Drug Therapy Protocols: Ketamine

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Date	July, 2022
Purpose	To ensure a consistent procedural approach to ketamine administration.
Scope	Applies to all Queensland Ambulance Service (QAS) clinical staff.
Health care setting	Pre-hospital assessment and treatment.
Population	Applies to all ages unless specifically mentioned.
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Ketamine

Drug class[1]

- Anaesthetic
- Analgesic

Pharmacology

Ketamine is an anaesthetic agent that acts as a NMDA receptor antagonist. At lower doses this drug produces significant analgesia, while the airway reflexes and respiratory drive are preserved.
At higher doses ketamine can be used as an induction agent for anaesthesia. Unlike other general anaesthetics, there is minimal haemodynamic compromise as ketamine acts as a sympathomimetic agent. However this may result in potentially transient tachycardia and hypertension. Ketamine produces a dissociative state and this will cause the patient to potentially have significant issues with perception, resulting in disinhibition or emergence phenomenon.[1–3]

Metabolism

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

Indications[1–4]

- **Severe traumatic pain** (following 0.1–0.2 mg/kg morphine OR 1–2 microg/kg fentanyl) associated with:
  - **fracture reduction and splinting**
  - **multiple or significant fractures** requiring facilitated extrication
  - **patients with splinted fractures** requiring ongoing narcotic analgesia for transport requirements

Indications *(cont.)*

- **Severe traumatic pain associated with burns** (following 0.2–0.3 mg/kg morphine OR 2–3 microg/kg fentanyl AND 1–2.5 mg (adult) OR 0.05 mg/kg (paediatric) midazolam)
- **Induction of anaesthesia**
- **Ongoing traumatic pain unresponsive to narcotics** (following 0.2–0.3 mg/kg morphine OR 2–3 microg/kg fentanyl)
- **Acute behavioural disturbance**[5] (with a SAT score of ≥ 2) unresponsive to droperidol (max dose) administration

Contraindications

- **Analgesia**
  - Allergy AND/OR Adverse Drug Reaction
  - Patients less than 1 year of age
  - GCS ≤ 12
  - Uncontrolled hypertension (SBP ≥ 180 mmHg AND/OR DBP ≥ 110 mmHg)
  - Suspected ACS OR acute heart failure
  - Known hydrocephalus OR raised intra-ocular pressure
- **Induction of anaesthesia**
  - Allergy AND/OR Adverse Drug Reaction

Ketamine

Precautions

- Patients greater than 65 years of age
- Patients who have been administered midazolam or other CNS depressant medication
- Patients with significant hypovolaemia (exaggerated effects and a delayed onset of action)
- Globe injuries
- Complex facial injuries and fractures
- Patients who have impaired respiratory function
- Patients exhibiting psychotic symptoms

Side effects [1–3]

- Dissociation and trance-like state
- Transient hypertonicity and nystagmus
- Disinhibition
- Emergence
- Hypertension
- Tachycardia
- Depression of consciousness
- Hypersalivation
- Nausea and/or vomiting
- Laryngospasm
- Respiratory depression (rare)

Presentation

- Ampoule, 200 mg/2 mL *ketamine hydrochloride*

Onset (IV)	Duration (IV)	Half-life
30 seconds	5–20 minutes	10–15 minutes

Schedule

- S8 (Controlled drugs).

Routes of administration

Intramuscular injection (IM) — CCP

Intravenous injection (IV) — CCP

Intraosseous injection (IO) — E CCP

Special notes

- Ambulance officers must only administer medications for the listed indications and dosing range. Any consideration for treatment outside the listed scope of practice requires mandatory approval via the *QAS Clinical Consultation and Advice Line*.
- When applicable, paramedics must adhere to all the requirements of *CPG: Sedation – procedural*, including the application of nasal $EtCO_2$ measurement where practical.
- Transient hypertension and tachycardia may occur following ketamine administration in some patients. Unless the hypertension or tachycardia is profound and/or sustained, ketamine administration may continue. For all borderline cases CCPs must discuss with the *QAS Clinical Consultation and Advice Line* prior to administration.
- Midazolam must not be administered unless the patient displays significant signs of emergence that are not attenuated with reassurance.
- Once the maximum analgesia dose of 1 mg/kg is administered, the *QAS Clinical Consultation and Advice Line* must be consulted prior to any further ketamine being administered.
- All parenteral medications must be prepared in an aseptic manner. The rubber stopper of all vials must be disinfected with an appropriate antimicrobial swab and allowed to dry prior to piercing.

Adult dosages[1–4]

- **Severe traumatic pain** (following 0.1 – 0.2 mg/kg morphine OR 1 – 2 microg/kg fentanyl) associated with:
  - Fracture reduction and splinting
  - Multiple or significant fractures requiring facilitated extrication
  - Patients with splinted fractures requiring ongoing narcotic analgesia for transport requirements
- **Ongoing traumatic pain unresponsive to narcotics** (following 0.2–0.3 mg/kg morphine OR 2–3 microg/kg fentanyl)

CCP	IV	**10–30 mg** Repeated every **2–3 minutes.** **Total maximum dose 1 mg/kg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a concentration of 10 mg/mL. Ensure all syringes are appropriately labelled.*

Severe traumatic pain associated with burns (following 0.2 – 0.3 mg/kg morphine OR 2 – 3 microg/kg fentanyl AND 1–2.5 mg midazolam)

CCP	IV	**10–30 mg** Repeated every **2–3 minutes.** **Total maximum dose 1 mg/kg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a concentration of 10 mg/mL. Ensure all syringes are appropriately labelled.*

Adult dosages *(cont.)*

Induction for anaesthesia

ECCP	**IV**	*QAS Clinical Consultation and Advice Line* approval required in all situations. **0.25–2 mg/kg** Single dose only **Total maximum dose 150 mg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a final concentration of 10 mg/mL. Ensure all syringes are appropriately labelled.*
ECCP	**IO**	*QAS Clinical Consultation and Advice Line* approval required in all situations. **0.25–2 mg/kg** Single dose only **Total maximum dose 150 mg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a final concentration of 10 mg/mL. Ensure all syringes are appropriately labelled.*

Acute behavioural disturbance[5] (with a SAT score of ≥ 2) unresponsive to droperidol (max dose) administration

CCP	**IM**	*QAS Clinical Consultation and Advice Line* approval required in all situations. ≥ 16 years – **200 mg** **Single dose only.** 12–15 years – **2 mg/kg** **Single dose only.**

Paediatric dosages[1–4]

Severe traumatic pain (following 0.1 – 0.2 mg/kg morphine OR 1 – 2 microg/kg fentanyl) associated with:

- Fracture reduction and splinting
- Multiple or significant fractures requiring facilitated extrication
- Patients with splinted fractures requiring ongoing narcotic analgesia for transport requirements

CCP	**IV**	> 1 year – **0. 1–0.3 mg/kg** Repeated every **2–3 minutes.** **Total maximum dose 1 mg/kg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a concentration of 10 mg/mL. Decant 18 mL of the prepared solution and dilute with a further 18 mL of sodium chloride 0.9% in a 20 mL syringe to achieve a final concentration of 1 mg/mL. Ensure all syringes are appropriately labelled. Administer the weight-based dose required.*

Severe traumatic pain associated with burns (following 0.2– 0.3 mg/kg morphine OR 2– 3 microg/kg fentanyl AND 0.05 mg/kg midazolam)

CCP	**IV**	> 1 year – **0.1–0.3 mg/kg** Repeated every **2–3 minutes.** **Total maximum dose 1 mg/kg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a concentration of 10 mg/mL. Decant 18 mL of the prepared solution and dilute with a further 18 mL of sodium chloride 0.9% in a 20 mL syringe to achieve a final concentration of 1 mg/mL. Ensure all syringes are appropriately labelled. Administer the weight-based dose required.*

Paediatric dosages *(cont.)*

Induction for anaesthesia		
ECCP	**IV/IO**	*QAS Clinical Consultation and Advice Line* approval required in all situations. **0.25–2 mg/kg** Single dose only **Total maximum dose 100 mg.** ***Syringe preparation:*** *Mix 200 mg (2 mL) of ketamine with 18 mL sodium chloride 0.9% OR water for injection in a 20 mL syringe to achieve a final concentration of 10 mg/mL. Ensure all syringes are appropriately labelled. Administer the weight-based dose required.*