CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This literature review will seek to explore what is already known about pain assessment and management in the critically ill patient in the ICU in general and the unconscious patient in particular. Pain and clinical conditions in the ICU associated with pain were first explored followed by pain assessment and management in ICU patient, pain management and sedation, pain and sedation protocols, pain in unconscious patients, barriers to pain assessment and management in the ICU, consequences of poorly managed pain and concluded with documentation of pain assessment and management.

2.2 DEFINITION OF PAIN

Pain is a sensory and emotional experience generally associated with tissue damage or inflammation (Carter, 1998). This pain is ultimately a perception and not an objective bodily state. Pain can either be acute or chronic. Acute pain is caused by tissue damage or inflammation with the duration of less than six months (Leo, 2008). Chronic pain is caused by pathophysiologic processes in the peripheral or central nervous system pathways with duration of more than six months (Leo, 2008). The clinical definition of pain states that pain is whatever the experiencing person says it is, and exists whenever he/she says it does (McCaffery, 1968). Unfortunately, some patients cannot provide a self report of pain

verbally, in writing or by other means such as finger span (Merkel, 2002) or blinking their eyes to answer yes or no questions (Pasero & McCaffery, 2002).

Pain is one of the stressors most commonly reported by critically ill patients (Blenkharn et al., 2002) and its alleviation is an essential element in intensive care nursing. Interviews within five days of discharge from ICU showed that 63% of surgical patients rated their ICU pain as being moderate to severe in intensity (Puntillo, 1990b). From the Study to Understand Prognosis and Preferences for Outcome (SUPPORT), pain was reported to occur in nearly 50% of seriously ill patients interviewed and was described as severe in 15% of patients (Desbians et al., 1996). Moderate to severe pain is experienced by patients in ICU's, a finding that reinforces the importance of this stressor (Stanik-Hutt, Soeken, Belcher, Fontaine, Gift, 2001; Watt-Watson, Stevens, Garffinkel, Streiner, Gallop, 2001). Recently, Puntillo (2007) concluded that approximately 45% to 82% of ICU patients have some degree of pain and if pain is not anticipated in these patients, it will continue to be under-recognized,

2.3 CLINICAL CONDITIONS IN ICU ASSOCIATED WITH PAIN

Critical care setting involves many sources of pain (Gelinas, Fortier, Viens, Fillion Puntillo, 2004). Critically ill patients undergo many routine procedures and treatments, which are associated with pain (Payen, Bru, Bosson, Lagrasta, Novel, Deschaux, Lavagne, Jacquot, 2001; Stanik-Hutt et al., 2001). Critically ill patients also have pain because of their disease conditions and treatment interventions such as endotracheal suctioning, physiotherapy, wound care and prolonged immobilization (Stein-Parbury & McKinley,

2000; Hickling, 2001; Mularski, 2004) thus making pain management a major concern in the ICU. Certain procedures including intubation, insertion of naso-gastric tubes are important and frequently overlooked sources of acute pain in the ICU (Mularski, 2004). Even being turned in bed has been identified by patients as one of the most painful and distressing aspects of ICU care (Mularski, 2004). Significantly higher pain intensity after turning was also described in a study of traumatically injured adults (Stanik-Hutt et al., 2001). In another study, ICU patients described being turned in bed as the most painful procedure, with wound drain removal, femoral catheter removal, placement of central line catheter and wound dressing (Hickling, 2001) and coughing in ventilated and non ventilated patients (Froese, 1997) also causing pain. Patients have conveyed that surgical pain worsened with movements or coughing (Puntillo, 1990b).

More studies identified sources of pain in critically ill patients to include their existing medical conditions, traumatic injuries, surgical or medical procedures, invasive instrumentation, blood draws, and other routine care such as turning, positioning, drain and catheter removal and wound care (Puntillo & Jacob, 1999; Stanik- Hutt et al 2001; Puntillo, Morris, Thompson, Perdue, Stanik-Hutt, 2004). In addition, immobility, hidden infection and early decubiti can cause pain and discomfort. Kwekkerboom & Herr, (2001) also identified sources of pain in ICU patients to include acute illness, surgery, trauma, invasive equipment, nursing and medical interventions and immobility. According to Turner, Briggs, Sprinhorn, (1990), arterial blood sampling and endotracheal suctioning were the most important factors that worried patients during their ICU stay.

Common interventions such as endotracheal tube suctioning, vascular cannulation and even repositioning in bed may elicit extreme pain and anxiety often associated with high

endogenous catecholamine surges (Puntillo, 2007). In an earlier study by Puntillo (1994), critically ill patients also identified endotracheal tube suctioning, coughing and chest tube removal as painful. Patients have stated that chest tube pain interferes with movement in bed, mobility and sleep (Fox, Gould, Davies, Owen, 1999). Patients who had a chest tube in place on postoperative day two had significantly higher pain levels than did patients who had their chest tubes removed on day one (Mueller, Tinguely, Tevaearai, Ravussin, Stumpe, and Von Segesser, 2000). The authors suggested that early removal of chest tubes after cardiac surgery limits pain sensation.

It is critical that clinicians recognize that non-surgical sources of pain such as endotracheal suctioning are frequently not recognized. Because ICU patients may not be able to fully communicate with their care providers, the importance of a heightened awareness of pain cannot be overemphasized (Puntillo, 2007).

2.4 PAIN ASSESSMENT AND MANAGEMENT IN ICU PATIENTS

The first step in providing adequate pain relief for patients is appropriate assessment (AHCPR, 1992). Thus pain assessment and management go hand in hand.

2.4.1 Pain Assessment in ICU

Assessment is fundamental to many nursing care situations. It can provide a basis for intervention, judge the progress of patients, the impact and efficacy of treatments, and is

essential for arriving at a proper diagnosis (Choiniere, Melzack, Girard, Rondeau, Paquin, 1990) and failure to adequately assess pain is one of the main common problems in pain under-treatment (Rutledge & Donaldson, 1998). Clearly, assessment of pain determines what strategies are used for its relief. Thus, if the patient's pain is inadequately assessed, analgesia intervention is also likely to be ineffective. For this reason, considerable attention must be given to pain assessment by nurses.

Pain assessment in the ICU should be performed regularly and consistently, not only to assess the initial onset and severity of a patient's pain, but also to assess a patient's response to treatment (Slonim, 2004; Mosenthal, 2005). For pain assessment to be done adequately it should be carried out simply, consistently and frequently using a standardized form of assessment (Coyne, Reiert, Carter, Dubuisson, Smith, Parker, Chatham, 1999; NHMRC, 1999; White, 1999).

Care in ICU always depends on what the nurse interprets through the senses of observation, hearing and touch (Department of Health, 2001& 2002). The intensive care nurse is in a position to immediately observe changes in the patient and thus prevent the development of complications affecting recovery. The need for staff to be competent in the assessment of pain has been identified in many fields of health care and it is reported that too many patients still suffer from poor pain management due to poor assessment (Department of Health, 2001 & 2002).

Nurses are guided in their pain assessment and management practices by ward protocols and prescriptions by medical staff. In order to enable medical staff to prescribe adequate analgesia, there is the need for an effective communication of the level of pain experienced

by patients. It is therefore important to perform regular accurate pain assessment which must be documented, so that an effective pain management plan can be developed especially in unconscious patients who cannot verbalize their pain. Without accurate assessment and consistent recording it is impossible to evaluate interventions designed to reduce pain (Bauman & Sahn, 1990).

The most reliable source of data on the patient is the patient himself or herself (Cheever 1999). Self assessment is the most accurate measurement of pain, and all attempts should be made to facilitate this (Pierce & Veijo, 2002). This makes patients in ICUs especially unconscious patients particularly at risk for poor pain assessment and management but yet relatively little is known about pain assessment and control in this group of patients (Whipple, Lewis, Quebberman, Wolff, Gottlieb, Medicus -Bringa 1995).

The inability to communicate during critical illness can be a traumatic life event that is frightening, reduces patient participation in care and decision-making and impairs pain and symptom assessment (Happ, 2001). In cases where an endotracheal tube is in situ or tracheostomy has been performed or in any other situation where patients' consciousness has been affected as in the case of this study, evaluation of pain becomes very difficult (McCaffery& Pesero, 2000). This raises the question of how pain is indeed assessed in the ICU specifically in unconscious patients and the accuracy of data obtained.

According to Foster (2001) changes in physiologic measures should be considered a cue to begin further assessment for pain or other stressors. Effective pain assessment of an unconscious patient relies heavily on the clinicians' observation and evaluations (Young et al., 2006). The concept of raising the profile of pain, in particular the promotion of pain as

the “fifth vital sign” would encourage intensive care nurses to conduct and document pain assessment processes as readily as other routine observations.

The Joint Commission on Accreditation of Healthcare Organization (JCACHO) added pain as the “fifth vital sign” which should be diligently monitored along with blood pressure, respiration, heart rate and temperature (JCACHO, 2004). The JCACHO Standards support the premise that all patients have a right to an ongoing pain assessment and management of pain. These include the following:

- The right of every individual patient to appropriate pain assessment and management, and the need for an organizational commitment to pain management.
- The requirement to assess the nature and intensity of pain and recognize the negative consequences of unrelieved pain.
- The appropriateness of prescribing medication that will be effective in treating painful symptoms of disease and treatment.
- The organizational responsibility to educate the patients, residents and family members about the importance of effective pain management.
- The need to include pain management as an integral part of symptom management after discharge from facility.

Whilst there has been much literature providing evidence on nurses’ perception of pain in practice and their decision-making under controlled situations, there is very little observed research to investigate the actual pain assessment practices of intensive care nurses’ routine clinical practice (Shannon & Bucknall, 2003).

The need to be accountable and responsible for effective pain assessment is an essential factor in improving pain management for the critically ill. Acknowledgement by intensive care nurses that pain assessment and management is poorly undertaken within the critical care environment is an important step towards improving pain management (Shannon & Bucknall, 2003). Tittle and McMillan (1994) strongly argue for the revision of nursing curricula and the development of long-term continuing education programmes in order to improve nursing practice hence better pain assessment and management.

2.4.1.1 Pain measurement tools for ICU patients

A number of pain measurement tools for ICU patients have been developed to assist nurses in their standardized assessment of patients' pain. Studies that evaluate pain assessment practice generally conclude that to be done well, pain assessment should be carried out using a standardized form of assessment (Coyne et al., 1999; NHMRC 1999; White, 1999). Some of the pain measurement tools include; behavioural pain scale, critical-care pain observation tool, non-verbal adult pain assessment scale, pain assessment and intervention notation alogarithm and pain assessment alogarithm.

- Behaviour Pain Scale- Behaviour Pain Scale (BPS) by Payen et al., (2001) was designed for critically ill patients. It consists of facial expressions, movements of the upper limbs and compliance with ventilation. Every item has four descriptions. Each pain indicator has a score from 1(no response) to 4 (full response). Criterion validity was tested for the BPS tool. The instrument correlated with changes in physiological indicators in the study by Payen et al., (2001). The results of Young

et al., (2005) indicated good inter-rater reliability when pain level was low, but when pain level increased, like when assessing patients during turning, inter-rater reliability ranged from 36% to 46%.

Limited amount of data suggests that certain observable behaviours may be valid indicators of pain (Puntillo et al., 1997, Puntillo et al., 2004). Pain behaviours can be markers of the existence, intensity and causes of pain. Indeed observing pain behaviours is a common method of assessing pain, especially when patients are unable to verbalize (Aissoaoui, Zeggwagh, Zekraoui, Abidi, Abouqal, 2005).

- Critical Care Pain Observation Tool (CPOT) by Gelinas, Fillion, Puntillo, Viens & Fortier, (2006) was developed for pain assessment in critical care patients. The instrument has four sections with different behavioural categories: facial expression, body movements, muscle tension and compliance with the ventilator for intubated patients or vocalization for extubated patients. Items in each category are scored 0-2.The golden standard in Gelinas et al., (2006) research was patient self-report of pain. The study showed that this pain intensity correlated moderately with CPOT scores. No statistically significant correlation was found between a patient's self-report and the physiological indicators.

- Nonverbal Adult Pain Assessment Scale (NVPS) by Odhner, Wegman, Freeland, Steinmetz, & Ingersoll, (2003) is a pain assessment tool developed for intubated and sedated patients in a burn trauma unit. It was developed on the basis of the FLACC (Face, Legs, Activity, Cry, and Consolability) pain assessment tool (Merkel, Shayevitz, Voepel-Lewis & Malviya, 1997), which was constructed for

children. The NVPS tool consists of the following categories: face, activity (movement), guarding, physiological signs I (vital signs: systolic blood pressure, heart rate and respiratory rate) and physiological signs II (pupillary response, skin, perspiration, flushing, diaphoretic and pallor). In a study by Odhner et al., (2003), the FLACC tool correlated well with the NVPS, the former being considered the gold standard in pain assessment.

- Pain Assessment and Intervention Notation alogarithm (P.A.I.N.) developed by Puntillo et al., (1997) has behavioural and eight physiological indicators of pain. The behavioural indicators are movements, facial indicators, posturing or guarding, and the physiological indicators were heart rate, blood pressure, respiratory rate, perspiration and pallor. There are three steps in the P.A.I.N: Step 1- assesses pain, Step 2- assesses process and Step 3- involves the analgesic treatment decision.

- Pain Assessment Algorithm by Blenkharn et al., (2002), was designed for non-communicative critically ill patients for the authors' own unit. Its contents are tachycardia, hypertension, sweating, pupil dilation, facial grimacing, writhing or distressed movements.

2.4.1.2 Nurses versus patients assessment of pain

The close proximity of nurses to patients puts them in a unique position to be able to effectively assess and manage patients' needs and priorities. However, many studies have shown that nurses do not make use of their proximity to the patient (Seers, 1987; Libreri,

1995; ldvall 2004). Seers (1987) claimed that 54% of nurses' expectations of patient's pain tend to be lower than what is actually reported by patients. Idvall (2004) found that despite the presence of enough nurses on duty who were knowledgeable about pain relief, the patients assessed the quality of most important aspects of care in postoperative pain management as being lower than the nurses assessed these aspects to be. Libreri (1995) concluded that 58% of physicians and nurses are not sufficiently knowledgeable about pain assessment and management and therefore do not take adequate measures to relieve it.

Many more studies have been conducted to examine the congruency between patients' and nurses' ratings of pain. Their findings are discouragingly consistent that nurses generally either underestimate or overestimate patients' pain status (Camp, 1988; Choiniere et al., 1990; Allock, 1996). When intensive care nurses were asked to assess pain intensity by using a visual analogue scale, 35% to 55% of nurses underrated the patient's pain (Hamill-Ruth & Marohn, 1999).

Puntillo et al., (1997) has pointed to the discrepancy between the intensity of pain expressed by patients and the evaluation of this by nurses. Nurses tend to underestimate patients' pain and therefore decrease the amounts of analgesia administered. In a study by Aslan, Badir & Selimen, (2003), they found that 44% of nurses considered patients pain as undesirable and most intensive care nurses did not know how to evaluate pain in patients having communication problems.

When asked, nurses are often the first to admit that inadequate pain assessment is a significant barrier to effective pain management (Dalton, 1989; Bookbinder, Coyle, Kiss, Brown, Gianella, Thaler, 1996; Clarke, French, Bilodeau, Capasso, Edwards, Empoliti,

1996). Despite this level of self-reflection and insight, however, inadequate and inconsistent pain assessment by nurses persists in practice. Evidence indicates that nurses inadequately assess and document pain and pain relief (Briggs & Dean, 1998; Coyne & Pasero, 1998; Rutledge & Donaldson, 1998) and in practice, they make inappropriate decisions concerning pain treatment, particularly drug utilisation (Puntillo & Weiss, 1994). Brett (2001) concluded that nurses are ineffective in pain assessment and have limited knowledge base of pain.

2.4.2 Pain Management in ICU Patients

Pain is a frequent and severe symptom in ICU patients and controlling pain is important (Stein-Purbury & McKinley, 2000). However, many patients are dissatisfied with the pain control they receive (Desbians et al., 1996). Pain in critically ill, sedated or unconscious patients is not only undertreated but underappreciated in the ICU setting (Blenkharn et al., 2002).

Since effective medications and interventions to manage pain already exist, how then are providers to improve the pain control they provide to critically ill patients? Perhaps the answer lies in standardizing the care around pain control. Guidelines for the use of sedation and analgesia do exist (Jacobi, Fraser & Coursins, Riker, Fontaine, Wittbrodtt, Chalfin, Masica, Bjerke, Coplin, 2002). However, adherence to guidelines even when they are evidence-based and adapted to local practices is generally poor (Bair, Bobek, Hoffmom-Hogg, Mion, Slomka, Arroliga, 2000). Despite practice guidelines, there seem to

be a considerable variability in the ways that providers address pain control (Freire, Atessa, Cawley, Phelps & Bridges, 2002).

Puntillo, White, Bonham Morris, Perdue, Stanik-Hutt & Thompson, (2001) showed that 78% of ICU nurses accepted that critical care unit patients received inadequate pain treatment. In spite of this it was shown that 98% of these nurses did not administer the analgesia prescribed in case of need. Delivery of pain management is therefore dependant on the subjective interpretation of nursing staff delivering primary care (Dasta, Fuhrman, McCandces, 1994; Tittle & McMillan, 1994).

Nurses are not united on the goal of pain management, with many supporting reduction rather than relief (Hunt, 1995). Several studies have shown that only a limited number of nurses feel strongly that patients can and should be maintained in a pain-free state (Brockopp et al., 1998). In one study of graduate student nurses, pain reduction and not pain relief was the goal of most respondents (Watt-Watson, 1987) only 10% of these nurses said patients should experience no pain. In addition, 49% of graduate nurses and 60% of student nurses believe that patients should be encouraged to increase their pain tolerance.

The National Health and Medical Research Council in Australia noted that the management of acute pain fails to be given appropriate priority and that acute pain is not properly treated in a variety of clinical situations (NHMRC, 1999). Carr (1997) reports findings that states that there is limited research concerning clinical decision-making in relation to the management of pain.

Continuous evaluation of pain management practice including a review of the prioritization of pain and also the level of knowledge of intensive care nurses in relation to research-based pain management strategies would not only promote improved pain management but would also assist in the planning of education. Health care professionals' knowledge needs to be current in order that they can play a pivotal role in pain management. Studies have shown that improvement in pain assessment and documentation leads to an improvement in pain management (Erdek & Pronovost, 2004).

Pain in hospitalized patients can be viewed as a preventable event. There are multiple methods to classify adverse events in pain management (Starck, Sherwood, Adams-McNeil, Thomas, 2001). Based on available literature and reviews of pain management in ICU these are classified as failures in management and failure in documentation

Intensive care nurses need not only to be aware of research-based pain management practices but also lead the way in implementation and continuous evaluation as a measure of decreasing pain in the future (Shannon & Bucknall, 2003). Two types of pain management strategies exist. They include pharmacological and non-pharmacological.

2.4.2.1 Pharmacological management

This refers to the use of pharmaceutical medications in the treatment of pain. Pain medications can be given by a number of routes including intravenous, intramuscular, rectal, topical, subcutaneous, epidural and intrathecal. For all modes of administration, assessment of the patient's suitability and contraindications for use is an essential part of

the decision making process. Patient controlled analgesia for intravenous, and more recently, epidural analgesia are commonly part of critical care (Elliot, Aitken & Chaboyer, 2006).Pain medications can be classified into 3 main categories: opioid agonist, non-opioids and adjuvant. Pain can be managed using a combination of the available agents (Elliot et al., 2006).

Pharmacological treatment of pain in critically ill patients centres on opoid drugs which act as opioid agonist binding to receptors in the brain, central nervous system (CNS) and other tissues (Liu & Gropper, 2003). Opioid drugs have a rapid action, are readily titrated and their metabolites if present, are less likely to accumulate. Morphine sulphate and fentanyl are routinely used in critical care areas (Elliot et al., 2006). Nurses' favour the use of morphine, midazolam and fentanyl over lorazepam and haloperidol (Mehta, Meade, Hynes, Filae, Bury, Hallet, McDonald & Cook, 2007). According to Puntillo (2007), opioids remain the mainstay for analgesia and newer analgesic drugs such as remifentanil (although with limited data in ICU patients) are beginning to be used in the ICU.

Non-opioid drugs such as non-steroidal anti-inflammatory drugs (NSAID) act by inhibiting of an enzyme within the inflammatory cascade, and may produce the analgesic effect required (Jacobi et al., 2002).

For ischaemic chest pain, nitrates which are adjuvant are used together with morphine sulphate as first-line pain measures (Elliot et al., 2000).

No single medication is ideal for all patients, and clinicians need to carefully select, monitor and titrate the doses of any agent selected (Elliot et al., 2006).

Dasta and colleagues (1994) undertook a study reviewing the prescription and administration of drugs to ICU patients, results showed that 90% of analgesics, sedatives and neuromuscular blockades had been prescribed on PRN (when necessary) basis. Other studies also found that analgesics and sedatives are ordered on PRN basis (Tittle & McMillan, 1994; Puntillo et al., 1997; Payen et al., 2001).

A sub-sample of patients (n = 75) who were prescribed morphine for pain showed that on average only 30% of patients received the maximum allowable dose (Dasta et al., 1994). Similar results were reported by Tittle and McMillan (1994) with ICU nurses on average administering only 30% of the maximum prescribed dose of analgesia. Patients were interviewed to ascertain their current pain status, and then extracted data on the administration of analgesia from the patients' charts. Of all patients reporting moderate to severe pain at the time of interview, 39% had not received any form of analgesia within the proceeding 24 hours and only 17% had received four or more doses of analgesic during the same period and when administered, opioid analgesia was always given in doses less than the maximum amount prescribed.

Nurses' reluctance to administer analgesics is also evident in findings that show that nurses often fail to administer prescribed analgesics, even when they identify the presence of moderate to severe pain (Cohen, 1980).Generally, one may assume pain is present, and if there is reason to suspect pain, an analgesic trial can be diagnostic as well as therapeutic (American Pain Society (APS) 2003).

2.4.2.2 Non-pharmacological interventions

Non-pharmacological interventions are all interventions that are done to control pain without the use of medications (Mathew & Mathew, 2003). Non-pharmacological interventions can include explanation and reassurance, provision of information to the patient, breathing exercises, distractions (television, music), guided imagery, meditation, repositioning and massage (Woodrow, 2006). Others include endotracheal and enteral tube positioning and patient positioning (Puntillo, 2007), as well as acupuncture, a quiet environment, physical therapy, spinal cord stimulation and transcutaneous nerve stimulation (National Centre for Complementary and Alternative Medicine (NCCAM), 2008).

The non-pharmacological techniques that are used to decrease the perception of pain increase the effectiveness of medications that are used to treat pain (Mathew & Mathew, 2003). Apart from the fact that non-pharmacological interventions add to the relief of pain, they also come under the domain of nursing care (Carroll et al., 1999). Non-pharmacological interventions have the benefit of being nurse initiated, non- invasive and able to be personalized for each patient. These strategies alone may not achieve a pain free experience but they have the capacity to enhance drug therapy and humanize the critically ill patients' experience (Elliot et al., 2006).

Although they help to relieve pain, non-pharmacological interventions are used with less than 35% of patients (Carroll et al., 1999). Non-pharmacological interventions could be further developed and used to enhance patient's comfort. Puntillo (2007) emphasized the importance of a multi-faceted approach to the management of pain in ICU patients. Non-

pharmacological strategies in addition to the aggressive approach to pharmacologic analgesia are extremely important.

2.4.2.3 Gate's theory of pain management

According to the spinal gate theory (Melzack & Wall, 1965), small doses of analgesia administered frequently are more effective than large doses at long intervals as small doses frequently maintain a peak level of analgesia in the blood. It therefore becomes imperative that intensive care nurses assess patients' pain regularly and manage it accordingly to prevent complications. They require skills in assessment, medication titration together with a strong commitment and accountability to assess and individualize treatment. There is therefore a great need to increase awareness of pain assessment and management in ICU nurses.

2.5 PAIN MANAGEMENT AND SEDATION

Pain management and sedation are closely linked because pain and anxiety are linked (Payen et al., 2001). Although pain and anxiety are linked, sedation scales are not useful for evaluating pain level in sedated patients or for guiding analgesia treatment decisions (Payen et al., 2001). Pain management is often combined with sedative administration to reduce anxiety (Elliot et al., 2006) and efforts to improve comfort for intubated patients' favours the concurrent use of sedatives and analgesics.

A primary aim of nursing critically ill patients is to provide comfort and adequate sedation is fundamental to this (Elliot et al., 2006). Sedation forms an integral component of the critically ill patient and sedative agents are administered in an attempt to allay anxiety and promote comfort (Aitken, Marshall, Elliot & McKinley, 2008). Discomfort and anxiety may occur as a result of the high levels of noise, technology, intrusive stimuli, invasive procedures and unfamiliar routines that are characteristic of the critical care environment (Stein-Parbury & McKinley, 2000; McKinley, Nagy, Stein-Parbury, Bramwell, Hudson, 2002).

To assess and manage a patient's sedation requirements accurately, the intensive care nurse must make several decisions that incorporate appropriate patient assessment together with physiological factors that influence the patient's sedation needs (Aitken et al., 2008) as done in pain management.

The lack of adequate assessment of pain in sedated critically ill patients interferes with optimum pain management (Payen et al., 2001). According to Payen et al., (2001), no criterion reference method exists for assessing pain in sedated mechanically ventilated patients.

Pain management and sedation are priority issues in the intensive care unit (Mehta et al., 2007). Methods for administering sedation and analgesia can influence the morbidity and mortality associated with critical illness (Kress, Pohlman & O'Connor, 2000). An inadequate level of sedation may lead to negative psychological sequelae such as anxiety, as well as physical problems such as accidental self-extubation or physical harm (Aitken et al., 2008).

The physiological responses to anxiety are well documented and include changes in autonomic tone (Zeller, McCain & Swanson, 1996), increased myocardial workload (McFetridge & Yarandi, 1997), increased coagulability (Camacho & Dimsdale, 2000), increased metabolism with a subsequent increase in oxygen requirement and immunocompromises patients (Zeller et al., 1996).

2.6 PAIN MANAGEMENT AND SEDATION PROTOCOLS

According to Guptil, (1999), there is a lack of protocol driven approaches to pain management in patient's care and some people end their lives in unnecessary pain and discomfort. Without a standard metric for pain, it is difficult to evaluate and improve performance (Erdek & Pronovost, 2004).

Protocol utilization is becoming more common in the ICU. The purpose of these protocols is to facilitate care by standardizing ICU management (Duane, Riblet, Golay, Cole, Weireter, Britt, 2002). Some procedures, such as insertion of a central line catheter, require additional pain management considerations such as administration of local anaesthetics. This highlights the potential need for additional pain protocols linked to key standard procedures (e.g. patient turning) to reduce patients' pain experience (Elliot et al., 2006). Procedures with written protocols, such as femoral sheath removal and insertion of central line catheter however, result in patients experiencing only mild pain, as analgesia and sedation are inherent in the protocols (Maggiore, Jonson, Richard, Jaber, & Lemaire, 2001). Tittle & McMillan (1994) demonstrated that a successfully implemented research-

based pain management protocol leads to a decline in pain intensity and improvement in nurses' knowledge about pain.

Implementation of an Analgesia-Delirium-Sedation (ADS) protocol using objective assessments with a goal of maintaining an awake and comfortable patient may obviate the daily interruption of infusions in critically ill trauma patients (Robinson, Mueller, Henson, Branson, Barsum & Tsuei, 2008). The researchers concluded that an objective assessment based ADS protocol without daily interruption of medication infusion decreases ventilator days and hospital length of stay in critically ill trauma patients.

A protocol driven approach to sedation has been shown to alleviate problems such as extreme prolonged unresponsiveness (Puntillo, 2007). Nursing directed sedation protocols have been shown to reduce the duration of mechanical ventilation and shorten the length of intensive care stay among critically ill adult patients (Mehta et al., 2007). Almost all nurses in a study by Mehta et al 2007, believed that a nursing directed sedation protocol combined with sedation/agitation scoring system would be valuable to patient care as well as professional nursing practice and that a standardized approach by nurses and physicians was important.

On the other hand, explicit detailed guidelines are not always needed to improve performance. Rather simple guidelines that allow staff to modify therapy to the patient's needs may be more effective than a complex, detailed guideline (Erdek & Pronovost, 2004). Duane et al., (2002), found that the use of weaning and sedation protocols did not affect the measured outcome. These findings may reflect difficulties inherent in the protocols or with their utilization. They concluded that before eliminating protocols from

the ICU, based on discouraging results, there should be continued research into their implementation and execution. Therefore, continued use of protocols is recommended to allow further evaluation of outcomes that may demonstrate benefits.

2.7 PAIN IN UNCONSCIOUS PATIENTS

Verbal adult patients describe a constant baseline arching pain with intermittent procedure related pain descriptors such as sharp, stinging, stabbing, shooting and awful pain; thus it should be assumed that those unable to report their pain (as in unconscious patients) also experience these sensations (Puntillo et al., 2001). Experts recommend assuming that unconscious patients have pain and treating them the same way the conscious patients would be treated when they are exposed to sources of pain (Bushnell, 1997). The ICU nurse can therefore serve as an advocate for the patient and family and participate with the multidisciplinary team to formulate a pain management plan for the unconscious patient.

Assessment of pain in others is notoriously difficult, but it is the professional responsibility of the nurse to identify it (United Kingdom Central Council for Nursing, 1997). It is particularly more difficult in critical care where many factors such as administration of sedative agents, mechanical ventilation and changes in level of consciousness may alter verbal communication with patients (Hamill-Ruth & Marohn, 1999; Shannon & Bucknall, 2003). Making accurate pain assessment for uncommunicative patients is of great interest with regard to various and frequent sources of pain (Desbians et al, 1996) and the potential effect of pain (or analgesia) on the patient's outcome (Carroll, Atkins, Herold, Mlcek, Shively, Clopton, Glaser, 1999; Lang, 1999).

Whilst the bases of pain assessment might include the patient's own verbal statement, facial expression, position or body language physiological indicators such as changes in heart rate, respiration and arterial blood pressure as well as sweating, nausea and vomiting could also be indicators of pain (Tittle & MacMillan, 1994). Patients who are unable to speak, such as unconscious patients or someone requiring a breathing machine (respirator) are also carefully observed for their levels of pain. These pain measurements are determined by closely monitoring the patient's vital signs (heart rate, respiration, pulse and temperature) as well as their level of agitation, irritation and restlessness (Scott & Fishman, 2004).

Studies also concluded that when patients cannot express themselves in any way, observable indicators clustered into physiological and behavioural categories, become unique indices for the assessment of pain (Solomon, 2000; Kwekkeboom & Herr, 2001). AHCPR, (1992), strongly recommended that these indicators become part of pain assessment when patients cannot express themselves. Physiological and behavioural indicators of pain can be used by health care professionals for pain assessment. The physiologic indicators of pain include tachycardia, changes in arterial blood pressure, diaphoresis and changes in pupillary size (Gelinas et al., 2004). In this study, the authors developed a standardized pain assessment and management documentation format which was found useful by the researcher and used to inform the instruments used in this study.

Indeed physiological indicators can be easily documented in critical care settings because of continuous monitoring. For instance, increased blood pressure and increased cardiac rate are common signs of acute pain (Puntillo et al., 1997, Payen et al., 2001). Other researchers have shown that increased heart rate and increased arterial blood pressure are

the most frequent physiological indicators of pain noted by observing nurses (Puntillo et al., 1997). According to Amato (1998), changes in physiological parameters including cardiovascular (elevated blood pressure and heart rate) and respiratory indicators are also indicators of pain in the unconscious patient.

Aissoaoui et al., (2005), found that heart rate and arterial blood pressure increased significantly during painful procedures, with the increase in heart rate measuring approximately 10%. Clinicians' observations associate pain with a variation of from 10% to 20% in physiological variables (Terai, Yukioka, Aseda, 1998). Whipple et al., (1995), found that vital signs (blood pressure, heart rate, respiration and temperature) seem to be relevant to nurses in assessing critically ill patient's pain. These pain indicators are also influenced by non-pain related factors that are prevalent in the ICU environment namely, medication, and pathological condition but pain needs to be ruled, out (Aissoaoui et al., 2005).

Blenkharn et al., (2002) developed a pain assessment alogarithm to aid nurses in the ICU in identifying the severity of pain in the critically ill patient non-verbal patient in their study, *Developing a Pain Assessment Tool for Use by Nurses in an Adult Intensive Care Unit.* ln the tool, patients' conscious level was first assessed and if unarousable, proceeds to use tachycardia, hypertension, sweating, facial grimacing, dilated pupils, writhing or distressed movements in rating the unconscious patients' pain and suggested treating patients pain and reassessing pain. Tools such as this could be helpful in the ICU setting to aid nurses in assessing unconscious patients' pain.

According to Pasero and McCaffery (2005) standardized tools promote consistency among health care providers and care settings and facilitate communication and evaluation of pain management treatment decisions. The researchers also concluded that a procedure for evaluating pain presence and response to treatment should be instituted in each health care setting. Effective pain management can only be achieved through accurate and systemic assessment. When critically ill patients are unable to report their pain, comprehensive pain assessment can only be achieved by using a scoring tool based on physiological and behavioural indicators of pain (Puntillo et al., 1997).

Scientific advances in understanding pain mechanisms, multidimensional methods of pain assessment and analgesic pharmacology have improved pain management practices. However, pain assessment for critically ill patients, especially for non-verbal patients, continues to present a challenge for clinicians and researchers (Aissoaoui et al., 2005). According to Gelinas et al., (2004), research is needed to develop tools to enhance pain assessment and management and to improve the quality of care for critically ill non-verbal patients. The researchers concluded that the relevance of physiological indicators for pain assessment in unconscious patients needs to be further explored.

2.8 BARRIERS TO PAIN ASSESSMENT AND MANAGEMENT IN THE ICU

Many barriers to pain assessment and management in the ICU have been identified. These barriers are mainly due to the complex nature of ICU patients (as in unconscious patients who are unable to communicate their pain) (Shannon & Bucknall, 2003). These barriers include nursing knowledge, communication, technology and time constrains.

The general public assumes and patients hope that nurses by virtue of their education and experience, possess a comprehensive and relevant knowledge base that is readily translated into clinical practice (Rees et al., 2000). Winslow (1998) cites naivety and misconception as major barriers to effective pain management. Tanabe and Buschman (2000) noted that 44% of 305 nurses surveyed felt that inadequate staff knowledge of pain management principles was a barrier that affected their practice. Knowledge is considered an important precursor of skills, attitudes and beliefs (Williams, Canar & Kubiak, Holmes, Corrigan, 1999). This inaccurate knowledge of pain and pain management can only support inappropriate attitudes and beliefs about pain, the person in pain and how best to treat him or her. Guru and Dubinsky (2000) compared patients' and nurses' perception of pain. The frequency of analgesia administration as well as the degree of pain relief as reported by patients was noted. They found that 49% of 79% with pain did not have their pain relieved. In a study conducted in an Australian Intensive Care Unit, Puntillo et al., (1997) found significant differences between nurses' and patients' average pain intensity scores throughout their ICU stay. The nurses were found to have consistently underestimated their patients' pain, reinforcing the need for standardized regular, systemic pain assessment.

Research related to intensive care nurses' pain assessment practices in the clinical setting which would have helped to improve the knowledge base of nurses remains limited, despite an increased awareness of the significance of pain for the critically ill patient especially the unconscious patients (Shannon & Bucknall, 2003).

Another barrier identified is communication. According to Cheever (1999) pain is a subjective experience and therefore the best indicator of patients' pain is their verbal report

thus making unconscious patients more vulnerable to pain. However, in the ICU, pain assessment techniques are used since patients cannot always communicate their pain. Mechanical or physiological barriers to communication include endotracheal intubation, loss of consciousness (unconscious patient), metabolic disorders, sedation, restrains and fatigue (Fowler, 1997). These barriers hinder facial expressions, hand movements, moaning, crying or wincing in a situation where reliance on interpretation of behavioural and physiological indicators to diagnose pain is a common clinical occurrence (Puntillo et al., 1997). In a small single unit sample, Puntillo and Weiss (1994) concluded that despite patients being intubated, significant information can be gathered from them by using a proper assessment tool or communication instrument.

Technology can also be a barrier to effective pain assessment because invasive technology can restrict the reliance on many behavioural indicators of pain. Consequently, the patient is often rendered unable to control movements normally utilized to express pain (Shannon & Bucknall, 2003). On the contrary, the presence of an invasive line enables constant measurement of blood pressure and heart rate, two commonly utilised indicators of pain and therefore can assist the pain assessment process (Shannon & Bucknall, 2003).

Time constraints especially in the ICU are considered a significant barrier to assessment of pain in the ICU patient. ICU nurses neglect pain assessment whilst attending to "more urgent patients' needs" (Alpen & Titler, 1994). ICU nurses need to view pain with the same degree of urgency and importance as other changes in vital signs in order to improve patient outcomes (Shannon & Bucknall, 2003). Due to the rapidly changing situations in the ICU, time constraints are often placed on the nurses' ability to perform an accurate assessment and management of pain. In order to perform an accurate assessment of pain, a

variety of methods may be required, once again increasing the essential time necessary to gain a response from critically ill patients (Shannon & Bucknall, 2003).

2.9 CONSEQUENCES OF POORLY MANAGED PAIN

Poorly managed pain has been found to have serious physiological sequelae (Stanik-Hutt, 1998). Pain can compromise recovery and negatively affect both morbidity and mortality. Pain also causes anxiety and depression (Desbians et al., 1996). Pain that is not adequately addressed may result in hypoxemia, resulting from respiratory disorder, myocardial ischaemia resulting from increased sympathetic activity, sodium and water retention, decreased gastrointestinal activity and venous stasis related to inactivity and thrombo-embolism (Acello, 2000).

Pain causes stress/metabolic response which lead to tremendous neurological elevation of plasma catecholamines, cortisol, glucose, antidiuretic hormones and acute phase protein levels. These elevations result in tachycardia, hypertension, vasoconstriction, increased oxygen consumption and blunting of immune response which complicates the patient's condition and prolongs ICU stay (Struebert & Carpenter, 1999). The risk of morbidity is further increased in patients compromised by certain underlying conditions, such as unstable angina and respiratory insufficiency, if they do not receive adequate analgesia (Struebert & Carpenter, 1999).

Patients who suffer inadequate pain management while hospitalized may experience other problems after discharge, including fears and complications associated with pain, analgesic management problems, mobility difficulty and sleep disruption (McDonald, 1999).

2.10 DOCUMENTATION OF PAIN ASSESSMENT AND MANAGEMENT

Researchers found that documentation of pain assessment and management which forms an important part of pain management was virtually non-existent (Blank, Mader, Wolfe, Keyes, Kirschner, Provost, 2001). To eliminate any "guesswork", and facilitate seamless care between all healthcare providers concerned with managing patients' pain, documentation of pain assessment and management should be clear, complete and readily accessible to all healthcare practitioners involved in the patients' care (Scott, 1994).

Researchers also found that little research has been done on the documentation of pain assessment and management in critical care (Gelinas et al., 2004). Further, documentation is often incomplete and inadequate (Gelinas et al., 2004).

Despite research literature demonstrating that critically ill patients, including those intubated or sedated, are able to communicate extensive information about their pain levels, intensive care nurses continue to document their own interpretation of critically ill patients' pain. Unfortunately this is a subjective interpretation of the patients' pain and may in fact underestimate the severity and location of pain (Shannon & Bucknall, 2003).

An effective pain assessment tool should form part of the documentation process as a means of improving communication not only between nurses and patients but also between all other medical staff. The incorporation of an assessment tool and the allocation of a specific place on the ICU chart for the documentation of pain assessment provide a valuable external cue to prompt nurses to undertake the pain assessment process. To date there is not a universal pain assessment tool that is suitable for all critically ill patients (Shannon & Bucknall, 2003).

Studies highlighted the lack of documentation on assessment and the under treatment of pain. As a solution to this situation, implementation of a pain flow sheet has been recommended (Kwekkeboom & Herr, 2001; Carroll et al., 1999; Tittle & MacMillan, 1994). Documentation of pain assessment improved with implementation a pain flow sheet (Carroll et al., 1999, Voigt, Paice & Pouliot, 1999).

Nursing documentation is an important source of information for research that focuses on clinical practice because it provides "evidence of care and patients' responses to that care and is the essential link between the care the patient receives and evaluation of that care" (Martin, Hinds & Felix, 1999).

Pain was considered documented if site and duration of intensity of pain was noted in the patients' records. Clarke et al., (1996) found that although 76% of nurses surveyed stated using a patient self-report pain assessment tool, there was little documented evidence (23%) of the use of such a tool in the patient's record. This was supported by another study which found that pain documentation was absent in 53% of medical records reviewed (Coyne et al., 1999). Of those records only 60% contained documentation of

some form of systematic pain assessment, and on average this assessment was documented only once every 24 hours.

Assessment approaches and pain indicators should be documented in a readily visible and consistent manner that is accessible to all health care providers involved in the assessment and management of pain (Gordon, Dahl, Miaskowski, McCarberg, Todd, Paice, 2005; Miaskowski, Clearly, Burney, Coyne, Finley, Foster, Grossman, Janjan, 2005). Cardiovascular and respiratory indicators can be easily documented in critical care settings. Some of these indicators are commonly monitored, such as blood pressure, cardiac rate, and respiratory rate.

The effectiveness of therapies cannot be adjusted according to the needs of the patient if there is no record of pain management carried out. In the absence of this type of documentation the effectiveness of therapies is difficult to track and hampers continuity of care for patients. The continued lack of pain assessment documentation highlights the ongoing gap between research and practice, given that there has been strong evidence since the mid-1980's that documentation of pain assessment improves pain management and decreases patients' pain (Shannon & Bucknall, 2003).

Although initially the documentation process may be seen to further infringe upon the time constraints under which intensive care nurses work, the resultant improvement in pain management should overcome the initial concerns of increasing nursing time spent on paperwork (Shannon & Bucknall, 2003).

2.11 SUMMARY

Pain has been described as one of the stressors most commonly reported by critically ill patients and its alleviation is essential in intensive nursing care. Unconscious patients are a particularly vulnerable group of patients in the ICU since they cannot verbalise their pain. Effective pain assessment and management is an ethical obligation for all health care providers and organizations. Fostering effective pain assessment and management in the critically ill patient requires the understanding that such care may prolong life. According to literature, as many as twenty percent of ICU patients die in the ICU setting, and the majority of dying ICU patients experience moderate to severe pain.

Assessment of pain by ICU nurses in the ICU is crucial since it determines what strategies are used for its relief. Pain must not only be assessed but the assessment must reflect in the management of the patient. The finding that pain assessment does not necessarily influence change in management is of concern. Experts recommend assuming that unconscious patients have pain and treating them the same way the conscious patients would be treated when they are exposed to sources of pain

Although pain assessment and management is such an important issue in the ICU, there is limited research concerning clinical decision-making in relation to pain assessment and management. Limited literature also exists on pain assessment and management in unconscious patients.

Pain is mostly managed in the ICU with pharmacological treatment and centres on opioid such as morphine. Although not routinely recorded on ICU charts, non-pharmacological

strategies add to the relief of pain and come under the domain of nursing care. Pain management in the ICU is often combined with sedation since pain and anxiety are linked

Pain assessment and management needs to be documented to ensure communication between health workers and continuity of care. Thus if pain medication is given but not recorded, it is assumed not to be given. The effectiveness of therapies cannot be adjusted according to the needs of the patient if there is no record of pain management carried out.

Though pain is whatever the experiencing person says it is and existing whenever he/she says it does an unconscious patient cannot report his/her pain thus the need to use physiological parameters that are continuously monitored in the ICU to measure their pain. In the event of an increase in any of the physiological parameters monitored in the unconscious patient, pain should be ruled out first by treating it within the hour of the increase then other treatment options can be considered if necessary. Behavioural parameters such as facial grimacing, writhing or distressed movements can also be used to assess unconscious patients pain.

This chapter explains pain as an equally urgent need for ICU nurses and the need to consider it as the "fifth vital sign". Sources of pain in the ICU were explored; the need for accurate pain assessment to facilitate pain management was also explored. Pain in unconscious patients, barriers to pain management and the adverse effects of poorly managed pain which causes prolonged ICU stay and economic constraints were also looked at and the need to document pain assessment and management for continuity of care. The next chapter will address the research design and method.