

Title: Critical care nurses' decision making: sedation assessment and management in intensive care

Concise Title: Sedation decision making

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Abstract

Aims: This study was designed to examine the decision making processes that nurses use when assessing and managing sedation for a critically ill patient, specifically the attributes and concepts used to determine sedation needs and the influence of a sedation guideline on the decision making processes.

Background: Sedation management forms an integral component of the care of critical care patients. Despite this, there is little understanding of how nurses make decisions regarding assessment and management of intensive care patients' sedation requirements. Appropriate nursing assessment and management of sedation therapy is essential to quality patient care.

Methods: Nurses providing sedation management for a critically ill patient were observed and asked to think aloud during two separate occasions for two hours of care. Follow-up interviews were conducted to collect data from five expert critical care nurses pre and post implementation of a sedation guideline. Data from all sources were integrated, with data analysis identifying the type and number of attributes and concepts used to form decisions.

Results: Attributes and concepts most frequently used related to sedation and sedatives, anxiety and agitation, pain and comfort and neurological status. On average each participant raised 48 attributes related to sedation assessment and management in the pre-intervention phase and 57 attributes post-intervention. These attributes related to assessment (pre – 58%, post – 65%), physiology (pre – 10%, post 9%) and treatment (pre – 31%, post 26%) aspects of care.

Conclusions: Decision making in this setting is highly complex, incorporating a wide range of attributes that concentrate primarily on assessment aspects of care.

Relevance to Clinical Practice: Clinical guidelines should provide support for strategies known to positively influence practice. Further, the education of nurses to optimally use such guidelines must take into account the highly complex iterative process and wide range of data sources used to make decisions.

Introduction

Sedation management forms an integral component of the care of the critically ill patient. Sedative agents are administered in an attempt to allay anxiety and promote comfort. 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 (McKinley *et al.*, 2002; Stein-Parbury & McKinley, 2000).

There is currently little understanding of how critical care nurses make decisions regarding the assessment of a patient's sedation level and appropriate administration of sedative agents. The use of formal sedation guidelines or sedation assessment instruments to increase consistency and facilitate communication between multiple clinicians remains infrequent (Egerod *et al.*, 2006; Mehta *et al.*, 2006). However, there is widespread agreement that the most appropriate sedation level should be tailored for each patient's needs. Ideally factors such as clinical condition, current management goals and patient history should be used to inform the decision (Abbott, 2004; Carrasco, 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. The physiological responses to anxiety are well documented and include changes in autonomic tone (Zeller *et al.*, 1996), increased myocardial workload (McFetridge & Yarandi, 1997), increased coagulability (Camacho & Dimsdale, 2000), increased metabolism with a subsequent increase in oxygen requirement and immunocompromise (Michelson *et al.*, 1994; Zeller *et al.*, 1996). These changes all have the potential to affect recovery.

Excessive administration of sedation may also lead to problems including preventable prolongation of mechanical ventilation with a concomitant increase in intensive care length of stay and complications associated with reduced mobility (Brattebo *et al.*, 2002; Gehlbach & Kress, 2002). In addition, patient comfort is compromised during extended periods of mechanical ventilation as verbal communication is not possible and consequently patients cannot be fully involved in treatment decisions.

Accurate assessment of patient sedation needs is essential to optimise management of sedation. There are a number of objective and subjective measures available to facilitate this assessment (Abbott, 2004; Carrasco, 2000; De Jonghe *et al.*, 2000; Young *et al.*, 2000). Objective measures include plasma drug concentration, electroencephalography and cerebral function monitoring. There are significant logistical and technical challenges associated with these methods; therefore, they are rarely used for routine monitoring in the critical care environment. The alternative subjective measures consist of systems which require the clinician to assign a score to a descriptor that most appropriately reflects the sedation level of the patient. In order to accurately assess and manage a patient's sedation requirements the critical care nurse must make a number of decisions that incorporate appropriate patient assessment together with physiologic factors that influence the patient's sedations needs.

Decision Making Processes

Nurses' decision making processes are influenced by environmental factors, patient and nurse related aspects of care, as well as work practices (Egerod, 2002; Weinert *et al.*, 2001). Examples of environmental factors include noise and light. Patient related factors include the current level of sedation, agitation, the patient's tolerance of various therapies, the interaction with and subsequent effect of the patient's family

with the patient, and the identified goals of sedation that relate to each specific patient. Nurse related factors include knowledge, attitudes and beliefs about sedation, previous experience and the ability to assess and interpret patient responses. Work practices include effective communication strategies to reduce the patient's level of anxiety, anticipating patient needs and clustering of care to allow the patient to rest.

Greater understanding of the decision making processes used by nurses has the potential to lead to improved patient care through refinement of the cognitive strategies used (Taylor, 2000). There are numerous theoretical perspectives on decision making, but they can be grouped into two major paradigms, namely rationalist or analytical and interpretive (also referred to as intuitive or humanistic). The rationalist approaches are based on the broad assumption that there is some analytical or problem-solving activity being undertaken by the decision-maker. It is suggested that decision making is a stepwise or sequential process and that it can be studied and made explicit. In contrast, interpretive approaches place emphasis on the progression from analytical decision making to the development of intuitive judgement as a practitioner moves from a novice to an expert practitioner. Decision making through the interpretive approach is considered as a whole process in the context of the decision making environment (Benner, 1984; Thompson, 1999). There currently exists little understanding, from any perspective, of the decision making processes that are undertaken by nurses during the assessment and management of critically ill patients' sedation requirements.

Consequently, this study was designed to examine the decision making processes which nurses undertake when assessing and managing a critically ill patient. In particular, this study examined the attributes and concepts that were used to

determine sedation needs of patients and also determined the influence of the implementation of a sedation guideline on the decision making processes.

Methods

Design

A naturalistic approach, with data collected from participants as they cared for a general intensive care patient requiring assessment and management of sedation, was used for this study. Data collection occurred simultaneously using two different approaches, concurrent verbal protocol (referred to subsequently as 'think aloud') and observation, preceded by a pilot study of both approaches. Simultaneous data collection using these two methods was undertaken to ensure complete data collection of all aspects of decision making.

Participants

Expert critical care nurses responded to advertising flyers and discussion at the ICU staff meeting for participation in this study. Two participants were enrolled in the pilot study with a further five participants enrolled in each of the two phases of the primary study. Inclusion criteria for expert critical care nurses were (Aitken, 2000; Benner, 1984; Elstein *et al.*, 1990):

- registered nurse with a critical care qualification
- more than five years critical care experience and currently working at least two days per week
- consider her/himself to be an expert in the care of the critically ill

Ethical Considerations

Permission to conduct this study was obtained from both the Hospital and the University Ethics Committees. Participants were provided with an information sheet and had the opportunity to ask further questions prior to providing informed consent. Participants were able to withdraw at any time during the study, including during data collection if they found the requirements too onerous or affecting their ability to provide patient care. No participant indicated s/he wished to withdraw from the study.

Participants were told of the general interest in critical care nurse decision making, but not the specific interest in sedation practices until after all data collection had been completed; this approach was approved within the ethical review.

Patients received an explanation of the study process, with particular emphasis on the rationale for the nurses' constant talking as well as the presence of two data collectors. This explanation was provided whether the patient was conscious or not, and was repeated at regular intervals based on the patient's level of awareness. The explanation was also provided to family and friends if they were present during the data collection phase. No patient or family indicated a problem with the data collection, or requested that the 'think aloud' be stopped.

Procedure

The pilot study was conducted to refine the data collection processes. During data collection from the first participant both data collectors used 'think aloud' to collect data. 'Think aloud' required the participant to wear a collar mounted microphone attached to a tape recorder during a two-hour period of normal care of a critically ill patient requiring assessment and management of sedation. Training in the technique of thinking aloud was conducted prior to the scheduled data collection, usually the day prior to, or on the same day as, data collection (Aitken & Mardegan, 2000).

The participant then verbalized every thought process they become aware of during the data collection period (Aitken & Mardegan, 2000). Participants were explicitly advised not to attempt to rationalise their thought processes during the thinking aloud as this had the potential to change the processes being reported. Transcripts from the 'think aloud' were transcribed as quickly as possible and a follow-up interview conducted to provide an opportunity for explanation and rationale for the decision

making processes identified. The data collector responsible for conducting the interview and analysing the 'think aloud' data observed the data collection process for context specific information, but did not record detailed notes of processes that were undertaken.

For the second pilot study participant the process was repeated using observation as the data collection technique. The data collectors recorded a verbal transcript of all activities that the participant undertook in their normal work role while caring for a patient requiring assessment and management of sedation. During this time the data collector was located in close proximity to the participant, but sufficiently removed to the side of the room to not obstruct normal practice. The verbal transcript from each data collector was transcribed as quickly as possible and a follow-up interview was conducted to facilitate clarification of the activities that were observed.

Throughout the pilot study participant processes were discussed and refined, and results were compared to ensure similar concepts were obtained. For the remaining five participants in the study both data collection processes, 'think aloud' and 'observation' were undertaken simultaneously. Both data collectors were aware that the emphasis of the study was on sedation assessment and management. The form of data collection that each collector was responsible for was randomly assigned immediately prior to data collection. Data were collected from five participants prior to and at least four months following introduction of a nurse-initiated sedation protocol (Elliott *et al.*, 2006a; Elliott *et al.*, 2006b). During data collection participants were caring for any general intensive care patient with sedation requirements.

The nurse-initiated sedation protocol involved an initial assessment of the need for sedation on the basis of a target Ramsay score of 3, with associated prompts to assess the need for sedation. Alternative regimens for sedation and/or analgesia

were then suggested. The intervention represented a standardised version of the sedation practices which were commonly used for mechanically ventilated patients before the protocol was implemented, with the addition of an explicit target sedation level (Elliott *et al.*, 2006b).

Education to support the introduction of the protocol included group and individual education sessions, placement of the guideline and supporting evidence on the intranet, provision of laminated copies of the protocol in patient care areas, placement of cartoon reminders in prominent locations and ongoing feedback of audit data (Elliott *et al.*, 2006a).

Data analysis

Data obtained from each of 'think aloud' and 'observation' were independently analysed by the data collector responsible for data collection. The analysis involved integration of the data obtained from both the first phase (either 'think aloud' or observation) and the second phase (retrospective interview). Transcripts were reviewed and only those sections relating to sedation assessment and management were used for analysis. Each transcript was read, with sedation segments being highlighted. Attributes and concepts were then identified and added progressively to a concept map for each participant. Analysis involved identifying the type and number of attributes and concepts used to form decisions regarding assessment and management of sedation requirements, as well as to determine if the attributes and concepts changed after implementation of the sedation guideline.

Attributes and concepts were assessed to determine whether they related to assessment, physiological or treatment aspects of care (see Figure 1 for definitions). This categorisation of attributes and concepts was initially determined by each data collector, then individually assessed by the principal investigator. The decision as to

whether an attribute or concept related to sedation was made by the data collector based on the situational context and any explanation provided by the participant during the retrospective interview. To ensure trustworthiness of the data any differences in identification of attributes and concepts as being related to sedation, or categorisation of attributes, were discussed and consensus reached between the principal investigator and a data collector. Both data collectors and the principal investigator had extensive experience in critical care nursing.

Results

Seven expert critical care nurses participated in this study including four female and three male participants. Participants ranged from 29 to 50 years in age and had between five and 25 years experience in nursing, including between five and 23 years critical care nursing experience. Three of the participants completed their first nursing qualification as a hospital certificate with two of these participants subsequently completing a Bachelor's degree in nursing, while the other four participants initially completed a Bachelor's degree in nursing. All seven participants had undertaken a speciality course in critical care nursing at the Hospital Certificate, Graduate Certificate or Graduate Diploma level.

Concepts

A range of concepts related to the assessment and management of sedation needs were raised by participants (Table 1). These concepts rarely dealt with only one aspect of care, instead they were generally complex issues that simultaneously dealt with two or all three aspects of assessment, physiology and treatment. For this reason it was not possible to consistently categorise concepts into the themes of assessment, physiology or treatment as intended.

Attributes

Participants raised a large number of attributes that detailed assessment, physiological and treatment aspects of sedation management and related areas during the two hours on data collection. On average each participant raised 48.0 attributes (assessment: 28; physiology: 5; treatment: 15) during the pre-intervention phase of data collection. This increased to an average of 57.2 attributes (assessment: 37.2; physiology: 5; treatment: 15) during the post-intervention phase of data collection. During both the pre- and post-intervention phase the majority of attributes related to assessment of the patient, with the smallest number detailing

physiological aspects of assessment and care. The assessment attributes represented a slightly higher proportion, with the proportion of treatment attributes being reduced in the post-intervention phase when compared to pre-intervention. However, this difference was minimal and possibly due to individual characteristics of patients rather than substantive differences in decision-making processes.

The attributes that were raised by participants primarily related to sedation and sedatives, agitation and anxiety, pain and comfort and neurological status (Table 2). Attributes related to level of sedation and sedative agents represented a large proportion in both the pre- and post-intervention phases, with the other categories varying in frequency. Again, it is possible that the differences arose as a result of the characteristics of the patients being cared for through each of these periods, rather than as a result of the change in protocol that guided care in this area. The specific detail of these attributes varied between those collected prior to and after the introduction of the sedation guideline (Tables 3 – 6), however no consistent differences could be identified.

Although level of sedation and sedatives were articulated as two separate concepts, many of the attributes leading to these concepts were similar, therefore they have been combined for descriptive purposes (Table 3). Level of sedation, along with agitation and anxiety (Table 4), pain and comfort (Table 5) and neurological status (Table 6), were all identified during both the pre and post-intervention phases of data collection and were common to most patient care episodes.

Miscellaneous concepts and related attributes included aspects of care such as communication and comprehension, and respiratory, haemodynamic and metabolic status. These miscellaneous concepts were generally only raised by one or two participants and appeared specific to the individual patient condition.

Attributes that were collected related to a number of aspects of the role of the critical care nurse. These are outlined below supported by excerpts from the data collected in this study:

- assessment of the patient's condition including a judgement of the adequacy of that condition, e.g. 'appropriate level of sedation' and 'should be more sedated'
- assessment of response to therapy, both in objective and subjective terms, e.g. 'good sedative' and 'gets agitated when off sedation'
- use of multiple sources of information during assessment, e.g. 'pain assessment', 'no signs of distress', 'asking patient if he has pain' and 'no grimacing'
- consideration of relevant history of both pathophysiology and treatment, e.g. 'had only just started infusion so was generous [in the amount of sedation administered]'
- consideration of the impact on physiology and pathophysiology, e.g. 'affects neurological assessment'
- consideration of known or possible pathophysiology, e.g. 'diaphoresis [was] linked with autonomic dysreflexia' and 'reduced renal function leading to need to dialyse morphine off'
- implications of treatment, e.g. 'long acting – takes longer to wean the longer he was on it'
- options in treatment including both pharmacological and non-pharmacological options, e.g. multiple sedative agents used for most patients and 'also talking to patient in soothing voice while seeking help'
- goals or targets of treatment, e.g. 'aim to sedate so he won't breathe up and fight ventilator' or alternatively 'wanting patient to wake up'
- patient safety, e.g. 'need to protect patient' and 'requiring head to be held due to unstable fracture [of the cervical spine]'

- consideration of related factors, e.g. the desire to 'avoid use of NMB' (neuromuscular blockade)
- balancing of alternative treatment options, e.g. 'could switch to midazolam if [current sedation is] not holding him'.

Discussion

Nurse participants in this study used a large amount of data to assess and manage patients' sedation needs. These data followed the common themes of sedation and sedatives, agitation and anxiety, pain and comfort and neurological status and are consistent with current best practice in the field (Fraser & Riker, 2007; Kress & Hall, 2006). Although these themes were common for each patient, there were also additional attributes raised that related to each individual patient, for example challenges associated with spinal injury, compromised organ function (e.g. renal) and specific communication challenges. These additional attributes and concepts suggest that, although the principles of sedation are common for each patient, expert critical care nurses do recognise the individual nature of each of their patients. The influence of the individual on critical care nurses' decision making, including the types, speed and complexity of decisions made, has been identified previously (Bucknall, 2003; Taylor, 2006). The past history of the patient, the current situation or health status, and how each individual responded to interventions was acknowledged as influencing the process of decision making. This is particularly worthy of note given the variable clinical condition of patients being cared for by participants during this study. It should be noted there was no attempt to ensure consistent clinical conditions, with the only requirement being that participants were caring for general intensive care patients with sedation requirements.

Of interest is the fact that neurological status appeared to be a greater driver of sedation assessment and management than pain and comfort. This is in the context where analgesia and sedation often appeared to be used interchangeably, with limited recognition of the differing roles of the agents. It is not clear from this study whether this emphasis on neurological status is a reflection of the preference for objective or tangible attributes within the critical care environment. In other words, neurological status is frequently assessed through tangible, objective attributes such

as 'patient response to stimuli' and 'ability to trigger ventilator'. In contrast, comfort is often described through more subjective measures, for example 'patient appeared to be resting quietly' or 'no sign of distress'.

Attributes that concentrated on the assessment aspects of care formed the major category, with an increase from 58% during the pre-intervention phase to 65% during the post-intervention phase. A key component of the nurse-initiated sedation protocol that formed the intervention between the two phases of this study was adequate assessment of patient's sedation needs and this may have prompted the slight increase during the two phases of the study. Assessment of the condition of the patient has been acknowledged as an important component of clinical nursing practice (Hedberg & Satterlund Larsson, 2003; McCaughan *et al.*, 2005), although no report of assessment aspects of care comprising the majority of attribute collection or the process of decision making could be located. This may reflect differences in clinical environments, with no other reports of critical care nursing practice identified that described the attribute or decision types. Alternatively it may reflect differences in types of data identified using different data collection techniques. Most other decision making studies have used a combination of observation and interview or think aloud and interview, but no reports of a combination of all three forms of data collection were located.

Despite this emphasis on assessment, there appeared to be little consideration of the related physiology before treatment options were considered and implemented. This may reflect a lack of understanding of physiology, or alternatively may indicate an inherent understanding to the point where expert critical care nurses do not need to consciously consider the associated physiology prior to implementation of treatment.

It was not possible to identify a path between each of the attributes and concepts raised by participants in this study, or to identify the decision making methods that were in use, only to identify where a relationship existed between various attributes and concepts. This limitation may have arisen because the critical care nurses were working on multi-dimensional aspects of practice, with multiple different components and shifting priorities informing their practice, hence there was no consistent pathway or link between aspects of practice related to sedation assessment and treatment. Decision making processes may only be able to be identified from studies conducted in the natural setting when they pertain to an aspect of practice that is near to continuous, for example haemodynamic monitoring in a patient with unstable cardiovascular status (Aitken, 2003).

These results support the notion that nurses' clinical decision making is not a linear analytic process, but instead involves a highly complex, iterative process that incorporates multiple attributes at different phases through the decision making process. This notion of a complex, iterative process is consistent with other investigation of the decision making process conducted in the critical care setting and appears dependent on a range of temporal, individual (both patient and nurse) and contextual factors (Corcoran-Perry *et al.*, 1999; Hancock & Easen, 2005).

Further, the clinical role of critical care nurses requires incorporation of information from many different aspects in order to competently care for patients. Although the range of research information sources used by nurses to inform decisions has been documented (McCaughan *et al.*, 2005; Thompson *et al.*, 2004), no comprehensive documentation of the range and depth of attributes used by critical care nurses during their decision making could be found in the literature. The ability to integrate data from multiple sources reflects a challenging component of nursing care and presents challenges for novice nurses developing skills in the area.

It is essential that educators take these notions, of the highly complex iterative process and the wide range of data sources, into account so as to ensure that development activities are as closely aligned with usual practice as possible. Use of strategies such as concept maps during exercises to develop clinical decision making skills may be useful in this area.

Implementation of processes within the clinical environment that facilitate clear documentation of the information that informs decisions, as well as the outcome of those decisions, is appropriate. This may be in the form of assessment charts, care plans, clinical pathways or similar. Further, consideration of the potential impact of protocol changes on decision making, and provision of education and development resources to assist nurses to develop knowledge of the relevant assessment, pathophysiology and treatment, is important for the development of effective decision making processes.

Conclusion

This study explored the decision making processes used by expert critical care nurses when assessing and managing the sedation requirements of their patients. Decision making in the critical care environment was found to be highly complex and incorporated a wide range of attributes. The majority of these attributes related to assessment aspects of care with treatment and physiology attributes also being used. A slight increase in the emphasis on assessment was noted post-implementation of a sedation guideline.

Decision making concentrated on a small number of concepts, including sedation and sedatives, anxiety and agitation, pain and comfort and neurological status. Additional concepts were identified for individual patients, suggesting common patterns that are augmented by unique requirements in each individual patient. The complex nature of decision making processes, as well as the broad range of attributes used by expert nurses during decision making, should inform educational strategies to develop novice nurses in the field of critical care.

Acknowledgements

This study was funded by the Hospira Australian College of Critical Care Nurses Sedation Grant

The authors wish to acknowledge Vicki Fox for her assistance with data collection and the nurses who participated in the study.

Contributions

Study design – LA, SM; Data collection – AM, RE; Data analysis – LA, AM, RE, SM; Manuscript preparation – LA, AM, RE, SM

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Table 1 – Concepts raised by participants

Descriptive Groups	Specific Concepts
Sedation / Level of sedation	Sedation, Level of sedation, Sedation score, Wanting patient to wake, Patient made lighter
Sedatives	Sedatives
Agitation and anxiety	Agitation, Anxiety
Pain, pain relief and comfort	Pain, Pain relief, Comfort, Discomfort, Causes of pain
Neurological assessment and status	Neurological status, Neurological assessment, Neurological insult, Neurological protection, No formal GCS assessment, Level of consciousness, Level of responsiveness, Obeying commands
Communication and comprehension	Comprehension, Communication
Respiratory status	Spontaneous respirations, Respiratory support, Finding it hard to breathe
Miscellaneous	Spinal cord injury, Patient, Management plan, Hypertension, Mean arterial pressure, Physical restraint, Shivering

Table 2 – Summary of attributes raised by participants

Descriptive Group	Assessment	Physiology	Treatment	Total (%)
Pre-Intervention				
Sedation & Sedatives	38	7	34	79 (32.9%) ¹
Agitation & Anxiety	15	1	8	24 (10.0%) ¹
Pain & Comfort	13	3	10	26 (10.8%) ¹
Neurological Status	52	14	15	81 (33.8%) ¹
Miscellaneous	22	-	8	30 (12.5%) ¹
Total: Pre-Intervention	140 (58.3%)²	25 (10.4%)²	75 (31.3%)²	240
Post-Intervention				
Sedation & Sedatives	46	8	15	69 (24.1%) ¹
Agitation & Anxiety	24	3	16	43 (15.0%) ¹
Pain & Comfort	47	3	15	65 (22.7%) ¹
Neurological Status	39	5	7	51 (17.8%) ¹
Miscellaneous	30	6	22	58 (20.3%) ¹
Total: Post-Intervention	186 (65.1%)²	25 (8.7%)²	75 (26.2%)²	286

Note: 1 - percentages indicate the % of each descriptive group as a proportion of the total for that phase (i.e. pre or post) of data collection

2 – percentages indicate the % of each attribute category as a proportion of the total attributes for that phase (i.e. pre or post) of data collection

Table 3 – Sedation attributes raised by participants

Attribute category	Pre-intervention attribute themes	Post-intervention attribute themes	Examples
Assessment	Level of sedation	Level of sedation	Use of sedation scores; response to level of sedation
	Level of consciousness	Level of consciousness	GCS; response to stimuli; ability to open eyes
	Comfort	Comfort	Level of patient comfort
	Physical assessment	Physical assessment	Patient ventilator dysynchrony; able to trigger ventilator; sleep pattern
	Length of sedation treatment	Type of sedation	Short vs long acting sedative agents; 2 week history of sedation
		Anxiety	
		Ability to communicate	
Physiology		Agitation	Pulling at lines
		Pain	
	Impact of sedation on physiological function	Clinical condition may alter metabolism and excretion of drugs	Masks seizures; masks pain; impacts on accurate neurological assessment
	Improves pt-ventilator synchrony	Physiological factors that may cause agitation need may require management	
Treatment	Assist with patient management	Assist with patient management	Prevent pt-ventilator dysynchrony
	Need to protect patient	Need to protect patient	Pt restraint (Physical and chemical restraint)
	Use of non sedative treatments to calm patient	Use of non sedative treatments to calm patient	Talking to patient during care
	Pharmacokinetics of sedative agents		
	Patient specific management with regard to sedative type and dose		
	Titrating sedation to patient need		
		Pain relief	

Table 4 – Agitation and anxiety attributes raised by participants

Attribute category	Pre-intervention attribute themes	Post-intervention attribute themes	Examples
Assessment	Physical assessment	Physical assessment	Restless; increased RR; increased BP; facial grimace
	External factors contributing to agitation	Factors contributing to agitation	Environmental stimuli; discomfort; being alone; inability to communicate; feeling unsafe
	Physiological factors contributing to agitation	Physiological factors contributing to agitation	Hypoxia; anxiety; pain; needing to open bowels
	Level of sedation		
	Not experiencing a fit (therefore agitated)		
Physiology	Diaphoresis		Linked with autonomic dysreflexia
		Understanding	Don't realise what is happening to them
		Physiological status	Shivering; difficulty breathing; inability to sleep
		Effect of sedation	Benzo withdrawal
Treatment	Sedative agents	Sedative agents	Sedation
	Non-pharmacological strategies to improve comfort	Non-pharmacological strategies to improve comfort	Verbal reassurance; explanation; positioning; clustering nursing care; touch; family with patient;
	Pt protection	Pt protection	Physical restraint; sedation r/t unstable cervical fracture
		Level of sedation	Adjust to individual needs
		Staff communication	Advice in handover re: pt being anxious

Table 5 – Pain and comfort attributes raised by participants

Attribute category	Pre-intervention attribute themes	Post-intervention attribute themes	Examples
Assessment	Physical assessment	Physical assessment	Respiratory effort; haemodynamic status (HR & BP); no sweating
	Patient behaviour	Patient behaviour	Indicates pain; anticipating pain from previous experience of care/procedures; appears relaxed; distressed; facial grimace
		Causes of pain/discomfort	Suctioning; sheets 'scrunched' under patient; need to use bedpan;
Physiology	Effect of pain relief	Effect of pain relief	Hypertension; inability to sleep; hemodynamic response to pain relief
	Pharmacokinetics		
		Severity of illness	Reduces perception of pain
Treatment	Pharmacological pain relief	Pharmacological pain relief	Fentanyl
	Management strategies	Management strategies	Infusion and bolus used; used in conjunction with sedation;
	Non pharmacological strategies	Non pharmacological strategies	Nurse spoke calmly to patient; making patient comfortable (combing hair, mouth and eye care); left patient alone

Table 6 – Neurological status attributes raised by participants

Attribute category	Pre-intervention attribute themes	Post-intervention attribute themes	Examples
Assessment	Level of consciousness	Level of consciousness	GCS; responds to questions appropriately; difficult to assess verbal when they are tubed; talking to patient and assessment of response;
	Level of sedation	Level of sedation	Need time for sedation to wear off; sedation scale not appropriate as pt not receiving sedation anymore; made him lighter
	Assessment strategies	Assessment strategies	Didn't assess pupils as wasn't appropriate; obeys commands when family present
	Communication	Communication	Could communicate well (in writing); unsure of comprehension
	Agitation	Agitation	Fighting ventilator; biting on ETT
	Pain		Patient's perception of pain; may not verbalise this without being asked
		Physiological	Left arm stronger than right; not moving feet; patient may be hard of hearing;
Physiology	Co-morbidities	Co-morbidities	Could bleed further still; subarachnoid and subdural haemorrhage
	Pharmacotherapy	Pharmacotherapy	Sedative effect
Treatment	Pharmacotherapy	Pharmacotherapy	Sedation
	Management	Management	Left patient alone; requested privacy; respiratory management; made him lighter

Definition of Categories

Assessment: collection of information to determine treatment or to assess the impact of treatment

Physiology: physiological abnormality or changes as a result of disease or treatment

Treatment: implementation of interventions to achieve satisfactory sedation status of the patient

Figure 1