

Patient comfort in the intensive care unit: a multicentre, binational point prevalence study of analgesia, sedation and delirium management

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The importance of effective assessment and management of pain, sedation needs and delirium in critically ill patients has been highlighted in the past decade. Significantly, in one study, two-thirds of critically ill patients received sedatives and opioids for a median of 3 days while receiving mechanical ventilation, and this proportion increased to 92% for a subgroup of patients with acute lung injury or acute respiratory distress syndrome requiring the same medications.¹ Incidences of delirium range from 20% to 80%.^{2,3}

It is essential that adequate pain relief and anxiolysis be provided to all critically ill patients, and one approach may be to manage the three elements of pain, agitation and delirium separately.⁴ Appropriate sedation helps ensure comfort for patients with invasive and difficult-to-tolerate procedures and treatments.⁵ The detrimental impact of poor analgesia and sedation practices, including undersedation and oversedation, has short-term and long-term consequences. These include anxiety, agitation, accidental removal of tubes and catheters, ineffective pain management, and increased intensive care and hospital lengths-of-stay in the short term.^{6,7} Compromised long-term psychological recovery has been reported in review articles and original research articles, particularly for cognitive function and delusional memories⁷⁻¹⁰ and post-traumatic stress disorder.^{11,12}

Proposed strategies to improve critical care practice in this area include effective assessment of analgesic and sedative needs using validated instruments, timely delivery of effective analgesia, use of lighter levels of sedation, and protocols involving nurse-directed sedation or daily sedation interruption.^{5,13-18}

Although multiple surveys have explored sedation practices in various countries, a major limitation associated with all reports is that they have commonly relied on clinicians' perceptions of practice.¹⁹⁻²³ Actual care delivered to patients often differs significantly from that documented in policies or guidelines, and varies between individual clinicians. These past studies and review articles have provided important information on baseline practice, but we wanted to conduct a detailed assessment of patient needs for sedative and analgesic medications, and delirium assessment in routine practice, supplemented by contemporaneous assessment of

ABSTRACT

Objective: To measure the prevalence of assessment and management practices for analgesia, sedation and delirium in patients in Australian and New Zealand intensive care units.

Materials and methods: We developed survey items from a modified Delphi panel and included them in a binational, point prevalence study. We used a standard case report form to capture retrospective patient data on management of analgesia, sedation and delirium at the end of a 4-hour period on the study day. Other data were collected during independent assessment of patient status and medication requirements.

Results: Data were collected on 569 patients in 41 ICUs. Pain assessment was documented in the 4 hours before study observation in 46% of patients. Of 319 assessable patients, 16% had moderate pain and 6% had severe pain. Routine sedation assessment using a scale was recorded in 63% of intubated and ventilated patients. When assessed, 38% were alert and calm, or drowsy and rousable, 22% were lightly to moderately sedated, 31% were deeply sedated (66% of these had a documented indication), and 9% were agitated or restless. Sedatives were titrated to a target level in 42% of patients. Routine assessment of delirium occurred in 3%, and at study assessment 9% had delirium. Wrist or arm restraints were used for 7% of patients.

Conclusions: Only two-thirds of sedated patients had their sedation levels formally assessed, half had pain assessed and very few had formal assessment of delirium. Our description of current practices, and other observational data, may help in planning further research in this area.

Crit Care Resusc 2013; 15: 213–219

the same components by a specifically trained individual. Our point prevalence study was therefore designed to audit actual practices in sedation, pain and delirium management across intensive care units in Australia and New Zealand. This information may provide baseline data for future studies of

Table 1. Demographic and clinical characteristics of patients studied

| Characteristic | Data |
|--|------------|
| Median age, years (IQR) (<i>n</i> = 568) | 62 (48–72) |
| Sex (men) (%) (<i>n</i> = 569) | 63% (361) |
| Mean APACHE II score (SD) (<i>n</i> = 534) | 18.5 (7.7) |
| Number of days in ICU (up to and including study day) (%) (<i>n</i> = 569)* | |
| 1 | 34% |
| 2–4 | 12% |
| 5–7 | 8% |
| > 7 | 26% |
| Postoperative diagnostic category on admission (%) | |
| Cardiovascular surgery | 18% (104) |
| Gastrointestinal surgery | 10% (55) |
| Neurological surgery | 6% (33) |
| Respiratory (thoracic) surgery | 3% (17) |
| Trauma | 3% (15) |
| Other | 4% (25) |
| <i>Total</i> | 44% (249) |
| Non-operative diagnostic category on admission (%) | |
| Respiratory | 17% (96) |
| Sepsis | 8% (46) |
| Cardiovascular | 7% (41) |
| Trauma | 7% (41) |
| Other | 17% (96) |
| <i>Total</i> | 56% (320) |
| Artificial airway requiring positive pressure ventilatory support on study day (<i>n</i> = 569) | 51% (293) |

IQR = interquartile range. APACHE = Acute Physiology and Chronic Health Evaluation. ICU = intensive care unit. * Percentages do not add to 100 due to missing data.

interventions to potentially improve patients' experiences and outcomes of ICU treatment.

Methods

Study design and sampling

This two-phase, dual-method design incorporated a modified Delphi panel to develop the item statements, followed by inclusion of the survey in an observational point prevalence study conducted within the binational Point Prevalence Program coordinated by the Australian and New Zealand Intensive Care Society (ANZICS) Clinical Trials Group (CTG) and the George Institute for Global Health.

The study was approved by the human research ethics committees of each participating institution, with the need for individual informed patient consent being waived.

Item development

Using a modified Delphi panel approach, five members of the research team participated as the expert panel and reached consensus on the statements for identifying assessment and management practices related to analgesia, sedation and delirium. Preliminary statements were based on recent^{3,19,24,25} and earlier²⁶ practice surveys and suggestions by the Delphi panel. Consensus on the content and format of a practice statement was defined as an arithmetic average of group response scores >3 on a 4-point scale ("strongly agree" = 4 to "strongly disagree" = 1). Two Delphi rounds were completed to reach consensus for the patient-level items, which were analgesia (three items), sedation (seven items) and delirium (four items) (see Appendix). These final 14 items were formatted into a case report form (CRF) and tested for clarity and feasibility using a sample of volunteer ICU research coordinators and clinicians before they were included in the study.

Data collection

The CTG point prevalence day was conducted on one of three assigned days in late 2009 and early 2010, with 41 ICUs participating (36 from Australia and five from New Zealand). Each site collected data on a single day. Of these ICUs, 31 were tertiary, six were metropolitan, three were regional or rural and one was located in a private hospital. A total of 569 patients were studied (Table 1 shows patient characteristics).

Data were collected locally at the sites by designated ICU clinical or research staff who had received training and/or were experienced in completing patient-level CRFs. Data collectors completed a CRF for each patient in the ICU at 10 am on the point prevalence day, using a prepared data dictionary which precisely defined the items, listed the range of acceptable responses and how those responses were to be derived. The two temporal components for CRF completion at the census point were:

- a retrospective note and chart review of the previous 4 hours, including discussions with the patient's nurse for any issues requiring clarification; and
- contemporaneous independent assessment for analgesic and sedative needs, and delirium scoring using the intensive care delirium screening checklist (ICDSC)²⁷ at or shortly after the census point.

Additional clinical data (Acute Physiology and Chronic Health Evaluation [APACHE] II score, APACHE diagnostic category, hospital admission date and ICU admission date) and demographic data (age and sex) were also collected.

Table 2. Common medications used for analgesia and/or sedation

| Medication | Delivery method | |
|------------|-------------------------|----------------------|
| | Infusion (%*) (n = 417) | Bolus (%*) (n = 192) |
| Fentanyl | 27% (113) | 29% (55) |
| Midazolam | 18% (73) | 11% (22) |
| Morphine | 19% (78) | 32% (61) |
| Propofol | 27% (114) | 16% (31) |

* Percentages do not add to 100 because they are % of total medications prescribed, and some medications prescribed are not included in table due to small numbers.

The patient's vital status was assessed at hospital discharge (censored 28 days after the study day), with patients categorised as alive, dead or still admitted to hospital.

Data analysis

Descriptive statistics were used for all clinical and demographic data and for all items in the CRF. The prime reporting statistics were expressed as percentages because denominators varied across data variables, due to non-systemic missing values. Non-normally distributed data are described using medians and interquartile ranges (IQRs) or percentages. Means and standard deviations describe normal data distributions. No assumptions were made about missing data.

Results

The sample represented 89% (31/35) of all tertiary units in Australia and New Zealand, 15% (6/39) of metropolitan units, 6% (3/49) of rural/regional, and 2% (1/59) of private ICUs. Patients were predominantly male (63%) with a mean APACHE II score of 18.5. Half the patients were intubated and ventilated, and just over half had a non-surgical diagnosis.

Pain assessment

Almost half the patients (46%) were documented as being assessed for pain, during routine clinical care, at any time in the 4 hours before assessment on the study day. For patients able to interact (58%), a numerical rating (0–10) for pain “now” was available for 91% (n = 290). The median pain score was 0 (IQR, 0–3). Over half the patients (54%) had pain scores of 0 (no pain), 25% had scores of 1–3 (mild), 16% had scores of 4–6 (moderate), and 6% had scores of 7–10 (severe pain).

Sedation assessment

Of the 569 patients studied, 293 had an artificial airway on the study day and of these, 185 patients (63%) had a

sedation score recorded, during routine clinical care, at any time in the 4 hours before observation. A variety of scales were in use at different study hospitals. The most common instruments were the Richmond agitation–sedation scale (RASS) (38%), the sedation–agitation scale (SAS) (28%) and the motor activity assessment scale (MAAS) (10%). About one-quarter of patients (24%) were assessed using modified scales (the RASS or the Ramsay score) or other scales.

Of the 293 patients assessed at the time of the survey using the RASS, 38% were alert and calm, or drowsy but rousable (RASS, 0 to –1), 22% were lightly to moderately sedated (RASS, –2 to –3), 31% were deeply sedated or unrousable (RASS, –4 to –5), while 9% were restless or agitated (RASS, +2 to +4).

Analgesic and sedative management

Most patients (60%; n = 340) were receiving either analgesic or sedative agents, or both, on the study day. Specifically, 52% were receiving analgesic agents by either infusion or bolus doses while 35% were receiving sedative agents by either infusion or bolus doses. For patients receiving analgesia and/or a sedative by intravenous infusions or bolus doses, the medications that were commonly used are listed in Table 2.

When considering only patients who were intubated and mechanically ventilated (n = 293), 77% of patients were receiving either a sedative or an analgesic or both, with 63% receiving an analgesic agent and 64% receiving a sedative agent. Sedation medication was prescribed to be titrated to a documented specific level of sedation in 42% of intubated and mechanically ventilated patients, and 26% of these patients received a planned cessation of sedation on the study day.

Two-thirds of the 90 patients with an RASS of –4 to –5 (66%) had a perceived specific indication for deep sedation; 23% had a perceived specific indication for management of haemodynamic instability, 14% for intracranial pressure, 14% for uncontrollable agitation and 10% for ventilator dys-synchrony. In 39% of instances, deep sedation was for unspecified “other” reasons.

Delirium assessment

Formal assessment of delirium was performed on the study day in 3% of patients (19/569). Of these patients, the ICDSC was used in 42% (eight patients), clinical assessment was used in 37% (seven patients), and two patients were assessed with other scales. No patients were assessed using the confusion assessment method for ICU (CAM-ICU), the delirium rating scale or the mini-mental state examination (MMSE). For the 428 patients with an RASS of –2 or higher (lightly sedated to very agitated) at the time of observation on the study day, delirium assessment identified 40 patients

(9%) as being delirious. Of these patients, 23 were intubated and ventilated, and 17 were spontaneously breathing.

Specific characteristics related to delirium included the finding that 77% of patients were normally wakeful and 21% were responsive to mild stimuli. Eight patients (2%) were hypervigilant. The most common behavioural manifestations observed for delirium were sleep–wake cycle disturbances (28%), inattention (15%), disorientation (13%) and psychomotor agitation or retardation (9%). Less common behaviours were symptom fluctuation (7%), inappropriate speech or mood (5%) and hallucinations or delusions (3%).

Physical restraints

During the study day, 7% of patients (40/569) were being restrained; all had wrist or arm restraints, and one patient also had ankle restraints.

Discussion

Key findings

In our study, only half the patients had been assessed for pain, two-thirds of patients receiving sedatives had formal assessment using a sedation score and a minority of patients had been formally assessed for delirium. Half of all study patients were receiving analgesics and over one-third were receiving sedatives. For patients who were mechanically ventilated, two-thirds were receiving analgesics and sedatives, with sedatives titrated for almost half of this subsample. The most common analgesics and sedatives used to promote patient comfort were morphine, fentanyl, propofol and midazolam, although prescribing patterns varied. For patients who were appropriate for prospective assessment of delirium, one in 10 were identified as delirious.

Comparison with previous studies

Despite the close practice relationship between sedation and analgesia assessment and management, pain assessment processes have been inconsistently examined in previous surveys of practice, with no Australian surveys including this aspect of care.^{3,19,26,28} Internationally, two reports of pain assessment practices were identified. The first, from Germany,²² reported practice changes from 2002 to 2006, with 21% of units reporting introduction of pain scoring during the 4-year period. No details of the actual number of units was included in the paper, with only numerical ratings or visual analogue scales used to assess pain. The second report detailed pain assessment in 43 ICUs in France (and one unit in Luxembourg) where it was noted that despite 90% of patients receiving opioids, only 42% of patients were assessed for pain, with the behavioural pain scale being the most common instrument used.²⁹ Systematic assessment of pain and sedation have been demonstrated

to reduce length of mechanical ventilation and incidence of nosocomial infections in one ICU in France.³⁰

At the time of our point prevalence assessment, most interacting patients reported no or mild pain, with only one-fifth reporting moderate-to-severe pain (ie, 4–10 on a 10-point numerical rating scale), suggesting that pain was reasonably well managed in the study units. This is consistent with “at rest” pain scores reported in a single Australian ICU³¹ as well as single-centre studies elsewhere.^{32,33} This low occurrence of self-reported pain is in contrast to the reports by patients in other studies that pain is one of the most common recollections from their time in the ICU.^{34,35} However, this may reflect ineffective peri-procedural management of pain at the time of interventions or activity, rather than pain being a continuously undertreated entity over the entire intensive care and hospital stay.

Similarly to previous survey findings,¹⁹ sedation assessment occurred in about two-thirds of patients who had an artificial airway in place. The most common instruments used were the RASS and the SAS, which is in contrast to most of the European and North American studies that report a higher use of the Ramsay score.^{20–23} O'Connor et al³⁶ had earlier found that more than half of patients were assessed using the Glasgow coma scale (even though it is not a true sedation scale), 25% were assessed with the SAS, 15% with the Ramsay score and 8% with the RASS. The use of scales and the transition to specific measures of ICU sedation highlights increased awareness and practice changes. One-quarter of patients were assessed using a modified version of an instrument, which raises questions about the validity and reliability of these modified versions.

Delirium assessment was not a routine practice in the ICUs we studied, and the CAM-ICU was not used as a delirium screening tool. This is consistent with an earlier Australasian report.³ More recently, Shehabi and colleagues³⁷ reported 51% of patients as delirious for at least 1 day, with the incidence increasing to more than 70% for patients with ICU stays of longer than 14 days. This highlights the need for closer monitoring. There is evidence, mainly from North America, that both the CAM-ICU and the ICDSC have good reliability and utility in practice, although the evidence in an Australian practice setting is somewhat less convincing.³⁸ Adoption of an effective instrument would enable application of research evidence to practice, and also enable more comparisons between countries, given the current global focus on assessing and intervening in the nexus between sedation, delirium and symptoms of post-traumatic stress.

Morphine, fentanyl, propofol and midazolam were the most common medications used for patient comfort, both as infusion and bolus doses, although prescribing patterns differed slightly. Given the high proportion of patients managed with light sedation levels, there was limited use of daily

wake-up or daily interruption of sedation, with this practice reported to be used in about one-quarter of cases. This use of daily interruption of sedation was at the lower end of the range reported in a review⁵ where sedation interruption was used in 20%–78% of patients in eight of 12 studies. Shehabi³⁷ also reported that only 3% of study days from a total of 2678 had routine sedation interruption. Patients who are managed with light sedation should have no need of daily interruption of sedation, and our results as well as results from another recent study³⁹ support this position.

Also similar to Shehabi,³⁷ about two-thirds of patients who were deeply sedated (RASS, –4 to –5) had a specific clinical indication for deep sedation, with about 10% of the intubated and ventilated patients assessed on the study day being deeply sedated without a clinical indication. Shehabi also reported that about 25% of patients with RASS assessments had prescribed targets for sedation despite finding that early sedation depth was predictive of time to extubation.³⁷

The low prevalence of physical restraints observed here differed significantly from a recent survey of 121 French ICUs. In almost one-third of units, physical restraint was used in over half of awake, calm and cooperative patients, and in two-thirds of ICUs, restraints, when used, were applied for more than half of mechanical ventilation duration.⁴⁰

Implications for practice

Our study identified that only two-thirds of sedated patients had their levels of sedation formally assessed, half had their pain assessed and very few had a formal assessment of delirium. Our baseline description of current practices can inform development and testing of specific strategies to improve assessment and management of discomfort and delirium for intensive care patients in Australia and New Zealand.

Strengths and limitations

The key strength of our study is that it provides a binational, multicentre evaluation of actual routine practices associated with management of sedation, analgesia and delirium, providing a detailed description of practice over 4 hours with an independent assessment at each site of pain, sedation and analgesia by a trained assessor.

We note some limitations that are inherent in a point prevalence design. Our assessment of patients occurred in a single 4-hour time frame during their ICU stay and, because prevalent patients may be systematically different to incident patients, the study may not accurately reflect management during the patient's entire ICU admission. In addition, the intensity of management may differ depending on the phase of the patient's illness (illness severity) and the type of primary pathology, and there may be competing priorities in patient management. For example, priority may be given to

reducing sedation or analgesia to facilitate neurological evaluation or to observe a patient's respiratory status, rather than to patient comfort.

A high representation of tertiary ICUs precluded meaningful comparisons between types and levels of ICUs in our analyses. We were therefore unable to identify any practice differences between types and levels of ICUs because of the low proportion of rural, regional and private units and, to a lesser extent, non-tertiary metropolitan units. Further work could focus on identifying important practice differences across types and levels of ICUs.

Conclusions

Our point prevalence study details current practices for assessing and managing pain, sedation and delirium in a sample of ICUs across Australasia. Two-thirds of sedated patients had their sedation levels formally assessed, half had their pain assessed and very few had a formal delirium assessment. These results suggest that current practices in many ICUs in Australia and New Zealand are not fully compliant with guidelines or expected practices. Our baseline description of current practices is, however, consistent with previous Australian and international observational data and may provide justification for randomised, interventional studies. It may also provide useful information for defining usual care.

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Competing interests

None declared.

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Appendix

| Item | Response |
|---|--|
| Sedation | |
| 1 Does the patient have an artificial airway (ETT or tracheostomy) and require positive pressure for some part of the study day (includes CPAP or pressure support)? | Yes/No |
| 2 Has the patient been assessed within the last 4 hours using a sedation scoring scale? | Yes/No |
| 2.1 Sedation scoring scale used (eg, RASS, Ramsay score, Riker SAS, MAAS, other [specify])? | Specify scale |
| 2.2 What was the documented score using your scale? | Numerical score or range |
| 3 Using the RASS, what is the actual sedation score now? | Numerical score |
| 4 Is sedation medication being titrated to a specific level of sedation? | Yes/No |
| 5 Does patient have an indication for deep sedation (eg, management of ICP, ventilator dyssynchrony, haemodynamic instability, uncontrolled agitation, other [specify])? | Yes/No |
| 6 Sedatives and analgesics patient is receiving by continuous infusion, bolus or both, and total dose (morphine, fentanyl, midazolam, propofol, dexmedetomidine, other [specify]). | Specify |
| 7 Did patient have a planned cessation of sedation at any time in the study day? | Yes/No |
| 7.1 At what time was the drug ceased and restarted? | 3 episodes: time started, time ceased, tick if not restarted |
| 7.2 What were the reasons for restarting infusions [tick all that apply] (time due according to daily interruption of sedation protocol, intolerance of ventilation, pain, agitation, haemodynamic instability, to perform a procedure, other [specify])? | Specify |
| Analgesia | |
| 8 Has patient been assessed within the last 4 hours using a pain scoring instrument? | Yes/No |
| 8.1 What was the documented pain score using your scale? | Numerical score |
| 9 Using a numerical rating scale from 0 (no pain) to 10 (worst imaginable pain), what is patient's pain score now? | Numerical score |
| 10 Has patient received any analgesics today, aside from those listed in question 6? | Yes/No; drug, total dose |
| Delirium | |
| 11 Has patient been assessed for delirium today using a delirium scoring tool? | Yes/No |
| 11.1 What delirium scoring tool was used (CAM-ICU, delirium rating scale, delirium screening checklist, MMSE, general clinical assessment, other [specify])? | Specify |
| 11.2 What was the documented score using your scale? | Numerical score or presence of delirium |
| 12 Did patient have an RASS of -3, -4 or -5 in item 3? | Yes/No |
| 13 On assessing the patient now (bedside nurse can assist), is the patient normally wakeful or easily roused, responsive to mild stimuli (eg, touch, calling name), hypervigilant or making exaggerated responses to normal stimuli? | Yes/No |
| Does patient have any of the following signs of delirium (bedside nurse can assist): | |
| 13.1 Inattention: difficulty following conversation or instructions; easily distracted by external stimuli; difficulty in shifting focus? | Yes/No |
| 13.2 Disorientation: any obvious mistake in time, place or person? | Yes/No |
| 13.3 Hallucination-delusion-psychosis: any manifestations of hallucination (eg, seeing or trying to catch nonexistent objects) or delusions? | Yes/No |
| 13.4 Psychomotor agitation or retardation: hyperactivity requiring additional drugs or physical restraints for patient or staff safety; or hypoactivity (clinically noticeable psychomotor slowing)? | Yes/No |
| 13.5 Inappropriate speech or mood: inappropriate, disorganised or incoherent speech, inappropriate display of emotion related to event or situation? | Yes/No |
| 13.6 Sleep-wake cycle disturbance: sleeping less than 4 hours or waking frequently at night; sleeping during most of the day? | Yes/No |
| 13.7 Symptom fluctuation: significant fluctuations in the manifestations of items 13.1-13.6? | Yes/No |
| 14 Did the patient require physical restraints during the study day? | Yes/No |
| 14.1 If yes, please specify type of restraints | Specify |

ETT = endotracheal tube. CPAP = continuous positive airway pressure. RASS = Richmond agitation-sedation scale. SAS = sedation-agitation scale. MAAS = motor activity assessment scale. ICP = intracranial pressure. CAM = confusion assessment method. ICU = intensive care unit. MMSE = mini-mental state examination.