

Analgesia and Sedation in the ICU

The most common reasons for agitation in ventilated patients are untreated pain, discomfort from the endotracheal tube, and patient-ventilator dyssynchrony. Obviously, the first step in evaluating agitation is to make sure the patient is OK—always check **Tubes, Sounds, and Sats** before increasing sedation. Also, make sure the patient is getting the right amount of inspiratory flow and that there's no auto-PEEP. "Fighting the ventilator" often means that the physician has not set the ventilator properly for the patient.

It's a surprisingly little-known fact that sedatives like propofol and benzodiazepines have no analgesic properties whatsoever. Zero. Zilch. Thus, if untreated pain and discomfort are common reasons for agitation, it makes little sense to treat with a drug that doesn't treat pain or discomfort! Narcotics should be first-line agents for ensuring adequate comfort in ventilated patients and can often be used alone, as long as they are dosed properly. Fentanyl is cheap, effective, and the metabolites don't tend to accumulate in renal failure. Morphine is also cheap and effective, and often will have a euphoric calming effect that fentanyl doesn't have. The metabolites do accumulate in renal or hepatic dysfunction, though, so the dose needs to be reduced; additionally, the histamine release can cause hypotension. The usual dose of **fentanyl** is **25-200 mcg/hour**. The usual dose of **morphine** is **2-10 mg/hour**. Constipation can be problematic with both, and withdrawal is more common than you think after several days/weeks of use.

Intermittent methadone is a good alternative for patients who have ongoing need for analgesics, and it doesn't have the rapid onset/offset that the IV narcotics do (with the accompanying hyperalgesia). A good starting dose is **5 mg PO every 8 hours**. Methadone is also easy to taper gradually, helping to avoid narcotic withdrawal.

Propofol is a sedative/hypnotic that can only be used on ventilated patients. It is a reliable sedative that has a quick offset, which makes it very useful in neurocritical care; it also lowers intracranial pressure. Downsides include hypotension and bradycardia (it behaves like a calcium channel blocker) and, at high doses, propofol infusion syndrome. The usual dose of **propofol** is **10-50 mcg/kg/min**. Propofol infusion syndrome is characterized by shock, metabolic acidosis, and cardiac dysrhythmias. Often fatal. It's usually seen with doses >70 mcg/kg/min. Hypertriglyceridemia may be a warning sign that the lipid-based propofol isn't being metabolized effectively.

Benzodiazepines are sedative/hypnotic drugs that are frequently used in the ICU. Midazolam is a quick-onset, titratable drug that is used as a continuous infusion. Midazolam is not a good drug for intermittent dosing due to its quick offset (about 15-20 minutes). Lorazepam, on the other hand, is a good drug for intermittent dosing, but its long duration of action means that it is not titratable as a continuous infusion. Both are useful in the treatment of status epilepticus or alcohol withdrawal syndromes. Benzodiazepines frequently cause delirium in ICU patients, especially those with renal dysfunction and the elderly. They should not be used as a first-line agent for sedation. The usual dose of

midazolam is **2-10 mg/hour**. The usual dose of **lorazepam** is **1-4 mg IV/PO every 4-8 hours**.

Dexmetetomidine is a central alpha-receptor antagonist, similar to clonidine. It has more sedating CNS effects than clonidine and less bradycardia and hypotension, but those do occur. This drug can be useful in both intubated and nonintubated patients as a standalone sedative, especially in those with delirium where benzodiazepines are not desirable. Adding dexmetetomidine to other sedative infusions is usually not helpful and may cloud the patient's consciousness even further. The usual dose of **dexmetetomidine** is **0.2-1.0 mcg/kg/hour**. Note that this is mcg/kg/hour, which is an uncommon dosing unit.

Sedation and analgesia should be titrated by the nursing staff using a standardized scale. The one in use at Palmetto Health Richland is the Richmond Agitation Sedation Scale, or RASS:

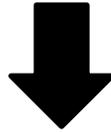
| <u>Score</u> | <u>Term</u> | <u>Description</u> |
|--------------|-------------------|---|
| +4 | Combative | Overtly combative, violent, immediate danger to staff |
| +3 | Very agitated | Pulls or removes tube(s) or catheter(s); aggressive |
| +2 | Agitated | Frequent non-purposeful movement, fights ventilator |
| +1 | Restless | Anxious but movements not aggressive vigorous |
| 0 | Alert and calm | |
| -1 | Drowsy | Not fully alert, but has sustained awakening (eye-opening/eye contact) to voice (>10 seconds) |
| -2 | Light sedation | Briefly awakens with eye contact to voice (<10 seconds) |
| -3 | Moderate sedation | Movement or eye opening to voice (but no eye contact) |
| -4 | Deep sedation | No response to voice, but movement or eye opening to physical stimulation |
| -5 | Unarousable | No response to voice or physical stimulation |

A common way to order sedation would be to "titrate for RASS -1 to -2."

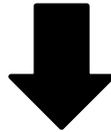
Stepwise approach to sedation and analgesia for a ventilated patient:

Titrate for RASS -1 to -2. Add an additional agent (e.g. go down an arrow) only if this can't be done with the existing medication.

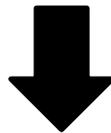
Fentanyl 25-200 mcg/hour
OR
Morphine 2-10 mg/hour



Lorazepam 1-4 mg IV q 4h PRN



Dexmetomidine 0.2-1.0 mcg/kg/hour
OR
Propofol 10-50 mcg/kg/min



Midazolam 2-10 mg/hr