

# PARENTERAL KETAMINE - SCH

## PRACTICE GUIDELINE<sup>®</sup>

### DOCUMENT SUMMARY/KEY POINTS

- Intravenous/Sub-Cutaneous ketamine infusions may be prescribed by medical staff in consultation with a member of the Acute Pain Service/ Anaesthetic Department /Intensive Care Unit Medical Officer/Palliative Care//Senior Oncologist/ Emergency Department Specialist.
- Intravenous/Sub-Cutaneous ketamine infusions must be prescribed on the approved hospital medical treatment form and on the hospital approved medication chart.
- Only those Registered Nurses who are aware of the pharmacology, use and administration of ketamine may care for patients receiving a ketamine infusion.
- Registered Nurses must also be assessed and competent in drug calculation and intravenous drug administration.
- As ketamine may be used in conjunction with an opioid infusion, naloxone must be available on the ward.
- Ketamine has a limited compatibility profile, therefore in some case such as limited IV access, ketamine infusions may need to be administered subcutaneously

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

<b>Approved by:</b>	SCHN Policy, Procedure & Guideline Committee	Original endorsed by SCHN HCQC
<b>Date Effective:</b>	1 August 2016	<b>Review Period:</b> 3 years
<b>Team Leader:</b>	Clinical Nurse Consultant	<b>Area/Dept:</b> Pain Service, SCH

## CHANGE SUMMARY

- Due for mandatory review – no major changes.
- Replaces SCH C.7.K.1 document of the same title.

## READ ACKNOWLEDGEMENT

- All Clinical Nurses and Medical Officers must read and notify their local manager that they understand the content of the document.
- Local managers will maintain records of read receipts for subsequent compliance and other audits.
- Registered Nurses must be assessed competent in drug calculation and intravenous drug administration prior to administering ketamine.

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## 1 Standard

- Intravenous/Sub-Cutaneous ketamine infusions may be prescribed by medical staff in consultation with a member of the Acute Pain Service/ Anaesthetic Department /Intensive Care Unit Medical Officer/Palliative Care/Senior Oncologist/ Emergency Department Staff Specialist.
- Intravenous/Sub-Cutaneous ketamine infusions must be prescribed on the approved hospital medical treatment form and on the hospital approved medication chart.
- Only those Registered Nurses who are aware of the pharmacology, use and administration of ketamine may care for patients receiving a ketamine infusion. Registered Nurses must also be assessed and competent in drug calculation and intravenous drug administration.
- As ketamine may be used in conjunction with an opioid infusion, naloxone must be available on the ward.
  - Ketamine has a limited compatibility profile, therefore in some case such as limited IV access, ketamine infusions may need to be administered subcutaneously.

## Outcomes

- Parenteral ketamine infusions are administered in a safe, effective manner.
- Patient achieves an optimal level of analgesia.

## 2 Introduction

Ketamine is a rapid acting anaesthetic agent used for induction and maintenance of anaesthesia and as an intravenous analgesic/sedative. It has potent analgesic properties and produces dissociative anaesthesia in high doses. This dissociative state is characterised by profound analgesia and amnesia, often with the retention of protective airway reflexes and independent respirations. A patient's eyes may remain open and the corneal and light reflexes may remain intact. The body may develop a hypertonic state with occasional spontaneous movements. Patients may awake slowly and with emergence phenomena such as agitation and hallucinations.

When ketamine is used in sub-anaesthetic doses by the subcutaneous or intravenous route, it may assist in controlling acute or chronic pain. It seems to be particularly useful for severe pain, which is not well controlled by other agents. It is also useful for patients who are tolerant to opioids, or to reduce opioid doses in order to minimise adverse effects of opioids.

**Ketamine has no reversal agent.**

## Pharmacology

### *Presentation*

- **100mg/mL injection (must be diluted prior to use)**

Ketamine, in sub-anaesthetic doses, is a non-competitive antagonist at the NMDA receptor, preventing binding of the excitatory amino acid glutamate.

### Pharmacokinetics

- After IV injection, onset of action is rapid (within 1 minute). This anaesthetic effect will last for 5-10 minutes. Recovery is within approximately 15-20 minutes.
- IM injection acts within 3 -4 minutes and the effect lasts 12 -25 minutes, when used in an anaesthetic setting.

Ketamine is rapidly absorbed following parenteral administration and has a plasma half-life is in the range of 2-4 hours. Following administration ketamine is rapidly and extensively distributed throughout the body into highly perfused tissues, including the brain. It is then redistributed from the central nervous system to peripheral tissues resulting in a short-lived therapeutic effect.

Ketamine undergoes extensive hepatic metabolism, with approximately 90% of ketamine excreted in the urine, mostly as metabolites.

Plasma half-life, clearance and volume of distribution (relative to body weight) are not significantly different between adults and children, although absorption following intramuscular injection is more rapid in children.

### Contraindications

- Contraindicated in patients with increased intracranial pressure
- Contraindicated in patients with cerebral trauma, Central Nervous System lesions/tumours, hydrocephalus
- Use with caution in patients with a history of seizures
- Contraindicated in conditions where a significant elevation of blood pressure is hazardous e.g., hypertension
- Contraindicated in patients with eye injuries or raised intraocular pressure
- Restricted use in infants less than 3 months old
- Caution should be used in cases of known pulmonary hypertension

### Adverse Reactions

**Cardiovascular:** Blood pressure and pulse rate are frequently elevated following high dose administration of ketamine. However, hypotension, bradycardia and arrhythmias have been observed. Low dose ketamine causes minimal changes in heart rate and blood pressure.

**Respiratory:** Although respiration is frequently stimulated, severe depression of respiration or apnoea may occur following rapid intravenous administration of ketamine. There may also be an increased production of secretions, which may increase the risk of aspiration.

**Eye:** Diplopia and nystagmus have been noted following administration of ketamine and there may be an increase in intraocular pressure.

**Psychological:** Emergence reactions have been noted. The manifestations vary in severity between pleasant dream like states, vivid imagery, hallucinations and emergence delirium. This can be accompanied by confusion, excitement or irrational behaviour. The duration lasts no more than a few hours; although in a few cases, recurrences have taken place up to 24 hours post-operatively. This emergence phenomena occurs least in those aged 15 years and under and those aged over 65 years. These reactions may be reduced if verbal, tactile and visual stimulation of the patient is minimised during the recovery period. In low doses, severe reactions are unlikely – possible hyperacuity, sensitivity to light and sound and vivid dreams may be seen. Use of benzodiazepines may decrease chance of emergence reactions, although may prolong the half-life of ketamine and increase sedative effects.

**Neurological:** In some patients, enhanced skeletal muscle tone may be manifested by tonic/clonic movements, jerking, which may resemble seizures. May increase ICP, therefore, ketamine is contraindicated in patients with raised ICP (head trauma, hydrocephalus, CNS lesions). Also should be used with caution in patients with history of seizures, as it may also lower the seizure threshold.

**Gastrointestinal:** Anorexia, nausea and vomiting.

**General:** Hypersalivation and increased lacrimation have been reported in a significant number of patients. Anticholinergics (e.g. glycopyrrolate, atropine) are often used concurrently to counter this effect.

Local pain, irritation and erythema can occur at intravenous and subcutaneous injection site. Ketamine is irritating to small veins.

### 3 Guidelines

1. Low dose ketamine infusions have been shown to aid post-operative analgesia when used alone or in conjunction with opioid infusions. When used in conjunction with an opioid infusion, opioid consumption may then be reduced by up to 50%. This may also reduce the incidence of opioid related side effects.
2. Some patients in special situations may require doses in excess of those normally required e.g. Oncology or palliative care patients.
3. Intravenous Ketamine infusions are administered via a PCA giving set as a sideline infusion via a syringe pump.
4. Sub-Cutaneous ketamine infusions are given via a Sub-Cutaneous cannula via a syringe pump
5. Syringes must be changed every 24 hours.
6. The syringe must be clearly labelled as per policy.
7. The line delivering ketamine to the patient must be clearly labelled.
8. Do not commence a ketamine infusion if the child has any signs of respiratory depression or is heavily sedated or difficult to rouse. As per the Opioid Infusion Policy, a *sedation score = 2 would require review by a Medical Officer.*

9. Ketamine is dose responsive:

- **Dosage Recommendations (for infants, children and adolescents)**
- Pain Management/Antihyperalgesia: 100-400 microg/kg/hour
- **Do not use in neonates without further consultation**
- Ketamine is compatible with blood products
- In exceptional circumstances, ketamine may be added to a PCA or Opioid syringe. Typically 1mg ketamine to 1mg morphine, however this dose may need to be adjusted as required.

**Please contact:**

- Pain Management team for recommended doses.
- Please contact the Pharmacy department for information on compatibilities

## 4 Standard Orders

1. An anti-reflux anti siphon PCA administration set is to be used for all intravenous ketamine infusions.
2. Sub-Cut infusions should be administered using a single intravenous administration set without any additional access ports
3. If ketamine is used in conjunction with an opioid infusion, naloxone must be available and given as required (as per Intravenous Opioid Infusion Policy).
4. A sideline infusion of a maintenance fluid running at a minimum of To Keep Vein Open is required (unless on CICU)

**Note:** Naloxone will not reverse any side effects associated with ketamine.

## 5 Prescribing

**The prescriber must:**

1. Place patient identification label on approved hospital medical treatment form and sign clearly.
2. Complete prescription for filling syringes.
3. Clearly sign and date prescription and print name.

## 6 Standard Prescription

- Ketamine 100-400microg/kg/hour intravenously or subcutaneously.

## 7 Syringe Order for Sideline Infusion (as per Guardrails' Settings)

Less than 20 kg: 5 mg/kg up to MAX 100mg in 50mL	Run pump at 100-400 microg/kg/hr (1mL/hr=100 microg /kg/hr)
20-40kg: 5 mg/kg up to MAX 200mg in 50mL	Run pump at 100-400 microg/kg/hr (1mL/hr=100 microg/kg/hr)
40-80 kg: 5 mg/kg up to MAX400mg in 50mL	Run pump at 100-400 microg/kg/hr (1mL/hr=100 microg/kg/hr)
Greater than 80kg: 5 mg/kg up to MAX 600mg in 50mL	Run pump at 100-400 microg/kg/hr (1mL/hr=100 microg/kg/hr)
SUB CUT Infusions: 10mg/kg up to MAX 600mg in 50mL	Run pump at 100-400 microg/kg/hr (Up to 60kg 1mL/hr=200 microg/kg/hr)

**NOTE:** *No regular bolus doses are to be charted*

- A single Clinician Initiated Bolus dose may be administered by senior anaesthetic or pain team medical staff. \*This excludes medical officers in the Emergency Department and Children's Intensive Care Unit.
- This must be charted and signed for on the medication chart under the once only dosing section.
- Nursing staff caring for that patient must be notified at the time of administration.
- Maximum recommended dose 0.1-0.2mg/kg = 1-2mL purge of STANDARD dilution ketamine infusion
- The administering doctor should remain on the ward for a minimum of 10 minutes post bolus.

## 8 Monitoring

- Continuous Pulse Oximetry monitoring is required for the duration of the infusion.
- Patient monitoring will include hourly assessment and documentation of:

- |  |
|--|
| <ol style="list-style-type: none"> <li>1. <b>PAIN SCORE/ FACES SCORE (if awake)</b></li> <li>2. <b>SEDATION SCORE</b></li> <li>3. <b>PULSE RATE</b></li> <li>4. <b>RESPIRATORY RATE</b></li> <li>5. <b>CUMULATIVE DOSE and INFUSION RATE</b></li> <li>6. <b>COMMENTS RE MANAGEMENT OF COMPLICATIONS</b></li> </ol> |
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- Temperature and Blood Pressure – 4<sup>th</sup> hourly.
- Palliative care patients require only 2-4 hourly documentation of observations or as appropriate to circumstances.
- Record Pain/Sedation & Dosing on Pain Forms
- All other observations to be recorded on SPOC

## 9 Documentation

1. All prescription orders must be recorded on the approved hospital medical treatment form.
2. Documentation of observations must be recorded on the approved opioid observation chart.
3. All syringes loaded must be recorded and signed by two Registered Nurses on the approved hospital medical treatment form and in the **SCHEDULE 4 DRUG REGISTER**.

## 10 Commencing Infusion

### Procedure for Commencement of Ketamine Infusion

1. Medical Officer to prescribe Ketamine Infusion as per policy
2. Wash hands thoroughly
3. A 50mL syringe must be loaded and checked by two Registered Nurses according to the prescription and accurately recorded on the approved medical treatment form and in the SCHEDULE 4 DRUG REGISTER.
4. An anti-reflux anti-siphon PCA administration set is to be used for all intravenous ketamine infusions
5. Syringe, with primed administration set attached, is then inserted into pump.
6. Prescription ID is checked against Patient ID bands
7. Pump program is checked
8. Prescription is rechecked by the two Registered Nurses and an additive label completed and attached to the syringe.
9. Check IV cannula site for leakage/inflammation.
10. Connect infusion line to patient.
11. Unclamp line to patient.
12. Press start to commence infusion.

## 11 Bibliography

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