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Should we include monitors to improve assessment of awareness and pain in unconscious palliatively sedated patients? A case report.

Stefaan Six[1], Steven Laureys[2], Jan Poelaert[3], Johan Bilsen[1], Peter Theuns[1,4], Liza Musch[1] and Reginald Deschepper[1]

1Mental Health and Wellbeing Research Group, Department of Public Health, Vrije Universiteit Brussel, Jette, Belgium, 2Coma Science Group, Cyclotron Research Centre and Neurology Department, University Hospital of Liège, University of Liège, Liège, Belgium, 3Department of Anesthesiology and Perioperative Medicine, Vrije Universiteit Brussel, Jette, Belgium, 4Department of Experimental and Applied Psychology, Vrije Universiteit Brussel, Brussels, Belgium. Corresponding author: Stefaan Six, Mental Health and Wellbeing Research Group, Department of Public Health, Vrije Universiteit Brussel, Laarbeeklaan 103, 1090 Jette, Belgium. Email: Stefaan.Six@vub.be

Abstract

Background: Awareness and pain during palliative sedation is typically assessed by observational scales, but the use of such scales has been put into question.

Case presentation: A woman in her mid 80s was admitted to a palliative care unit, presenting with chronic lymphatic leukemia, depression and a cerebrovascular accident, with right sided hemiplegia and aphasia. The patient was unable to eat and was suffering from nausea and vomiting. Before admission the patient had expressed her desire to discontinue treatment on several occasions.

Case management: The decision was made to initiate palliative sedation. The patient consented to take part in a study to assess level of comfort and pain by using two monitoring devices (NeuroSense monitor and ANI (Analgesia Nociception Index) monitor).

Case outcome: The patient died 90 hours after initiation of palliative sedation. Titration of the medication was challenging and sedation was not deep enough during the first two days.

Thirteen assessments made with the Ramsay Sedation Scale showed that the patient was considered to be in a deep sleep, while in fact the NeuroSense monitor indicated otherwise.

Conclusion: This case demonstrates the feasibility and potential advantages of using monitoring devices to objectify assessments of pain and discomfort in palliatively sedated patients.

Key statements

What is already known about this topic?

- Concerns regarding the comfort of palliatively sedated patients include the use of observation as the only means to assess sedation, difficulties assessing awareness, and titration of drugs.
- A small number of studies have used Bispectral Index (BIS) monitoring to make objective assessments, but the protocol for the BIS monitor is not freely available.

What this paper adds?

- We report a case where the palliative sedation process could have been improved substantially by including the values of two monitoring devices that have known protocols (NeuroSense monitor and ANI monitor).
- This case demonstrates the feasibility and potential advantages of using these devices to improve assessments of pain and discomfort.

Implications for practice, theory or policy

- In the context of palliative care, monitoring devices should be considered to improve assessments of awareness and pain in unconscious palliatively sedated patients, rather than relying solely on observation and observational scales.

Background

It is assumed that palliatively sedated patients are unaware of their clinical situation and do not experience symptoms of discomfort, such as pain, dyspnea, delirium, and other distressing conditions that are common during the last phase of terminal illness. Level of awareness and pain in this patient group is typically assessed by observational scales, but the use of such scales during palliative sedation has been put into question.[1,2] A few studies have used the BIS monitor (Bispectral Index) to improve assessment of awareness during palliative sedation. However, the algorithm used by the BIS-monitor is not freely available. Alternatively, monitoring devices such as the NeuroSense monitor (NeuroWave Systems Inc.) to assess the hypnotic depth of anesthesia and the ANI monitor (Mdoloris Medical Systems SAS, Lille, France) to assess the analgesia/nociception balance have open protocols. The NeuroSense monitor displays two frontal EEG signals, and calculates a number of parameters including the bilateral WAVcns index (Wavelet Anesthetic Value for the Central Nervous System) ranging from 100 (awake) to 0 (flat EEG). The lower the index, the lower the likelihood of consciousness. The ANI monitor continuously monitors heart rate variability (HRV) and transforms this into an analgesia nociception index (ANI, 0–100), which assesses parasympathetic activity as a possible measure of nociception. The ANI provides greater stability than raw indices of HRV. A recent study showed that ANI is effective in detecting pain in deeply sedated critically ill patients.[3] The analgesia nociception index is a non-invasive tool based on the analysis of the respiratory fluctuations of heart rate that mainly reflect the variability in the parasympathetic tone and so is likely useful to assess pain and discomfort in non-communicative patients. The lower the index, the higher the likelihood of pain.

Case Report

Case presentation

A woman in her mid 80s was admitted (in 2017) to the palliative ward of a general hospital in Flanders, Belgium, after being treated for chronic lymphatic leukemia over the past 12 years. Before admission, the patient was known to be severely depressed after losing her daughter to cancer and had expressed her desire to discontinue treatment on several occasions. She recently refused medication intake or further treatment after having experienced a cerebrovascular accident, with right sided hemiplegia and aphasia. Concerning cognition, she did not present any severe impairments, and was able to communicate non-verbally by gesturing and nodding. Furthermore, this patient was unable to eat and was suffering from nausea and vomiting.

Case management

Considering her earlier requests to discontinue treatment and after consulting with her family and the general practitioner, it was decided to focus on comfort care and initiate palliative sedation. The patient, who had always been supportive of scientific research, consented to take part in a study to assess level of comfort by using a NeuroSense and ANI monitor, in addition to the commonly used observational assessments of pain, awareness and communication. Nurses, physicians and family members were blinded to the monitor outputs. A small USB-camera was placed above the bed to register behavioral reactions. For a full description of the study protocol see Six et al.[4]

Palliative sedation was initiated, with an initial dosage of 60mg/24h Midazolam and 20mg/24h Morphine, next to Aliprazide (150mg/24h) and Haloperidol (5mg/24h).

Approximately 1 hour after sedation was started and the family had said their goodbyes, the attending nurse was asked by the first author to assess the patient's situation. The nurse's impression was that the patient was in a deep sleep and in her professional opinion would not wake up. She also thought that the patient was comfortable and free of pain and gave a Ramsay score of 5. The Ramsay Sedation Scale (RSS) is a frequently used observational scale based on the patient's ability to react to different stimuli. It consists of six sedation levels, ranging from 1 (agitated and restless) to 6 (no response to stimulation).[5]

After this, the first author checked the values of the NeuroSense monitor (WAVcns scores were 92 and 93 for the left and right hemisphere respectively) and the ANI monitor (score = 100). Counter to what was expected according to the nurse's assessment, these monitor values indicated that the patient was very likely to be aware and close to waking up. Indeed, after 5 minutes the patient opened her eyes. The first author then took the opportunity to ask the patient if she was in any pain, and she nodded this was not the case. This was consistent with the readings from the ANI monitor. Moreover, the patient made it quite clear she was well aware and conscious of her environment by signaling that she wanted the door of the room to remain open.

Case outcomes

Several adjustments to her medication regime were necessary in the following days (see table 1) and the patient died approximately 3.5 days after sedation had been started.

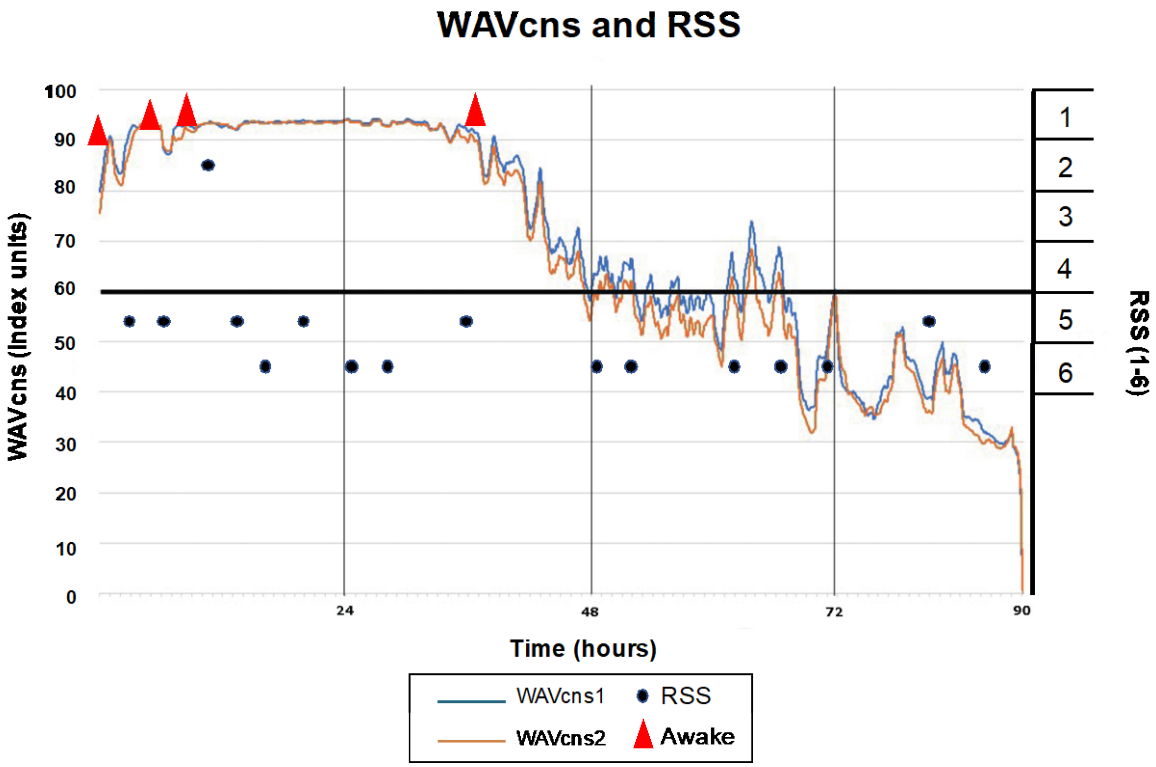
Time since start sedation (hours)	**Medication regime**	**Ramsay Sedation Score**	**WAVcns (left & right hemisphere)**	**ANI**
1	Fentanyl 25 mcg/72h (patch)	5	92, 93	90

	15mg Midazolam (bolus injection at start) 60mg/24h Midazolam, 20mg/24h Morphine (subcutaneous infusion)			
6	15mg Midazolam (bolus injection)	Not registered in medical file	84, 92	99
11	15mg Midazolam (bolus injection)	2	93, 93	99
12	60mg/24h Midazolam, 40mg/24h Morphine (subcutaneous infusion)	5	93, 92	98
14	90mg/24h Midazolam, 40mg/24h Morphine (subcutaneous infusion)	6	93, 94	100
67	120mg/24h Midazolam, 60mg/24h Morphine (subcutaneous infusion)	6	70, 68	99

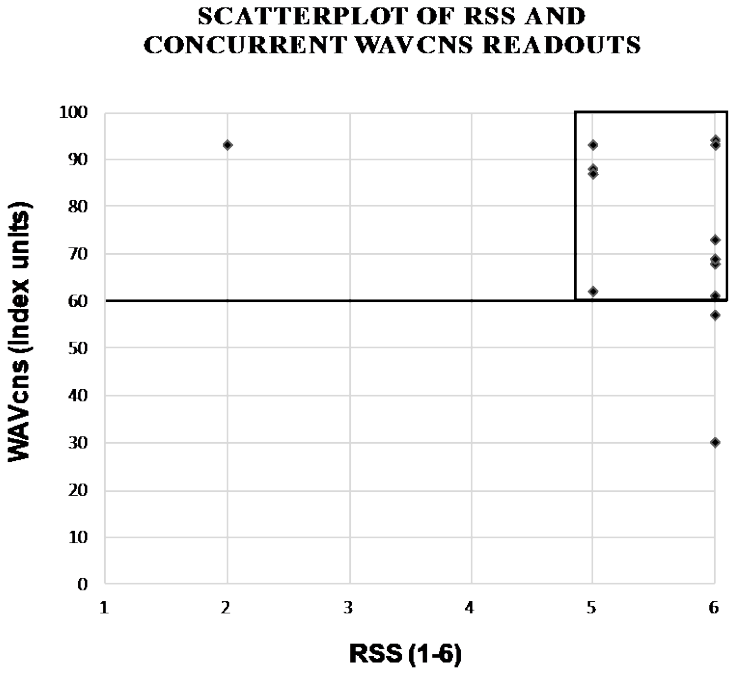
Table 1 Medication regime adjustments

Graph 1A with WAVcns indices (hourly moving averages) clearly shows that the titration of the medication was challenging and sedation was not deep enough during the first two days (the patient woke up 1 hour, 6 hours, 11 hours and 36 hours after start of sedation). Nurses regularly documented the level of sedation using the RSS; of the 16 RSS scores, 13 showed that the patient was considered to be in a deep sleep by the attending nurse (i.e. RSS 5-6) while in fact the NeuroSense indicated otherwise (i.e. ≥ 60). The Ramsay scores were given by trained palliative care nurses, with extensive professional experience.

(graph 1A and 1B over here)



Graph 1 A: Concurrent sedation level according to WAVcns and RSS. WAVcns indices (hourly moving average) for both hemispheres are shown from start of continuous sedation until death. The horizontal black line indicates the cut-off point (WAVcns=60) where patients are considered at risk of waking up. The vertical axis on the right shows the Ramsay Sedation Scale categories (1 = patient is anxious and agitated or restless, or both; 2 = patient is cooperative, oriented, and tranquil; 3 = patient responds to commands only; 4 = patient exhibits brisk response to light glabellar tap or loud auditory stimulus; 5=patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus; 6=patient exhibits no response). RSS scores of 4, 5 and 6 indicate that the patient is asleep according to the nurse, but for continuous palliative sedation therapy to be successful generally a score of at least 5 is considered necessary.



Graph 1 B: Scatterplot of RSS and concurrent WAVcns readouts. The black line indicates the cut-off (60) where patients are found to be at risk of waking up by WAVcns. The box indicates all RSS assessments that are in disagreement with WAVcns.

Discussion

This case illustrates that using WAVcns and ANI seems to provide more valid and objective information on sedation level and discomfort than do observational scores such as the Ramsay scale. Making an accurate assessment of pain and discomfort in unconscious palliatively sedated patients is notoriously difficult. In their review Deschepper et al. mention several concerns about the risks that patients experience an uncomfortable death[1]. These include but are not limited to 1) the use of observation (and observational scales that rely on motor responsiveness) to assess palliatively sedated patients, which is questionable since the medication itself impacts on motor responsiveness, 2) difficulties with assessing (un)awareness, and 3) problems with the titration of drugs.

The WAVcns index suggested that the patient was insufficiently sedated, which was confirmed by her waking up. Furthermore, the ANI index suggested that the patient was comfortable and free of pain, which too was confirmed by the patient herself. In pain assessment, self-report is considered to be the golden standard. These findings show that the palliative sedation process for this patient could have been improved substantially by including the aforementioned monitoring values in the assessment. Similar results were obtained in a study by Barbato et al. who used a Bispectral Index monitor to assess depth of sedation[6,7].

Additionally, from a psychosocial viewpoint, it is important for relatives that, after they have said their goodbyes, they can be confident that the patient stays asleep, since waking up may cause considerably more distress to them. Noteworthy, family members reported that

the visibility of the NeuroSense monitor's sensor patch on the patients' forehead, was quite acceptable and non-intrusive.

Conclusion

This case clearly demonstrates the feasibility and potential advantages of using monitoring devices to objectify assessments of pain and discomfort in palliatively sedated patients. More research is needed to assess acceptability of this practice for family members and to further investigate the added value when comparing with traditional assessment methods.

Declarations

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Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

SS designed and wrote the paper. RD, PT, SS, SL, JB, LM and JP made substantial contributions to the conception and design of the study. RD, JB, JP, LM and PT reviewed and restructured the paper. All authors approved the final version.

Ethics approval and consent to participate

Ethical approval for this study was obtained from the biomedical ethics committee of the University and University Hospital of Brussels (19th February 2013, BUN 14320136504) . Written informed consent was obtained from the patient and her family members.

Competing interests

The authors declare that they have no competing interests.

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