and Behavioral Research*, SAGE Publications Ltd., Thousand Oaks, CA.
Hodge, A., Hugman, A., Varndell, W. & Howes, K. 2013, 'A review of the quality assurance processes for the Australasian Triage Scale (ATS) and implications for future practice.', *Australasian Emergency Nursing Journal*, vol. 16, no. 1, pp. 21-29.

Hogg, L., Bobek, M., Milon, L., BM, L., Banjac, S., VanKerkhove, K. & Arroliga, A. 2001, 'Interrater reliability of 2 sedation scales in a medical intensive care unit: a preliminary report', *Am J Crit Care*, vol. 10, pp. 79-83.

Hohl, C., Sadatsafavi, M., Nosyk, B. & Anis, A. 2008, 'Safety and clinical effectiveness of midazolam versus propofol for procedural sedation in the emergency department: a systematic review', *Academic Emergency Medicine*, vol. 15, pp. 1-8.

Hole, A. & Klepstad, P. 1999a, 'Scoring systems in intensive care.', in A.R. Webb, M.J. Shapiro, M. Singer & P.M. Suter (eds), *Oxford textbook of critical care*, Oxford University Press, Oxford.

Hole, A. & Klepstad, P. 1999b, 'Sedation scoring', in A. Webb, M. Shapiro, M. Singer & P. Suter (eds), *Oxford textbook of critical care*, 1st edn, Oxford University Press.

Holmes, C. 2006, *Mixed (up) methods, methodology and interpretive frameworks.*, Paper presentation at the Mixed Methods Conference, Cambridge, UK.

IBM 2011, *SPSS*, 20 edn, California.

Ibrahim, E. & Kolleff, M. 2001, 'Using protocols to improve the outcomes of mechanically ventiliated patients', *Critical Care Clinics*, vol. 17, no. 4, pp. 989-1001.

Innes, G., Murphy, M., Nijessen-Jordan, C., Ducharme, J. & Drummond, A. 1999, 'Procedural sedation and analgesia in the emergency department. Canadian concensus guidelines.', *17*, vol. 1, no. 145-156, p. 145.

Intensive Care Society of Ireland 2006, *Report.*, viewed October 11th 2009 <http://www.icmed.com/archive/publications/annual%20Report20062007.doc>.

Ivankova, N., Creswell, J. & Stick, S. 2006a, 'Using mixed-method sequential explanatory design: from theory to practice', *Field Methods*, vol. 18, no. 1, pp. 3-20.

Ivankova, N., Creswell, J. & Stick, S. 2006b, 'Using mixed-methods sequential explanatory design: from theory to practice', *Field Methods*, vol. 18, no. 3, pp. 3-12.

Jackson, D., Daly, J. & Chang, E. 2003, 'Approaches in qualitative research', in S. Schneider, D. Elliott, G. Wood-LoBiondo & J. Haber (eds), *Nursing research*, 2nd edn, Mosby, Brisbane, Australia.

Jacobi, J., Fraser, G.L., Coursin, D., Riker, R.R., Fontaine, D., Wittbrodt, E., Chalfin, D., Masica, M., Bjerke, H., Coplin, W. & *al., e.* 2002, 'Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult.', *Crit Care Med*, vol. 30, pp. 119-141.

Jacques, T., Harrison, G.A., McLaws, M.-L. & Kilborn, G. 2006, 'SOCCER: Signs Of Critical Conditions and Emergency Responses', *Resuscitation*, vol. 69, pp. 175-183.

Joacobsen, K. 2011, *Introduction to health research methods - a practical guide*, Jones & Bartlett Learning, London.

Johnson, R. & Onwuegbuzie, A. 2004, 'Mixed methods research: a research paradigm whose time has come.', *Educational Researcher*, vol. 33, no. 7, pp. 14-26.

Jones, A., Benbow, J. & Gidman, R. 2014, 'Provision of training and support for newly qualified nurses', *Nursing Standard*, vol. 28, no. 19, pp. 44-50.

Jones, T., Mims, B. & Luecke, L. 2001, 'Two successful models for preparing competent critical care nurses.', *Critical Care Nursing Clinics of North America*, vol. 13, no. 1, pp. 35-52.

Kelly, A. 2005, 'Relationships in emergency care: communication and impact.', *Top Emerg Med*, vol. 27, no. 3, pp. 192-197.
Kelly, S. 2011, 'Qualitative interviewing techniques and styles', in I. Bourgeault, R. Dingwall & R. de Vries (eds), *The SAGE handbook of qualitative methods in health research*, Sage Publishing Ltd, London.
Kilner, E. & Sheppard, L. 2010, 'The role of teamwork and communication in the emergency department: a systematic review', *International Emergency Nursing*, vol. 18, pp. 127-137.
Kleinsasser, A. 2000, 'Researchers, reflexivity, and good data: writing to unlearn', *Theory into Practice*, vol. 39, no. 3, pp. 155-162.
Knott, J.C. & Isbister, G. 2008, 'Sedation of agitated patients in the emergency department', *Emergency Medicine Australia*, vol. 20, pp. 97 - 100.
Kollef, M., Levy, N.A., TS, Schaiff, R., Prentice, D. & Sherman, G. 1998, 'The use of continous IV sedation is associated with prolongation of mechanical ventilation', *Chest*, vol. 114, no. 2, pp. 541-548.
Kramer, M. 1974, *Reality shock: Why nurses leave nursing*, Mosby, St. Louis: CV.
Krauss, B. 2008, 'Monitoring for prcedural sedation', in J. Burton & J. Miner (eds), *Emergency sedation and pain management*, Cambridge Press, USA.
Kraut, R., Egido, C. & Galegher, J. 1990, 'Patterns of contact and communication in scientific research collaboration', in R. Kraut, C. Egido & J. Galegher (eds), *Intellectual teamwork: social and technological foundations of cooperative work*, Lawrence Erlbaum Associates, Hillside, NJ, pp. 149-171.
Kress, J. & Hall, J. 2001, 'Cost considerations in sedation, analgesia, and neuromuscular blockade in the ICU.', *Semin Respir Crit Care Med*, vol. 22, pp. 199-209.
Kvale, S. & Brinkman, S. 2009, *Interviews: learning the craft of qualitative research interviewing*, 2nd edn, Sage, London.
Laing, A.S. 1992, 'The applicability of a new sedation scale for intensive care ', *Intensive and Critical Care Nursing*, vol. 8, pp. 149-152.
Lambe, S., Washington, D., Fink, A., Herbst, K., Liu, H., Fosse, J. & Asch, S. 2002, 'Trends in the use and capacity of California's emergency departments: 1990-1999.', *Annals of Emergency Medicine*, vol. 39, pp. 389-396.
LeBlanc, J., Dasta, J., Prunchniki, M., Gerlach, A. & Cook, C. 2005, 'Evaluation of the bispectral index (BIS), lorazepam concentrations (LC), and the sedation-agitation scale (SAS) in critically ill surgical patients', *Critical Care Medicine*, vol. 33, no. 12 (suppl.).
Leigh, J., Howarth, M. & Devitt, P. 2005, 'The role of the lecturer practitioner: an exploration of the stakeholders and practitioners perspective', *Nurse Education in Practice*, vol. 5, no. 5, pp. 258-265.
Lewin III, J.J., Helms, L., Young, M. & Mirski, M.A. 2008, 'Monitoring sedation in the adult ICU', *Contemporary Critical Care*, vol. 6, no. 7, pp. 1 -12.
Lincoln, Y. & Guba, E. 1985, *Naturalistic inquiry*, Sage, London.
Liu, W.-I., Edwards, H. & Courtney, M. 2011, 'The development and descriptions of an evidence-based case management educational program', *Nurse Education Today*, vol. 31, pp. 51-57.
Luer, J. 1995, 'Sedation and chemical relaxation in critical pulmonary illness: suggestions for patient assessment and drug monitoring', *AACN Clinical Issues*, vol. 6, no. 2, pp. 333-343.
Macario, A., Weinger, M., Carney, S. & Kim, A. 1999, 'Which clinical anesthesia outcomes are important to avoid? The perspective of patients.', *Anesth Analg*, vol. 89, no. 3, pp. 652-658.

Marchesi, C., Brusamonti, E., Borghi, C., Giannini, A., Di Ruvo, R., Minneo, F., Quarantelli, C. & Maggini, C. 2004, 'Anxiety and depressive disorders in an emergency department ward of a general hospital: a control study', *Emergency Medicine Journal*, vol. 21, pp. 175-179.

Margery, J. 1997, 'Sedation of adult crticially ill ventilated patients in intensive care units: a national survey', *Australian Critical Care*, vol. 10, no. 3, pp. 90-93.

Martin, J., Franck, M., Sigel, S., Weiss, M. & Spies, C. 2007, 'Changes in sedation management in German intensive care units between 2002 and 2006: a national follow-up survey', *Critical Care*, vol. 11, no. 6, pp. 1-7.

Mason, M. 2010, 'Sample size and sturation in PhD studies using qualitative interviews', *Qualitative Social Research*, vol. 11, no. 3, p. Art. 8.

Maxcy, S. 2003, 'Pragmatic threads in mixed methods research in the social sciences: the search for multiple modes of inquiry and the end of the philosophy of formalism.', in A. Tashakkori & C. Taddlie (eds), *Handbook of mixed methods in social and behavioural research*, SAGE Publications, California, USA.

Maxwell, J. 2010, 'Using numbers in qualitative research', *Qualitative Inquiry*, vol. 16, no. 6, pp. 475-482.

McCaig, L. & Nawar, E. 2006, 'National Hospital Ambulatory Medical Care Survey: 2004 emergency department summary', *Advanced Data*, pp. 1-29.

McCann, M., Brustowicz, R., Bacsik, J., Sullivan, L., Auble, S. & Laussen, P. 2002, 'The bispectral index and explicit recall during the intraoperative wake-up test for scoliosis surgery', *Anesthesia and Analgesia*, vol. 94, no. 6, pp. 1474-1478.

McCready, J. 2010, 'Jamesian pragmatism: a framework for working towards unified diversity in nursing knowledge development', *Nursing Philosophy*, vol. 11, no. 3, pp. 191-203.

Meggs, W., Czaplijski, T. & Benson, N. 1999, 'Trends in emergency department utilization, 1988-1997', *Academic Emergency Medicine*, vol. 6, no. 10, pp. 1030-1035.

Mehra, B. 2002, 'Bias in qualitative research: voices from an online classroom', *The Qualitative Report*, vol. 7, no. 1, viewed October 2013 <http://www.nova.edu/ssss/QR/QR7-1/mehra.html>.

Mehta, S., McCullagh, I. & Burry, L. 2009, 'Current sedation practices: lessons learned form international surveys', *Crit Care Clin*, vol. 25, pp. 471-488.

Mertens, D. 2003, 'Mixed methods and the politics of human research: the transformative-emancipatory perspective.', in A. Tashakkori & C. Teddlie (eds), *Handbook of mixed methods in social and behavioural research.*, SAGE Publications, California, USA.

Microsoft 2010a, *Excel*, Microsoft, Redmond, Washington.

Microsoft 2010b, *Word*, Microsoft, Redmond, Washington.

Microsoft 2012, *Tips for creating strong passwords and passphrases*, viewed November 11th 2012 <http://windows.microsoft.com/en-AU/windows7/Tips-for-creating-strong-passwords-and-passphrases>.

MIMSOnline 2013a, *Midazolam*, viewed September 2013 <https://www.mimsonline.com.au.acs.hcn.com.au/Search/FullPI.aspx?ModuleName=Product%20Info&searchKeyword=Midazolam&PreviousPage=~/Search/QuickSearch.aspx&SearchType=&ID=69120001_2>.

MIMSOnline 2013b, *Thiopentone Sodium*, viewed September 2013 <https://www.mimsonline.com.au.acs.hcn.com.au/Search/FullPI.aspx?ModuleName=Product%20Info&searchKeyword=thiopentone&PreviousPage=~/Search/QuickSearch.aspx&SearchType=&ID=19180002_2>.

MIMSOnline 2103a, *Rocuronium*, viewed September 2013 <https://www.mimsonline.com.au.acs.hcn.com.au/Search/FullPI.aspx?ModuleName=Product%20Info&searchKeyword=Rocuronium&PreviousPage=~/Search/QuickSearch.aspx&SearchType=&ID=94250001_2>.

MIMSOnline 2103b, *Suxamethonium*, viewed September 2013 <https://www.mimsonline.com.au.acs.hcn.com.au/Search/FullPI.aspx?ModuleName=Product%20Info&searchKeyword=Suxamethonium&PreviousPage=~/Search/QuickSearch.aspx&SearchType=&ID=94250001_2>.

Miner, J.R., Martel, M., Meyer, M., Readon, R. & Biros, M.H. 2005, 'Procedural sedation of critically ill patients in the emergency department', *Emerg Med*, vol. 12, pp. 124-128.

Mitchell, P., Ferketich, S. & Jennings, B. 1998, 'Quality health outcomes model.', *Image - The Journal of Nursing Scholarship*, vol. 30, pp. 43-46.

Mondello, E., Siliotti, R., Noto, G., Cuzzocrea, E., Scollo, G., Trimarchi, G. & Venuti, F. 2002, 'Bispectral Index in ICU: correlation with Ramsey Score on assessment of sedation', *J Clin Monit Comput*, vol. 17, pp. 271-277.

Moons, P., Sels, K., De Becker, W., De Geest, S. & Ferdinande, P. 2004, 'Development of a risk assessment tool for deliberate self-extubation in intensive care patients', *Intensive Care Med*, vol. 30, pp. 1348 - 1355.

Morgan, D. 1998, 'Practical strategies for combining qualitative and quantitative methods: applications to health research', *Qualitative Health Research*, vol. 8, no. 3, pp. 362-376.

Morgan, D. 2007, 'Paradigms lost and pragmatism regained. Methodological implications of combining qualitative and quantitative methods.', *journal of Mixed Methods Research*, vol. 1, no. 48-76, p. 48.

Morse, J. 1991, 'Approaches to qualitative-quantitative methodological triangulation.', *Nursing Research*, no. 40, pp. 120-123.

Morse, J. & Niehaus, L. 2009, *Mixed methods design: principles and procedures*, Left Coast Press, California, USA.

Nasraway, S.J., Wu, E., Kelleher, R., Yasuda, C. & Donnelly, A. 2002, 'How reliable is the Bispectral Index in critically ill patients? A prospective, comparative, single-blinded observer study', *Crit Care Med*, vol. 30, no. 1483-1487.

Nastasi, B., Hitchcock, J., Sarkar, S., Burkholder, G., Varjas, K. & Jayasena, A. 2007, 'Mixed methods in intervention research: theory to adaptation', *journal of Mixed Methods Research*, vol. 1, no. 2, pp. 164-182.

National Emergency Nurses Affiliation 2009, *Position statement: procedural sedation*, no January 11th, NENA, Canada, <http://nena.ca/blogs/about/archive/2010/01/10/position-statement-procedural-sedation.aspx>.

National Health and Medical Research Council 2007a, *Australian code the responsible conduct of research*, Australian Government.

National Health and Medical Research Council 2007b, *National statemet of ethical conduct in human research*, Australian Government, Australia.

National Health and Medical Research Council 2011, *Emergency Care Acute Pain Management Manual*, NHMRC, Canberra.

National Nursing and Nursing Education Taskforce 2006, *National Nursing and Nursing Education Taskforce, final report.*, National Nursing and Nursing Education Taskforce, Canberra.

Nehring, W. & Lashley, F. 2004, 'Current use and opinions regarding human patient simulators in nursing education: an international survey', *Nursing Education Perspectives*, vol. 35, pp. 244-248.
Némethy, M., Paroli, L., Williams-Russo, P.G. & Blanck, T. 2002, 'Assessing sedation with regional anesthesia [sic]: inter-rater agreement on a modified Wilson Sedation Scale', *Anesthesia & Analgesia*, vol. 94, pp. 723-728.
New South Wales Department of Health 2011a, *Clinical Initiatives Nurse in Emergency Departments*, viewed January 2013 <http://www.ecinsw.com.au/sites/default/files/field/file/CIN_Facilitators%20Manual_final.pdf>.
New South Wales Department of Health 2011b, *Transitioning to practice: emergency nursing program*, New South Wales Department of Health, Sydney.
New South Wales Department of Health 2012, *South Eastern Sydney Local Health District: Health Services Plan 2012-2017*, Sydney.
New South Wales Government 1991, *Nurses and Midwives Act*.
New South Wales Government 1998, *Privacy and Personal Information Protection Act*
New South Wales Government 2002, *Health Records and Information Privacy Act*
New South Wales Government 2011, *Public Health System Nurses' and Midwives' (State) Award 2011*, in N.S.W.D.o. Health (ed.)Sydney.
New South Wales Health 2002, *NSW Rural Health Report*, Sydney.
New South Wales Health 2012a, *Emergency department models of care*, Emergency Care Institute.
New South Wales Health 2012b, *Essentials of Care*, viewed January 25th 2013 <http://www0.health.nsw.gov.au/nursing/projects/eoc.asp>.
Nguyen, H., Rivers, E., Havstad, S., Knoblich, B., Ressler, J., Muzzin, A. & Tomlanovich, M. 2000a, 'Critical care in the emergency department: a physciological assessment and outcome evaulation', *Academic Emergency Medicine*, vol. 7, pp. 1354-1361.
Nguyen, H., Rivers, E., Havstad, S., Knoblich, B., Ressler, J., Muzzin, A. & Tomlanovich, M. 2000b, 'Critical care in the emergency department: a physiological assessment and outcome evaluation.', *Academic Emergency Medicine*, vol. 7, pp. 1354-1361.
Nielsen, A., Noone, J., Voss, H. & Mathews, L. 2013, 'Preparing nursing students for the future: an innovative approach to clinical education', *Nurse Education in Practice*, vol. 13, no. 4, pp. 301-309.
Nightingale, F. 1860, *Notes on nursing: what it is, and what it is not*, D. Appleton and Company, New York.
Nisbet, A. & Mooney-Cotter, F. 2009, 'Comparison of selected sedatio scales for reporting opioid-induced sedation assessment.', *Pain Management Nursing*, vol. 10, no. 3, pp. 154-164.
Nursing Education Review Secretariat 2002, *National review of nursing education*, Commonwealth of Australia, Canberra, ACT.
O'Cathain, A., Nicholl, J., Sampson, F., Walters, S., McDonnell, A. & Munro, J. 2004, 'Do different types of nurses give different triage decisions in NHS Direct? A mixed methods study', *Journal of Health Services Research & Policy*, vol. 9, no. 4, pp. 226-233.
O'Connor, G., Geary, U. & Moriarty, J. 2009, 'Critical care in the emergency department', *European Journal of Emergency Medicine*, vol. 16, pp. 296-300.
Olson, D.M., Thoyre, S.M. & Auyong, D.B. 2007, 'Perspectives on sedation assessment in critical care', *AACN Advanced Critical Care*, vol. 18, no. 4, pp. 380 - 395.

Onwuegbuzie, A. & Collins, K. 2007, 'A typology of mixed methods sampling designs in social science research', *The Qualitative Report*, vol. 12, no. 2, pp. 281-316.
Onwuegbuzie, A. & Dickinson, W. 2008, 'Mixed methods analysis and information visualization: graphical display for effective communication of research results', *The Qualitative Report*, vol. 13, no. 2, pp. 204-225.
Onwuegbuzie, A. & Johnson, R. 2006, 'The validity issues in mixed research', *Research in The Schools*, vol. 13, no. 1, pp. 281-316.
Onwuegbuzie, A. & Leech, N. 2004, 'Enhancing the interpretation of 'significant' findings: the role of mixed methods research', *The Qualitative Report*, vol. 9, pp. 770-792.
Onwuegbuzie, A. & Teddlie, C. 2003, 'A framework for analysing data in mixed methods research.', in A. Tashakkori & C. Teddlie (eds), *Handbook of mixed methods in social & behavioural research*, Sage, Thousand Oaks, CA.
Pallant, J. 2007, *SPSS survival manual*, A&U.
Pasero, C. & McCaffrey, M. 2002, 'Monitoring sedation', *American Journal of Nursing*, vol. 102, no. 2, pp. 67 - 69.
Patanwala, A., Stahle, S. & Sakles, J. 2011, 'Comparison of succinycholine and rocuronium for first-attempt intubation success in the emergency departmnt', *Academic Emergency Medicine*, vol. 18, pp. 10-14.
Perry, J., Lee, J., Sillberg, V. & Wells, G. 2008, 'Rocuronium versus succinylcholine for rapid sequence induction intubation ', *Cochrane Database System Review*, vol. 16, no. 2.
Pezalla, A., Pettigrem, J. & Miller-Day, M. 2012, 'Researching the researcher-as-instrument: an exercise in interviewer self-reflexivity', *Qualitative Research*, vol. 12, no. 2, pp. 165-185.
Polit, D. & Totana Beck, C. 2010, *Essentials of nursing research: appraising evidence for nursing practice*, 6th edn, Lippincott WIlliams & Wilkins, Philadelphia, PA.
Preece, R. 2000, *Starting research: an introduction to academic research and dissertation writing*, Continuum International Publishing Group, London.
Prince of Wales Hospital Emergency Department 2009a, 'IV Procedural Sedation Policy', unpublished.
Prince of Wales Hospital Emergency Department 2009b, 'Resuscitation Nurse Development Program Handbook', unpublished.
Proehl, J. 1992, 'The Glasgow Coma Scale: do it and do it right.', *J Emerg Nurs*, vol. 18, pp. 421-423.
Punch, K. 1998, *Introduction to social research: quantitative and qualitative approaches*, Sage, London.
Puntillo, K., Pasero, C., Li, D., Mularski, R., Grap, M., Erstad, B., Varkey, B., Gilbert, H., Medina, J. & Sessler, C. 2009, 'Evaluation of pain in ICU patients', *Chest*, vol. 135, pp. 1069-1074.
QRS International Pty Ltd 2012, *NVivo*, Burlington, USA.
Quensland Health 2008, 'Managment of patients with psychostimulant toxicity: Protocols for emergency departments'.
Rady, M., Rivers, E. & Nowak, R. 1996, 'Resuscitation of the critically ill in the ED: response to blood pressure, heart rate, shock index, central venous oxygen saturation, and lactate.', *American Journal of Emergency Medicine*, vol. 14, no. 2, pp. 218-225.
Ramsay, M., Savege, T., Simpson, B. & Goodwin, R. 1974, 'Controlled sedation with alphaxalone-alphadolone', *BMJ*, vol. 2, pp. 656-659.

Randwick City Council 2011, *Community profile*, Randwick City Council, viewed January 22nd 2011 <http://profile.id.com.au/Default.aspx?id=305>.
Rassin, M., Sruyah, R., Kahalon, A., Naveh, R., Nicar, I. & Silner, D. 2007, '"Between the fixed and the changing": Examining and comparing reliability and validity of 3 sedation-agitation measuring scales', *Dimensions of Critical Care Nursing*, vol. 26, no. 2, pp. 76 - 82.
Rawnsley, N. 2000, 'Response to Kim's human living concept as a unifying perspective for nursing.', *Nursing Science Quarterly*, vol. 31, no. 1, pp. 41-44.
Redfern, E., Brown, R. & Vincent, C. 2009, 'Identifying vulnerabilities in communication in the emergency department', *Emergency Medcine Journal*, vol. 26, pp. 653-657.
Reichhardt, C. & Rallis, S. 1994, 'Qualitative and quantitative inquires are not incompatible: a call for a new partnership', in C. Reichhardt & S. Rallis (eds), *The qualitative-quantitative debate: new perspectives*, Jossey Bass, San Francisco.
Reschreiter, H., Maiden, M. & Kapila, A. 2008, 'Sedation practice in the intensive care unit: a UK national survey', *Critical Care*, vol. 12, no. 6, pp. 152-161.
Rex, D. 2006, 'Moderate Sedation for Endoscopy: Sedation Regimens for Non-Anesthesiologists', *Ailment Pharmacology & Therapeutics*, vol. 24, no. 2, pp. 163-171.
Richardson, D. 2002, 'The access-block effect: relationship between delay to reaching an inpatient bed and inpatient length of stay.', *Med J Austr*, vol. 177, pp. 492-495.
Richardson, D. 2009, *2009 access block point prevalence survey: executive summary*, The Road Trauma and Emergency Medicine Unit, Australian National University, <http://www.acem.org.au/media/2009__Point_Prevalence_Study_Exec_Summary.pdf>.
Riess, M., Graefe, U., Goeters, C., Van, A. & Bone, H. 2002, 'Sedation assessment in critically all patients with bispectral index', *European Journal of Anaesthesiology*, vol. 19, no. 1, pp. 18-22.
Riker, R. & Fraser, G. 2005, 'Monitoring sedation, agitation, analgesia, neuromuscular blockade, and delirium in adult ICU patients.', *Semin Respir Crit Care Med*, vol. 22, pp. 189-198.
Riker, R., Fraser, G. & Cox, P. 1994, 'Continuous infusion of haloperidol controls agitation in critically ill patients.', *Critical Care Medicine*, vol. 22, no. 3, pp. 433-440.
Riker, R., Picard, J. & Fraser, G. 1999, 'Prospective evaluation of the Sedation-Agitation Scale for adult critically ill patients.', *Care Med*, vol. 27, pp. 1325-1329.
Ritchie, J., Lewis, J. & Elam, G. 2003, 'Designing and selecting samples', in J. Ritchie & J. Lewis (eds), *Qualitative research practice. A guide for social science students and researchers*, SAGE, Thousand Oaks, CA.
Rivers, E., Nguyen, H., DT, H. & Donnino, M. 2002, 'Critical care and emergency medicine', *Current Opinion in Critical Care*, vol. 8, no. 6, pp. 600-606.
Rodrigues, G.J. & do Amaral, J. 2004, 'Influence of sedation on morbidity and mortality in the intensive care unit', *Sao Paulo Medical Journal*, vol. 122, no. 1, pp. 8-11.
Rolfe, G. & Freshwater, D. 2001, 'Critical reflexivity: a politically and ethically engaged research method for nursing.', *Journal of Research in Nursing*, vol. 6, no. 1, pp. 526-537.

Rose, L. & Gerdtz, M. 2007, 'Invasive ventilation in the emergency department part 2: implications for patient safety', *Australasian Emergency Nursing Journal*, vol. 10, pp. 26-29.
Rossman, G. & Wilson, B. 1985, 'Numbers and words: combining quantitative and qualitative methods in a single large-scale evaluation study.', *Evaluation Review*, vol. 9, no. 5, pp. 627-643.
Rowe, K. & Fletcher, S. 2008, 'Sedation in the intensive care unit', *Continuing Education in Anaesthesia, Critical Care and Pain*, vol. 8, no. 2, pp. 50-55.
Russell, B. 1910, *Philosophical essays*, Routledge, London.
Russell, B. 1945, *A history of western philosophy*, Simon & Schuster, Forage Village, MA.
Ryan, G. & Bernard, H. 2003, 'Techniques to identify themes', *Field Methods*, vol. 15, no. 1, pp. 85-109.
Ryder-Lewis, M. & Nelson, K. 2008, 'Reliability of the Sedation-Agitation Scale between nurses and doctors', *Intensive and Critical Care Nursing*, vol. 24, pp. 211-217.
Sale, J., Lohfield, L. & Brazil, K. 2002, 'Revisiting the quantitative-qualitative debate: implications for mixed methods research', *Quality and Quantity*, vol. 36, pp. 45-53.
Sandelowski, M. 1998, 'Rigor or rigor mortis: the problem of rigor in qualitative research revisited.', *Advances in Nursing Science*, vol. 16, no. 2, pp. 1-8.
Sayer, M. 2010, 'Improving collaboration and patient safety by encouraging nurses to speak-up: overcoming personal and organizational obstacles through self-reflection and collaboration', University of California, ProQuest Dissertations & Thesis.
Scalea, T. 2005, 'Does it matter to how head injured patients are resuscitated?', in A. Valadka & B. Andrews (eds), *Neurotrauma: evidence-based answers to common questions*, Thieme, London.
Schensul, S., Schensul, J. & LeCompte, M. 1999, *Essential Ethnographic Methods: Observations, Interviews, and Questionnaires*, AltaMira Press, London.
Scherer, M. & Lane, J. 1997, 'Assessing consumer profiles of "ideal" methods', *Disability & Rehabilitation: An international multidisciplinary Journal*, vol. 19, no. 12, pp. 528-535.
Schneider, Z. 2013, 'Writing proposals and grant applications', in, *Nursing research: methods and appraisal for evidence-based practice*, 4th edn, Mosby, Sydney.
Schulte-Tamburen, A., Scheier, J., Briegel, J., Schwender, D. & Peter, K. 1999, 'Comparison of five sedation scoring systems by means of auditory evoked potentials', *Intensive Care Med*, vol. 25, pp. 377-382.
Sessler, C. 2008, 'Patient-focused sedation and analgesia in the ICU', *Chest*, vol. 133, p. 565.
Sessler, C.N. 2004, 'Sedation scales in ICU', *Chest*, vol. 126, no. 6, pp. 1727 - 1730.
Sessler, C.N., Gosnell, M.S., Grap, M.J., Brophy, G.M., O'Neal, P.V., Keane, K.A., Tesoro, E.P. & Elswick, R.K. 2002, 'The Richmond Agitation-Sedation Scale: Validity and reliability in adult intensive care unit patients', *Am J Respir Crit Care Med*, vol. 166, pp. 1338 - 1344.
Sessler, C.N., Grap, M.J. & Brophy, G.M. 2001, 'Multidisciplinary management of sedation and analgesia in critical care.', *Semin Respir Crit Care Med*, vol. 22, pp. 211-225.
Shehabi, Y., Chan, L., Kadiman, S., Alias, A., Ismail, W., Tan, M., Khoo, T., Ali, S., Saman, M., Shaltut, A., Tan, C., Yong, C. & Bailey, M. 2013, 'Sedation depth

and long-term mortality in mechanically ventilated critically ill adults: a prospective longitudinal mutlicentre cohort study', *Intensive Care Medicine*, vol. 39, pp. 910-918.
Shenton, A. 2004, 'Strategies for ensuring trustworthiness in qualitative research projects', *Education for Information*, vol. 22, no. 2, pp. 63-75.
Shulman, L. 2005, 'Signature pedagogies in the professions.', *Daedalus*, pp. 52-59.
Silverman, D. 2012a, *Doing qualitative research*, 3rd edn, Sage, London.
Silverman, D. 2012b, 'Effective qualitative research', University of Technology, Sydney.
Skinner, D., Driscoll, P. & Earlam, R. (eds) 1996, *ABC of major trauma.*, 2nd edn, BMJ Publishing Group, London.
Smally, A. & Nowicki, T. 2007, 'Sedation in the emergency department', *Current Opinion in Anaesthesiology*, vol. 20, no. 379-383, p. 379.
Smith, J. 1983, 'Quantitative versus qualitative research: an attempt to clarify the issue. ', *Educational Researcher*, vol. 12, no. 3, pp. 6-13.
Soliman, H.M., Mélot, C. & Vincent, J.-L. 2001, 'Sedation and analgesic practice in the intensive care unit: the results of a European survey', *British Journal of Anaesthesia*, vol. 87, no. 2, pp. 186-192.
Spain, D., Crilly, J., Whyte, I., Jenner, L., Carr, V. & Baker, A. 2008, 'Safety and effectiveness of high-dose midazolam for severe behavioural disturbance in an emergency department with suspected psychostimulant-affected patients', *Emergency Medicine Australia*, vol. 20, pp. 112 - 120.
Stålhammar, D., Starmark, J.-E., Holmgren, E., Eriksson, N., Nordström, C.-H., Fedders, O. & Rosander, B. 1988, 'Assessment of responsiveness in acute cerebral disorders: a multicentre study on the Reaction Level Scale (RLS85).', *Acta Neurochir (Wien)*, vol. 90, pp. 73-80.
Standard Performance and Reporting Collaboration 2012, *ED presentations and admissions*, South East Sydney Local Health Disctrict,.
Starmark, J. & Heath, A. 1988, 'Severity grading in self-poisoning', *Human and Experimental Toxicology*, vol. 7, pp. 551-555.
Stawicki, S.P. 2007, 'Sedation scales: very useful, very underused', *OPUS 12 Scientist*, vol. 1, no. 2, pp. 10 - 12.
Strydom, H. & Delport, C. 2002, 'Sampling and pilot study in qualitative research', in A. De Vos (ed.), *Research at grass roots for the social sciences and human service professionals*, J.L Schaik Publishers, London.
Sun, X. & Weissman, C. 1994, 'The use of analgesics and sedatives in critically ill patients: physicians' orders versus medication administered', *Heart & Lung*, vol. 23, no. 2, pp. 169-176.
Svenson, J., Besinger, B. & Stapczynski, J. 1997, 'Critical care of medical and surgical patients in the ED: length of stay and initiation of intensive procedures', *American Journal of Emergency Medicine*, vol. 15, no. 7, pp. 654-657.
Talisse, R. & Aikin, S. 2008, *Pragmatism: a guide for the perplexed*, Continuum International, New York.
Tashakkori, A. & Teddlie, C. 1998, *Mixed methodology: combining qualitative and quantitative approaches.*, Sage, Thousand Oaks, CA.
Tashakkori, A. & Teddlie, C. 2003, 'The past and future of mixed methods research: from data triangulation to mixed method model designs', in A. Tashakkori & C. Teddlie (eds), *Handbook of mixed methods in social and behavioral research*, 2nd edn, Sage, Thousand Oaks, CA, pp. 671-702.

Tashakkori, A. & Teddlie, C. 2010, *SAGE Handbook of mixed methods in social and behavioral research*, 2nd edn, SAGE Publications Ltd., Thousand Oaks, CA.
Teasdale, G. & Jennett, B. 1974a, 'Assessment of coma and impaired consciousness.', *Lancet*, vol. 2, no. 7872, pp. 81-84.
Teasdale, G. & Jennett, B. 1974b, 'Assessment of coma and impaired consciousness. A practical scale.', *Lancet*, vol. 2, no. 7872, pp. 81-84.
Teddlie, C. & Tashakkori, A. 2009, *Foundations of mixed methods research*, SAGE publications, California, USA.
Teddlie, C. & Yu, F. 2007, 'Mixed methods sampling: a typology with examples', *journal of Mixed Methods Research*, vol. 1, pp. 77-100.
Tesseris, T., Patntazidis, N., Routsi, C. & Fragoulakis, D. 1991, 'A comparative study of the Reaction Level Scale (RLS85) with Glasgow Coma Scale (GCS) and Edinburgh-2 Coma Scale (Modified) (E2CS(M)).', *Acta Neurochir (Wien)*, vol. 110, pp. 65-76.
The American Society of Anethesiologists 2009, *Continuum of Depth of Sedation; Definition of General Anesthesia and Levels of Sedation/Analgesia*.
The Association of Anaesthetists of Great Britain and Ireland 2007, *Recommendations for standards of monitoring during anaesthesia and recovery*.
The Independent Hospital Pricing Authority 2009, *Definition of emergency services for ABF purposes*, IHPA, viewed December 2012 <http://www.ihpa.gov.au/internet/ihpa/publishing.nsf/Content/ihpa-three-year-plan.html~appendix-A>.
The Royal College of Anaesthetists 2006, *A guide for departments of anaesthesia, critical care and pain management*, Joint Committee on Good Practice, UK.
Trzeciak, S., Dellinger, R., Abate, N., Cowan, R., Strauss, M., Kilgannon, J., Zanotti, S. & Parrillo, J. 2006, 'Translating research to clinical practice: a 1-year experience with implementing early goal-direct therapy for septic shock in the emergency department', *Chest*, vol. 129, no. 2, pp. 225-232.
Turkman, A., Altan, A., Turgut, S., Vatansever, S. & Gokkaya, S. 2006, 'The correlation between the Richmond Agitation-Sedation Scale and bispectral index during dexmedetomidine sedation.', *European Journal of Anaesthesiology*, vol. 23, pp. 300-304.
University of Technology Sydney 2013, *HREC Guidelines for Undergraduate and Postgraduate Students*, University of Technology, Sydney, viewed September 2013 <http://www.gsu.uts.edu.au/policies/hrecguide.html>.
Valsiner, J. 2000, 'Data as representations: contextualizing quantitative and qualitative research strategies.', *Social Science Information*, vol. 39, pp. 99-113.
van Merriënboer, J., Kester, L. & Paas, F. 2006, 'Teaching complex rather than simple tasks: balancing intrinsic and germane load to enhance transfer of learning.', *Applied Cognitive Psychology*, vol. 20, pp. 343-352.
van Merriënboer, J. & Kirschner, P. 2007, *Ten steps to complex learning.*, Taylor & Francis, New York.
van Merriënboer, J. & Sweller, J. 2005, 'Cognitive load theory and complex learning: recent developments and future directions.', *Educational Psychology Review*, vol. 17, pp. 147-177.
van Taijlingen, E. & Hundley, V. 2002, 'The importance of pilot studies', *Nursing Standard*, vol. 16, no. 40, pp. 33-36.
Varndell, W., Fry, M. & Elliott, D. 2011, 'Emergency nurses' practices in assessing, monitoring and administering continuous intravenous sedation for the critically

ill patient: a retrospective audit', paper presented to the *9th International Conference for Emergency Nurses (ICEN)*, Melbourne, Vic.
Varndell, W., Fry, M. & Elliott, D. 2013, 'Emergency nurses' practices in assessing, monitoring and administering continuous intravenous sedation for the critically ill patient: preliminary qualitative findings.', paper presented to the *11th International Conference for Emergency Nurses (ICEN)*, Melbourne, Vic.
Varndell, W., Fry, M., Gallagher, R. & MacGregor, C. 2013, 'Measuring patient dependency: performance of the Jones' Dependency Tool in an Australia adult emergency department', *Australasian Emergency Nursing Journal*, vol. 16, pp. 64-72.
Walker, N. & Gillen, P. 2006, 'Investigating nurses' perceptionos of their role in manageing sedation in intensive care: an exploratory study', *Intensive and Critical Care Nursing*, vol. 22, pp. 338-345.
Watson, B.D. & Kane-Gill, S.L. 2004, 'Sedation assessment in critically ill adults: 2001 - 2004 update', *Ann Pharmacother*, vol. 38, pp. 1898 - 1906.
Watson, D. 2006, 'The impact of accurate patient assessment on quality care', *Nursing Times*, vol. 102, no. 6, pp. 34-37.
Way, N., Stauber, H., Nakkula, M. & London, P. 1994, 'Depression and substance use in two divergent high school cultures: quantitative and qualitative analysis', *Journal of Youth and Adolescence*, vol. 23, no. 3, pp. 331-357.
Weaver, C.S., Hauter, W.H., Duncan, C.E., Brizendine, E.J. & Cordell, W.H. 2007, 'An assessment of the association of bispectral index with 2 clinical sedation scales for monitoring depth of procedural sedation', *The American Journal of Emergency Medicine*, vol. 25, pp. 918 - 924.
Webb, D., Sweet, D. & Pretty, I. 2002, 'The emotional and psychological impact of mass casualty incidents on forensic odontologists', *Journal of Forensic Sciences*, vol. 47, no. 3, pp. 539-541.
Weinert, C., Chlan, L. & Gross, C. 2001, 'Sedating critically ill patients: factors affecting nurses' delivery of sedative therapy', *American Journal of Critcal Care*, vol. 10, no. 3, pp. 156-165.
Weinert, C. & McFarland, L. 2004, 'The state of intubated ICU patients: development of a two-dimensional sedation rating scale for critically ill adults.', *Chest*, vol. 126, pp. 1883-1890.
Westcott, C. 1995, 'The sedation of patients in intensive care units: a nursing review', *Intensive & Critical Care Nursing*, vol. 10, no. 2, pp. 79-83.
Whyte, S. 2000, 'The specialist nurse: a classification system', *Contemporary Nurse*, vol. 9, no. 1, pp. 6-15.
Wilson, E., David, A., MacKenzie, N. & Grant, I.S. 1990, 'Sedation during spinal anaesthesia: comparison of propofol and midazolam', *British Journal of Anaesthesia*, vol. 64, pp. 48-52.
Wood, S. & Winters, M. 2011, 'Care of the intubated emergency department patient', *The Journal of Emergency Medicine*, vol. 40, no. 4, pp. 419-427.
World Health Organisation 2009, *Human factors in patient safety: review of topics and tools*, WHO.
Wubker, A. 2007, 'Measuring the quality of healthcare: the connection between structure, process, and outcomes of care, using the example of myocardial infarction treatment in Germany.', *Disease Management Health Outcomes*, vol. 15, pp. 225-238.
Young, C., Knudsen, N., Hilton, A. & Reves, J. 2000, 'Sedation in the intensive care unit', *Critical Care Medicine*, vol. 28, no. 3, pp. 854-866.

## APPENDIX 1: Methodological evaluation of observational sedation-scoring tools

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Ramsey Sedation Scale** | Carrasco et al. (1992) | CS | *n*=102 adult patients, 1040 assessment across 4 time points, unknown N$^{o}$ of raters. | Not tested | Not tested | Newcastle Sedation Scale, *r*=0.89-0.92, nil *p* recorded. | Not tested |
| | Riker et al. (1994) | CS | *n*=8 adult patients, two raters, unknown number of assessments. | Not tested | Not tested | Construct validity demonstrated on comparison to Harris Scale, *r*=0.83, *p*=<0.001. | Not tested |
| | Riker, Picard & Fraser (1999) | CS | *n*=45 adult patients, 69 assessments by pairs of raters. | Not tested | Inter-rater *r*=0.87, *p*=<0.001; $\kappa_w$=088, *p*=<0.001; inter-rater κ=0.87, *p*=<0.001. | Harris Scale $r^2$=0.83. | Not tested |
| | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | Inter-rater κ=0.94, *p*=<0.001 | Auditory evoked potentials (AEP) τ=0.71, *p*=<0.05, $r^2$=0.68, *p*=<0.05 | Not tested |
| | Brandl et al. (Brandl et al. 2001) – *Abstract* | CS | *n*=60 adult patients, 2 raters. | Not tested | Inter-rater: 2 investigators, $\kappa_w$=0.93; between investigators and nurses, $\kappa_w$=0.85 and 0.87, *p*=<0.001 respectively | VAS (subjective) $r_s$=0.77, *p*=<0.001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| | Ely et al. (2003) | CS | *n*=38 adult patients, 290 (paired) observations. | Not tested | Not tested | SAS *r*=0.91, *p*=<0.001. | Not tested |
| | Mondello et al. (2002) | CS | *n*=20 adult patients, 980 observations. | Not tested | Not tested | Ramsay score =2, Bispectral Index (BIS) =88±15.1; Ramsay score =6, BIS =52.2±10.7, *p*=<0.001. | Not tested |
| | Weinert & McFarland (2004) | CS | *n*=59 patients,85 assessments. | Not tested | Not tested | VICS $r_s$=0.68, *p*=<0.001 | Not tested |
| | Hernández-Gancedo et al. (2006) | CS | *n*=50 adult patients, blinded observer. | Not tested | Not tested | BIS *r*=-0.622, *p*=<0.01; Observer's Assessment of Alertness and Sedation (O/AAS) *r*=-0.890, *p*=<0.001. | Not tested |
| | Binnekade et al. (2006) | CSec | *n*=46 adult patients, 443 assessments. | Not tested | Not tested | Sedic Scale $r_s$=0.74, *p*=.01. | Not tested |
| **Bion Sedation Scale** | Bion (1986) | CS | *n*=12 adult patients, single rater. | Not tested | Inter-rater *r*=0.45, *p*=<0.01. | Not tested | Not tested |
| **Cohen Scale** | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | No | AEP τ=0.62, *p*=<0.05, $r^2$=0.56, *p*=<0.05 | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Reaction Level Scale-85** | Stålhammar et al. (1988) | CS, MS | *n*=88 adult patients, 51 observers conducted 164 pair-wise assessments. | Not tested | Overall inter-rater κ=0.69±0.05. Physicians κ=0.65, registered nurses κ=0.74, nursing assistants κ=0.80. No difference found between departments, κ>0.60. | No formal testing | Overall: κ>0.60, with exception to levels 5 and 6, κ>0.50. |
| | Starmark & Heath (1988) | CS | *n*=26 adult ICU patients. | Not tested | Inter-rater κ=0.65 | GCS (sum score), p<0.02. | Not tested |
| | Tesseris et al. (1991) | CS | RLS85 vs. GCS: *n*=46 adult patients, two raters. RLS85 vs. Edingburgh-2 Coma Scale (Modified), *n*=28 adult patients, two raters. | Not tested | RLS85: overall agreement κ=0.73. | GCS (sum score) 1st observer, *r*= -0.76, 2nd observer, *r*=-0.88, both *p*<0.00002. $E_2CS(M)$ 1st observer, *r*=0.92, 2nd observer, *r*=0.90, both *p*<0.00002. | Not tested |
| | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | Not tested | AEP τ=0.64, *p*=<0.05, $r^2$=0.59, *p*=<0.05 | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Newcastle Sedation Scale (or modified / Cook Glasgow Coma Scale)** | Hernández-Gancedo et al. (2006) | CS | *n*=50 adult patients, single observer. | Not tested | Not tested | BIS *r*=-0.593, *p*=<0.001; Ramsay Sedation Scale *r*=0.890, *p*=<0.001. | Not tested |
| **Observers' Assessment of Alertness/Sedation Scale** | Weaver et al. (2007) | CS | *n*=75 adult patients, single rater. | Not tested | Not tested | BIS *r*=0.59 [95% CI, 0.44-0.74] | Not tested |
| | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | Not tested | AEP τ=0.68, *p*=<0.05, $r^2$=0.61, *p*=<0.05 | Not tested |
| **Cambridge Sedation Scale** | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | Not tested | Auditory evoked potentials τ=0.68, *p*=<0.05, $r^2$=0.51, *p*=<0.05. | Not tested |
| **Wilson Sedation Scale** | Némethy et al. (2002) | CS | *n*=100 adult patients, pair-wise raters. | Not tested | Inter-rater agreement, 79% κ=0.72, *p*=<0.00001. | Not tested | Not tested |
| **Harris Scale** | Riker, Picard & Fraser (1999). | CS | *n*=45 adult patients, 69 assessments by pairs of raters. | Not tested | Inter-rater *r*=0.93, *p*=<0.001. | SAS $r^2$=0.83; construct validity comparing SAS *r*=0.86, *p*=<0.001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Inova Sedation Scale** | Schulte-Tamburen et al. (1999) | CS | *n*=95 adult patients, 190 observations. | Not tested | Not tested | Auditory evoked potentials $\tau$=0.62, *p*=<0.05, $r^2$=0.57, *p*=<0.05. | Not tested |
| | Nisbet et al. (2009) | CS | *n*=96 (postal questionnaire), one set scenario, 18 panel experts rated depth of sedation and listed their resulting actions against. | Cronbach's $\alpha$ 0.803. | Percentage agreement for correct score, correct actions, sample (experts), 47.4% (53.3%) and 67.4% (53.3%) respectfully. | No stated fully | Not tested |
| **Bloomsbury Sedation Scale** | Moons et al. (2004) | CS | *n*=74 adult patients, one rater, 74 assessments. | Not tested | Not tested | Ramsey *r*=-0.93, *p*=<0.001. | Not tested |
| **New Sheffield Sedation Scale** | (Laing 1992) | S | Multiple nurses completed an evaluation questionnaire post using the scale hourly. | Not tested | Not tested | Face validity suggested, nil statistical analysis. | Not tested |
| **Pasero Opioid-Induced Sedation Scale** | Nisbet et al. (2009) | S | *n*=96 (postal questionnaire), one set scenario 18 panel experts rated depth of sedation and listed their resulting actions against. | Cronbach's $\alpha$ 0.780. | Percentage agreement for correct score, correct actions, sample (experts), 78.9% (100%) and 80% (93.3%) respectfully. | No stated fully. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Luer Scale** | Hogg et al. (2001) | CS | *n*=31 adult patients, 155 measurements by 5 raters. | Not tested | Pearson *r*=0.37-0.94, *p*=<0.001; correlation coefficient=0.81. | Not tested | Not tested |
| **Agitation-Calmness Evaluation Scale** | Battaglia et al. (2003) | RCT, DB | | Not tested | Inter-rater concordance, 83.6%. | Not tested | Not tested |
| **Brussels Sedation Scale** | Detriche et al. (1999) | CS, MP | *n*=20 adult patients, 1 independent rater. | Not tested | "Sedation levels assigned by the investigator were identical to those of the nurses" | Not tested | Not tested |
| **Motor Activity Assessment Scale** | Devlin et al. (1999) | RND, CS | *n*=25 adult patients, 400 independent pair-wise assessments, 4 raters at 4 hourly intervals. | Not tested | Inter-rater κ=0.83. | Visual analogue scale *p*=<0.001; vs. blood pressure *p*=<0.001; heart rate *p*=<0.001; and, agitated-related sequelae *p*=<0.001. | Not tested |
| | Weaver et al. (2007) | CS | *n*=75 adult patients, single rater assigned to observe depth of sedation. | Not tested | Not tested | BIS *r*=0.53 [95% CI, 0.36-0.70] | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Vancouver Interaction and Calmness Scale** | De Lemos et al. (2000) | CS, MP | *n*=54 adult patients, 302 observations by 67 nurses. | Coefficient alpha=0.96, for both final subscales. | Inter-rater reliability was confirmed by ICC values of 0.89 and 0.90 for the calmness and intervention subscales respectfully. | Construct validity: calmness score negatively correlated to need for intervention $r_s$=-0.83, *p*=<0.001. Mean interaction scores discriminate between acute vs. subacute ICU populations, mean difference 3.14 (95% CI 1.23 to 5.04, *p*=<0.001). | Guyatt's responsiveness statistic results: 1.3 (interaction subscale) and 1.7 (calmness subscale). |
| | Weinert & McFarland (2004) | CS | *n*=59 adult patients, 75 nurses, 100 assessments. | Not tested | Not tested | MSAT motor activity domain vs. VICS calmness domain, $r_s$ =-0.41, *p*=<0.001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Avipras Sedation Scale** | Avripas et al. (2001) | CS | *n*=20 adult patients, two independent raters. | Not tested | Inter-rater: agitation, κ=0.74 (*r*=0.82); alertness κ=0.82 (*r*=0.91), heart rate κ=1.0 (*r*=1.0) and respiration κ=1.0 (*r*=1.0), and; overall score κ=0.97 (*r*=0.97). | Correlation between nurses' assessment of patient distress and the two independent raters, *r*=0.7, *p*=0.0006. | Not tested |
| **Modified Wilson Sedation Scale** | Némethy et al. (2002) | CS | *n*=100 adult patients, pair-wise raters. | Not tested | Inter-rater κ=0.75. | Original Wilson Sedation Scale (Wilson et al. 1990) score, 79%, κ=0.72 *p*=<0.00001. Disagreement occurred between scores of 2 (drowsy) and 3 (eyes closed but rousable to command). On merging categories 2 and 3 to form the modified Wilson Sedation Scale, κ=0.90. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Sedation-Agitation Scale** | Sessler et al. (2002) | CS | *n*=192 adult patients, five raters. | Not tested | Inter-rater κ=0.91, *p*=<0.001 | RASS *r*=0.78, *p*=<0.0001; VAS *r*=0.82, *p*=<0.0001. | Not tested |
| | De Jonghe et al. (2003) | CS | *n*=80 adult patients, 152 assessments, three raters. | Not tested | Not tested | ATICE (conscious [tolerance] domain) *r*=0.78 [*r*=0.65], *p*=<0.001. | Not tested |
| | Wit & Epstein (2003) | CS | *n*=19 adult patients, 80 assessments. | Not tested | Not tested | BIS $r^2$=0.48, *p*=<0.001. | Not tested |
| | Deogaonkar et al. (2004) | CS | *n*=30 adult patients, observed for six hours, 154 data points (BIS) analysed. | Not tested | Not tested | BIS $r^2$=0.725, *p*=<0.0001 | Not tested |
| | LeBlanc et al. (2005) | CS | *n*=12 adult patients, 55 data points (BIS). | Not tested | Not tested | BIS $r^2$=0.072, nil *p* value stated. | Not tested |
| | Dahaba et al. (2006) | CS | *n*=54 randomised adult patients, single rater. | Not tested | Not tested | BIS $r^2$=0.72, *p*=<0.001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| | Rassin et al. (2007) | CS | *n*=79 adult patients, 130 observations, three raters. | Not tested | Inter-rater by professional group: research team vs. ICU Nurse, *r*=0.83 and vs. ICU physician, *r*=0.86. Inter-rater agreement of ICU nurse vs. ICU physician, *r*=0.83. Variance testing: F=0.35, *p*=0.43. | Not tested | Not tested |
| | Ryder-Lewis et al. (2008) | RND, CS | *n*=69 adult patients, 25 nurses and seven physicians. | Not tested | $\kappa_w$=0.82. Inter-class correlations, single measure *r*=0.921, *p*=<0.001. | Not tested | Not tested |
| **Richmond Agitation and Sedation Scale** | Sessler et al. (2002) | MP, CS | *n*=192 adult patients, 172 assessments. | Not tested | Inter-rater κ=0.65-0.80, *r*=0.944-0.973. Inter-rater reliability among entire adult ICU population, κ=0.73, *r*=0.956. | VAS *r*=0.84, *p*=<0.0001; SAS, *r*=0.78, *p*=<0.0001; vs. Ramsey Sedation Scale (score), *r*=-0.78, *p*=<0.0001; and, vs. GCS (score), *r*=0.79, *p*=<0.0001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| | Ely et al. (2003). | CS | *n*=38 adult patients, 290-paired observations. | Criterion validity, 411-paired observations on first 96 patients, *p*=<0.001 for differing levels of consciousness. | Inter-rater $\kappa_w$=0.91. | Construct validity vs. attention screening examination tool *r*=0.78, *p*=<0.001, GCS summed score *r*=0.91, *p*=<0.001 and BIS *r*=0.63, *p*=<0.001. Face validity: 26 critical care RNs, 81% strongly agreed for goal-directed delivery of sedation; 92% agreed with instruments sedation-scoring scheme | Sensitive to dose of medication at 8 hours *r*= -0.31, *p*=<0.001 |
| | Deogaonkar et al. (2004) | CS | *n*=30 adult patients, observed for six hours, 154 data points (BIS) analysed. | Not tested | Not tested | BIS $r^2$=0.810, *p*=<0.0001. | Not tested |
| | Turkman et al. (2006) | CS | *n*=11 adult patients, 88 observations. | Not tested | | BIS *r*=0.900, *p*=<0.0001. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| | Rassin et al. (2007) | CS | *n*=79 patients, 130 observations, three raters. | Not tested | Inter-rater agreement: research team vs. ICU Nurse, *r*=0.88 and vs. ICU physician, *r*=0.91. ICU nurse vs. ICU physician, *r*=0.86. Variance testing: F=0.18, *p*=0.57. | SAS, *r*=0.92, *p*=<0.0001, vs. VAS *r*=0.86, *p*=<0.0001. | Not tested |
| | Nisbet et al. (2009) | CS | *n*=96 (postal questionnaire), one set scenario 18 panel experts rated depth of sedation and listed their resulting actions against. | Cronbach's α 0.770. | Percentage agreement for correct score, correct actions, sample (experts), 74.7% (86.7%) and 69.5% (60%) respectfully. | No stated fully. | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Adaptation to the Intensive Care Environment** | De Jonghe et al. (2003) | CS | *n*=80 adult patients, 152 assessments, three raters. | Cronbach's α testing: consciousness 0.87, tolerance 0.67. | Bedside nurse vs. physician, consciousness domain *r*=0.99, tolerance domain *r*=0.92. Beside nurse vs. research nurse, consciousness domain *r*=0.99, tolerance *r*=0.92. Research nurse vs. physician, consciousness domain *r*=0.99, tolerance domain, 0.96. | Consciousness and [*Tolerance*] domain vs. Ramsey *r*=0.86 [*r*=0.43]; vs. SAS *r*=0.73 [*r*=0.58]; vs. GCS *r*=0.91; vs. COMFORT (sum score) scale *r*=0.79; and, VAS (sum score) *r*=0.75. (Consciousness and [*Tolerance*] domain) vs. Ramsey *r*=0.87 [*r*=0.64]; vs. SAS *r*=0.78 [*r*=0.65]; vs. GCS *r*=0.91; vs. COMFORT (sum score) scale *r*=0.80; and, VAS (sum score) *r*=0.81. All correlations *p*=<0.001. | Longitudinal correlational analysis of scale change: total sedatives and analgesics in last 1hr, consciousness domain *r*=0.72, tolerance domain *r*=0.55. Total sedatives and analgesics in last 24hrs, consciousness domain *r*=0.51, tolerance domain *r*=0.45. All correlations *p*=<0.001. |
| **Modified Sedation-Agitation Scale** | Gill et al. (2003) | CS | *n*=37 adult patients, 270 paired assessments, one research rater. | Not tested | Not tested | BIS $r_s$ =0.690, *p*=<0.0005 | Not tested |

| | | | | Psychometric testing | | | |
|---|---|---|---|---|---|---|---|
| **Tools** | **Validation study** | **Study design** | **Sample** | ***Internal consistency*** | ***Reliability*** | ***Validity*** | ***Responsiveness*** |
| **Minnesota Sedation Assessment Tool** | Weinert & McFarland (2004) | CS | Reliability testing: *n*=35 adult patients, 18 nurse raters, 91 pair-wise assessments. Validity testing: *n*=59 adult patients, 75 nurse raters, 100 pair-wise assessments. | Not tested | Overall arousal scale inter-rater reliability κ=0.85; overall motor activity scale inter-rater reliability κ=0.72. | VICS $r_s$ =0.68, *p*=<0.001 | Not tested |
| **Sedic Scale** | Binnekade et al. (2006) | CSec | *n*=46, 443 assessments. | Not tested | Inter-class coefficient, 0.88 (95% CI, 0.81-0.91). Agreement between score categories 65%, $\kappa_w$=0.82. | RSS $r_s$=0.74 | Not tested |

**Key**: AE*P*=Audio Evoked Potentials; BIS=Bispectral Index; CS=Cohort study; DB=double blinded; K=Kappa; $K_w$=Weighted Kappa; M*P*=multiphase; MS=multisite; *r*=Pearson's correlation; RCT=Randomised Control Trial; RND=Randomised; $r_s$=Spearman's Rho; S=Survey; τ=Kendall's tau

## APPENDIX 2: Summary of nursing positions and definitions

The following is a summary of the various types of New South Wales nursing positions encountered during the course of this study, of which the pre-requisite was to be a Registered Nurse. The title 'Registered Nurse' is defined under section three of the Nurses and Midwives Act (1991) as a person registered by the Nursing and Midwifery Board of Australia. Registered Nurses (RN) were employed in various positions at either study site. The various positions Registered Nurses were appointed to are described in the Public Health System Nurses' and Midwives' (State) Award (2011).

**Clinical Nurse Educator (CNE)**

A CNE is a Registered Nurse who has relevant clinical or education post registration qualifications, who provides for the delivery of clinical education (knowledge and skills), support and professional development and the ward/unit level (New South Wales Government 2011).

**Nurse Educator (NE)**

A NE is a Registered Nurse who has relevant clinical or education post registration qualifications, who is responsible for the development and delivery of nursing education courses/programs at a hospital/service based level (New South Wales Government 2011).

**Clinical Nurse Consultant (CNC)**

A CNC is a Registered Nurse who is appointed as such to a position approved by the organisation, who has more than five years post registration experience and greater than three years in the speciality field. Suitable post registration qualifications relevant to the appointed specialist field are required (New South Wales Government 2011).

**Nurse Manager (NM)**

A NM is a Registered Nurse who is responsible for service delivery, staff performance, patient safety and untilisation of departmental/organisational resources (New South Wales Government 2011).

**Clinical Nurse Unit Manager (CNUM)**

A CNUM is a Registered Nurse in charge of a ward/department who co-ordinates service delivery on a shift-by-shift basis, implements service policy, ensures environmental safety, gives direction and supervision of nursing activities and monitors and adjusts service delivery to patient needs (New South Wales Government 2011).

**Nurse Practitioner (NP)**

A NP is a Registered Nurse appointed as such to a position approved by the Director General and who is endorsed by the Nursing and Midwifery Board of Australia/Australian Health Practitioner Regulation Agency to practice as a NP (New South Wales Government 1991, 2011).

**Clinical Nurse Specialist Grade 1 (CNS1)**

A CNS1 is a Registered Nurse with relevant post registration qualifications and at least 12-months experience working in the relevant specialist field, and applies a high level of specialist knowledge, experience and skill in providing complex care in that specific specialised area of practice (New South Wales Government 2011).

**Clinical Nurse Specialist Grade 2 (CNS2)**

A CNS2 is a Registered Nurse with relevant post registration qualifications and at least three years' experience working in the relevant specialist field, and applies a high level of specialist knowledge, experience and skill in providing complex care in that specific specialised area of practice. Further, a CNS2 exercises extended autonomy in decision-making, clinical skills, knowledge and judgement in providing complex care in a

specialised mode of clinical practice (e.g. case management, service leadership or an authorised extended role) (New South Wales Government 2011).

# APPENDIX 3: Documentation audit tool

**Documentation of continuous sedation**

MRN | Gender | Date attended ED
Time attended ED | Time discharged from ED | LOS

| For all intubations | | | Comments |
|---|---|---|---|
| Patient information | Name and date of birth | ☐ | |
| Procedure information | Date | ☐ | |
| | Time | ☐ | |
| | Indication | ☐ | |
| **Emergency Intubations** | | | |
| Pre-sedation vital signs | GCS | ☐ | E V M = |
| | Pupil light response | ☐ | |
| | Limb strength | | |
| | RR | ☐ | /min |
| | HR | ☐ | /min |
| | BP | ☐ | SBP DBP |
| | $SpO_2$ | ☐ | |
| | Pain score | ☐ | /10 |
| | Pain severity | ☐ | *Description:* |
| | Temperature | ☐ | °C |

| **Drugs used** | | |
|---|---|---|
| *Drug Name* | | Comments |
| Thiopentone | ☐ | |
| Suxamethonium | ☐ | |
| Rocuronium | ☐ | |
| Fentanyl | ☐ | |
| Morphine | ☐ | |
| Ketamine | ☐ | |
| Midazolam | ☐ | |
| Propofol | ☐ | |
| Other | ☐ | |
| | | |
| End-tidal $CO_2$ | ☐ | |

Adverse events/difficulties:

Plan for ongoing sedation:

| Frequency of observations | 0-15mins | 15-30mins | 30-60mins | 1-2hrs | 2-3hrs | 3-4hrs | 4-5hrs | 5-6hrs | Total |
|---|---|---|---|---|---|---|---|---|---|
| GCS | | | | | | | | | |
| Pupil light response | | | | | | | | | |
| Limb strength | | | | | | | | | |
| RR | | | | | | | | | |
| HR | | | | | | | | | |
| BP | | | | | | | | | |
| $SpO_2$ | | | | | | | | | |
| End-tidal $CO_2$ | | | | | | | | | |
| Temp | | | | | | | | | |
| Pain score | | | | | | | | | |
| Pain severity | | | | | | | | | |

# APPENDIX 4: Site specific approval to conduct

NSW Health
South Eastern Sydney Local Health District

11 September 2012

Mr Wayne Varndell
(Acting) Nurse Educator
Emergency Department
Prince of Wales Hospital
RANDWICK NSW 2031

**FILE COPY**

Dear Mr Varndell

**HREC reference number:** LNR/12/POWH/202
**SSA reference number:** LNRSSA/12/STG/155
**Project title:** Emergency Nurses' Practices in assessing, Monitoring and Administering Continuous Intravenous Sedation for Critically Ill Adult Patients

Thank you for submitting a Low and Negligible Risk Research – New South Wales, Site Specific Assessment (SSA) Form for governance review on 21 May 2012.

**Low risk research**
*The National Statement on Ethical Conduct in Human Research 2007* describes research as "low risk", where the only foreseeable risk is one of discomfort. Discomforts may include minor side-effects of medication, discomforts related to measuring blood pressure or anxiety induced by an interview. Where the risk, even if unlikely, is more serious than discomfort, the research is not low risk.

**Negligible risk research**
*The National Statement on Ethical Conduct in Human Research 2007* describes research as "negligible risk" where there is no foreseeable risk of harm or discomfort; and any foreseeable risk is not more than inconvenience to the participants. Inconvenience is the least form of harm that is possible for human participants in research. The most common examples of inconvenience in human research are filling in a form, participating in a survey or giving up time to participate in a research activity. Where the risk, even if unlikely, is more than inconvenience, the research is not negligible risk.

**The following documents were submitted for consideration and entered into AURED:**

| Document | Details | Date |
|---|---|---|
| SSA LNR Form | AU/7/EB5E08 | 30/07/2012 |

I am pleased to inform you that authorisation has been granted by the Chief Executive (or delegate) for this project to take place at the following site/s:

☐ **St George Hospital & Health Service**

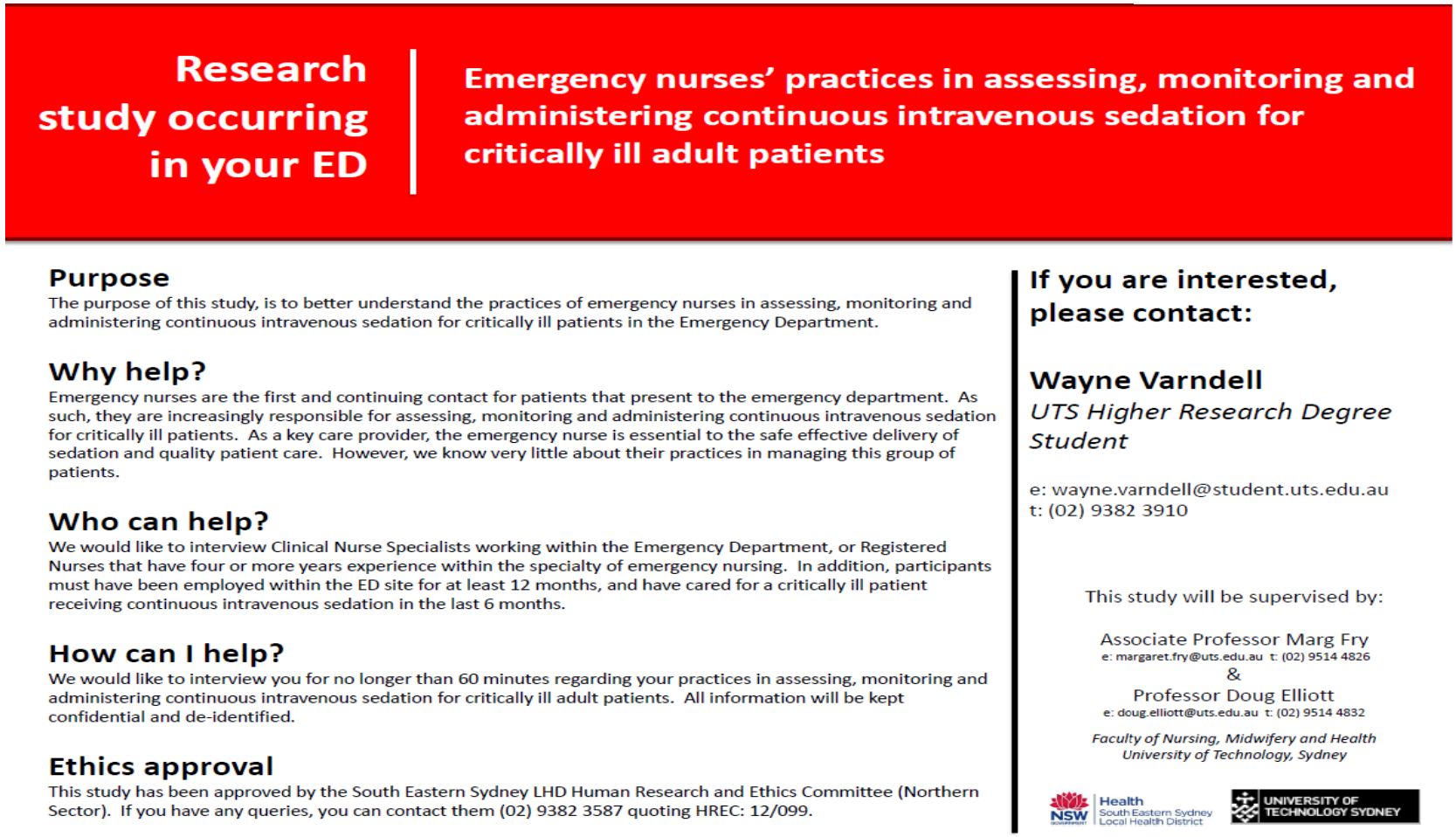
Authorisation is conditional on ethical and scientific approval of the project, which has been granted in line with Policy Directive PD2010_055 *Research - Ethical and scientific review of human research in NSW Public Health Organisations.*

Yours faithfully

Production Note:
Signature removed prior to publication.

**Helen Fraser**
*Manager, Research Support Office – SESLHD*

**APPENDIX 5: Study poster**



Research study occurring in your ED

Emergency nurses' practices in assessing, monitoring and administering continuous intravenous sedation for critically ill adult patients

## Purpose

The purpose of this study, is to better understand the practices of emergency nurses in assessing, monitoring and administering continuous intravenous sedation for critically ill patients in the Emergency Department.

## Why help?

Emergency nurses are the first and continuing contact for patients that present to the emergency department. As such, they are increasingly responsible for assessing, monitoring and administering continuous intravenous sedation for critically ill patients. As a key care provider, the emergency nurse is essential to the safe effective delivery of sedation and quality patient care. However, we know very little about their practices in managing this group of patients.

## Who can help?

We would like to interview Clinical Nurse Specialists working within the Emergency Department, or Registered Nurses that have four or more years experience within the specialty of emergency nursing. In addition, participants must have been employed within the ED site for at least 12 months, and have cared for a critically ill patient receiving continuous intravenous sedation in the last 6 months.

## How can I help?

We would like to interview you for no longer than 60 minutes regarding your practices in assessing, monitoring and administering continuous intravenous sedation for critically ill adult patients. All information will be kept confidential and de-identified.

## Ethics approval

This study has been approved by the South Eastern Sydney LHD Human Research and Ethics Committee (Northern Sector). If you have any queries, you can contact them (02) 9382 3587 quoting HREC: 12/099.

## If you are interested, please contact:


**Wayne Varndell**

*UTS Higher Research Degree Student*

e: wayne.varndell@student.uts.edu.au
t: (02) 9382 3910

This study will be supervised by:

Associate Professor Marg Fry
e: margaret.fry@uts.edu.au t: (02) 9514 4826
&
Professor Doug Elliott
e: doug.elliott@uts.edu.au t: (02) 9514 4832

*Faculty of Nursing, Midwifery and Health*
*University of Technology, Sydney*


NSW Health South Eastern Sydney Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

# APPENDIX 6: Participant information sheet

Health
South Eastern Sydney
Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

**Appendix 3**

**INTERVIEW PARTICIPANT INFORMATION SHEET**

***Emergency nurses' practices in assessing and monitoring continuous intravenous sedation for critically ill adult patients in the Emergency Department***

**Invitation**

You are invited to participate in an interview about improving our understanding of nursing practices in assessing, monitoring and administering continuous intravenous sedation for critically ill adult patients in the emergency department. Wayne Varndell, Higher Degree Research student, is conducting the study with supervision from Associate Professor Margaret Fry, Faculty of Nursing, Health and Midwifery, the University of Technology, Sydney.

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

**1. What is the purpose of this study?**

To improve our understanding of nursing practices in assessing, monitoring and administering continuous intravenous sedation to critically ill adult patients in the emergency department (ED).

**2. Why have I been invited to participate in this study?**

You are eligible to participate in this study as you are employed as a Clinical Nurse Specialist within the Emergency Department, have four or more years' experience within the specialty of emergency nursing, have been employed within the ED site for at least 12 months, and have cared for a critically ill patient receiving continuous intravenous sedation in the last 6 months.

**3. What if I don't want to take part in this study, or if I want to withdraw later?**

Participation in this study is voluntary. It is completely up to you whether or not you participate. You may withdraw your data from the study at any time during data collection. Once the data has been collected and de-identified it will not be possible to withdraw your data from the study. If you decide not to participate, it will not affect your position within the Emergency Department now or in the future. Whatever your decision, it will not affect your relationship with the staff. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason.

**4. What does this study involve?**

If you agree to participate in this study, you will be asked to sign the Participant Consent Form. You will be asked to participate in a one on one interview with our research student, which could last up to 45 minutes. The interview will be audio-recorded to allow us to analyse what you say at a later time.

**5. What happens if I suffer injury or complications as a result of the study**

If you require treatment or suffer loss as a result of the negligence of any of the parties involved in the study, you may be entitled to compensation; the cost of your treatment would have to be paid out of such compensation.

**6. Are there risks to me in taking part in this study?**
Your only commitment to this study will be approximately 30-45 minutes of your time, during you will be asked about your clinical experience in assessing, monitoring and administering continuous intravenous sedation for critically ill adult patients.

**7. Will I benefit from the study?**
This study aims to further knowledge and may improve future care of emergency patients. While it will not directly benefit you, your involvement and reflection of practice may be of indirect benefit to your nursing practice.

**8. Will taking part in this study cost me anything, and will I be paid?**
Participation in this study will not cost you anything nor will you receive any payment for your participation.

**9. How will my confidentiality be protected?**
Any information we collect will be stored in a way that cannot be associated with you. Any identifiable information that is collected about you in connection with this study will remain confidential and will be disclosed only with your permission, or except as required by law. Only the researchers named above will have access to your details and results that will be held securely at Prince of Wales Hospital Emergency Department.

**10. What happens with the results?**
If you give us your permission by signing the consent document, we plan to publish the results in peer-reviewed journals and present the results at professional conferences. We will also need to share the results with to the Ethics Secretariat of the Human Research Ethics Committees at the University of Technology, Sydney and South Eastern Sydney Local Health District - Northern Sector, for monitoring purposes. In any publication, information will be provided in such a way that you cannot be identified.

**11. What should I do if I want to discuss this study further before I decide?**
If after you have read this information you have any queries, Associate Professor Margaret Fry will be able to discuss these with you. If you would like to know more at any stage, please do not hesitate to contact Associate Professor Margaret Fry on (02) 9514 4826 or email using Margaret.Fry@UTS.edu.au.

**12. Who should I contact if I have concerns about the conduct of this study?**
This study has been approved by the South Eastern Sydney Local Health District (Northern Sector) Human Research Ethics Committee. Any person with concerns or complaints about the conduct of this study should contact the Research Support Office which is nominated to receive complaints from research participants. You should contact them on 02 9382 3587, or email ethicsnhn@sesiahs.health.nsw.gov.au and quote HREC project number 12/102.

**Thank you for taking the time to consider this study.**
**If you wish to take part in it, please sign the attached consent form.**
**This information sheet is for you to keep.**

# APPENDIX 7: Participant consent form

Health
South Eastern Sydney
Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

**Appendix 4**

**INTERVIEW PARTICIPANT CONSENT FORM**

***Emergency nurses' practices in assessing and monitoring continuous intravenous sedation for critically ill adult patients in the Emergency Department***

1. I,.....
   of.....
   agree to participate in the study described in the Participant Information Sheet set out above.

2. I acknowledge that I have read the Participant Information Sheet which explains why I have been invited, the aims of the study and the nature and the possible risks of the investigation, and the information sheet has been explained to me to my satisfaction.

3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.

4. Your only commitment to this study will be approximately 45 minutes of your time. The interview should have no impact on your practice and the care you deliver to patients.

5. I understand that I can withdraw from the study at any time without prejudice to my relationship to the Emergency Department and or Hospital.

6. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.

7. I understand that if I have any questions relating to my participation in this research, I may contact Associate Professor Margaret Fry on (02) 9514 4826 or email using Margaret.Fry@UTS.edu.au.

8. I acknowledge receipt of a copy of this Consent Form and the Participant Information Sheet.

Complaints may be directed to the Research Ethics Secretariat, South Eastern Sydney Local Health District – Northern Sector, Prince of Wales Hospital, Randwick NSW 2031 Australia (phone 02-9382 3587, fax 02-9382 2813, email ethicsnhn@sesiahs.health.nsw.gov.au.

**Signature of participant** **Please PRINT name** **Date**

_____

**Signature of researcher** **Please PRINT name** **Date**

_____

# APPENDIX 8: Revocation of consent form

Health
South Eastern Sydney
Local Health District

UNIVERSITY OF TECHNOLOGY SYDNEY

**Appendix 5**

**INTERVIEW REVOCATION OF CONSENT**

***Emergency nurses' practices in assessing and monitoring continuous intravenous sedation for critically ill adult patients in the Emergency Department***

I hereby wish to **WITHDRAW** my consent to participate in the study described above and understand that such withdrawal **WILL NOT** jeopardise my relationship with Wollongong/Shoal Haven District Hospital.

Signature Date

Please PRINT Name

The section for Revocation of Consent should be forwarded to:

Margaret Fry, PhD
Associate Professor of Nursing
Higher Research Degree Program Coordinator
Faculty of Nursing, Midwifery and Health University of Technology, Sydney
P.O Box 123
Broadway, NSW 2007

Contact details

Tel: 61 (02) 9514 4826
Fax: 61 (02) 9514 4835
Mobile: 0425 313 391
Email: Margaret.Fry@uts.edu.au



*Version 4 (01/08/12)*

## APPENDIX 9: Interview schedule

**Demographics**: M or F **Years working in ED**:

**Years working in the Resuscitation Area**:

**Highest level of post-registration nursing qualification**:

**Candidate code**: **Interview commenced at**:

**Digital recorder number**: **Interview ended at**:

1. What do you feel is the role of continuous intravenous sedation for critically ill patients in the ED?
2. How important is the emergency nurses' role in managing continuous sedation in the critically ill patient?
3. What knowledge do emergency nurses need to safely care for a patient receiving continuous intravenous sedation?
4. What skills do you think an emergency nurses need to safely care for a patient receiving continuous intravenous sedation?
5. On a scale of 1 to 10, how confident do you feel in managing continuous intravenous sedation for critically ill patients in ED?
6. How do medical staff inform nursing staff about sedation requirements?
7. Do you feel supported by medical staff when caring for a continually sedated patient?
8. In your clinical practice, do you find any particular patient groups receiving sedation easier or harder to manage?
9. On a scale of 1 to 10, how confident do you feel in managing those difficulties?

10. When documenting your patient care, how do you describe the level of sedation your patient is experiencing?

11. Which patient observations help you to determine the adequacy of sedation for your patient?

12. On a scale of 1 to 10, how confident do you feel in altering the sedation for your patient?

13. If you thought your sedated patient was in pain, what pharmacological agents would you use?

14. On a scale of 1 to 10, how confident would you be in initiating intravenous analgesia for your sedated patient?

15. If you thought your sedated patient was agitated, what pharmacological agents might you use?

16. On a scale of 1 to 10, how confident are you in initiating medication to calm your sedated patient?

| Comments: |
| --- |
| |