

ICU CORNER

Sedation scales: Very useful, very underused

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GENERAL INFORMATION

ICU CORNER is a section of *OPUS 12 Scientist* dedicated to brief topic reviews geared toward preparation for the various Critical Care Board Examinations. Each quarterly edition of *OPUS 12 Scientist* will contain one or two condensed overviews, accompanied by a list of selected references. Contributions via regular article submission process are welcome, subject to Editorial Board and Section Editor approval.

Cite as: Stawicki SP. *OPUS 12 Scientist* 2007;1(2):10-12.

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Keywords: ICU, Critical Care Board Exam, Review, Sedation scales.

SEDATION SCALES IN THE ICU

Majority of critically ill patients experience significant distress, anxiety, and agitation during their intensive care unit (ICU) stays. Numerous factors, including sleep deprivation, unfamiliar environment, delirium, adverse medication effects, pain, and extreme anxiety can contribute to ICU patient distress.

Important pathophysiologic mechanisms affected by ICU-associated distress include significant increases in catecholamines, cortisol, growth hormone, vasopressin, prolactin, glucagon, fatty acids, and protein catabolism. Clinically significant sequelae of this physiologic dysregulation include fluid and electrolyte imbalances, altered wound healing, and disturbances of the sleep-wake cycle.

Intensivists often employ various sedative agents to relieve ICU-associated distress and prevent secondary complications of such distress. There are a variety of pharmacologic agents used for this purpose, including benzodiazepines, propofol, antipsychotic agents, and alpha₂-agonists.

Both oversedation and undersedation of critically ill patients can have significant adverse effects. Undersedation of agitated patients may result in harmful consequences, including ventilator asynchrony, increased oxygen consumption, inadvertent removal of devices and catheters, wasted ICU resources, and even post-traumatic stress disorder. Oversedation can result in unnecessary mechanical ventilation (including complications of prolonged ventilation → ventilator associated pneumonia and lung injury), neuromuscular dysfunction, and other sedation-related complications. In order to appropriately titrate and balance sedation in the ICU, several monitoring and assessment tools have been devised over the years.

This review briefly discusses the most relevant and most widely used sedation assessment and monitoring methods. There are many potential advantages of using objective methods for sedation assessment in the ICU. Some of the most important reasons to use sedation scales are: (a) ability to accurately

document patient status; (b) ability to accurately communicate between ICU caregivers; (c) ability to titrate sedation therapy to established clinical goals/ranges; (d) ability to optimize patient comfort and safety; (e) potential to minimize length of mechanical ventilation; and (f) potential to decrease ICU length of stay. Although there are numerous published and validated sedation assessment scales, the author of this review has no personal preferences and recommends familiarity and routine use of any one scale, as long as it is performed in a standardized and consistent fashion.

RASS (Richmond Agitation Sedation Scale). The RASS consists of a scale ranging from +4 to -5. A score of 0 is equated with a patient who is alert and calm. On one extreme of the RASS score, +4 represents a very combative, violent patient, who is considered dangerous to the staff. On the other extreme, -5 represents a patient who is unarousable, with no response to voice or physical stimulation. **Figure 1** summarizes the RASS score.

Score	Term	Description
+4	Combative	Overtly combative or violent, immediate danger to staff
+3	Very agitated	Pulls on or removes tubes or catheters or has aggressive behavior toward staff
+2	Agitated	Frequent nonpurposeful movement or patient ventilator dyssynchrony
+1	Restless	Anxious or apprehensive but movements not aggressive or vigorous
0	Alert and calm	
-1	Drowsy	Not fully alert, but has sustained (more than 10 seconds) awakening, with eye contact/eye opening to voice
-2	Light sedation	Briefly (less than 10 seconds) awakens with eye contact to voice
-3	Moderate sedation	Any movement (but no eye contact) to voice
-4	Deep sedation	No response to voice, but any movement to physical stimulation
-5	Unarousable	No response to voice or physical stimulation

Figure 1. The RASS scale. Adapted from Sessler CN, Gosnell MS, Grap MJ, et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. *Am J Respir Crit Care Med* 2002;166:1338–1344.

RS (Ramsay Scale). The RS is a simple scale, scored from 1 (patient anxious and agitated or restless or both) to 6 (no response to light glabellar tap). Details of the RS can be found in **Figure 2**.

Level	Response
1	Awake and anxious, agitated, or restless
2	Awake, cooperative, accepting ventilation, oriented, tranquil
3	Awake; responds only to commands
4	Asleep; brisk response to light glabellar tap or loud noise
5	Asleep; sluggish response to light glabellar tap or loud noise stimulus but does not respond to painful stimulus
6	Asleep; no response to light glabellar tap or loud noise

Figure 2. The Ramsay Scale. Modified from Ramsay M, Savege T, Simpson BRJ, et al. Controlled sedation with alphaxalone/alphadolone. *BMJ* 1974;2:656–659.

VICS (Vancouver Interaction and Calmness Scale). The VICS consists of two separate scores, the interaction score and the calmness score. Each score is composed of five categories, with each category graded on a scale from 1 to 6 (Figure 3).

	Strongly agree	Agree	Mildly agree	Mildly disagree	Disagree	Strongly disagree
Interaction Score:30						
Patient interacts	6	5	4	3	2	1
Patient communicates	6	5	4	3	2	1
Information communicated by patient is reliable	6	5	4	3	2	1
Patient cooperates	6	5	4	3	2	1
Patient needs encouragement to respond to questions	1	2	3	4	5	6
Calmness score:30						
Patient appears calm	6	5	4	3	2	1
Patient appears restless	1	2	3	4	5	6
Patient appears distressed	1	2	3	4	5	6
Patient is moving around uneasily in bed	1	2	3	4	5	6
Patient is pulling at lines and tubes	1	2	3	4	5	6

Figure 3. The VICS scale. Modified from De Lemos J, Tweeddale M, Chittock D. Measuring quality of sedation in adult mechanically ventilated critically ill patients. J Clin Epidemiol 2000;53:908–919.

MAAS (Motor Activity Assessment Scale). The MAAS is scored from 0 (patient unresponsive) to 6 (dangerously agitated, uncooperative patient). See Figure 4 for details.

Score	Definition
0	Unresponsive Does not move with noxious stimuli
1	Responsive only to noxious stimuli. Opens eyes or raises eyebrows or turns head toward stimulus or moves limbs with noxious stimuli
2	Responsive to touch or name. Opens eyes or raises eyebrows or turns head toward stimulus or moves limbs when touched or name is loudly spoken
3	Calm and cooperative. No external stimulus is required to elicit movement and patient adjusts sheets or clothes purposefully and follows commands
4	Restless and cooperative. No external stimulus is required to elicit movement and patient picks at sheets or tubes or uncovers self and follows commands
5	Agitated. No external stimulus is required to elicit movement and attempts to sit up or moves limbs out of bed and does not consistently follow commands (for example, lies down when asked but soon reverts back to attempts to sit up or move limbs out of bed)
6	Dangerously agitated, uncooperative. No external stimulus is required to elicit movement and patient pulls at tubes or catheters or thrashes side to side or strikes at staff or tries to climb out of bed and does not calm down when asked

Figure 4. The MAAS scale. Adapted from Devlin JW, Boleski G, Mlynarek M, et al. Motor Activity Assessment Scale: a valid and reliable sedation scale for use with mechanically ventilated patients in a adult surgical intensive care unit. Crit Care Med 1999;27:1271–1275.

SAS (Sedation-Agitation Scale). The SAS is scored from 1 (unarousable) to 7 (dangerous agitation). See Figure 5 for details.

Level	Behaviors
7	Dangerous agitation. Pulls at endotracheal tube, tries to remove catheters, climbs over bed rail, strikes at staff, thrashes side-to-side
6	Very agitated. Does not calm, despite frequent verbal reminders; requires verbal reminding of limits, physical restraints; bites endotracheal tube
5	Agitated. Anxious or mildly agitated, attempts to sit up, calms down to verbal instructions
4	Calm and cooperative. Calm, awakens easily, follows commands
3	Sedated. Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple commands
2	Very sedated. Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously
1	Unarousable. Minimal or no response to noxious stimuli, does not communicate or follow commands

Figure 5. The Riker Sedation-Agitation Scale. Adapted from Fraser GL, Riker R. Monitoring sedation, agitation, analgesia, and delirium in critically ill adult patients. Crit Care Clin 2001;17:1– 21.

HS (Harris Scale). This scale consists of three sub-categories: (a) general condition; (b) compliance with mechanical ventilation; and (c) response to endotracheal suctioning. The HS was developed specifically for patients receiving mechanical ventilation. Details of the Harris Scale can be found in Figure 6.

General condition

1. Confused and uncontrollable
2. Anxious and agitated
3. Conscious, oriented, and calm
4. Asleep but arousable to speech, obeys commands
5. Asleep but responds to loud noise or sternal pressure
6. Unarousable

Compliance with mechanical ventilation

1. Unable to control ventilation
2. Distressed, fighting ventilator
3. Coughing when moved but tolerating ventilation most of the time
4. Tolerating movement

Response to endotracheal suctioning

1. Agitation, distress, prolonged coughing
2. Coughs, distressed, rapid recovery
3. Coughs, not distressed
4. No cough

Figure 6. The Harris Scale. Modified from Harris E, O'Donnell C, Macmillan RR, et al. Use of propofol infusion for sedation of patients undergoing haemofiltration– Assessment of the effect of haemofiltration on the level of sedation on blood propofol concentration. J Drug Dev 1991;4(Suppl 3):37–39.

ATICE (Adaptation to the Intensive Care Environment). This scale contains two domains: (a) consciousness and (b) tolerance. There are two questions pertaining to the consciousness domain and there are three questions pertaining to the tolerance domain. The total score for the ATICE scale is a sum of the responses to the two domains. The score ranges from 0 (extremely poor adaptation) to 20 (very good adaptation). See Figure 7 for details.

Consciousness domain graded 0–5		
Awakeness	Comprehension, sum of 1 point responses	
Eyes close, no mimic 0	Open/close eyes 1	
Eyes closed, only face mimic after strong painful stimulation 1	Open your mouth 1	
Eyes open after strong painful stimulation 2	Look at me 1	
Eyes open after light painful stimulation 3	Nod yes with head 1	
Eyes open after verbal order 4	Close eyes and open mouth 1	
Eyes open spontaneously 5		
Tolerance domain		
Calmness, graded 0–3	Ventilator synchrony, sum of 1 point elements	Face relaxation, graded 0–3
Life-threatening agitation 0	No blockade of the inspiratory phase of ventilation 1	Permanent grimacing 0
Agitation, does not respond to verbal order 1	No respiratory rate > 30 1	Severe provoked grimacing 1
Agitation, responds to verbal order 2	No cough 1	Moderate provoked grimacing 2
Calm 3	No use of accessory muscles 1	Relaxed face 3

Figure 7. The ATICE scale. Modified from De Jonghe BD, Cook D, Griffith L, et al. Adaptation to the intensive care environment (ATICE): development and validation of a new sedation assessment instrument. Crit Care Med 2003;31:2344–2354.

AVRIPAS. This scale consists of four components: (a) agitation; (b) alertness; (c) heart rate; and (d) respiration. Agitation, alertness, and respiration are measured on a 5-point scoring

system. Heart rate is measured on a 4-point scale. The overall sedation score for this system is a sum of each component, with scores ranging from 1 (sedated) to 19 (need for more sedation). See **Figure 8** for details.

Agitation

1. Unresponsive to command/physical stimulation
2. Appropriate response to physical stimuli/calm
3. Mild anxiety/delirium/agitation (calms easily)
4. Moderate anxiety/delirium/agitation
5. Severe anxiety/delirium/agitation

Alertness

1. Difficult to arouse, eyes remain closed
2. Mostly sleeping, eyes closed
3. Dozing intermittently, arouses easily
4. Awake, calm
5. Wide awake, hyper-alert

Respiration

1. Intubated, no spontaneous effort
2. Respirations even, synchronized with ventilator
3. Mild dyspnea/tachypnea, occasional asynchrony
4. Frequent dyspnea/tachypnea, ventilator asynchrony
5. Sustained, severe dyspnea/tachypnea

Patient classification

- Acutely ill (weaning not a goal)
- Ventilated patient being weaned
- Chronic ventilated patient (weaning not a goal)
- Nonventilated patient

Sedation goal

- 5-9
- 7-10
- 6-9
- 7-9

Figure 8. The AVRIPAS scale. Modified from Avripas MB, Smythe MA, Carr A, Begle RL, Johnson MH, Erb DR. Development of an intensive care unit bedside sedation scale. *Ann Pharmacother* 2001;35:262-263.

BLOOMSBURY. Also known as the University College London Hospitals sedation protocol, this scale spans from -3 (unarousable) to +3 (agitated and restless). There is also categorization for natural sleep. The Bloomsbury scale (**Figure 9**) appears to have a high association with the Ramsay Sedation scale.

Level	Behaviors
3	Agitated and restless
2	Awake and uncomfortable
1	Awake but calm
0	Roused by voice, remains calm
-1	Roused by movement or suction
-2	Roused by painful stimuli
-3	Unarousable
A	Natural sleep

Figure 9. The BLOOMSBURY Scale. Adapted from Sackey PV, Martling CR, Granath F, Radell PJ. Prolonged isoflurane sedation of intensive care unit patients with the Anesthetic Conserving Device. *Crit Care Med* 2004;32:2241-2246.

Other methods of sedation monitoring in the ICU include the Bispectral Index (BIS) monitoring, auditory evoked potentials (AEP), and the Patient State Index (PSI). When compared to the above-listed sedation scales (RASS, RS, AVRIPAS, BLOOMSBURY, ATICE, SAS, MAAS, VICS), these sedation monitoring/assessment tools (BIS, AEP, PSI) are more objective. However, their discussion will be reserved for a different issue of ICU CORNER.

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