KETAMINE CONTINUOUS INFUSION FOR INTRAVENOUS SEDATION / ANALGESIA (ADULTS) – ED / ICU

PURPOSE:

To outline the management of the patient who is receiving a continuous ketamine infusion.

SUPPORTIVE DATA:

Ketamine is a general anesthetic with sedative and analgesic properties. This standard covers its use for continuous infusion in the ICU and ED. This standard does not apply to procedural sedation. The patient must be receiving mechanical ventilation if on a dose of greater than 15 mcg/kg/minute. In the ED, though, the patient receiving Ketamine infusion **must** be receiving mechanical ventilation.

Ketamine loading doses and boluses are administered by the provider. Ketamine boluses should only be given when absolutely necessary (e.g. for extreme agitation), require the presence of the attending physician during administration and are administered by the provider. The desired effect is achieved in 1-3 minutes and the duration of action is 10-15 minutes. Most patients are alert in less than 15 minutes after the infusion is discontinued. Concurrent administration of a low dose benzodiazepine may be desired.

Ketamine must be titrated to a specific physician ordered score on the Richmond Agitation-Sedation Scale (RASS) if being used for sedation or ordered pain scale if used for pain management.

Ketamine is contraindicated in patients with known hypertensive encephalopathy and severe psychosis.

Caution should be used in patients with known or presumed coronary artery disease (CAD).

Hypertension and emergence reactions (psychological manifestations, e.g. hallucination, vivid dreams, delirium) are common adverse effects.

ASSESSMENT:

1. Verify patient is on a mechanical ventilator prior to initiating infusion (if being used for sedation).
2. Assess the following immediately prior to initial administration and a minimum of every hour:
   - Blood pressure
   - Heart rate
   - Respiratory rate
   - Oxygen saturation
   - End tidal carbon dioxide (ETCO2) (as ordered)
   - Level of consciousness
   - Presence/absence of anxiety or agitation
3. Determine concentration and verify dosage upon initiation, within one hour of assuming care of the patient or earlier as clinically appropriate, and with bag changes. In addition, verify accurate dosage with every rate change.
4. Assess the following prior to and after each titration and provider administered bolus, and a minimum of every 2 hours:
   - VS and oxygen saturation
   - RASS score (prior to bolus only) if ordered for sedation

- Pain score if ordered for pain management

5. Assess for the following adverse effects a minimum of every 2 hours:
   - Increased pulmonary secretions, hypersalivation
   - Tachycardia/ Bradycardia
   - Hypertension/ Hypotension
   - Signs of increased ICP (e.g. unequal pupils)

ADMINISTRATION/ TITRATION:

6. Administer medication as ordered. The following are recommended:
   - Use premixed medication: 500 mg in 250 mL bag (concentration 2 mg/mL)
   - For sedation in intubated patients (ICU/ED)
     - Loading dose: 0.5 – 1 mg/kg IV push over 1 minute administered by the provider
     - Maintenance dose: 5 – 50 mcg/kg/minute
     - Increase by 5 mcg/kg/minute every 10 minutes until maximum ordered dose is reached or desired sedation level (RASS score) is achieved
   - For analgesia in non-intubated patients (ICU only):
     - Loading dose: 0.1 - 0.5 mg/kg IV push over 1 min administered by the provider
     - Maintenance dose: 1 - 15 mcg/kg/minute
     - Increase by 1 mcg/kg/minute every 10 minutes until ordered maximum dose is reached or desired pain score is achieved

7. Administer via infusion pump with Guardrails.
8. Administer I.V. Ketamine as ordered.
   Order to include:
   - Desired RASS score or pain scale score
   - Rate (dose)
   - Maximum rate of infusion usually:
     - Sedation 50 mcg/kg/minute
     - Analgesia 15 mcg/kg/minute
   - Route
   - Holding parameters (i.e. blood pressure >180/120)

DISCONTINUATION:

9. Decrease infusion as ordered by 5 mcg/kg/min every 10 minutes.
10. Stop infusion as ordered 10 to 15 minutes prior to extubation.

SAFETY:

11. Ensure the following:
    - Patient is receiving mechanical ventilation if being administered for sedation
    - Infusion pump Guardrails is used for administration of continuous infusion
    - Intravenous line is patent

12. Verify medication administration record (MAR) and pump settings with second RN prior to administering each new bag for correct:
    - Medication
    - Dose
    - Concentration
    - Pump settings
    - Patient

REPORTABLE CONDITIONS:

13. Discontinue infusion and notify provider immediately for the following:
    - Significant change in VS or oxygen saturation
    - Arrhythmias

14. Notify provider for:
    - Increased pulmonary secretions, hypersalivation
    - Tachycardia/ bradycardia
    - Hypertension/ hypotension
    - Increased ICP (for patients with intracranial pressure monitoring)
    - Signs of increased ICP (e.g. unequal pupils)
    - Allergic response
    - Sedation / analgesia is not achieved

PATIENT/FAMILY TEACHING:

15. Instruct on the following:
    - Purpose of the drug
    - Possible side effects
    - To notify the nurse of side effects

ADDITIONAL STANDARDS:

16. Refer to the following as indicated:
    - Mechanical Ventilation - ICU
    - Artificial Airway - ICU
    - Sedation and Analgesia (Intravenous) – ICU
    - Pain Management

DOCUMENTATION:

17. Document in accordance with “documentation standards”.
18. Document infusion and bolus dosages in MAR.

Richmond Agitation Sedation Scale (RASS) *

Score	Term	Description	
+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)	Verbal Stimulation
-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	Physical Stimulation
-5	Unarousable	No response to *voice or physical* stimulation	

Procedure for RASS Assessment

1. Observe patient
   a. Patient is alert, restless, or agitated. **(score 0 to +4)**
2. If not alert, state patient's name and *say* to open eyes and look at speaker.
   b. Patient awakens with sustained eye opening and eye contact. **(score –1)**
   c. Patient awakens with eye opening and eye contact, but not sustained. **(score –2)**
   d. Patient has any movement in response to voice but no eye contact. **(score –3)**
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   e. Patient has any movement to physical stimulation. **(score –4)**
   f. Patient has no response to any stimulation. **(score –5)**

* Sessler CN, Gosnell M, Grap MJ, Brophy GT, O'Neal PV, Keane KA et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. Am J Respir Crit Care Med 2002; 166:1338-1344.

* Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S et al. Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). JAMA 2003; 289:2983-2991.

REFERENCES:

- Barr J, et al. Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit (2013). Critical Care Medicine; 41:263-306
- Cat, T., & Tucker, C. (2016). Use of ketamine for sedation and pain management in the intensive care unit. Society of Critical Care Medicine Clinical Pharmacy and Pharmacology Section Newsletter, 16(3), Society of Critical Care Medicine.
- Miller AC, Jamin CT, Ealmin EM (2011). Continuous Intravenous Infusion of Ketamine for maintenance sedation. Minerva Anestesiol; 77:812-20
- Schwenk, E. S., Viscusi, E. R., Buvanendran, A., Hurley, R. W., Wasan, A. D., Narouze, S., et al. (2018). Consensus guidelines on the use of ketamine infusions for actute pain management from the American Society of Regional Anesthesia and Pain Medicine and the American Society of anesthesiologists, Regional Anesthesia and Pain Medicine; 43: 1-11.
- LAC+USC Clinical Resources: Micromedix and UptoDate drug info (Lexi-comp)
- DHS Clinical Standardized Guidelines
- LAC+USC Ketamine Continuous Infusion for Intractable Epilepsy (Adults)

Initial date approved: 4/17	Reviewed and approved by: Professional Practice Committee Pharmacy & Therapeutics Committee Nurse Executive Council Attending Staff Association Executive Committee	Revision Date: 12/17, 10/18, 06/19