

## Optimizing sedation and analgesia in the ICU: A long journey

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The term hypnotic derives from “hypnos,” the Greek god of sleep, who relieved men from the weariness of their labors at the end of the day. It is difficult to imagine a group of patients more in need of sedative-hypnotic agents than those in the intensive care unit (ICU). In this high-stress environment, sedation and analgesia is required to facilitate tolerance of the endotracheal tube and tracheal suctioning<sup>(1)</sup>. Even patients who are not intubated may find the ICU environment very anxiety-provoking. Furthermore, sleep deprivation may delay the process of weaning from ventilatory support. Agitation and the associated psychological distress can result in accidental extubation or displacement of vital catheters and monitors. Acidosis or respiratory failure may result in tachypnea, leading to an increase in the work of breathing and oxygen consumption.

In some patients it is necessary to use muscle relaxants to facilitate mechanical ventilation and also to treat patients with decreased cranial compliance who might be seriously injured by coughing-induced increases in intracranial pressure. In these instances, there is a risk in subjecting the patient to the distress of being aware while paralyzed. It has been recommended that paralyzed patients be treated as though they are conscious and frequently reoriented to time and place. Paralysis may reduce the requirements for sedative and analgesic drugs by abolishing muscle spindle input to the reticular activating system; however, in the current practice environment, muscle relaxants are used only when they are clinically indicated, after first ensuring a lack of patient awareness. The modern trend away from the use of muscle paralysis stems partly from the advent of intermittent mandatory ventilation.

Sedation-analgesic techniques have become increasingly important with the development of improved IV titration and cerebral monitoring techniques. The use of long-acting benzodiazepines (eg, diazepam, lorazepam) and opioid an-

algesics (e.g., morphine) has been replaced by shorter-acting and more titratable sedative-analgesic drugs (e.g. propofol, remifentanyl, dexmedetomidine).

Propofol and midazolam infusions are currently the mainstays of sedation in the ICU. The development of central tolerance to its sedative-hypnotic effects and the occurrence of hyperlipidemia tend to limit the use of propofol as the sole agent when sedation is required for periods longer than 48-72 hours. However, midazolam displays tremendous pharmacokinetic and dynamic variability and may have an even greater propensity to accumulate in critically ill patients. The availability of the short-acting opioid analgesic, remifentanyl, reduces the dosage requirements for both of these sedative-hypnotic drugs. In addition to reducing the sedative-hypnotic dosage requirement, dexmedetomidine, a potent alpha-2 agonist, markedly reduces the opioid analgesic requirement in the ICU. Monitoring the level of sedation is a rapidly emerging field, and the availability of a less costly and more reliable depth of sedation monitors will further reduce the risk of drug accumulation and prolonged recovery. Since it is difficult to accurately define dosing strategies for sedative drugs, these agents must be carefully titrated against their clinical and/or electrophysiological effects on the brain. The clinically-useful dosage ranges for sedative-hypnotics is generally reduced in critically-ill patients. However, there is greater variability in the sedative and analgesic infusion rates required to produce adequate sedation and analgesia due to the rapid development of tolerance to the central nervous system depressant effects of these short-acting drugs.

This presentation will review the peer-reviewed literature relating to the clinical practices which have evolved over the last 25 years as they relate to the use of sedative and analgesic medication in the ICU setting in order to enhance patient comfort and improve clinical outcomes.

### MULTIPLE-CHOICE QUESTIONS:

1. What is the MOST common complaint of patients regarding their ICU stay?
  - a) Pain
  - b) Thirst
  - c) Anxiety
  - d) Nausea
2. Of these currently available sedative and analgesic drugs possess the most profound combination of sedative AND analgesic properties?
  - a) Midazolam
  - b) Propofol
  - c) Remifentanyl
  - d) Dexmedetomidine
3. What one of the following factors is NOT an advantage of propofol over midazolam for ICU sedation?
  - a) Ability to titrate
  - b) Pain on injection
  - c) Interpatient variability
  - d) Speed of recovery

### ANSWERS

1. C
2. D
3. B

### REFERENCE

1. Mendel PR, White PF. Sedation of the critically ill patient. *Int Anesthesiol Clin* 1993;31:185-200.

