

**Critical Review Form
Case Series**

Keseg D, Cortez E, Rund D, Caterino J. The Use of Prehospital Ketamine for Control of Agitation in a Metropolitan Firefighter-based EMS System. Prehosp Emerg Care. 2015 January-March;19(1):110-115.

Objectives: "to provide a descriptive analysis of the Columbus Division of Fire's experience with utilizing ketamine in the prehospital setting. We described the paramedic impression of the patient's clinical status, the use of additional sedating medications, and the frequency of endotracheal intubation." (p. 111)

Methods: This retrospective cohort chart review was conducted using Columbia Division of Fire patient care reports and records from destination hospitals in central Ohio. Patients aged 18 years or older receiving ketamine between October 2010 and October 2012 were eligible for inclusion. In this EMS system, ketamine was only stocked on EMS supervisor vehicles and was only administered by the EMS supervisors themselves. Per protocol, the dosage was 4 mg/kg intramuscularly (IM) or 2 mg/kg intravenously (IV).

The primary outcome was the proportion of patients whose condition was noted by prehospital personnel as "improved" following ketamine administration. Secondary outcomes included "effectiveness" of sedation, defined as the proportion of patients requiring additional chemical sedation or the use of physical force, conducted electrical weapons (i.e. Tasers), or lachrymatory agents (i.e. pepper spray). An additional secondary outcome was need for endotracheal intubation.

There were 36 patients identified during the study period, of whom 35 had clinical information available in the EMS records and only 31 had ED data available. Of the 35 patients with EMS data, 4 received IV ketamine alone, 29 received IM ketamine alone, and 2 received IM followed by IV ketamine. The median age was 29 years and 29 (77%) were male.

Guide		Comments
A.	Are the results valid?	
1.	Were there clear criteria for inclusion	No. Only patients who received ketamine were

	in the case series?	included in the study. However, there was no protocol dictating who should receive ketamine for agitation.
2.	Was the condition identified and measured in a standard, reliable way for all participants included?	No. Again, there was no protocol dictating who should receive ketamine, but rather only EMS supervisors had access to ketamine, and hence it was only given when an AMS supervisor was present.
4.	Were consecutive patients included and was inclusion complete?	No. Only EMS supervisors were able to administer ketamine in this study, hence only patient encounters involving the EMS supervisor could be included.
5	Was sufficient demographic information provided for included patients?	No. The only demographic information provided were median age, gender, race and reason for ketamine administration. No information regarding medical or psychiatric history was provided, nor was information regarding use of illicit substances provided.
6.	Was follow-up of subjects long enough to detect the outcome of interest?	Yes. The primary and secondary outcomes are all short-term outcomes, and hence were measurable during the EMS and ED encounter.
7.	Was follow-up complete?	No. Of 36 patients who received ketamine during the study period, clinical and demographic information was only available for 35, and ED data were available for only 31.
B.	What were the results?	
1.	What were the outcomes?	<ul style="list-style-type: none"> • Patient condition was noted to have improved in 32 of 35 cases (91%, 95% CI 77% to 98%). • Additional sedation methods or significant force was required in 14 cases (40%, 95% CI 24% to 58%). All cases of "significant force" involved conducted electrical weapons. • Eight of 35 patients underwent endotracheal intubation either in the prehospital setting or in the ED (23%, 95% CI 10% to 40%).
2.	How precise was the estimate of the outcomes? (i.e. what were the 95% confidence intervals?)	See above. This was a small study with rather wide 95% confidence intervals.
C.	How can I apply the results to patient care?	
1.	Were the study patients similar to my patient?	No. In this EMS system, ketamine was only stocked on EMS supervisor vehicles and was only administered by the EMS supervisors themselves. There was no criteria by which to

		determine who would receive ketamine, but rather its use was limited to those occasions when an EMS supervisor was present.
2.	Were all clinically important outcomes considered?	No. The authors did not look at duration of sedation, need for additional chemical restraint, ED length of stay, need for ICU admission, hospital length of stay, or cost.
3.	What are the implications of the results? Are the likely treatment benefits worth the potential harm and costs?	In this study, need for use of "significant force" was rather high, despite the use of ketamine as a sedating agent. This is rather surprising given the typically rapid onset of sedation with this agent. Additionally, intubation rates were rather high. Unfortunately, this was a small study with poor overall methodology, making any significant inference difficult based on its results.

Limitations:

1. In this study, only EMS supervisors were allowed to administer ketamine for agitation. This is not, therefore, a consecutive sample of patients, and may in fact represent a distinct subset of patients with attributes that are vastly different from the typical agitated patient encountered by the EMS system ([convenience sampling](#)).
2. No information was provided regarding who abstracted data from EMS and hospital records, or what sort of form was used to record abstracted data ([Gilbert 1996](#) and [Worster 2004](#)).
3. While the authors note no documented use of physical force in those patients requiring "significant use of force," this seems extremely unlikely, as patients requiring chemical restraint, and in particular those receiving conducted electricity, would likely required significant physical force to assist with restraint.
4. Four of 35 patients with EMS information did not have ED records identified, and yet the authors did not exclude such patients when calculating the number requiring intubation. Excluding these patients, 26% of patients with complete data required intubation either by EMS or in the ED.

Bottom Line:

This small, retrospective case series demonstrated a rather high rate of need for "significant force" despite the use of IM ketamine for sedation, with a high rate of intubation. Unfortunately, several issues with methodology (convenience sampling) and reporting make it difficult to make any inferences based on the results.