Critical Review Form
Therapy

Intravenous ketamine for adult procedural sedation in the emergency department: a prospective cohort study, *Emerg Med J* 2008; 25: 498-501

Objectives: **"To evaluate the use of intravenous ketamine for procedural sedation in adults attending the emergency department;" and "to document the physiological changes and incidence of adverse events". (p. 498)**

Methods: **Prospective, observational study over 2-years at St. Thomas' Hospital (London, England) enrolling all patients over age 16 who received ketamine for procedural sedation. Exclusion criteria included: abnormal airway, current respiratory tract infection, significant head injury, ocular injury, significant cardiac disease (CAD or CHF), systolic BP > 180mm Hg or diastolic BP > 110mm Hg; previous psychotic illness, hyperthyroidism, thyroid medication, porphyria, or allergy to ketamine.**

Ketamine was used only when a certified EM physician was in the department (12 hours/day weekdays and 8hours/day weekends). Demographic data was collection on a standardized form which also included a ketamine contraindication checklist. The initial dose of ketamine was 0.5mg/kg IV followed 5-minutes later by a second dose, if sedation deemed inadequate. Adequate sedation was defined as "the ability to perform the procedure without involving a painful response from the patient". Specific adverse events monitored included laryngospasm, recovery agitation, vomiting, hypersalivation, and clonic movements.

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	
1.	Were patients randomized?	No, this was an observational trial with no control group.

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	
1.	Were patients randomized?	No, this was an observational trial with no control group.

2.	Was randomization concealed (blinded)?	No randomization, no blinding.
3.	Were patients analyzed in the groups to which they were randomized?	All patients received the same intervention and were analyzed the same.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	No control group.
B.	**Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?**	
1.	Were patients aware of group allocation?	Yes, therefore subject to multiple forms of bias.
2.	Were clinicians aware of group allocation?	Yes.
3.	Were outcome assessors aware of group allocation?	Yes.
4.	Was follow-up complete?	No loss to follow-up reported.
II.	**What are the results (answer the questions posed below)?**	
1.	How large was the treatment effect?	• 92 patients were recruited from Aug 2005 – Aug 2007. • Adequate sedation was achieved in 98.9% (91/92) and 50% required a second dose. • All but 5 procedures were orthopedic. The remainder were abscess I&D (3) and chest tube insertion (2). • Heart rate (30%) and mean systolic BP (25%) both increased after ketamine but pre-procedure. All patients maintained oxygen saturation > 97%.

		• 20 patients (21.7%) experienced an adverse event: 12 recovery agitation (7 required treatment with 1-10mg IV midazolam) and 4 clonic movements. There were no reported cases of laryngospasm. • • Mean time for recovery 25 minutes (range 10 – 50 minutes).
2.	How precise was the estimate of the treatment effect?	No CI were provided.
III.	**How can I apply the results to patient care (answer the questions posed below)?**	
1.	Were the study patients similar to my patient?	Probably, busy 130,000 volume urban ED. The study setting differs with most experienced EM physicians present <50% of time.
2.	Were all clinically important outcomes considered?	No – patient satisfaction measures.
3.	Are the likely treatment benefits worth the potential harm and costs?	Yes, if readily available ketamine found to be safe, efficacious and acceptable to patients and physicians.

Limitations

1) **No control group, so unable to exclude various forms of bias (selection, co-intervention, ascertainment). In general, observational trials should follow the STROBE guidelines.**

2) **No validated scale used to rate emergence reaction or routine to baseline alertness.**

3) **No inter-rater reliability of the subjective outcomes. Furthermore, the investigators do not describe the experience level of the raters which could impact the reproducibility.**

4) **Limited external validity in US settings with "24/7" EM staffing.**

5) **No Confidence Intervals were reported.**

6) **Extensive number of contraindications without any reporting of proportion who were ineligible.**

7) **No stratification of adverse reactions based upon ketamine re-dosing.**

Bottom Line

Single-center, observational trial suggesting that ketamine 0.5mg/kg IV alone almost always provides sufficient procedural sedation for orthopedic procedures, but over 20% will experience an adverse reaction (most commonly an emergence reaction) necessitating midazolam therapy.