



MONOGRAPH

KETAMINE

Scope (Staff):	Medical, Pharmacy, Nursing, Anaesthetic Technicians
Scope (Area):	All Clinical Areas

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [DISCLAIMER](#)

! HIGH RISK MEDICINE !

QUICKLINKS

Dosage/Dosage Adjustments	Administration	Compatibility	Monitoring
---	--------------------------------	-------------------------------	----------------------------

DRUG CLASS

General anaesthetic.

Ketamine is an N-methyl-D-aspartate (NMDA) antagonist. It is a general anaesthetic which can induce dissociative anaesthesia, and at sub-anaesthetic doses has analgesic effects through modulation of nociceptive inputs in the central nervous system (CNS).¹

Ketamine is a [High Risk Medicine](#) and a [Schedule 8 medication](#)

INDICATIONS AND RESTRICTIONS¹

On general ward areas it is only to be prescribed by the Acute Pain Service (APS) or an anaesthetist. The route of administration depends on the indication.

- Pre-medication, procedural pain, conscious sedation
- Adjunct for acute, chronic, and neuropathic pain
- Induction and maintenance of anaesthesia
- Refractory seizures/status epilepticus

CONTRAINDICATIONS

- Hypersensitivity to Ketamine or any component of the formulation²
- Uncontrolled hypertension³

PRECAUTIONS

- Ketamine increases blood pressure (BP) and heart rate. Use with caution in patients with conditions that may be exacerbated by an increase in BP and/or heart rate (e.g. poorly controlled hypertension, stroke, intracerebral haemorrhage, tachyarrhythmia). Monitor cardiac function closely if used for these patients.⁴
- Psychiatric disorders: may cause hallucinations, irrational behaviour. Minimise stimulation.⁴
- Raised intracranial pressure (head trauma, intracranial mass/abnormalities, intracranial bleed, hydrocephalus): May be further raised.³
- Raised intraocular pressure (glaucoma, ocular trauma): May be further raised.³
- Consider starting with a lower dose of ketamine when using with another CNS depressant.⁵

FORMULATIONS

Listed below are products available at PCH, other formulations may be available, check with pharmacy if required:

- Ketamine vials 200mg/2mL
- Ketamine pre-filled syringes (Baxter®) – 30 mg/30 mL, 400 mg/50 mL.

Imprest location: [Formulary One](#)

DOSAGE & DOSAGE ADJUSTMENTS

Neonates: [Refer to Neonatal Medication Protocols](#)

Dosing in Overweight and Obese Children:

- Calculate dose based on ideal body weight³

Renal impairment:

- No dose adjustment required

Hepatic impairment:

- Consider dose reduction in significant hepatic impairment as elimination of ketamine could be delayed.⁴

GENERAL WARD AREAS:

Preoperative or procedural sedation and analgesia:

Oral (1-18 years): 3-10 mg/kg, 20-30 minutes before the procedure.^{3, 5}

- Start with a lower dose, doses greater than 5 mg/kg should be discussed with anaesthetist before prescribing.
- IV solution may be administered orally, see ADMINISTRATION.⁵

See [Procedural Sedation](#)

Postoperative, phantom limb, neuropathic or chronic pain:

Continuous IV infusion: In general ward areas ketamine must be ordered by APS or an anaesthetist. See [Ketamine Infusion Management in General Ward Areas](#)

Recommended Ketamine Dose ^{3, 6} (If Infusion rates > 2 mL/hr are required it will be at the discretion of the APS)		
Infants, Children and Adolescents	≤ 40 kg	> 40 kg
Dose diluted with sodium chloride 0.9%	5 mg/kg (max 200 mg)	200 mg
Concentration	100 micrograms/kg/mL	4 mg/mL
Infusion Rate	0 – 200 micrograms/kg/hr	0 – 2 mL/hr (0 – 8 mg/hr)
Bolus dose	100 – 200 micrograms/kg	1 – 2 mL (4 – 8 mg)
Maximum dose per hour (including boluses)	400 micrograms/kg/hr	4 mL/hr (16 mg/hr)

EMERGENCY DEPARTMENT:

Procedural Sedation/Analgesia (1-18 years):

Intravenous: 1 – 1.5 mg/kg over at least 1 minute, immediately before the procedure. Further doses of 0.5 mg/kg may be given every 10 minutes as required to achieve adequate sedation or prolonged effect.⁵

Intramuscular: 4 mg/kg, 5 minutes before the procedure. A further dose of 2 mg/kg may be given if adequate sedation not achieved in 15 minutes.⁵

See [PCH Emergency Department Guideline - Ketamine Sedation](#)

CRITICAL CARE:

Procedural sedation/Analgesia (3 months -18 years):

- Intravenous: 1 – 2 mg/kg immediately before the procedure. May repeat doses of 0.5 mg – 1 mg/kg up to every 5-15 minutes if required.¹
- Intramuscular: 3 – 4 mg/kg given 5 minutes before the procedure. May repeat doses of 2 mg/kg after 10 minutes if required.⁵
- Enteral: 3 – 10 mg/kg given 30 minutes before the procedure.⁵
- Continuous intravenous infusion: 0 – 6 microgram/kg/MINUTE¹

Induction and maintenance of anaesthesia (3 months – 16 years):

- Intravenous induction: 1 – 2 mg/kg¹
- Intramuscular induction: 4 – 6 mg/kg. Doses up to 10mg/kg have been used^{1, 3}
- Continuous intravenous infusion: 10 – 45 microgram/kg/MINUTE⁷

ADMINISTRATION**Intravenous Infusion:****General wards**

- Dilute 5 mg/kg (maximum of 200 mg) of ketamine up to a total volume of 50 mL with a compatible fluid, so that 1 mL/hr is equivalent to 0.1 mg/kg/hr.

Paediatric Critical Care – mechanically ventilated patients

Patient's Weight	Concentration (in sodium chloride 0.9%)	Notes
10 kg or less	30 mg in 30 mL (1 mg/mL)	In a 5 kg patient, 2 microg/kg/min = 0.6 mL/hr
Above 10 kg	400 mg in 50 mL (8 mg/mL)	In a 20 kg patient, 2 microg/kg/min = 0.3 mL/hr

- Patients 10 kg or less may be prescribed the higher strength (400 mg in 50 mL) preparation to reduce fluid overload if clinically indicated, at the treating consultant's discretion.
- Patients requiring high doses of ketamine infusion (e.g. anaesthetic doses/refractory seizures) may be prescribed 800 mg in 50 mL preparation to reduce fluid overload if clinically indicated, at the treating consultant's discretion.

Oral:

Draw up the required dose from IV vial, dilute in a small amount of flavoured drink (as it is bitter) and give orally.⁵ Oral ketamine is to be given on an empty stomach to prevent vomiting and aspiration.^{1, 3} See [Procedural Sedation](#).

Intravenous Injection:

Dilute 200mg vial to 20mL with water for injection or sodium chloride to produce a 10mg/mL solution and give as a slow intravenous injection over 2-3 minutes. Rapid administration can lead respiratory depression and hypertension.^{1, 8}

Intramuscular Injection:

Draw up in a Luer lock syringe with 22G needle. Administer undiluted over a few seconds into a large muscle, usually anterolateral thigh or deltoid.³

COMPATIBILITY (LIST IS NOT EXHAUSTIVE)

Compatible fluids: Glucose 5%, sodium chloride 0.9%, water for injections^{3, 8}

Compatible at Y-site: Human albumin, amikacin, amiodarone, atropine, caffeine citrate, calcium gluconate, cefazolin, cefepime, cefotaxime, ceftazidime, cefuroxime, chlorpromazine, clindamycin, clonidine, digoxin, diphenhydramine, dobutamine, dopamine, fentanyl, gentamicin, haloperidol, hydrocortisone sodium succinate, hydromorphone, magnesium sulfate, metoclopramide, metronidazole, midazolam, milrinone, morphine, naloxone, pancuronium, paracetamol, penicillin G, piperacillin/tazobactam, potassium chloride, promethazine, propofol, ranitidine, tobramycin³

Only commonly used drugs are listed below. This is not a complete list of incompatible drugs.

[Compatibilities of IV drugs](#) must be checked when two or more drugs are given concurrently.

INCOMPATIBLE drugs: Aciclovir, barbiturates, furosemide (frusemide), heparin, insulin, meropenem, phenobarbital (phenobarbitone), phenytoin, sodium bicarbonate, co-trimoxazole^{3, 8}

MONITORING**Intravenous administration:**

See Ketamine Infusion Management in General Ward Areas

- Observe and record the following on the age-appropriate observation and response chart and Pain Assessment and Management Record - heart rate, respiratory rate, oxygen saturation, pain intensity score (when awake), sedation score
 - Half hourly for the first two hours from the start of the infusion then, at a minimum, hourly thereafter.
 - Pre and 15 minutes post bolus administration
- Continuous pulse oximetry for infants less than 6 months of age and children with clinical conditions that increase the risk of respiratory compromise
- Functional Activity Score – once per shift and as required when clinical condition indicates

Oral dose in general ward areas:

- Heart rate, respiratory rate, oxygen saturation, blood pressure (if clinically indicated), sedation score (UMSS), pain intensity score (if indicated)
 - Every 15 minutes (at a minimum) during the sedation period

See [Procedural Sedation](#)

ADVERSE EFFECTS⁴

Common: Raised blood pressure and pulse rate, increased muscle tone, nausea, vomiting, lacrimation, hypersalivation, raised intracranial pressure, raised intraocular pressure, emergence reactions (including vivid/unpleasant dreams, confusion, hallucinations, irrational behaviour)

Infrequent: Bradycardia, diplopia, nystagmus, hypotension, pain on injection, erythema, morbilliform rash

Rare: Apnoea, laryngospasm, arrhythmia, anaphylaxis

NOTE: Rapid intravenous injection or high doses may cause respiratory depression and increase in blood pressure.

STORAGE²

- Ketamine is a Schedule 8 medication and must be stored as outlined in the [Schedule 8 and Restricted Schedule 4 Medication](#) Policy.
- Store below 30°C.
- Protect from light.
- Ward prepared solutions for IV administration should be used within 24 hours

INTERACTIONS

This medication may interact with other medications; consult PCH approved references (e.g. [Clinical Pharmacology](#)), a clinical pharmacist or PCH Medicines Information Service on extension 63546 for more information.

Please note: The information contained in this guideline is to assist with the preparation and administration of Ketamine. Any variations to the doses recommended should be clarified with the prescriber prior to administration

Related CAHS internal policies, procedures and guidelines

[Analgesia and Sedation in Paediatric Critical Care](#)

[High Risk Medicines](#)

[Ketamine Infusion Management in General Ward Areas](#)

[PCH Emergency Department Guideline - Ketamine Sedation](#)

[Procedural Sedation](#)

[Schedule 8 and Restricted Schedule 4 Medication](#)

References

1. Ketamine: Paediatric drug information [Internet]. UpToDate. [cited 4 October, 2023]. Available from: <https://www.uptodate-com.pklibresources.health.wa.gov.au/contents/ketamine-pediatric-drug-information>.
2. MIMS Full Product Information: Ketalar. 2021 [cited 4 October 2023]. In: MIMS Online [Internet]. [cited 4 October 2023]. Available from: <https://www.mimsonline-com-au.pklibresources.health.wa.gov.au/>.
3. Clinical Pharmacology: Ketamine Paediatric Monograph [Internet]. Gold Standard Inc. [cited 4 October 2023]. Available from: <https://www-clinicalkey-com.pklibresources.health.wa.gov.au/pharmacology/monograph/333?type=1&n=Ketamine>.
4. Ketamine. [cited 4 October 2023]. In: Australian Medicines Handbook [Internet]. [cited 4 October 2023]. Available from: <https://amhonline-amh-net->

au.pklibresources.health.wa.gov.au/chapters/anaesthetics/general-anaesthetics/iv-general-anaesthetics/ketamine.



5. Ketamine. [cited 4 October 2023]. In: AMH Children's Dosing Companion [Internet]. [cited 4 October 2023]. Available from: <https://childrens-amh-net-au.pklibresources.health.wa.gov.au/monographs/ketamine>.

6. Thalayasingam P, Weber D. Acute Pain Management in Children. In: Sims C, Weber D, Johnson C, editors. A guide to paediatric anaesthesia. 2nd ed. Switzerland: Springer; 2020. p. 199-220.

7. Ketamine. [cited 4 october 2023]. In: BNF for Children [Internet]. [cited 4 october 2023]. Available from: <https://www.medicinescomplete-com.pklibresources.health.wa.gov.au/#/content/bnfc/819808331?hspl=ketaamine>.

8. Burridge N, Collard N, Symons K. Australian Injectable Drugs Handbook. Collingwood, VIC: Society of Hospital Pharmacists of Australia; [cited 2023 October 4]. Available from: <https://aidh-hcn-com-au.pklibresources.health.wa.gov.au/search/ketamine>.

This document can be made available in alternative formats on request for a person with a disability.

File Path:			
Document Owner:	Chief Pharmacist		
Reviewer / Team:	Samara Williams (Senior Pharmacist), Vicki Corkish (Nurse Practitioner APS), Dr David Sommerfield (Consultant Anaesthetist); Dr Simon Erickson (PCC Consultant), Melanie Cairns (PCC CNS), Jessica Swanson (PCC Nurse)		
Date First Issued:	Oct 2016	Last Reviewed:	Nov 2023
Amendment Dates:	Jun 2024	Next Review Date:	Nov 2026
Approved by:	PCH&N Medication Safety Committee	Date:	May 2024
Endorsed by:	CAHS Drug & Therapeutics Committee	Date:	Jun 2024
Standards Applicable:	NSQHS Standards:   NSMHS: N/A Child Safe Standards: N/A		

Printed or personally saved electronic copies of this document are considered uncontrolled



Healthy kids, healthy communities

Compassion

Excellence

Collaboration

Accountability

Equity

Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital