GUEST EDITORIAL

Will Adequate Sedation Assessment Include the Use of Actigraphy in the Future?

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The current challenges of oversedation and undersedation leave healthcare personnel looking for more answers. Oversedation is cost prohibitive in the 21st century. With the shortage of nurses and healthcare dollars, care providers are evaluating methods to continuously improve care, lower costs, and decrease overall length of stay.

Oversedation can have detrimental effects on patients and their families, particularly when a loved one is unarousable and needs unwarranted diagnostic testing. Unnecessary tests are costly in dollars, as well as in nursing time and care. How many times have you brought a patient for computed tomography of the head because of unresponsiveness, only to find out that the patient's neurological findings are not abnormal? After the sigh of relief, we ask ourselves if we could have prevented this unnecessary procedure. In the past several years, hospital budgets and subsequent reimbursement have decreased, making everyone much more cost conscious.

Although oversedation may make it "easier" to care for our patients, undersedation of patients may lead to added stress and agitation among patients, unanticipated removal of vascular access devices and tubes by patients,[1] patients' recall of therapeutic paralysis,[2] and potential injuries to healthcare providers. It is no surprise that 92% of critically ill patients require sedatives and analgesics.[3]

It is generally accepted that an analysis of the root causes of agitation would yield many explanations for the behavior. Agitation develops in nearly 71% of patients during the intensive care unit stay[4] as a result of impaired sleep cycles, delirium, pain, and so on. Most of these conditions are easily treatable; however, subtle cues of agitated behavior are easily overlooked.

With the reduction in the number of inpatient beds, the shortage in nursing personnel, and the increasing costs of pharmaceutical agents, a multidisciplinary approach to assessment of sedation must be taken. Historically, vital signs were used to determine the level of sedation in critically ill patients. Because many factors can alter vital signs, this approach is severely limiting. Recently, the Society of Critical Care Medicine and the American Society of Health-System Pharmacists revised the clinical practice guidelines for sedation and analgesia.[5,6] This group of specialists reviewed peer-reviewed research literature from 1994 through 2001. On the basis of the clinimetric properties of the research studies, new guidelines were proposed.

Healthcare providers are urged to use a recommended sedation scale, develop an individualized sedation goal for each patient, evaluate the goal frequently, and redefine the goal as necessary. Although the Ramsay Sedation Scale[7] has gained wide acceptance in the past several decades, it has not been recommended for assessing critically ill patients. The Ramsay scale is a 6-point scale that includes scores for 3 awake states and 3 asleep states. It does not address the issue of agitation.

The Sedation Agitation Scale,[8] developed by Richard Riker, combines a sedation continuum with assessment of agitation. This 7-point scale includes descriptors and behaviors to assist bedside practitioners with correct scoring. The Motor Activity Awareness Scale,[9] a derivative of the Sedation Agitation Scale, is 7-point scale that includes clarified descriptors in which "and" or "or" are used to describe behavior. Both of these scales have good clinimetric properties, are easy to administer, and do not require a lengthy assessment.

The Vancouver Interaction and Calmness Scale[10] is also recommended in the practice guidelines. This tool is actually 2 independent scales in one. The first scale is used to evaluate a patient's interactions and communication; the second scale is used to evaluate the degree of calmness or restlessness. Each of the assessment scores can range from 5 to 30. The target score for this tool has not been clearly defined.

The bispectral index (BIS) monitor (Aspect Medical Systems, Newton, Mass) has been cited in the guidelines[5] as a potentially promising tool for assessing sedation. The 2002 guidelines cite the BIS as having limitations within the intensive care unit; however, it was acknowledged that the software was being upgraded to deal with several of the limiting factors. Since the publication of the guidelines, more than 25 peer-reviewed manuscripts[11-14] on BIS monitoring have been published.

The BIS monitor (A-2000 XP System with the BIS Extend Sensor) is an objective tool that processes electroencephalographic information and calculates a number between 0 and 100 to provide a direct, continuous measure of a patient's level of consciousness and response to sedation. The monitor illustrates the quality of the signal that is being received, the BIS score, and a 12-hour trend. Both the BIS value and a second variable can be assessed for trends simultaneously. Typically, nurses use electromyographic and BIS data concurrently. Monitoring those data provides the healthcare team with knowledge on sedation and may also shed light on the potential need for analgesia if muscle activity increases. A BIS value of 50 to 60 would indicate adequate sedation; however, a variable electromyographic reading may indicate a need for analgesia.

The Richmond Agitation-Sedation Scale[15] was published after the practice guideline recommendations had come out. This instrument is a 10-point scale with good clinimetric properties[16] in critically ill adults. It is easy to implement and correlates with scores on the Glasgow Coma Scale, Ramsay Sedation Scale, Sedation Agitation Scale, Comfort Scale, Visual Analog Scale, and the BIS monitor. The Richmond Agitation-Sedation Scale has scoring for 4 levels of agitation and 5 levels of sedation.

Although each of the subjective scales mentioned have validity and reliability, they do not allow continuous evaluation of the level of sedation and/or agitation, they require that patients be stimulated and often disrupt the patient's state to perform the assessment, and they cannot be reliably used in patients who are deeply sedated or paralyzed. As technology continues to expand our assessment potential, research tools previously used in patients who were not critically ill are being evaluated in critical care.

Actigraphy (activity measure) has gained acceptance as a research tool for the evaluation of sleep disturbances, circadian rhythms,[17] and so on. Many of the reasons for agitation include disturbed sleep patterns, so it is not surprising that this tool has found its way into critical care. The Actiwatch[18] (Mini Mitter, Bend, Ore) is easy to apply to either a wrist or an ankle. The study by Grap et al[19] indicates that actigraphy data correlate with scores on the Richmond Agitation-Sedation Scale[15] and the Comfort Scale and with observed movement of patients. Similar to BIS monitoring, actigraphy allows clinically important events to be "marked."

Although actigraphy research in critically ill populations is in its infancy,[20] several current limitations are evident. The raw actigraphy data cannot be used for making actual decisions about patient care because data must be downloaded before analysis and use. In research, the need to download the actigraphy data is not a concern. Patients act as their own controls, so care must be taken to determine the correct population for actigraphy because patients with certain conditions may not be appropriate (eg, restless leg syndrome, diabetic neuropathy, neurological disorders).

Actigraphy also lacks precision, and the use of restraints may alter patients' activity because they serve as a reminder not to move or pull at tubes or catheters. Caution must be taken to avoid assuming that all muscle activity is the result of agitation. Although the sedation continuum includes levels of agitation, there is a need to differentiate the level of sedation with muscle activity or movement. The brain is responsible for the level of consciousness (sedation) as opposed to spinal-mediated pain responses (analgesia).[21] Patients' movement does not necessarily reflect an inadequate sedation level and may, in fact, be more related to inadequate analgesia.

As stated by Grap et al,[19] future research is needed. Protocols should include longer periods of data collection with a larger sample size for generalizability. Research to correlate continuous BIS and electromyographic readings with actigraphy may be warranted. Muscle activity is another variable that may help with the assessment of inadequate sedation that may lead to agitation.

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