Adult ICU Pain and Sedation Guideline for Mechanically Ventilated Patients

Exclusion Criteria:
- Patient receiving sedation for seizures, ETOH withdrawal or other condition where stopping sedation would be detrimental or patients receiving neuromuscular blockade

General Principles:
- Intermittent bolus doses should be trialed before continuous infusions of sedatives and analgesics
- Patients admitted to the unit already receiving continuous infusions should have these infusions stopped to assess need for continuous vs. bolus dose therapy
- Always assess for and treat pain first! Every attempt should be made to optimize analgesia (Non verbal pain score 0-3, ≤ 5 on 0-10 scale) before initiating sedatives
- The Sedation-Agitation Scale (SAS) is used to assess the sedation/agitation level of the patient. The goal SAS for patients is 3-4 unless otherwise specified by provider order
- Consider if symptoms of breakthrough pain or agitation are related to patient care activities. These episodes should be treated with bolus doses of either midazolam, propofol, or fentanyl while maintaining the current continuous infusion rate
- Prior to any increase in either midazolam or fentanyl infusions, a bolus dose MUST be given. This bolus dose should be equivalent to the current hourly infusion rate
- Reassess and document the level of sedation and analgesia every hour

Pain Management: NVPS>3
- Initiate Hydromorphone 1 mg IV x1, reassess in 5-15 min
  - If NVPS≤3 then start 1 mg IV q2h prn
  - If NVPS>3 then give 1mg IV x1, reassess in 5-15 min
    - If NVPS≤3 then start 1mg IV q2h prn
    - If NVPS> 3 then give 1 mg IV x1 and initiate Fentanyl infusion 50mcg/hr
  - For patients on q2h prn therapy if NVPS>3 on three consecutive assessments consider switching to a Fentanyl infusion
- Usual Fentanyl continuous infusion dose: 25 – 250 mcg/hour
- Initiate Fentanyl infusion at dose ordered by provider. Continuous Fentanyl infusion order includes an order to administer a Fentanyl bolus dose equivalent to the current hourly rate Q1 hour PRN for breakthrough pain
- Titrate Fentanyl infusion in 25 mcg/hr increments to a NVPS ≤ 3 or to ≤ 5 on a 0-10 pain scale
- Prior to any increase in Fentanyl infusion rates, Fentanyl bolus doses equivalent to the currently hourly infusion rate should be administered
- If the Fentanyl infusion dose exceeds 250 mcg/hour, contact provider to discuss additional options

Sedation Management: SAS>4
- Initiate Midazolam 2 mg IV x1, reassess in 5-15 min
  - If SAS≤4 then start Midazolam 1mg IV q1h prn SAS>4
  - If SAS>4 then give Midazolam 2mg IV x1 reassess in 5-15 min
    - If SAS≤4 then start Midazolam 1 mg IV q1h prn SAS>4
    - If SAS>4 then give Midazolam 2mg IV x1 and initiate a Midazolam infusion at 2mg/hr or if hemodynamically stable a Propofol infusion at 20 mcg/kg/min
  - For patients on q1h prn therapy, if SAS>4 on three consecutive assessments consider switching to a Midazolam or Propofol infusion
Usual continuous infusion dose is 0.5-10 mg/hour for Midazolam and 5-65 mcg/kg/min for Propofol

Initiate Midazolam or Propofol infusion at dose ordered by provider. Continuous infusion or dosing for Midazolam includes an order to administer Midazolam bolus doses equivalent to the current hourly rate Q1 hour PRN for breakthrough agitation. Continuous infusion orders for Propofol includes an order to administer a Propofol bolus of 10 mg every 5 minutes for moderate agitation (SAS 5) or 20 mg every 5 minutes for severe agitation (SAS 6-7).

Titrate Midazolam in 1 mg/hr increments or Propofol in 5 mcg/kg/min increments to a SAS of 3-4.

Prior to any increase in Midazolam infusion rates, a bolus doses equivalent to the currently hourly infusion rate should be administered.

If dose exceeds 10 mg/hour for Midazolam or 65 mcg/kg/min for Propofol, contact provider to discuss additional options.

Additional Agents:

**Propofol**

Indications:
- Considered first line therapy for sedation in patients requiring frequent neurologic assessments (e.g. q1h)
- Considered a first line therapy for sedation in patients requiring continuous sedation if hemodynamically stable
- May be considered for added synergy or to help facilitate extubation in patients requiring high doses of benzodiazepines
- May be utilized in patients with refractory seizures or in the treatment of alcohol withdrawal. For either of these indications, higher doses (> 50 mcg/kg/minute) are often required.

**DO NOT USE:**
- Patients not able to tolerate a potential drop in SBP > 20 mmHg or HR > 10 BPM
- Hemodynamically unstable patients defined as a SBP < 90 mmHg, MAP < 65 mmHg,
- HR < 55 BPM
- In place of standard therapy for the treatment of substance withdrawal (e.g. benzodiazepines for alcohol withdrawal)

Usual continuous infusion dose is 5 – 65 mcg/kg/min

Initiate infusion at dose ordered by provider, continuous infusion order includes an order to administer bolus doses of 10mg q5 minutes prn for moderate agitation (SAS of 5) and 20 mg q5 minutes prn for severe agitation (SAS of 6-7) as long as hemodynamically stable (SBP > 90 mm Hg or MAP ≥ 65 mm Hg).

Any increases in infusion rate should be made in 5 mcg/kg/minute increments no more frequently than q10 minutes until SAS of 3-4 is achieved.

If the dose exceeds 65 mcg/kg/minute contact provider to discuss options. Doses should not exceed 80 mcg/kg/minute.

Consider adding intermittent dose benzodiazepines either ATC or PRN in patients requiring > 50 mcg/kg/min.

Infusion line should be changed q12h due to lipid content and risk for microbial growth.

When infusion rates are > 50 mcg/kg/minute:
- Check triglycerides Mon/Wed/Friday
  - If triglycerides > 500 consider discontinuing propofol and choosing an alternative agent, however make sure level was not drawn from the same line propofol was infusing through
- Check CK level daily
- Monitor for unexplained anion gap metabolic acidosis (lactic acidosis)
  - High dose propofol (> 50 mcg/kg/minute for > 48 hours) may cause propofol infusion syndrome. Propofol related infusion syndrome (PRIS) is characterized by metabolic...
acidosis, hypotension, bradyarrhythmias, lipemia, rhabdomyolysis, and cardiac failure. If suspect PRIS, propofol should be stopped immediately and an alternative sedative agent be utilized.

**Dexmedetomidine**
- **Indications:**
  - Use as an adjunctive, short-term (≤ 72 hours) sedative agent for patients in the ICU, OR, or PACU setting who have failed or are intolerant to primary therapy, including propofol, benzodiazepines, haloperidol, and atypical antipsychotics
  - Use as a sedative agent to facilitate extubation in patients who are not able to be weaned from conventional medications used for pain/sedation (benzodiazepines, propofol, haloperidol, etc) for a duration not to exceed 72 hours
- **DO NOT USE:**
  - Patients not able to tolerate a potential drop in SBP > 20 mmHg or HR > 10 BPM
  - Hemodynamically unstable patients defined as a SBP < 90 mmHg, MAP < 65 mmHg, HR < 55 BPM
  - In place of standard therapy for the treatment of substance withdrawal (e.g. benzodiazepines for alcohol withdrawal)
  - Patients receiving neuromuscular blocking agents
- **Usual continuous infusion dose is 0.2-1.5mcg/kg/hr**
- **Initiate infusion at dose ordered by provider and increase by 0.1 mcg/kg/hr q 30 minutes until a SAS or 3-4 is achieved**
- **Dexmedetomidine has analgesic effects, however patients with major pain and discomfort may need an additional analgesic agent**

**Remifentanil**
- **Indications:**
  - Use as an analgesic agent in patients requiring frequent neurological assessments (e.g. q1h), however once frequent assessments are no longer required fentanyl should be used
- **Usual continuous infusion dose is 0.05-0.2 mcg/kg/min**
- **Initiate infusion at dose ordered by provider and increase in 0.01 mcg/kg/min increments to a NVPS ≤3**
- **If dose exceeds 0.2 mcg/kg/min, contact provider to discuss additional options**

**Ketamine**
- **Indications:**
  - This guideline refers to the use of ketamine as an adjunctive sedative/analgesic agent in MECHANICALLY VENTILATED patients for ICU sedation
  - Use of ketamine for this indication DOES NOT require an acute pain service/palliative care consult, however use should be discussed with an ICU attending
  - Use of ketamine for the treatment of intractable pain in NON-INTUBATED patients is outside the scope of this guideline and DOES require an acute pain service/palliative care consult. Please refer to policy 8.11.3 and the ketamine dose guidelines put together by palliative care for these patients.
  - Clinical situations where ketamine may be appropriate:
    - Opioid tolerance due to its analgesic effects as well as its ability to reduce central sensitization
    - Status asthmaticus/COPD due to its bronchodilating effects
    - Hemodynamic instability due to its sympathomimetic effects
  - Produces a cataleptic state where eyes may remain open
- **USE WITH CAUTION:**
- Patients with hypertension and/or tachycardia, decompensated heart failure, pulmonary hypertension
- Patients with or at risk for delirium/psychiatric illness, may exacerbate or cause delirium
- Patients with seizure disorders, may cause seizures, but has also been used to treat status epilepticus
- Patients with increased intraocular pressure

**Usual dose for sedation/analgesia in MECHANICALLY VENTILATED patients:**
- Bolus: 0.5-1 mg/kg can be given prior to starting the infusion
- Infusion: 0.5-1 mg/kg/hr with the usual range being 0.1-4.5 mg/kg/hr (Alaris soft max: 2 mg/kg/hr)
  - Please note this dose range is much higher than what is used for the treatment of intractable pain in NON-INTUBATED patients
- Opioid sparing doses are typically 0.05-0.5 mg/kg/hr
- Dose can be increased by 0.25-0.5 mg/kg/hr every 30 minutes to achieve a SAS of 4 or NVPS ≤ 3
  - Consider slower titration of 0.1 mg/kg/hr if using lower doses (0.05-0.5 mg/kg/hr)
- Bolus dose and titration can be performed by a nurse who has completed the required education in MECHANICALLY VENTILATED patients

**Daily Sedation Interruption Protocol:**
- To be performed at least once daily by 8:00 AM in ALL patients with a SAS of ≤4
- Sedation/analgesia interruption should be coordinated with Respiratory Therapy
- Sedation and analgesia interruption should be documented clearly on the Critical Care Flowsheet by indicating the SAS and Pain Scores at the time of interruption, the length of time infusions held, and the SAS and Pain Scores at the time of restarting pain and sedation medications (if needed)

**Exclusion Criteria:**
1. Patients receiving sedation for the primary purpose of treating seizures, alcohol withdrawal or other condition where stopping sedation would be detrimental to the patient
2. Patients with increasing oxygen requirements or ventilator dysynchrony
3. Pharmacologically paralyzed
4. Physician order to hold
5. Planned withdrawal of life support

- Hold pain and sedation medications
- Perform SAS/Pain assessment at baseline then q30 minutes until SAS and Pain scores have remained stable for a minimum of 2 assessments
- If at any time after sedation interruption, the patient reaches SAS ≥ 5 bolus with dose equal to 50% of the previous rate and restart the infusion at 50% the previous rate. Also consider using the intermittent dose protocol instead of going back on the infusion if feasible at this time. Delirium may also be contributing to the agitation, see delirium protocol for assessment and
treatment. Adjust subsequent dosing of sedatives and analgesics per the pain and sedation
guideline.

**Sedation Reduction Protocol:**

- For any patient who did not tolerate sedation interruption, consider a sedation reduction
  - Decrease infusion of sedation/analgesia medications by 25%
  - “Sedation Reduction” should be clearly documented on the Critical Care Flowsheet
- Any patient that completed Sedation Interruption in AM and required restart of therapy should receive Sedation Reduction at 8PM

**Selected References**


Kress JP, Pohlman AS, O’Connor MF, Hall JB. Daily Interruption of Sedative Infusions in Critically Ill Patients Undergoing Mechanical

Guidelines are intended to be flexible. They serve as reference points or recommendations, not rigid criteria. Guidelines should be followed in most cases, but there is an understanding that, depending on the patient, the setting, the circumstances, or other factors, guidelines can and should be tailored to fit individual needs.

Approved by CCQC April 2016 (updated to add ketamine)