Ketamine (Low Dose): Continuous Intravenous Infusion

Site Applicability

Acute Care units SPH and MSJ (HAU/PACU)

Practice Level:

Advanced skill: Registered Nurses (RN) who have completed PCA module pump education and training and maintain Q2 yearly competency review

Need to Know:

1. Ketamine is a diverse anesthetic agent that has analgesic, dissociative, sedative and amnesiac properties.
2. Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist and the NMDA receptor plays an active role in the development of central hyperactive pain states such as hyperalgesia and allodynia.
3. In **small, sub anesthetic doses**, ketamine has been shown to help treat acute and neuropathic pain, pain that is refractory to opioids and hyperalgesia.
4. Patients on low dose ketamine infusions may still receive multimodal analgesia such as (but not limited to) opioids, NSAIDs, acetaminophen and low dose lidocaine infusion as ordered.
5. IV ketamine can be administered via peripheral or central IV lines.
6. Ketamine infusions should NOT be administered to persons with hypersensitivity to ketamine untreated/uncontrolled hypertension, glaucoma, previous CVA, severe cardiac decompensation.
7. After IV or subcutaneous administration, onset is rapid, usually within 30 seconds, with duration of 5 to 10 minutes. There are no antagonists to ketamine.
8. When ketamine is used at low doses, side effects are infrequent but may still occur. Potential side effects include:
    - Tachycardia
    - Dysphoria (restlessness, agitation, anxiety)
    - Vivid dreams or nightmares

- Irrational behavior
- Confusion
- Hallucinations
- Hypertension
- Salivation
- Nausea
- Amnesia

9. The co-administration of lorazepam (benzodiazepines) or clonidine (Alpha A agonist) can help minimize and prevent side effects.
10. Ketamine can potentiate the effects of opioids; respiratory depression is usually associated with opioids as ketamine preserves respiratory drive and self-protective muscle. Consider administration of naloxone if POSS 3 or greater and RR less than 8 per minute.
11. For **continuous ketamine infusions** only the PCA module is used. The PCA dose request cord is **not used** and is left attached to pump and secured to back of module.
12. PCA syringe modules are placed in the soiled utility room promptly when ketamine is discontinued. Remove all IV tubing connected to the pump before leaving it in the soiled utility room.

Equipment and Supplies:

1. Alaris PCA CareFusion Pump
2. Alaris PCA Pump Module and key
3. Alaris PCA tubing set
4. Ketamine infusion Powerplan (ordered and activated)
5. Medication syringe for intravenous infusion
6. For 8D: Medication infusion bag

Protocol

For in-patients on general units

Ketamine is infused intravenously via Alaris Smartpump with Adult General drug library profile: ketamine continuous. The medication will be in a pharmacy-prepared syringe and programmed via a locked PCA module, with a maximum dose of 30 mg/h. A maintenance IV (TKVO) will be required at Y-site.

Note: first program DOSE in mg/hour i.e. DOSE _____ mg/h on pump (rate (mL) /hour will auto populate based on the dose) to a maximum dose of 30 mg/h.

For MSJ HAU/PACU ONLY

Ketamine is infused intravenously via Alaris Smartpump with Adult General drug library profile: ketamine continuous: Pain. **Note**: first program DOSE in mg/hour i.e. DOSE _____ mg/h on pump (rate (mL) /hour will auto populate based on the dose) to a maximum dose of 30 mg/h.

Ketamine vials are stocked in the ADC in PACU/HAU at MSJ. Registered nurses will mix the infusion bag to a concentration of 5 mg/ml as per the PDTM. A maintenance IV (TKVO) will be required at Y-site.
Dilute 250 mg ketamine in NS 50 mL **OR** dilute 500 mg ketamine in NS 100 mL

For Interventional Pain Clinic out-patients (8D):

Ketamine is infused intravenously via Alaris Smartpump with Adult General drug library profile: ketamine continuous and 'pain chronic neuro' therapy selection. The medication will be in a pharmacy-prepared infusion bag with a maximum dose of 55 mg/h.

NOTE: All set up and changes in programming will require an independent double check by a second PCA pump competency assessed RN or other qualified clinician (i.e. anesthesiologist) (See BD-00-07-40034 Independent Double Check and Double Check of Medications)

In-Patient Assessment and Monitoring:

A) Initial

Pulse (P), blood pressure (BP), respiratory rate (RR), SpO_2, Pasero Opioid Induced Sedation Scale (POSS), orientation to date, time, place and person and pain assessment (OPQRST) inclusive of pain intensity.

B) Ongoing

P, BP, RR, SPO_2, POSS, Pain intensity and potential side effects: Q1H X 4 hours then Q4H for duration of infusion

Out-Patient 8D Interventional Pain Clinic Assessment and Monitoring:

A) Initial

Pulse (P), blood pressure (BP), respiratory rate (RR), SPO_2, Pasero Opioid Induced Sedation Scale (POSS), orientation to date, time, place and person and pain assessment (OPQRST) inclusive of pain intensity.

B) Ongoing

P, BP, RR, SPO_2, POSS: Q15min for duration of infusion

Potential side effects: Assess Q1H and PRN

Pain Assessment at completion of infusion

Interventions: See Appendix B – Prevention and Management of Potential Problems)

1. Notify the Acute Pain Service / Chronic Pain Service (depending on the service the patient is covered by) if :
    - Inadequate pain control
    - POSS = 3 or greater (see Appendix A)
    - Respiratory rate less than 8/min.
    - Patient has dysphoria
2. If patient has dysphoria (restlessness) or vivid dreams reassure the patient. Provide lorazepam or clonidine if ordered. Consider decreasing dose. If symptoms persist or are bothersome to the patient, stop Ketamine and notify the Acute Pain Service /Chronic Pain Service (depending on the service the patient is covered by)
3. Provide care for patient in a quiet, calm, space.
    a. Consider moving patient to a private/semiprivate room

Patient and Family Education:

1. Review the potential side effects of dysphoria, vivid dreams, salivation, cardiac stimulation (tachycardia) with the patient and family.
2. Encourage patient to report any signs and symptoms of dysphoria or any new onset side effects.

Documentation:

Document assessments in interventions in the patient health record (electronic or paper during a system downtime)

See Appendix C for details regarding documentation

Related Standards & Resources

1. Parenteral Drug Therapy Manual Monographs - Ketamine

References:

1. Allen, C., & Ivester, J. (2017). Ketamine for pain management: Side effects & potential adverse events. *Pain Management Nursing, 18, (6),* 372-397
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4. Klaess, C., Jungquist, C. (2018). Current Ketamine practice: Results of the 2016 American Society of Pain management nursing survey on Ketamine. *Pain Management Nursing , 19 (3),* 222-229.
5. Polomano, K.; Buckermaier, C.C. (3rd); Kwon, K.H.; Hanion, A. L.;Rupprecht,C.; Goldberg, C. & Gallagher, R. M. Effects of low-dose IV ketamine on peripheral and central pain from major limb injuries sustained in combat. Pain Medicine, 14 (7), 1088 to 1100.
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8. Zachine, J.; Samarcq, D.; Lorne, E.; Moutravers, P.; Beloucif, S.& Dupont. H. (2008). Postoperative ketamine administration decreases morphine consumption in major abdominal surgery: a prospective, randomized, double-blind, controlled study. Pain, 106, 1856-1861.

Persons/Groups Consulted:

Anesthesiologist, Pain Specialist

Medication Use Evaluation Pharmacist, Secretary PHC P&T

Nurse Educator, Surgery

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Appendix A: Pasero Opioid Induced Sedation Scale (POSS)

Pasero Opioid-Induced Sedation Scale (POSS)		
Score	**Meaning of Score**	
S	Sleep, easy to rouse	**Acceptable**; no action necessary; may increase opioid dose if needed ***do not document S in the first 24 hours of therapy –** you must wake the patient to assess sedation
1	Awake and alert	**Acceptable**; no action necessary; may increase opioid dose if needed
2	Slightly drowsy, easily roused	**Acceptable**; no action necessary; may increase opioid dose if needed
3	Frequently drowsy, rousable, drifts off to sleep during conversation	**Unacceptable;** • NOTIFY prescriber /APS for adjustment of opioid orders; hold next dose of oral opioids and if PCA also in use, remove PCA button until direction from prescriber received • Monitor respiratory status and sedation closely until POSS is 2 or better and respiratory rate equal or greater than 8 • If possible and/or patient condition allows, sit patient in high fowlers position • Consider administering a non-sedating, non-opioid analgesic for pain i.e. acetaminophen or NSAID and use non pharmacological approaches to pain i.e. position changes, warm blanket, ice pack
4	Somnolent, minimal or no response to verbal and physical stimulation (use trapezius muscle squeeze for physical stimulation - do not use sternal rub)	**Unacceptable;** • stop opioid • oxygen by mask 10 L/min and monitor vital signs • administer naloxone as per order • IMMEDIATELY page Prescribing Service STAT • **PROVIDE AIRWAY and BREATHING SUPPORT** • **DO NOT re-commence opioid therapy prior to patient being seen by the prescribing service physician**

Appendix B: Prevention and Management of Potential Problems

POTENTIAL PROBLEMS	INTERVENTIONS
Dysphoria	If symptoms causing distress and/or patient is agitated: • Reassure patient • Give Lorazepam or clonidine if ordered • Consider decreasing dose If dysphoria persists or lorazepam not ordered • Stop ketamine infusion • Contact Acute Pain Service /Chronic Pain Service (depending on the service the patient is covered by)
Inadequate Pain Control	• Titrate infusion rate up until maximum range dose met as per powerplan orders • If pain control remains inadequate call Acute Pain Service /Chronic Pain Service (depending on the service the patient is covered by)
New onset of tachycardia or increased BP	• Assess patient for symptoms related to tachycardia and elevated BP. • Consider decreasing dose or stopping infusion. • Contact Acute Pain Service /Chronic Pain Service or (depending on the service the patient is covered by)
Respiratory Rate less than 8 **OR** POSS 3 or greater	• Stop ketamine infusion • Contact Acute Pain Service /Chronic Pain Service (depending on the service the patient is covered by)

Appendix C Documentation In-Patient Medical/Surgical

1. Sedation Assessment:

Location in Cerner	What to Document	Frequency
Interactive View and I&O; Pain Management band; Sedation Scale; Sedation Scale Used	Pasero Opioid Induced Sedation Scale	
Pasero Opioid Induced Sedation Scale	1 = Awake and Alert 2 = Slightly drowsy, easily roused 3 = Frequently drowsy, rousable, drifts off to sleep during conversation 4 = Somnolent S = ~~Sleep, easy to rouse~~ *Do not use in the first 24 hours of infusion	**Initiation:** • Q1h X 4h • then Q4H and PRN

2. Pain Management – Vital Signs:

Location in Cerner	What to Document	Frequency
Interactive View and I&O; Pain Management; Vital Signs	Temperature Pulse SBP/DBP	• Q1h X 4h, then Q4h and PRN
	Respiratory Rate	**Initiation:** • Q1h X 4h • then Q4H and PRN
	Oxygen Therapy: Oxygen flow rate SpO_2 SpO_2 site	• Q1H X 4H then Q4H and PRN

3. Pain Assessment:

Location in Cerner	What to Document	Frequency
Interactive View and I&O; Pain Management; Pain Assessment		Q1h X 4h then Q4H and PRN
• Pain Present	Pain present	
• Resp Rate	Same as VS above	Same as VS above
• Location	Location of pain	Q1h X 4h then Q4H and PRN
• Pain Tool Used	Numeric Pain Scale	
• Numeric Pain Scale ○ Numeric Pain Score ○ Acceptable Pain Numeric ○ Numeric Pain Score with Activity ○ Numeric Pain Score at Rest	0 to 10	

4. Pain Education:

Location in Cerner	What to Document	Frequency
Interactive View and I&O; Pain Management; Pain Education		
Pain Management	Verbalizes understanding Demonstrates Needs further teaching Needs practice/supervision Other	Initial set up and PRN

5. PCA Documentation in Pain Modalities:

Location in Cerner	What to Document	Frequency
Interactive View and I&O; Pain Management; Pain Modalities	Create Dynamic Group: i. Intravenous ii. IV Modality Drug Name Ketamine iii. IV Infusion location	Initial set up
• Infusion Type	Continuous Infusion	Every assessment and /or change

• Verification Type	Change new syringe Change in Caregiver Change in pump programming Initial set up	As applicable
• IDC Completed		When applicable (i.e. any pump programming change, bolus dose, syringe change)
• Pump Related Activity	Pump change Pump cleared Pump labelled Pump stopped Removal, other	When applicable
• Verified Pump Settings With Orders •		Every assessment and /or change
• Adverse Effects	Assess for Dysphoria and nausea If none, document "no adverse effects"	Q4h and prn
• Continuous Rate • Continuous Rate Unit of Measure	Use mg/hr	Q4h and prn and with any changes

6. Potential Complications:

Location in Cerner	**What to Document**	**Frequency**
Pain Management; Pain modalities; IV or Subcutaneous Infusions; Adverse Effects	• Dysphoria • Nausea and vomiting • Sedation • (or document no adverse effects)	On assessment and /or change

7. Once ketamine discontinued, click on ketamine dynamic group, right click and inactivate.