



20. KETAMINE (KETANEST®, KETASET®, KETALAR®)

a) Pharmacology

Hypnotic analgesic

b) Pharmacokinetics

A rapid-acting nonbarbiturate hypnotic analgesic agent characterized by normal pharyngeal-laryngeal reflexes, normal or enhanced skeletal muscle tone, and possible cardiovascular and respiratory stimulation.



ONSET OF ACTION FOR **IV/IO** KETAMINE MAY BE 5–10 MINUTES.

ONSET OF ACTION FOR **IN/IM** KETAMINE MAY TAKE UP TO 15–20 MINUTES.

c) Indications

- (1) The patient reports moderate to severe pain.
- (2) The patient displaying signs and symptoms of excited delirium syndrome.
- (3) Ventilatory difficulty secondary to bucking or combativeness in intubated patients. **(NEW '20)**
- (4) CPR-induced awareness. **(NEW '20)**

d) Contraindications

- (1) Known hypersensitivity to ketamine
- (2) Penetrating eye injury



INDICATED FOR MUSCULOSKELETAL EXTREMITY/BACK PAIN. NOT FOR CHEST PAIN, ABDOMINAL/FLANK PAIN, OR HEADACHE.

e) Adverse Effects

- (1) Although respiration is frequently stimulated, respiratory depression may occur with rapid IV administration. Laryngospasm has been known to occur.
- (2) Although hypotension may occur, blood pressure and heart rate are frequently stimulated.
- (3) Involuntary myoclonus that may mimic seizure activity
- (4) Possible enhanced secretions
- (5) Possible unpleasant dreams and delirium upon emergence from sedation

f) Precautions

- (1) The likelihood of respiratory depression and undesired pressor effects is increased by too rapid IV administration.
- (2) Myoclonic movements are possible and should not be confused for, seizure activity, or emergence from sedation.
- (3) Some patients who have received ketamine for control of excited delirium syndrome go on to requiring advanced airway management. ALS clinicians should closely monitor such patients to anticipate airway needs.



TO AVOID DOSING ERRORS, CLINICIANS SHOULD BE AWARE AND CONFIRM PROPER SELECTION OF CONCENTRATION PRIOR TO ADMINISTRATION. KETAMINE IS PROVIDED FOR IM OR IN ADMINISTRATION IN 100 MG PER ML CONCENTRATION. FOR IV ADMINISTRATION, KETAMINE IS PROVIDED IN 10 MG PER ML.




g) Dosage

(1) Pain Management


- (a) Adult: Administer 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.
 - (i) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.
 - (ii) If IV unavailable, administer 0.5 mg/kg IN/IM (if delivery device is available; divide administration of the dose equally between the nares to a maximum of 1 mL per nare).
 - (iii) Reassess in 15 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.5 mg/kg IN/IM.
- (b) Pediatric: Administer 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.
 - (i) Reassess in 5–10 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.2 mg/kg IV/IO over 1–2 minutes. Maximum single dose 20 mg.
 - (ii) If IV unavailable, administer 0.5 mg/kg IN/IM (if delivery device is available, divide administration of the dose equally between the nares to a maximum of 1 mL per nare).
 - (iii) Reassess in 15 minutes. If pain remains moderate to severe, then administer a second dose of ketamine 0.5 mg/kg IN/IM.

(2) Excited Delirium Syndrome





(a) Adult

- (i) IV dosing: Administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg.
 - a. If severe agitation persists, administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg. Maximum total IV/IO dose 200 mg.
 - b. If agitation persists after second dose of IV/IO ketamine, consider midazolam 2.5 mg IV/IO.
- (ii) IM dosing: 4 mg/kg IM. Maximum total IM dose 400 mg.
 - a. If severe agitation persists after IM ketamine dose, administer midazolam 5 mg IM.
 - b.  Additional dose of 4 mg/kg IM ketamine for persistent agitation requires medical consultation.

(b) Pediatric

- (i) IV dosing: For children 13 to 18 years of age, administer 1 mg/kg IV/IO. Maximum single IV/IO dose 100 mg. Maximum total IV/IO dose 200 mg.
 - a.  Patients who have not yet reached their 13th birthday require medical consult: Administer 1 mg/kg IV/IO. Maximum single IV dose 100 mg. Maximum total IV/IO dose 200 mg.



- b. If severe agitation persists, administer 1 mg/kg IV/IO. Maximum single IV dose 100 mg.
 - c. If agitation persists after second dose of IV ketamine, consider midazolam 0.1 mg/kg in 2.5 mg increments SLOW IVP/IO over 1–2 minutes. Maximal single dose of midazolam 2.5 mg.
 - (ii) IM dosing: Patients aged 13 to 18 years, administer 4 mg/kg IM. Maximum IM dose 400 mg.
 - a.  Patients who have not yet reached their 13th birthday require medical consult: Administer 4 mg/kg IM. Maximum IM dose 400 mg.
 - b. If severe agitation persists, administer midazolam 2.5 mg IM.
 - c.  Additional dose of 4 mg/kg IM ketamine for persistent agitation requires medical consultation.
- (3) Ventilatory difficulty secondary to bucking or combativeness in intubated patients. **(NEW '20)**
 - (a) **Ketamine** may be preferred for patients who have hypotension or possible hypovolemia, or if ventilatory difficulty is thought to be the result of pain response.
 - (i) Dose: Administer 2 mg/kg IVP/IO over 60 seconds. May repeat 2 additional doses of 1 mg/kg for IVP/IO every 10–15 minutes to a total of 3 doses as needed. Additional doses require medical consultation.
- (4) CPR-induced awareness **(NEW '20)**
 - (a) Adult
 - (i) Consider ketamine 1 mg/kg IV/IO.
 - (ii)  Repeat doses with medical consultation.
 - (b) Pediatric
 - (i)  Obtain medical consultation from a pediatric base station.