# Nursing care of the mechanically ventilated patient: What does the evidence say?: Part two

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**Abstract**

The care of the mechanically ventilated patient is a fundamental component of a nurse's clinical practice in the intensive care unit (ICU). Published work relating to the numerous nursing issues of the care of the mechanically ventilated patient in the ICU is growing significantly, yet is fragmentary by nature. The purpose of this paper is to provide a single comprehensive examination of the evidence related to the care of the mechanically ventilated patient.

In part one of this two-part paper, the evidence on nursing care of the mechanically ventilated patient was explored with specific focus on patient safety: particularly patient and equipment assessment. This article, part two, examines the evidence related to the mechanically ventilated patient's comfort: patient position, hygiene, management of stressors (such as communication, sleep disturbance and isolation), pain management and sedation.

**Keywords:**

Nursing care; Mechanical ventilation; Stressors; Pain management; Sedation management

## Introduction

It is vital for intensive care nurses to deliver high quality care to the critically ill patient using relevant technologies but also incorporating psychosocial care measures (Urden, 2006). This balance is often one of the largest challenges facing nurses in the intensive care environment. The foundation for quality care would presume a thorough patient assessment and equipment safety check was undertaken. This was addressed in part one of this two-part article. Following patient assessment and safety checks, consideration of nursing care interventions to promote patient comfort and well-being need to be addressed. For this reason, intensive care nurses need to

determine the unique interventions that will positively impact on the mechanically ventilated patient and assist in the patient's progression toward desired outcomes.

This paper is the second of a two-part series addressing a focused evidence-based approach to the nursing care of the mechanically ventilated patient. It is essential that nursing care of the mechanically ventilated patient in the intensive care unit (ICU) is underpinned by evidence. Evidence addressing the overarching care of the mechanically ventilated patient is scant and fragmentary by nature. The purpose of this paper is to provide a single comprehensive examination of the evidence related to the care of the mechanically ventilated patient. This article examines the evidence supporting patient comfort measures in the ICU: positioning, hygiene, stressors, pain and sedation management.

To identify the evidence supporting practice a thorough review of current literature was undertaken using the following steps: electronic search conducted of MEDLINE, CINAHL, EMBASE and Psych-Review databases for articles published between 1980 and 2006, and key words used were mechanical ventilation, patient assessment, patient comfort, sedation and pain management.

## Patient comfort

The promotion of patient comfort through focused nursing interventions is an integral component of expert nursing care in the ICU. The nature of intensive care nursing brings an abundance of unique patient physiological and psychological challenges. A delicate balance is often struck between the skills required in the use of technical equipment and the caring role of the nurse who uses their ability to observe, safeguard, relate to their patients as valued people and provide care that is focused on comfort (Clifford, 1986 and Urden, 2006). The humane appreciation of the patient's environment and the provision of comfort measures to alleviate and, where possible, normalise the patient's day to day routine go a long way to reducing the mechanically ventilated patient's psychological stress. For the purpose of this paper, patient comfort measures include: positioning; hygiene interventions such as eye care, mouth care and washing; management of stressors; pain and sedation management.

## Patient positioning

Positioning the intensive care ventilated patient can improve patient comfort and also address the physiological aims of optimising oxygen transport (through the effects of improving ventilation/perfusion mismatching), reducing the work of breathing and reducing myocardial workload (Stiller, 2000). Specific examples of patient positioning that may be used in the ICU are: supine, semi-recumbent, prone and side lying. Evidence supports the semi-recumbent positioning of ventilated patients, with the head of the bed elevated from 30° to 45°, to reduce the incidence of ventilated acquired pneumonia (VAP) (Bonten, 2005). The degree of head of bed elevation and the time spent supine are identified risk factors for aspiration of gastric contents (Torres et al., 1992) and consequently the development of VAP. A seminal prospective, randomised, clinical trial conducted by Drakulovic et al. (1999) compared continuous semi-recumbence (45° elevation) to no

elevation in the early mechanical ventilation period and found a significantly greater incidence of VAP in patients without elevation of the head of the bed. Recently, Grap et al. (2005) found that VAP was more likely to develop in patients with high Acute Physiology and Chronic Health Evaluation (APACHE) II scores who spent more initial ventilatory time with the head of the bed less than 30°. Consideration of the elevation of the head of the patient's bed is dependent upon specific patient problems such as head injury and acute lung injury. In such circumstances, individual patient assessment should be undertaken and clinical practice should be based on related evidence.

Further, altering the critically ill patient's position can dramatically improve gas exchange, shorten the patient's stay in the intensive care unit and improve the outlook for recovery (Misasi and Keyes, 1996). The typical position for patient care is the supine semi-recumbent position, but in other positions (notably prone or right or left lateral decubitus) oxygenation and ventilation may improve. Positioning the patient should take into account haemodynamic stability and relevant lung pathology. Positioning can assist in matching ventilation and perfusion throughout the lung given that there is preferential blood flow to gravity dependent areas of the lung (Misasi and Keyes, 1996). Positioning the patient in a side lying position with the affected lung uppermost can improve oxygenation for patients with unilateral lung disease (Misasi and Keyes, 1996). However, nursing evaluation of the patient's physiological response to position changes is vital. Clinical examples of position changes to improve ventilation perfusion mismatch are prone positioning and rotational therapy. Prone positioning has been demonstrated to improve ventilation perfusion mismatch however, no definitive length of time for the patient to remain prone has been established (Piedaleu and Albert, 2003). In addition, specially constructed beds facilitate continuous turning of a patient from side to side with a 40° (kinetic rotation) or greater rotation (continuous lateral rotational therapy (CLRT)) (Marik and Fink, 2002). It is noted that CLRT is thought to be of little pulmonary benefit to the critically ill patient (Collard, 2003).

Consideration of skeletal alignment, natural anatomical flexion and individual patient comfort is important in positioning the ventilated patient (Stiller, 2000). Although no research has been undertaken to determine the most effective time frame for turning the critically ill patient, it is accepted that patients are turned every 2–4 h and nursed on a pressure relieving mattress. Further mobilisation techniques that may be used for the ventilated patient include: limb exercises (passive, active assisted or active resisted); the patient actively moving in the bed; getting out of bed via mechanical lifting devices or slide transfers; sitting on the edge of the bed; standing; transfers from bed to chair; and walking. These forms of mobilisation can improve joint range of motion, soft tissue and muscle strength and function, decrease the risk of thrombo-embolism (Daber and Jackson, 1987), and also assist in restoring normal body fluid distribution through gravity (Stiller, 2000).

Hygiene

Effective nursing measures to meet the mechanically ventilated patient's basic hygiene needs and to facilitate comfort are an essential component of expert intensive care nursing practice.

## Eye care

Mechanically ventilated patients who are sedated and/or unconscious are a high risk group who are dependent on eye care to maintain eye integrity. These patients are susceptible to corneal dehydration, abrasions and infection as a result of impairment of basic eye protective measures, such as the blink reflex (Dawson, 2005). Consequently, for this group of patients individual assessment to determine eye care needs is essential. Anecdotally, in the majority of ICU's eye care is performed every 2 h to prevent corneal abrasions, dehydration and infection. There are multiple methods of eye care such as normal saline irrigation, eye drops, taping, paraffin-based gauze, ointments, gels and polyethylene (Dawson, 2005). One randomised controlled study found that polyethylene covers (cling wrap) are as effective as hypromellose drops and lacri-lube ointment in reducing the incidence of corneal damage in mechanically ventilated patients (Koroloff et al., 2004). A systematic review recommended the following: eye care be provided to all ICU patients; ointments and drops are more effective in reducing corneal abrasion than no treatment; and polyethylene covers are more effective in reducing corneal abrasion than ointment and drops (Best Practice, 2002).

## Mouth care

There appears to be considerable variation in use of oral hygiene and comfort measures in the ventilated patient. Swabs (foam sticks) and toothbrushes are common choices for mechanical cleansing while there is a wide variety in the choice of cleansing agents such as: commercial mouthwashes, chlorhexidine, sodium bicarbonate, hydrogen peroxide and fluoride (O'Reilly, 2003). Evidence supports the use of a soft bristled toothbrush and rinsing of the oral cavity (Munro and Grap, 2004). Stiefel et al. (2000) compared the condition of the mucous membranes, teeth and tongue of eight ICU patients before and after toothbrushing and found toothbrushes were effective in improving oral health. However, a limitation of this study that dental plaque variations were not reported nor was a link made to VAP.

The choice of cleansing agent is again varied. Although chlorhexidine has been used in oral hygiene protocols for oncology patients (Dodd et al., 2000) its efficacy has not been established in the critically ill intensive care patient population. However, its use is noted to benefit adjunct plaque removal and suppress potential pathogens (Houston et al., 2002).

Frequency of oral care has been reported at 2, 3, 4 and 12 hourly intervals (Munro and Grap, 2004). A review paper by O'Reilly (2003) suggested that oral care at two and four hourly intervals improved oral hygiene. However, overlooking oral care for extended timeframes reversed previous benefits. It is now recommended that individualised oral care be established and maintained (O'Reilly, 2003).

The administration of ice chips is a method to reduce mouth dryness, thus enhancing the patient's comfort and assisting in reducing bacterial growth (Trieger, 2004). Although it is established in the literature that the intubated ICU patient requires oral care to promote physical comfort and

prevent nosocomial infections (Munro and Grap, 2004 and O'Reilly, 2003), this key area of nursing care is supported largely by anecdotal opinion or research limited by small sample size and methodological issues. Despite this regular oral assessment and the use of protocols of oral hygiene management are essential.

Washing

Maintaining patients' personal hygiene is a fundamental aspect of nursing care. A range of benefits, such as patient assessment and communication, can be gained when experienced nurses bathe or wash patients. There is a paucity of evidence-based literature on the frequency of washing and choice of cleansing agents to use for the critically ill patient. Larson et al. (2004) suggested nurses' preferred to use a disposable bath to the traditional basin bath. Common practice would appear to be giving the patient a complete wash or bed-bath once per day and a "mini" wash to facilitate comfort for the patient's hand, face and peri toilet at another stage of the day. Frequent washing with soap-based products is thought to dry out the skin (Ertel, 2000). The choice of cleansing agent is varied from simple soap to emollient-based lotions and is often an individual nursing choice or patient preference. Hair washing again promotes patient comfort and psychological well-being. Hair washing frequency and choice of agents should be individualised to meet the patient's needs.

Urinary catheters are a leading source of nosocomial infections (Zoldam et al., 2005) in the critically ill patient. Common practice is cleansing of the perineum and meatus twice daily with soap and water. However, it is clear from the dearth of empirical evidence that there is an urgent need to establish well-constructed research studies to investigate the frequency and process of meatal catheter care in the mechanically ventilated critically ill patient.

Management of stressors

The area of psychosocial care of the ventilated patient has been a focus of significant research over the past few decades. There is a recognised interface between the ICU environment and the patient's experience of stress (Moser et al., 2003). It has been reported that a considerable number of ventilated patients' experience communication difficulties, sleep deprivation, nightmares and feelings of isolation and loneliness (Rotondi et al., 2002 and Johnson et al., 2006).

Communication stressors

Communication difficulties are a source of great stress for mechanically ventilated patients, often leading to feelings of vulnerability and powerlessness (Happ, 2001 and Magnus and Turkington, in press). Ashworth's (1980) seminal observational study of ICU nurse–patient communication interactions concluded that communication in the ICU occurred most frequently in conjunction with physical or procedural care. More recent literature still suggests communication is procedurally focused and that nurses identify numerous barriers in communicating with the mechanically ventilated patients in their care: heavy workload; focus on technological or physical care (Fox and Jeffrey, 1997); difficulty in lip reading; patient's inability to write; patient personality (Leathart, 1994); and lack of education regarding communication (Happ, 2001). It is interesting that despite

the general belief that communication with mechanically ventilated patients is an integral component of quality nursing care evidence still suggests that communication is not effectively or consistently managed (Moser et al., 2003 and Alasad and Ahmad, 2005).

Although communication with the mechanically ventilated patient is a challenging aspect of nursing care there are behaviours and devices, which can facilitate the process. The nurse's use of positive body language, friendly facial expression, eye contact and use of questions with a yes/no response has been reported to reduce patient distress (Leathart, 1994). Other useful strategies reported comprise the inclusion of familiar people, such as family members, and the use of specific staff who are familiar with the patient (Magnus and Turkington, in press). Lip reading and pen and paper are still the most commonly used communication tools (Ashworth, 1980 and Wojnicki-Johansson, 2001). Other low technology devices suggested are word or picture charts, alphabet boards and rewritable magnetic boards (Magnus and Turkington, in press). More advanced technological devices such as electronic voice output communication aids through a computer are usually used for longer term mechanically ventilated patients based on an individual patient assessment and evaluation (Happ, 2001).

Sleep disturbance

Sleep disturbance (frequent interruption to sleep) is a significant problem and a noted stressor for mechanically ventilated patients in the ICU. Critically ill patients have reported high levels of fragmented sleep (Tamburri et al., 2004). Debate exists in the literature regarding sedation in the ventilated patient; whether it is a solution for rest or part of the problem for sleep disturbance (Honkus, 2003). While it is not always possible to actively promote sleep in the most unstable critically ill patient, there are many instances where nurses can individualise care for each patient by planning sleep promoting interventions. The common causes of sleep disturbance have been reported as environmental noise (including alarms, equipment, telephones and talking), lighting, discomfort, stress and pain (Honkus, 2003 and Thomas, 2003). The potential impact on patients deprived of sleep includes suppression of the immune system leading to an impaired capacity to combat infection and impeded wound healing; weakened upper airway musculature and delayed weaning from ventilation (Honkus, 2003). Further, visual hallucinations and delirium can result (Ramful, 2005 and Schuurmans et al., 2001).

Preparing the ventilated patient for sleep can be a challenge for the organisation of nursing care. It is often recommended that care givers should decrease environmental noise and consolidate care into short episodes to enable periods of uninterrupted rest for the patient (Tamburri et al., 2004 and Reishtein, 2005). Many studies recommend the following care interventions: timely silencing of equipment alarms; pre-emptive silencing of ventilator alarms prior to suctioning; dimmed lighting; minimising lights turned on at night; positioning the patient comfortably; considering the ICU room temperature; clustering of care, where possible, to promote periods of uninterrupted sleep; avoiding care interventions that are commonly performed at night as part of traditional practice (for example; patient washing between 3 and 5 a.m. or electrocardiograph recording at 5 a.m.) (Honkus, 2003, Thomas, 2003, Tamburri et al., 2004, Monsen and Edell-Gustafsson, 2005 and

Reishtein, 2005). The implementation of such interventions is based on unit policy and expert ICU nursing care, recognising that it is essential to promote the re-establishment of the ventilated patient's diurnal rhythms.

Feelings of isolation and loneliness

Hupcey (2000) undertook a grounded theory study of 45 critically ill adult patients who were in ICU for a minimum of three days and identified that the ventilated patient's need to feel safe is paramount. Feelings of isolation, loneliness, fear and anxiety impact negatively on patient perceptions of safety. Intensive care nurses can use numerous interventions to reduce patients' perception of isolation and loneliness. Orientation to day and time can be achieved through repeated communication and large clocks with faces in view for the patient. Placing objects familiar to the patient, such as family photos, around the bedspace can personalise the ICU environment. For long-term mechanically ventilated patients, normalising their day with "trips to the outside" is another mechanism to reduce isolation. The authors note the impact on workload from this intervention but also report the positive benefits of such a practice to patient and staff.

It is recognised families have a positive impact on the patient's progression in the ICU (Powers and Goldstein, 2000). Social isolation and other stressors in the ICU may contribute to mechanically ventilated patient's sense of dependency and increase acute confusion and distress (Jones et al., 2000 and Price, 2004). There is evidence that social interaction, in the form of family presence, can be beneficial to the mechanically ventilated patient (Bizek, 2005). Family-focused care is a philosophy of care that acknowledges the family unit as the fundamental focus of all health care interventions (Wright and Leahey, 1994). In the ICU this translates to firstly, the consideration of the mechanically ventilated patient in the context of their family and secondly, the assessment of individual family needs and the planning and implementation of interventions to improve outcomes for patients and their families. Simple measures such as encouraging the family to be with the patient, talk to the patient and hold their hand are of great benefit to the patient and family.

Interventions such as relaxation, massage (Lower et al., 2003), music therapy (Evans, 2002) and therapeutic touch and empathetic physical contact (Adomat and Killingworth, 1994) have been identified as reducing patient isolation and loneliness and promoting comfort. These interventions need to be assessed on an individual basis for the ventilated patient. There is scope for further research into the efficacy of these interventions.

Moser et al. (2003) reported that the use of spiritual comfort, such as offering or arranging spiritual counselling and prayer, was used as an intervention by only a small number of nurses. However, Hupcey's (2000) study identified this as a source of comfort to the patient. Some patients in this study explained that when feeling scared, knowing others were praying for them was comforting and helped them through the ICU experience. Pastoral care should be individualised to meet the patient's needs.

Pain management

There is a paucity of large-scale research studies that directly focus on pain management in the critical care unit which has resulted in the development of consensus guidelines (ANZCA, 2005 and Jacobi et al., 2002). A significant number of patients recall experiencing pain during their time in intensive care (Hogarth and Hall, 2004 and Puntillo, 2003). Furthermore, nurses underestimate patient's pain (Aslan et al., 2003 and Jacobi et al., 2002). Pain has many deleterious effects; therefore it may be useful to view pain as the fifth vital sign when undertaking assessment (Shannon and Bucknell, 2003).

Pain assessment and evaluation

It is widely acknowledged that an individual's self-report of pain is the most accurate (ANZCA, 2005). This is problematic due to the inability of many mechanically ventilated patients to verbalise because of endotracheal intubation, and significant impairment of non-verbal communication caused by such factors as sedation (Jacobi et al., 2002). Therefore, tools selected should be appropriate to the individual, and all methods deemed likely to garner the necessary information should be used (ANZCA, 2005 and Puntillo et al., 1997). Methods include the use of assessment tools, and behavioural and physiological cues (ANZCA, 2005 and Jacobi et al., 2002).

Several assessment tools have been utilised for critically ill patients, though there is limited validation of tools in this population. Tools gauging intensity of pain include the visual analogue scale and the numeric rating scale (Jacobi et al., 2002). Tools developed specifically for critically ill patients and requiring further validation include the adult non-verbal pain scale (Odhner et al., 2003), pain assessment and intervention notation tool (Puntillo et al., 2002), both of which use behavioural and physiological data and the behavioural pain scale (Payen et al., 2001).

Both behavioural and physiological indicators may inform pain assessment of the mechanically ventilated patient (see Table 1). Physiological indicators are the least reliable and may have returned to baseline before pain is resolved. Significant pain may be present with no change in behavioural or physiological parameters (Puntillo et al., 1997). Other factors, which may inform pain assessment, include the presence of wounds, procedures to be undertaken, and proxy assessment data from family members, poorly correlated with self-reports (Odhner et al., 2003 and Jacobi et al., 2002).

Table 1. Behavioural and physiological pain indicators

| Behavioural indicators[a] | Physiological indicators[b] |
|---|---|
| • Facial expression—grimacing, frowning, wincing, tearing | • Heart rate, blood pressure, respiratory rate—elevated or reduced |
| • Movements—restless, tentative, withdrawing, rocking/rhythmic | • Dilated pupils |
| • Posture—rigidity, guarding, stiffness | • Pallor |
| • Non-compliance with ventilation—coughing, gagging, "bucking" | • Diaphoresis |

a Odhner et al. (2003) and Payen et al. (2001). b Jacobi et al. (2002) and Puntillo et al. (2002).

An analgesia plan with clear aims needs to be established and communicated to all caregivers (Jacobi et al., 2002). Documentation is vital to effective communication and optimal management of pain, therefore pain assessment and response to interventions must be clearly documented (Shannon and Bucknell, 2003).

Pharmacological pain management

Intravenous administration of opioids is the preferred method of pain relief, with continuous administration favoured over intermittent for achieving a steady state of analgesia (Jacobi et al., 2002). Patient controlled analgesia (PCA) may be used for ventilated patients who are sufficiently awake and physically able to manage the device (Jacobi et al., 2002). There is evidence supporting PCA as more effective for the elderly (ANZCA, 2005). However, this evidence needs to be considered in the context of the critically ill mechanically ventilated older adult. Recommended agents are morphine and fentanyl, with morphine recommended if intermittent administration is used due to its longer duration of action, and fentanyl recommended to achieve rapid onset effect (Jacobi et al., 2002). Those patients who have received opioids for greater than seven days and/or those who have received high doses are at significant risk of withdrawal syndrome during weaning of opioids, particularly if the drug is suddenly terminated. Opioids should therefore be weaned by regular diminution of dosage, monitoring closely for withdrawal signs and symptoms (see Table 2) (Jacobi et al., 2002 and Cammarano et al., 1998).

Table 2. Signs and symptoms of opioid and/or benzodiazepine withdrawal

| Signs | Symptoms |
|---|---|
| • Pupil dilation | • Agitation |
| • Diaphoresis | • Irritability |
| • Tearing | • Lowered threshold for pain |
| • Rhinorrhea | • Cramps |
| • Tachycardia | • Fretfulness |
| • Hypertension | • Sleeplessness |
| • Tachypnoea | • Headache |
| • Fever | • Photosensitivity |
| • Vomiting | • Audio sensitivity |
| • Diarrhoea | |
| • Tachypnoea | |
| • Tremor | |
| • Myoclonus | |
| • Convulsion | |

Jacobi et al. (2002) and Cammarano et al. (1998).

## Non-pharmacological pain management

Limited research exists into effectiveness of non-pharmacologic pain interventions and outcomes are often contradictory. Pharmacologic measures should be optimised and non-pharmacologic interventions used to complement (Titler and Rakel, 2001). The provision of information prior to procedures outlining expectations including sensations has been demonstrated as effective (ANZCA, 2005 and Shi et al., 2003). Other strategies to enhance pain management include distraction, relaxation techniques, heat and cold treatments, massage, transcutaneous electric nerve stimulation and music (ANZCA, 2005 and Titler and Rakel, 2001). Such interventions need to be evaluated on an individual patient basis.

## Sedation

Pain management and sedation are inextricably linked (Park et al., 2001). Continuous intravenous sedation prolongs mechanical ventilation time (Kollef et al., 1998). Daily withdrawal of sedation to reassess requirements reduces ventilation time, length in intensive care and complications such as VAP (Kress et al., 2000). Similarly, the use of protocols/guidelines with clear goals has demonstrated a reduction in ventilation time, medication side effects, morbidity, length in intensive care and costs (Ibrahim and Kollef, 2001 and Brook et al., 1999). Therefore, protocols incorporating daily withdrawal of sedation should be utilised.

## Sedation assessment and evaluation

Pain and other correctable causes of distress need to be eliminated prior to meeting sedation requirements. As previously noted in part one of this two-part paper, a number of tools have been developed to determine the patient's level of anxiety and agitation and thus sedation requirements. Commonly used in clinical practice, the Ramsay Scale is a six-point numerical scale of motor response founded on depth of sedation (Ramsay et al., 1974). Discrimination in quality and degree of sedation is limited (Jacobi et al., 2002). The Riker Sedation-Agitation Scale (SAS) is a seven-point scale illustrating behaviour from unrousable through to dangerous agitation (Riker et al., 1999). The Richmond Agitation-Sedation Scale (RASS) is a 10-point scale illustrating patient behaviour from unrousable to combative (Sessler et al., 2001). Both the SAS and RASS have been validated in critical care populations and use observation, response to voice; and if no response to voice, response to physical stimulation (Jacobi et al., 2002 and Sessler et al., 2002). Many tools have been developed for critical care populations, though no best tool has been identified (Sessler, 2004 and Jacobi et al., 2002). Other tools include the Minnesota Sedation Assessment Tool, Adaptation to the Intensive Care, Motor Activity Assessment Scale, Adaptation to the Intensive Care Environment instrument and the Vancouver Interactive and Calmness Scale (Sessler, 2004).

## Pharmacological sedation management

Combining opioids and sedatives provides a synergistic effect, resulting in lower dosage of each (Gehlbach and Kress, 2002). As for opioids, continuous intravenous administration is favoured over intermittent for achieving a steady state for the ventilated patient. Benzodiazepines are

recommended for their anxyiolytic and amnesiac properties (Hogarth and Hall, 2004). The preferred drugs are midazolam, diazepam and lorazepam, with midazolam and diazepam recommended for rapid sedation, and lorazepam favoured for longer term use. However, midazolam is most frequently utilised. Propofol, delivered in a lipid emulsion is advocated for situations necessitating quick arousal. Triglyceride levels require monitoring during administration (Jacobi et al., 2002). High doses should only be used for short periods due to the risk of myocardial failure, rhabdomyolysis and metabolic acidosis (Jacobi et al., 2002 and State Coroner Victoria, 2004). After longer term use and high doses, doses should be decreased regularly to avoid withdrawal symptoms (Jacobi et al., 2002).

Delirium, variously referred to as ICU psychosis and ICU syndrome (McGuire et al., 2000) is not commonly monitored in critical care, and may be the cause of unexplained distress which is unresponsive to the above measures (Gehlbach and Kress, 2002). It is linked with increased length of stay, morbidity and mortality. Delirium has a variety of physiological origins (see Table 3), which must be addressed as a primary management strategy, along with pharmacological and non-pharmacological interventions aimed at symptom control (Eisendrath and Shim, 2006).

Table 3. Possible aetiology of delirium in the ICU

| |
|---|
| Neurological disruptions |
| • Trauma |
| • Haemorrhage |
| • Infarction |
| • Tumour |
| • Drug/alcohol excess or withdrawal |
| • Infection |
| |
| Metabolic disruptions |
| • Acid–base anomalies |
| • Hepatic encephalopathy |
| • Uraemia |
| |
| Cardiorespiratory disruptions |
| • Cardiac arrest |
| • Heart failure |
| • Cardiac rhythm disturbances |
| • Respiratory failure |
| • Shock |
| |
| Systemic disruptions |
| • Sepsis |
| • Coagulation disorders |
| • Poisoning |
| • Drugs |

Eisendrath and Shim (2006).

Roberts et al. (2005) identified three tools to detect delirium expressly in the critical care context; the Cognitive Test for Delirium (CTD), the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) and the Intensive Care Delirium Screening Checklist (ICDSC). The CTD and CAM-ICU require patients to be aware such that they can obey commands or nod/shake their head in response to questions. The ICDSC can be implemented with unresponsive patients, which lends itself to use with any critical care patient (Roberts et al., 2005). An algorithm for the management of delirium has been developed by Eisendrath and Shim (2006). The drug of choice is haloperidol (Eisendrath and Shim, 2006 and Jacobi et al., 2002), which achieves a tranquil and detached state (Gehlbach and Kress, 2002). Non-pharmacological interventions include (Eisendrath and Shim, 2006):

- orientation to time and place;
- manipulation of the environment, e.g. lighting, noise;
- the provision of sensory aids, e.g. glasses, hearing aid;
- measures to provide the patient with a perception of control, e.g. seeking their input regarding care.

**Conclusion**

In summary, this paper has presented the current evidence to underpin the nursing care of the mechanically ventilated patient. Part one of this two-part paper presented an evidence-based overview of the initial management of the mechanically ventilated patient, covering patient safety issues. In this paper, specific areas of patient comfort, through positioning, hygiene and management of stressors, and pain and sedation management have been presented. It is evident that there are many areas of care that would benefit form further research. Future research should determine the most effective strategies to provide comfort to the patient through alleviation of common stressors such as communication issues, sleep disturbance, isolation, and pain and sedation management. The utilisation of a care bundle for the ventilated patient could also serve as a quality improvement process and a mechanism of ensuring evidenced-based practice (Fulbrook and Mooney, 2003). Nursing care of the ventilated patient is multifaceted and, although it provides challenges for the nurse, it also offers many opportunities for the provision of expert, quality, evidence-based nursing care.

**References**

Adomat R, Killingworth A. Care of the critically ill patient: the impact of stress on the use of touch in intensive therapy units. J Adv Nurs 1994;19:912—22.

Alasad J, Ahmad M. Communication with critically ill patients. J Adv Nurs 2005;50(4):356—62.

Ashworth P. Care to communicate. London: Royal College of Nursing; 1980.

Aslan FE, Badir A, Selimen D. How do intensive care nurses assess patients' pain? Nurs Crit Care 2003; 8(2):62-7

Australian and New Zealand College of Anaesthetists (ANZCA) and Faculty of Pain Medicine. Acute pain management: scientific evidence. 2nd ed. Australian Government National Health and Medical Research Council; 2005.

Best practice: evidence based practice information sheets for

health professionals. Eye care for intensive care patients, vol. 6(1). The Joanna Briggs Institute for Evidenced Based Nursing and Midwifery; 2002. p. 1—6.

Bizek K. The patient's experience with critical illness. In: Morton PG, Fontaine DK, Hudak CM, Gallo BM, editors. Critical care nursing: a holistic approach. 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2005. p. 12—26.

Bonten MJ. Prevention of hospital acquired pneumonia: European perspective. Infect Dis Clin N Am 2005;17(4):773—84.

Brook AD, Ahrens T, Schaiff R, Prentice D, Sherman G, Shannon W, et al. Effect of nursing-implemented sedation protocol on the duration of mechanical ventilation. Crit Care Med 1999;27(12):2609—15.

Cammarano WB, Pittet J-F, Weitz S, Schlobohm RM, Marks JD. Acute withdrawal syndrome related to the administration of analgesic and sedative medications in adult intensive care unit patients. Crit Care Med 1998;26(4):676—84.

Clifford C. Patients, relatives and nurses in a technological environment. Intensive Care Nurs 1986;2:67—72.

Collard HR. Prevention of ventilator-associated pneumonia: an evidenced-based systematic review. Ann Intern Med 2003;138:494—501.

Daber SE, Jackson SE. The role of the physiotherapist in the intensive care unit. Intensive Care Nurs 1987;3:165—71.

Dawson D. Development of a new eye care guideline for critically ill patients. Intensive Crit Care Nurs 2005;21:119—22.

Dodd MJ, Dibble SL, Miaskowski C, MacPhail L, Greenspan D, Paul S, et al. Randomised clinical trial of the effectiveness of 3 commonly used mouthwashes to treat chemotherapy-induced mucositis. Oral Surg Oral Med Oral Pathol Oral Radiol 2000;90:39—47.

Drakulovic MB, Torres A, Bauer T, Nicolas J, Nogue S, Ferrer M. Supine body position as a risk factor for nosocomial pneumonia in mechanically ventilated patients: a randomised trial. Lancet 1999;354:1851—8.

Eisendrath SJ, Shim JJ. Management of psychiatric problems in

critically ill patients. Am J Med 2006;119(1):22—9.

Ertel K. Modern skin cleansers. Dermatol Clin 2000;18(4):
561—75.

Evans D. The effectiveness of music therapy as an intervention for hospital patients: a systematic review. J Adv Nurs 2002;37(1):8—18.

Fox S, Jeffrey J. The role of the nurse with families of patients in ICU: the nurses' perspective. Can J Cardiovasc Nurs 1997;8(1):17—23.

Fulbrook P, Mooney S. Care bundles in critical care: a practical approach to evidence-based practice. Nurs Crit Care 2003;8(6):249—55.

Gehlbach BK, Kress JP. Sedation in the intensive care unit. Curr Opin Crit Care 2002;8(4):290—8.

Grap MJ, Munro C, Hummel R, Elswick R, McKinney J, Sessler C. Effect of backrest elevation on the development of ventilator-associated pneumonia. Am J Crit Care 2005;14(4):
325—33.

Happ MB. Communicating with mechanically ventilated patients: state of the science. AACN Clin Issues 2001;12(2):247—58.

Hogarth DK, Hall J. Management of sedation in mechanically ventilated patients. Curr Opin Crit Care 2004;10(1):40—6.

Honkus V. Sleep deprivation in critical care units. Crit Care Nurs Q 2003;26(3):179—89.

Houston S, Hougland P, Anderson JJ, LaRocco M, Kennedy V, Gentry LO. Effectiveness of 0.12% chlorhexidine gluconate oral rinse in reducing prevalence of nosocomial pneumonia in patients undergoing heart surgery. Am J Crit Care 2002;11(6):567—70.

Hupcey JE. Feeling safe: the psychosocial needs of ICU patients. J Nurs Scholarship 2000;32:361—7.

Ibrahim EH, Kollef MH. Using protocols to improve the outcomes of mechanically ventilated patients. Crit Care Clin 2001;17(4):989—1001.

Jacobi J, Fraser GL, Coursin DB, Riker RR, Fontaine D, Wittbrodt ET, et al. Clinical practice guidelines for the sustained use of sedatives and analgesics in the critically ill adult. Crit Care Med 2002;30(1):119—41.

Johnson P, St John W, Moyle W. Long-term mechanical ventilation in a critical care unit: existing in an uneveryday world. J Adv Nurs 2006;53(5):551—8.

Jones C, Griffiths R, Humphries G. Disturbed memory and amnesia related to intensive care. Memory 2000;8(2):79—94.

Kollef MH, Levy NT, Ahrens TS, Schaiff R, Prentice D, Sherman G. The use of continuous IV sedation is associated with prolongation of mechanical ventilation. Chest 1998;114(2):541—8.

Koroloff N, Boots R, Lipman J, Thomas P, Rickard C, Coyer F. A randomised controlled study of the efficacy of hypromellose and Lacri-Lube combination versus polyethylene/Cling wrap to prevent corneal breakdown in the semiconscious intensive care patient. Intensive Care Med 2004;30:1122—6.

Kress JP, Pohlman AS, O'Connor MF, Hall JB. Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. N Engl J Med 2000;342(20):1471—7.

Larson EL, Ciliberti T, Chantler C, Abraham J, Lazaro EM, Venturanza M, et al. Comparison of traditional and disposable bed baths in critically ill patients. Am J Crit Care 2004;13(3):235—41.

Leathart AJ. Communication and socialisation (2): perceptions of neophyte ICU nurses. Intensive Crit Care Nurs 1994;10:142—54.

Lower J, Bonsack C, Guion J. Peace and quiet. Nurs Manag 2003;34(4):40A—140A.

Magnus VS, Turkington L. Communication interaction in ICU—– patient and staff experiences and perceptions. Intensive Crit Care Nurs, in press.

Marik PR, Fink MP. One good turn deserves another. Crit Care Med 2002;30(21):146.

McGuire BE, Basten CJ, Ryan CJ, Gallagher J. Intensive care unit syndrome. Arch Intern Med 2000;160:906—9.

Misasi RS, Keyes JL. Matching and mismatching ventilation and perfusion in the lung. Crit Care Nurse 1996;16(3):23.

Monsen MG, Edell-Gustafsson UM. Noise and sleep disturbance factors before and after implementation of a behavioural modification programme. Intensive Crit Care Nurs 2005;21:208—19.

Moser DK, Misook LC, McKinley S, Reigel B, Kyungeh A, Cherrington CC, et al. Critical care nursing practice regarding patient anxiety assessment and management. Intensive Crit Care Nurs 2003;19:276—88.

Munro C, Grap MJ. Oral health and care in the intensive care unit: state of the science. Am J Crit Care 2004;13(1):25—33.

O'Reilly M. Oral care of the critically ill: a review of literature and guidelines for practice. Aust Crit Care 2003;16(3): 101—10.

Odhner M, Wegman D, Freeland N, Steinmetz A, Ingersoll GL. Assessing pain control in nonverbal critically ill adults. Dimensions Crit Care Nurs 2003;22(6):260—7.

Park G, Coursin D, Ely EW, England M, Fraser GL, Mantz J, et al. Balancing sedation and analgesia in the critically ill. Crit Care Clin 2001;17(4):1015—27.

Payen J-F, Bru O, Bosson J-L, Lagrasta A, Novel E, Deschaux I, et al. Assessing pain in critically ill sedated patients by using



a behavioural pain scale. Crit Care Med 2001;29(12):2258—63.

Piedaleu F, Albert RK. Prone positioning in acute respiratory distress syndrome. Respir Care Clin N Am 2003;9:495—502.

Powers P, Goldstein C. The value of patient- and family-centered care. Am J Nurs 2000;100(5):84—8.

Price AM. Intensive care nurses' experiences of assessing and dealing with patients' psychological needs. Nurs Crit Care 2004;9(3):134—42.

Puntillo K. Pain assessment and management in the critically ill: wizardry or science. Am J Crit Care 2003;12(4):310—6.

Puntillo KA, Miaskowski C, Kehrle K, Stannard D, Gleeson S, Nye P. Relationship between behavioural and physiological indicators of pain, critical care patients' self-reports of pain and opioid administration. Crit Care Med 1997;25(7): 1159—66.

Puntillo KA, Stannard D, Miaskowski C, Kehrle K, Gleeson S. Use of a pain assessment and intervention (PA.I.N.) tool in critical care nursing practice: nurses' evaluation. Heart Lung 2002;31(4):303—14.

Ramful A. Psychological disturbances caused by sleep deprivation in intensive care patients. Br J Anaesth Recovery Nurs 2005;6(4):63—7.

Ramsay MAE, Savege TM, Simpson BRJ, Goodwin R. Controlled sedation with alaphaxalone-alphadolone. Br Med J 1974;2:656—9.

Reishtein JL. Sleep in mechanically ventilated patients. Crit Nurs Clin N Am 2005;17(3):251—5.

Riker RR, Pickard JT, Fraser GL. Prospective evaluation of the sedation-agitation scale for adult critically ill patients. Crit Care Med 1999;27(7):1325—9.

Roberts B, Rickard CM, Rajbhandari D, Turner G, Clarke J, Hill D, et al. Multicentre study of delirium in ICU patients using a simple screening tool. Aust Crit Care 2005;18(1):6—16.

Rotondi AJ, Chelluri L, Sirio C, et al. Patients' recollections of stressful experiences while receiving prolonged mechanical ventilation in an intensive care unit. Crit Care Med 2002;30:746—52.

Schuurmans MJ, Duursma SA, Shortridge-Baggett LM. Early recognition of delirium: review of the literature. J Clin Nurs 2001;10:721—9.

Sessler CN, Gosnell MS, Grap MJ, Brophy GM, O'Neal PV, Keane KA, et al. The Richmond Agitation-Sedation Scale. Am J Respir Crit Care Med 2002;166(10):1338—44.

Sessler CN, Grap MJ, Brophy GM. Multidisciplinary management

of sedation and analgesia in critical care. Semin Respir Crit Care Med 2001;22(2):211—25.

Sessler CN. Sedation scales in the ICU. Chest 2004;126(6): 1727—30.

Shannon K, Bucknell T. Pain assessment in critical care: what have we learnt from research. Intensive Crit Care Nurs 2003;19(3):154—62.

Shi S-F, Munjas BA, Wan TT, Cowling WR, Grap MJ, Wang BB. The effects of preparatory sensory information on ICU patients. J Med Syst 2003;27(2):191—204.

State Coroner Victoria. Coronial Communique 2004;2(2):4.

Stiefel KA, Damron S, Sowers NJ, Velez L. Improving oral hygiene for the seriously ill patient: implementing research-based practice. Med Surg Nurs 2000;9:40—3, 46.

Stiller K. Physiotherapy in intensive care: towards evidence-based practice. Chest 2000;118(6):1801—13.

Tamburri LM, DiBrienza R, Zozula R, Redeker NS, Johnson RW. Nocturnal care interactions with patients in critical care units. Am J Crit Care 2004;13(2):102—12.

Thomas LA. Clinical management of stressors perceived by patients on mechanical ventilation. AACN Clin Issues 2003;14(1):73—81.

Titler MG, Rakel BA. Nonpharmacologic treatment of pain. Crit Care Nurs Clin N Am 2001;13(2):221—9.
Torres A, Serra-Batlles J, Ros E, Piera C, Puig de la Bellacasa J, Cobos A, et al. Pulmonary aspiration of gastric contents in patients receiving mechanical ventilation: the effect of body position. Ann Intern Med 1992;116(7):540—3.

Trieger N. Guest editorial: oral care in the intensive care unit. Am J Crit Care 2004;13(1):24.

Urden L. Critical care nursing practice. In: Urden L, Stacy K, Lough M, editors. Thelan's critical care nursing: diagnosis and management. Philadelphia: Mosby Elsevier; 2006. p. 3—13.

Wojnicki-Johansson G. Communication between nurse and patient during ventilator treatment: patient reports and RN

evaluations. Intensive Crit Care Nurs 2001;17:29—39.

Wright M, Leahey M. Nurses and families: a guide to family assessment and intervention. 2nd ed. Philadelphia: FA Davis Co.; 1994.

Zoldam D, Spitzer C, Hafner H, Waitschies B, Klein W, Sohr D, et al. Surveillance of nosocomial infections in a neurological intensive care unit. Infect Control Hosp Epidemiol: Off J Soc Hosp Epidemiol Am 2005;26(8):726—31.