

Prehospital Sedation: Effectiveness of Ketamine

Paramedic Mini CAT – Fanshawe College

Date of review: 10.03.2022

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Clinical Scenario:

Paramedics are dispatched CTAS 1 to a patient experiencing a sudden onset of bizarre behaviours that include severe agitation, delirium, violence and “superhuman” strength. Upon arrival to a local residence is a middle-aged male who appears to be distressed and is frantically going to multiple different front yards and is destroying property. It is noted that the patient is missing a shirt and his pants. Paramedics stage and wait for backup as the scene is not safe. The paramedic crew begin to prepare their PPE. Upon police arrival, it takes 6 police officers to restrain the patient and upon searching the patient, one single baggy of cocaine was located. The information was relayed to paramedics and the paramedics deemed that this was a case of excited delirium and patched base hospital to request sedation. After approval, one paramedic began to get an intramuscular injection of Ketamine ready to sedate the patient, to better exam him, as he was still very combative. Paramedics administered 5mg of Ketamine via IM injection to the patient. About 5 minutes later the paramedics can assess the patient and begin transport. The patient was noted to be febrile, tachypnea and extremely diaphoretic. The attending paramedic continues to monitor and prepares in case the need to intubate, as that is a risk with sedation and excited delirium can cause respiratory failure.

Background

Excited delirium, not yet recognized in the DSM-5 or ICD, is an acute state of delirium that causes extreme agitation, aggressive behavior, and hyperthermia. Excited delirium episodes are closely linked to prolonged drug use; however, it can also be caused by psychiatric illness, which is much less common. It can take many people to restrain a patient experiencing excited delirium. Patients can experience respiratory or cardiac arrest while being restrained due to over-exertion of the body during an acute episode. Sedation is important to be able to assess the patient properly and safely and to be able to attend to the patient in case of respiratory or cardiac arrest. Over time, paramedics have been utilizing different medications, such as haloperidol, lorazepam, midazolam, and ketamine. In Ontario’s most recent standard, paramedics administer 5mg/kg of ketamine to sedate patients with suspected excited delirium.

Review question (PICO)

In prehospital setting where excited delirium is suspected, is ketamine the best drug for sedation compared to other sedatives that have a lower risk of complications?

Search strategy (Basic): (paramedic OR ems OR prehospital OR pre-hospital OR ambulance OR emergency medical technician OR emt) AND (excited delirium OR severe agitation) AND (sedation)

Limits: Year: 2016, Language: English

Databases searched: CINAHL, Cochrane, Medline, Google Scholar

Search results: CINAHL: 4 Cochrane: 0 Medline: 11 Google Scholar: 25

Included for review: 3 studies reviewed that are discussed below. One study includes analyzing and comparing multiple strategies.

Title, author, year	Study design & LOE	Population	Intervention	Outcomes	Results	Weaknesses & Strengths
<p>Prehospital Ketamine Administration for Excited Delirium with Illicit Substance Co-Ingestion and Subsequent Intubation in the Emergency Department</p> <p>Joshua J. Solano; Lisa M. Clayton; Daniel J. Parks; Shayne E. Polley; Patrick G. Hughes; Charles H. Hennekens; Richard D. Shih; Scott M. Alter</p> <p>2021</p>	<p>Retrospective chart review</p> <p>Collected data from 2017-2019 from 2 community hospitals in Florida</p> <p>Total of 86 patients were eligible for the study</p>	<p>Male and female patients that were over 18 years of age that are sedated with ketamine (IV) while experiencing excited delirium</p> <p>South Florida, USA</p>	<p>Paramedics to sedate excited delirium patients with ketamine via IM</p> <ul style="list-style-type: none"> - Initial dose of 400mg - Can give a second dose of 400mg - Can follow up with 5mg IM midazolam 	<ul style="list-style-type: none"> - Patients need intubating after sedation - Patients do not need intubating after sedation 	<p>Patients found with cocaine or benzodiazepines in their system have a higher rate of intubation after sedation with ketamine</p> <p>Lab results show that patients with increased creatinine and decreased sodium were more often intubated</p>	<p>Strengths:</p> <ul style="list-style-type: none"> - Focuses on excited delirium - Studies were able to use previous data documented - Retrospective studies can allow better studies of uncommon calls, such as excited delirium <p>Weaknesses:</p> <ul style="list-style-type: none"> - Focuses on ketamine only for sedation - Article does not state how many patients needed to be further sedated with midazolam - No concrete evidence but allows further questions to be generated

Title, author, year	Study design & LOE	Population	Intervention	Outcomes	Results	Weaknesses & Strengths
<p>Canadian paramedic experience with intramuscular ketamine for extreme agitation: A quality improvement initiative</p> <p>Jennie Helmer, Joe Acker, Jon Deakin, Tania Johnston</p> <p>2020</p>	<p>Quality improvement study</p> <p>Comparing if ketamine is more effective than midazolam.</p> <p>July 2018 - January 2019</p>	<p>Patients of all ages that experienced a +3 or +4 on the Richmond Agitation Sedation Scale (RASS)</p> <p>Excluded any patients that scored below a +3 on the RASS</p>	<p>Ketamine administered to patients scoring a +3 or +4 on the RASS.</p> <p>14 patients received 4mg/kg ketamine via IM</p> <p>19 patients received 5mg/kg ketamine IM</p>	<p>- Sedation is effective</p> <p>- Sedation is not effective</p> <p>- Adverse effects occur</p> <p>- Airway intervention needed</p>	<p>Majority of adverse effects occurred with 5mg/kg dosage of ketamine, however the dosage itself does not confirm incidence of side effects</p> <p>11/33 patients needed airway management.</p> <p>2/14 patients who received 4mg/kg needed airway management</p> <p>9/19 patients needed airway management who received 5mg/kg</p>	<p>Strengths:</p> <p>Study has similar findings on the onset of Ketamine (approx. 5 minutes) which correlates with a study that is compared by Richard Armour (row 3).</p> <p>Weaknesses:</p> <ul style="list-style-type: none"> - small sample size (33) - paramedics themselves completed the clinical audit form (Could be bias) - paramedics determine RASS score (may differ from ER RASS score)

Title, author, year	Study design & LOE	Population	Intervention	Outcomes	Results	Weaknesses & Strengths
<p>Chemical sedation of excited delirium in the pre-hospital setting</p> <p>Richard Armour</p> <p>2020</p>	<p>Comparison study of 9 studies between 1997-2019</p>	<p>Discarded any studies that occurred in the hospital setting or non-interventional in nature</p>	<p>Different treatments for extreme agitation, psychiatric emergencies, active physical violence towards the patient themselves or others</p>	<ul style="list-style-type: none"> - patient may need more sedation - patient may need to be intubated - time it takes for drug to sedate the patient - depth of sedation 	<ul style="list-style-type: none"> - Ketamine has the most adverse effects - Haloperidol was found to have less adverse effects vs. ketamine, but less adequate level of sedation <p>Ketamine was the most common sedative used as</p>	<p>Strengths:</p> <ul style="list-style-type: none"> - Compares studies with multiple different medicants/dosages - <p>Weaknesses:</p> <ul style="list-style-type: none"> - These studies do not study excited delirium directly and some studies did not include “extreme agitation” - Some studies are not recent - Selection bias due to some studies having more ketamine statistics vs. different drugs

Considerations:

Prehospital Ketamine Administration for Excited Delirium with Illicit Substance Co-Ingestion and Subsequent Intubation in the Emergency Department:

This study reviewed cases from January 1st, 2017, to April 30th, 2019, and included 86 participants. With only one study with a small number of participants, the conclusions drawn cannot be concrete. In addition, the data that we can pull from this study is not the effectiveness of ketamine vs. other drugs, however but its that perhaps another method of sedation may be able to be used in cases where the paramedics suspect cocaine induced excited delirium to reduce intubation risk.

Canadian paramedic experience with intramuscular ketamine for extreme agitation: A quality improvement initiative:

This study collected data from 2018-2019 and examined 33 patients who received different doses ketamine for extreme agitation. The sample size is small, with only 33 patients being analysed. In addition, paramedics reported their RASS scores for their own patient. This may introduce bias into the study as different paramedics may score the same patient differently.

Chemical sedation of excited delirium in the pre-hospital setting:

There are 9 different studies that were analyzed. Each study has different treatments (medications and dosages). Since they are all different, there are 9 different results, that may share some similar findings, however it would be more concrete if there were similar studies to be able to draw better connections. In addition, these studies did not reference excited delirium directly, however these patients shared similar signs and symptoms, but may be slightly different than excited delirium. Lastly, the populations change in every study, with different number of patients receiving amounts of treatment. For an example, in one study, 95 patients received ketamine vs. only 68 patients receiving haloperidol (Armour, 2020, table.1 row 9)

Future Studies and Considerations:

Future studies should include studies that are not retrospective and more quantitative research. Analyzing retrospective data may not be as accurate as we are looking back in time and making connections to questions that occur in the future. With a present, quantitative approach, we may be able to get more solid answers that answer a more specific question, and we can manipulate the variables better. This may be a difficult approach however because paramedics do not respond to an excited delirium call everyday and instead is not very common. We may need to expand our demographics to allow more research.

Clinical bottom line:

Based on the literature I have reviewed; it has found that ketamine is the most effective drug to sedate patients experiencing excited delirium. However, studies have also showed that sedating patients that experience excited delirium due to cocaine use, have a higher rate of intubation. Since this was information was only found in one study, it cannot be concrete evidence and more research should be conducted.

References

Armour, R. (2020, March 1). Chemical sedation of excited delirium in the pre-hospital setting. *British paramedic journal*. Retrieved February 23, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7783905/>

Helmer, J., Johnston, T., Deakin, J., & Acker, J. (2020). Canadian paramedic experience with intramuscular ketamine for extreme agitation: A quality improvement initiative. Retrieved February 23, 2022, from https://www.researchgate.net/profile/Tania-Johnston/publication/340951832_Canadian_paramedic_experience_with_intramuscular_ketamine_for_extreme_agitation_A_quality_improvement_initiative/links/5f18ae2d92851cd5fa3ed206/Canadian-paramedic-experience-with-intramuscular-ketamine-for-extreme-agitation-A-quality-improvement-initiative.pdf

Solano, J. J., Clayton, L. M., Parks, D. J., Polley, S. E., Hughes, P. G., Hennekens, C. H., Shih, R. D., & Alter, S. M. (2021, December). Prehospital ketamine administration for excited delirium with illicit substance co-ingestion and subsequent intubation in the emergency department. *Prehospital and disaster medicine*. Retrieved February 23, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8607139/>

Background References:

Ministry of Health (2020). *Advanced Life Support Patient Care Standards*. Version 4.7. Retrieved February 23, 2022, from https://www.health.gov.on.ca/en/pro/programs/emergency_health/edu/docs/ALS%20PCS%20-%20v4.7.pdf?subject=Advanced%20Life%20Support%20Patient%20Care%20Standards%20v4.7

Takeuchi, A., Ahern, T. L., & Henderson, S. O. (2011, February). Excited delirium. *The western journal of emergency medicine*. Retrieved February 23, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3088378/>