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Clinical Implications of Sedation in Critical Care

Sedation therapy and/or pain control medications are associated with almost everything done to support a patient in the intensive care unit (ICU)—e.g., mechanical ventilation, pain control, reduction of anxiety and agitation, and undisturbed sleep. Pain, lack of sleep, anxiety/agitation and physical and psychological stress associated with invasive tubes and catheters may all be present from the moment a patient enters the ICU. Sedation therapy may appear to be indicated on an empiric basis to "calm" the patient, allow essential ICU procedures to be conducted and prevent the patient from harming self or ICU staff.

An accumulating body of evidence and evaluated experience has indicated, however, that sedation therapy is most beneficially applied with a structured approach. A structured approach—such as an algorithm or protocol—includes validated assessment scales for patient stressors and validated algorithms for sedation drug selection, application, monitoring and withdrawal. The use of a structured approach accomplishes what should be a principal goal of sedation therapy: to avoid excessively prolonged sedation, over-sedation and suboptimal sedation, and the consequences associated with each.

The consequences of poorly managed sedation have been shown in a number of well-designed studies. A finding common in these studies is that (1) sedation therapy is received by a majority of patients entered into an ICU, especially those receiving mechanical ventilation, and (2) persistent use of sedation is associated with longer duration of mechanical ventilation, longer weaning time and longer stay in the ICU.[1]

The corollaries are the consequences of (1) suboptimal sedation—anxiety, pain, agitation, patient-ventilator dys-synchrony, or (2) excessive or prolonged sedation—prolonged time on ventilator, need for tracheostomy, cognitive deficits including delirium, and long-term psychological deficits such as post-traumatic stress disorder (PTSD). Delirium is a strong predictor of lengthened hospital stay and of long-

term cognitive impairment. The presence of delirium also adds to time and expense necessary for investigating causes other than sedation complication—e.g., organ failure.
Surveys of sedation management practices have consistently found that while sedation is received by a majority of ICU patients, a structured approach to sedation is used inconsistently in managing ICU patients. Lack of a structured approach may enable unintended sedation mismanagement.

Goal-directed sedation management is a structural approach that uses a variety of tools to assess need for sedation, match patient needs to therapeutic approach, monitor patient responses and match outcomes to goals established for the individual patient. A sedation goal or endpoint is established for each patient, and the patient is monitored using an established protocol to assess physical and psychological condition and response to therapy.

A structured approach assures that appropriate tools are in place to evaluate pain and pain control, other medications being taken by the patient, and underlying medical and psychological problems. A pain evaluation scale provides the most reliable information when the patient is able to self-report level of pain and what stressors are most associated with pain. In the absence of a patient's ability to report subjectively, objective tools should be used to assess pain behaviors.

Goal-directed sedation therapy will include a validated sedation scale such as the long-established Ramsay sedation scale[2], Richmond Agitation-Sedation Scale (RASS)[3], or the newer Adaptation to Intensive Care Environment (ATICE) scale.[4] Use of an appropriate sedation scale identifies problems associated with sedation and protects the patient from unintended sedation consequences as well as protects ICU health-care givers by early identification of patients whose agitation may pose physical risk to self or the ICU staff.

A patient's apparent need for sedation and subsequent effects of sedation can produce unwanted and unintended events. Need for sedation should be paired with investigation of the condition(s) requiring sedation. Unintended effects of sedation should trigger investigation of the precipitating event(s) and condition(s)—e.g., other medications taken by the patient, neurologic, metabolic, physiologic problems and withdrawal of a medication that precipitates withdrawal symptoms. Withdrawal symptoms are often nonspecific and may mimic a number of other physical and psychological conditions.

The effects of sedative drugs may include delirium, or may potentiate psychological effects a patient experiences in the ICU. Delirium over an extended period is frequently associated with long-term loss of brain function.

Altering sedative exposure in the ICU can improve both survival and brain function. Two recent studies tested the hypothesis that use of sedatives and pain control medications with different mechanisms of action can reduce sedative exposure, reduce duration of mechanical ventilation and reduce risk for delirium.

The MENDS randomized controlled trial of the effects of sedation was conducted in 106 adult mechanically ventilated patients at two medical centers.[5] The investigators found that when patients were managed with individualized sedation goals, use of dexmedetomidine was associated with better survival and lower incidence of delirium than occurred with use of lorazepam.

The randomized controlled SEDCOM study of prolonged sedation in 366 mechanically ventilated patients found, that at comparable sedation levels, dexmedetomidine reduced duration of mechanical ventilation and incidence of delirium compared to results with midazolam.[6]

Avoiding inadequate or heavy-handed sedation may be accomplished by an algorithmic approach to structured sedation therapy. An algorithmic approach promotes regular assessment of the patient's status, beginning upon entry into the ICU, in order to achieve the least sedation necessary to address goal-directed sedation therapy. This stands in contrast to the traditional approach to a patient who enters the ICU in an agitated state that may result in harm to self or to ISU health-care givers, and appears to require immediate deep sedation to suppress agitation.

An algorithmic approach also promotes rational, structured investigation of causes of agitation, delirium or coma. While complications of sedation may be a cause of a patient's pathologic state, other infectious, neurologic or metabolic causes should be considered in a structured investigation. A structured protocol may be implemented by trained ICU nurses who see the patient at regularly

scheduled intervals.[7] When implemented properly and seamlessly, a structured sedation protocol reduces time on mechanical ventilation and avoids unnecessary loss of consciousness.[8]

Assessment of a patient's need for sedation and pain control may indicate a trial of combined sedation and pain control therapy. A prospective, open-label trial in mechanically ventilated patients of midazolam and fentanyl in combination demonstrated more reliable sedation than with midazolam alone.[9]

An algorithmic sedation protocol may include a daily sedative interruption, which has been found to be useful in reducing complications of critical illness as well as allowing the patient to maintain an objective contact with the environment. A daily interruption has been shown to pose no additional risk for myocardial ischemia in mechanically ventilated patients at risk for coronary artery disease.[10]

A daily wake-up call mandated in a sedation protocol also reduces risk for psychological problems that persist after discharge.[11] An increasingly recognized long-term psychological problem is ICU-associated post-traumatic stress disorder (PTSD).[12]

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Standards of Practice

Standards of practice for sedation and pain control in the intensive care unit (ICU) are evolving with an accumulating body of evidence and evaluated experience. Evolutionary change is away from tradition and empiricism, in the direction of structured, goal-directed, algorithmic sedation protocols.

Well-designed, randomized controlled studies are compiling evidence showing that structured sedation protocols improve patient outcomes and reduce length of ICU stay. What may be called the traditional approach to sedation of the mechanically ventilated patient in the ICU is driven by concern for safety of the agitated patient and by contingent preference to conduct necessary procedures with a calm patient. A heavy-handed approach to sedation also reduces risk for suboptimal sedation.

A structured approach to sedation sets goals for the lowest level of sedation necessary to meet the goals. Selection of sedative drug and dosage are made on the basis of objectively derived information regarding the patient's medical and pharmacotherapeutic history, possible underlying pathology, psychological status, types and level of pain, agitation and response to stimuli. The structured approach to sedation is adapted to each patient's individualized needs.

Evolution also is in the direction of encouraging the maximum level of consciousness consistent with safety of the mechanically ventilated patient. Prolonged unconsciousness is increasingly shown to be associated with complications ranging from delirium to after-discharge psychological impairments.