



SAMMY GRAM

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What about ketamine?

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As a pre-hospital provider, how many times have you heard, “This pain is terrible, please just knock me out!” and you wish you could. But you know that with the tools you have on hand, to get the patient to that point may involve intubation and ventilation, not to mention a significant risk of hypotension. How about an RSI sedative that doesn’t depress cortisol production in critical patients? Or one that actually props up the BP and doesn’t depress respirations or airway protective reflexes just in case you can’t get the tube.

How about a way to achieve better analgesia with a smaller dose of narcotic? Ketamine fills all of these needs.

Ketamine was first synthesized in 1962 and was chosen as the most promising of 200 PCP derivatives. Following clinical trials, it was FDA approved in 1970. In the adult population, it has been used extensively by the US military as an anesthetic/analgesic with excellent results as well as the medical communities in many other countries. It is on the World Health Organization’s list of essential medicines. In America, the drug traditionally saw more use in pediatric and anesthesia medicine until about the last decade when emergency and intensive care specialties saw its potential.

How it works

Obviously our brain must take information from the senses. Seeing, hearing, smell, taste, touch, pain, etc. all of this “outside info” comes in low in the brain and is sent

through a “switching system” to the interpretive areas of the brain. This info enters the brain through the NMDA receptor system that uses Glutamate as its primary neurotransmitter. Ketamine blocks these receptors below the Glutamate attachments. Low doses block some pain perception; higher doses dissociate all sensory info coming into the brain. Unlike sedatives or other agents that depress consciousness, ketamine leaves an awake brain that feels nothing, doesn’t see, hear, smell or taste. The brain is just coasting along in an unstimulated neutral sort of place. This dissociation can be sufficient for surgery if needed. Ketamine also appears to reduce re-uptake of dopamine (euphoria), serotonin (mellow/stable emotion), and norepinephrine (blood pressure and cardiac support). There is also a bronchial dilatory effect with Ketamine.

In practice there are at least 3 levels of dose related effects.

Analgesia: Reduction in the amount of pain information able to enter the brain.

Partial dissociation: Partial/incomplete sensory information getting to interpretive areas can lead to hallucinations and very strange dreams and experiences. A friend of mine was having a painful procedure done under Ketamine and had an out of body experience.

He believed he had died and no one noticed it yet. He didn't like this! This problem can be managed by giving more ketamine and pushing them into complete dissociation or by giving a benzodiazepine, like Versed. We try to avoid this area of action.

Complete Dissociation: The brain is isolated and at rest but still "awake." The patient generally appears to be asleep. There may be slight stiffening, occasional movement or some myoclonus from time to time. This is the state we hope to induce for RSI and severe pain management or management of wild combative patients. Ketamine is primarily metabolized in the liver and excreted by the kidneys. Once disassociation is achieved, additional doses really don't change the effect, but does prolong the duration.

We have been using Ketamine since 2014 on the helicopters and our MICU. The learning curve continues for us. Personally, I am more and more impressed with this drug all the time.

Giving Ketamine

When administering Ketamine IV, it is best to give it over 60 seconds.

Our protocol for RSI is to use a dissociative dose of 1-2 mg/kg. This works in less than 1 minute and lasts for up to 20 minutes. Duration of action is variable from person to person.

Currently for pain, the dose is 0.1-0.2 mg/kg with a 1 mcg/kg dose of Fentanyl. Per our current protocol, 6-10mg/kg can be given IM. This route works very well for psychotic, aggressive and combative patients. IM uptake is remarkably fast at 3-4 minutes and duration is extended to 25 minutes or longer. Repeat doses can be the same as original dose.

Partial dissociation and emergence reactions

Somewhere between the analgesic dose and the dissociation dose, kind of a medical twilight zone exists. Some patients are terrified by this and others enjoy it. As I mentioned previously, these can be managed if it is bothering the patient by a small dose of versed or just giving more Ketamine. My partner and I were caring for a gentleman with 2 fractured femurs who was in agony. We gave an analgesic dose in an earlier dosing format. The patient relaxed, he stopped crying out and smiled.

He then started playing with something in the air in front of him and enjoyed this for the rest of the flight. We shrugged our shoulders and said, "this is good."

Another patient on the MICU said repeatedly "I'm dead" but was more perplexed than scared. When the crew told the patient that they had arrived at the destination, she said, "you mean heaven?"

Bob and I had a severely combative patient that was restrained and despite Haldol and Ativan was escaping from those restraints while airborne. Ketamine solved this tremendous safety issue in about a minute.

An MICU patient was found naked, agitated and running around their room. IM Ketamine quickly defused the situation yielding a quiet and safe transport. This "Twilight zone" can also occur as the Ketamine wears off. This is called an emergence reaction.

The approximate occurrence rate is around 10-20% for the states of altered perception. If your patient is fully awake before you give Ketamine, you can mentally prepare them by asking them to think of a pleasant place or time and explain that some people have vivid and strange dreams with this drug.

Some physicians believe that many of their patients have had less trouble since they have been given this information prior to Ketamine administration.

There is different data for contraindications, although many have been removed. If the patient has an allergy to this drug (very unlikely) of course don't give it. If a patient is already markedly hypertensive, we don't want to elevate the BP further. The rapid rise in BP can be blunted by stretching admin time to 60 seconds. BPs generally return to pre-administration baseline in about 15 minutes. Of course, your medical director will need to choose the indications, contraindications and dosages if they decide you should use this drug.

Adverse reactions (FDA data)

While BP and heart rate usually increase, hypotension and bradycardia have been seen.

- Excess salivation (managed with atropine) Respiratory depression or apnea (usually following rapid IV push) laryngospasm.

- Double vision, nystagmus
- Increased muscle tone and some tonic-clonic movements similar to seizures have been seen. Non-purposeful body movements don't necessarily indicate a need for re-dosing, this should be time based.
- Nausea, vomiting
- Pain or rash at the injection site

There is some animal based concern about changes in brain structure in developing brains. This drug is not recommended for neonates or in pregnant mothers. While Ketamine has been used for years in pediatric patients, FDA states that safety and effectiveness has not been established.

Conclusion: There are some essential areas of patient need in the pre-hospital environment that this drug could and is able to effectively provide help. It is worthy of consideration for the EMS toolbox.

Bibliography available on request.

Samaritan Makes Change in Leadership Structure

In February the leadership structure was changed to now include a program manager to meet the needs of the growth and expansion of the Samaritan Program. Brett Steffen, who has been part of the team since 2010, has been promoted to this newly created position. Brett started as a paramedic during the launch of the MICU Program, and most recently assumed the role as flight paramedic stationed at PRMC. Brett's job duties will include overseeing the daily operation of the program. Chad Owen will remain as Program Director for Flight, EMS, Communications, along with assuming the responsibilities of Emergency Services of Allen County. Under this new structure, Jay Curry will continue in the role of Clinical Supervisor with a focus on Education and EMS Coordinator. The team looks forward to the continued growth in 2016 and meeting the ever changing needs of the communities in which we serve!

Samaritan Pilot Biography: Carl Wendt

Parkview Samaritan is proud to introduce you to one of our pilots, Clark Wendt. Clark began his career with Samaritan in July of 2013. He is a dual-rated Commercial, Multi-Engine Instrument Pilot as well as an Instrument Flight Instructor qualified in both airplanes and helicopters.



Since his first flight lesson in August of 1993, he has accumulated nearly 6000 flight hours.

In 1999 he began helicopter flight instruction at Tomlinson Aviation in Ormond Beach Florida. For several years he was employed at multiple local companies, flying business and corporate aircrafts. He also flew for his family's business.

Prior to joining Parkview, Clark owned and operated his own business that provided aircraft rental, aircraft management, flight instruction and pilot services. His flight career geographically covered the Eastern, Midwest and Southern regions of the United States.

When asked about his decision to join Samaritan, Clark replied, "Flying EMS wasn't ever my plan; but, I believe that it was God's plan all along. As the economy changed and my commercial flying career was on a downward turn, I started looking at what I could do to keep flying. I believe God led me to this career and gave me this opportunity. I love this job and the people I work with. Samaritan Two has become my family now and I wouldn't want to be doing anything else."

Clark currently lives in Wabash with his wife Amy and children Ashley (15) and Michael who is a freshman at Purdue University. He enjoys spending time with them as well as his adult step-daughters, Tisha and Hayley.