NAEMSP 2014 ANNUAL MEETING

Vitamin K or KO ?

Outcomes of EMS Ketamine Use

Dr. David P. Keseg M.D. FACEP
Medical Director-Columbus Division of Fire

DISCLOSURE

- Dr. Keseg has no financial interest in any companies that are involved in the manufacture of products related to this presentation.

CFD EMS OVERVIEW

Geographical Information

AREA	SIZE	POPULATION
Metro Columbus	399.1 square miles	1,742,798
City of Columbus	222.2 square miles	769,934

FIRST LINE APPARATUS SUMMARY
Emergency Units in Service

34	Engines	7	EMS Supervisors
15	Ladders	1	Incident Support Unit
5	Rescues	2	Bomb Squads
7	Battalion Chiefs	1	Safety Officer
32	Medics	14	Boats
1	Hazmat	1	Command Unit

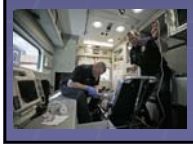

ENGINE


MEDIC


LADDER

CFD EMS OVERVIEW

- All ALS Fire based EMS System
- Two EMT-Ps on each Medic Vehicle (32)
- At least one EMT-P on each engine (34)
- At least one Engine and One Medic per 32 stations
- Seven EMS Supervisors –one per battalion
- (1 Captain and 6 Lieutenants per unit)



FIVE-YEAR COMPARISON

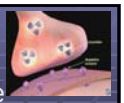
	2008	2009	2010	2011	2012
Total Incidents	146,144	142,981	148,918	161,693	149,117
Fire Incidents	24,868	21,470	21,861	23,715	34,659
Ems Incidents	110,739	110,398	115,311	137,442	114,458

GEOGRAPHICAL

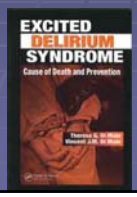
Metro Columbus
399.1 square miles
population: 1,742,798

City of Columbus
9.9 square miles
population: 791,868

Objectives



- Review the pharmacology of Ketamine
- Understand the use of Ketamine in ED
- Discuss the implementation of Ketamine
- Look at paramedic perception of Ketamine
- Review outcome data in CFD for Ketamine use



A Short History of Ketamine

1962: Calvin Stevens invented CL369, renamed CI 581 and was then rechristened Ketamine.

1964: Ketamine given to a human for first time by Edward Domino, his wife coins the phrase "dissociative anesthesia"

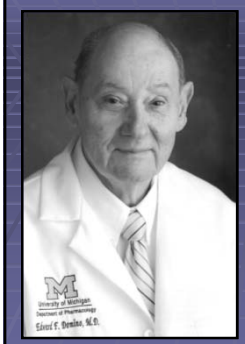
1966: Ketamine was patented by Parke-Davis - used in Vietnam War. It was patented by Parke-Davis as part of an effort to find a safer anesthetic alternative to Phencyclidine (PCP), which was more likely to cause hallucinations, neurotoxicity and seizures.

1970: FDA approved ketamine for use on children and the elderly.

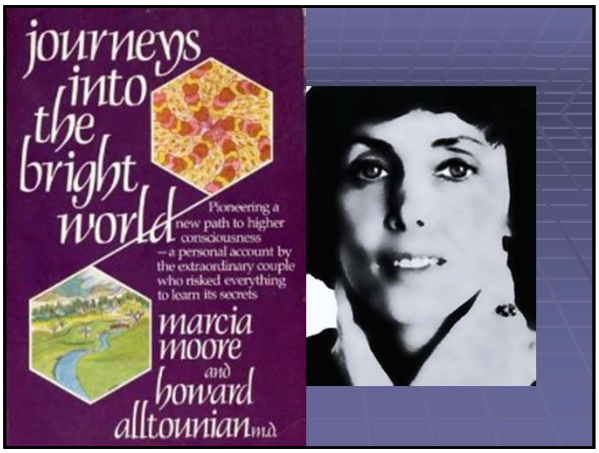
1970s: The drug was used in psychiatric and other academic research. In Argentina "ketamina" used in therapy to regress clients back to the womb.

1978: Marcia Moore and John Lilly. Psychonauts - write influential books on the subjective use of Ketamine. John Lilly's The Scientist and Marcia Moore and Howard Alltounian's Journeys into the Bright World, which documented the unusual phenomenology of ketamine intoxication.

August 3rd, 1965
First human administration



Edward Domino, MD



"Excited Delirium": Unique Challenges for EMS and Law Enforcement

EMS MANAGEMENT OF THE AGITATED PATIENT

Miami Police Shoot, Kill Man Eating Another Man's Face

ExDS Indicators

"Excited Delirium Syndrome," is a medical crisis that may be due to a number of underlying conditions. Subjects can demonstrate some or all of the indicators below in law enforcement settings. More indicators will increase the need and urgency for medical attention.

- ☐ Extremely aggressive or violent behavior
- ☐ Constant or near constant physical activity
- ☐ Does not respond to police presence
- ☐ Attracted to/destructive of glass/reflective
- ☐ Attracted to bright lights/loud sounds
- ☐ Naked/inadequately clothed
- ☐ Attempted "self-cooling" or hot to touch
- ☐ Rapid breathing
- ☐ Profuse sweating
- ☐ Keening (unintelligible animal-like noises)
- ☐ Insensitive to/extremely tolerant of pain
- ☐ Excessive strength (out of proportion)
- ☐ Does not tire despite heavy exertion

Excited Delirium (ExD) Panel Workshop (April 2011), The NIJ Technology Working Group (TWG) on Less-Lethal Devices The Weapons and Protective Systems Technologies Center

ExDS Response Measures

IDENTIFY
Observe, record, and communicate the indicators related to this syndrome – handle primarily as a medical emergency.
(SEE REVERSE SIDE)

CONTROL
Control and/or restrain subject as soon as possible to reduce risks related to a prolonged struggle

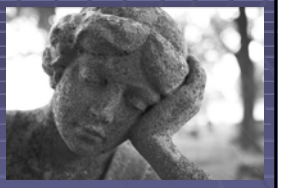
SEDATE
Administer sedation as soon as possible. Consider calming measures. Remove unnecessary stimuli where possible, including lights/sirens.

TRANSPORT
Take to hospital as soon as possible for full medical assessment and/or treatment.

This material is based upon work supported by the National Institute of Justice (NIJ) under a Cooperative Agreement Award No. 2010-D-CX-K085. Any opinions, findings, and conclusions or recommendations are those of the author(s), is the best knowledge currently available and does not necessarily reflect the views of the NIJ and should not be construed as an official Department of Justice position, policy, or decision.

EMS Drugs for Sedation

- Benzodiazepines
  - Valium, Versed, Ativan
- Antipsychotics
  - Haldol, Droperidol
- Atypical Antipsychotics
  - Geodon, Zyprexa
- Dissociative agents
  - Ketamine



Ideal Drug for Sedation

- Rapid Onset
- Single Dose
- Easy to administer
- Minimal adverse effects on:
  - Cardiac
  - Blood Pressure
  - Respiratory
  - Temperature
  - Neurologic

Medical Mythology

Myth: Ketamine should not be used as an induction agent for intubation in patients with head injury

CJEM • JCMU

Yevgeny Filanovsky, MD;[*] Philip Miller, MD;[†] Jesse Kao, MD[‡]

Tintinalli: "Ketamine should be avoided in patients with closed head injuries"

Based on its pharmacological properties, ketamine appears to be the perfect agent for the induction of head-injured patients for intubation.

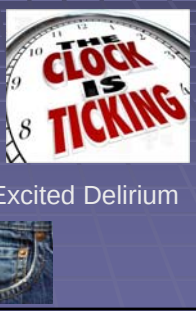
Table 2. Key studies of prospective trials of ketamine and intracranial pressure

Study	Study type	Study population	ICP	CPP
Mayberg et al.[12]	Prospective trial	• 20 neurosurgical patients (10 with supratentorial tumours, the rest with intracranial aneurysms) • ICP measured before and after administration of ketamine 1 mg/kg IV	Small but statistically significant decrease in ICP after ketamine administration	No significant change over 10 min
Kolenda et al.[13]	Prospective RCT	• 35 patients with moderate or severe head injury • Ketamine + midazolam sedation v. fentanyl + midazolam sedation	Slightly higher ICP values in the ketamine group (~ 2 mm Hg difference)	Higher in the ketamine group than the control group by average of 8 mm Hg
Bourgoin et al.[14]	Prospective double-blind RCT	• 25 patients with severe head injury • Continuous infusion ketamine-midazolam v. sufentanil-midazolam infusion	No significant difference between groups	No significant difference between groups
Bourgoin et al.[15]	Prospective double-blind RCT	• 30 patients with TBI receiving sufentanil-midazolam or ketamine-midazolam using target controlled infusion	No significant difference between groups	No significant difference between groups
Schmittner et al.[16]	Randomized prospective trial	• 24 patients with TBI • Group 1: methohexitone + ketamine sedation • Group 2: methohexitone + fentanyl sedation	No significant difference between groups	No significant difference between groups

CPP = cerebral perfusion pressure; ICP = intracranial pressure; IV = intravenously; RCT = randomized controlled trial; TBI = traumatic brain injury.

So how about Ketamine???

- Rapid onset of action: < 5 minutes
- Highly Effective in single dose
- Can give IM (through jeans)
- Favorable Safety Profile
  - Supports heart rate and BP
  - Preserves respiratory drive
  - No hyperthermia
- Limited data for Ketamine in Excited Delirium



Ketamine Adverse Effects

- Laryngospasm
- Hypersalivation
- Nausea/Vomiting
- Possible drug interactions:
  - ETOH
  - Opiates
  - Benzos
  - Psych Meds

Case Conference

Successful Management of Excited Delirium Syndrome with Prehospital Ketamine: Two Case Examples

Jeffrey D. Ho, MD, Stephen W. Smith, MD, Paul C. Nystrom, MD, Donald M. Dawes, MD, Benjamin S. Orozco, MD, Jon B. Cole, MD, William G. Heegaard, MD, MPH

Advantages of Ketamine for ExD:

- ***Safety of IM administration to EMS personnel***
- ***Onset of action IM 5 minutes***
- ***Duration of action 20-30 minutes***
- ***Keeps protective airway reflexes intact***
- ***Rarely affects respiratory drive***
- ***High minute ventilation buffers acidosis***

The Emergency Department Experience with Prehospital Ketamine
A Case Series of 13 Patients

Aaron M. Burnett, MD, Joshua G. Salzman, MA, EMT-B, Kent R. Griffith, RN, EMT-P, Brian Kroeger, PhD, Ralph J. Frascone, MD

- 13 patients received prehospital Ketamine for presumed Excited Delirium Syndrome
- Outcomes and observations after ED arrival
- Follow up was conducted on 100% of patients given Ketamine between April and December 2011

The Emergency Department Experience with Prehospital Ketamine A Case Series of 13 Patients

Aaron M. Burnett, MD, Joshua G. Salzman, MA, EMT-B, Kent R. Griffith, RN, EMT-P, Brian Kroeger, PhD, Ralph J. Frascone, MD

- ***Two*** **patients required intubation in the ED due to**
  - **recurrent laryngospasm (Ketamine dose 5.3mg/kg)**
  - **intracranial hemorrhage (Ketamine dose 5.2mg /kg)**
- ***One*** **hypoxic patient required jaw thrust/NRB (Ketamine dose 4.5mg/kg)**
- ***One*** **patient had hypersalivation treated with suction (Ketamine dose 5.7mg/kg)**
- ***Five*** **patients required additional sedation**
- ***Five*** **patients discharged home**
- ***Seven*** **admitted to hospital**

PREHOSPITAL EMERGENCY CARE 2012;16:412–414

Laryngospasm and Hypoxia After Intramuscular Administration of Ketamine to a Patient in Excited Delirium

Aaron M. Burnett, MD, Benjamin J. Watters, MD, Kelly W. Barringer, MD, Kent R. Griffith, RN, EMT-P, Ralph J. Frascone, MD

Conclusion

We report what we believe is the first case of laryngospasam associated with prehospital administration of IM ketamine to a patient in excited delirium. This case demonstrates that laryngospasm may be encountered with IM ketamine but that it can be successfully managed with positive-pressure ventilation.

A prospective review of the use of ketamine to facilitate endotracheal intubation in the helicopter emergency medical services (HEMS) setting

A Sibley,[1,2] M Mackenzie,[1,2] J Bawden,[2] D Anstett,[2] C Villa-Roel,[2] B H Rowe[2]

- ***Prospective observational study over 2 years***
- ***71 patients***
- ***Aeromedical service staffed by nurse/paramedic***

"..useful agent for intubation in the prehospital setting.."

Contents lists available at SciVerse ScienceDirect
American Journal of Emergency Medicine
journal homepage: www.elsevier.com/locate/ajem

Brief Report

Hemodynamic consequences of ketamine vs etomidate for endotracheal intubation in the air medical setting

Brian Price MD [a], Annette O. Arthur PharmD [b,*], Michael Brunko MD [c], Pam Frantz RN, CFRN [c], Joshua O. Dickson NREMT-P, FP-C [d], Tom Judge EMTP [d], Stephen H. Thomas MD, MPH [b,e]

ABSTRACT

Objective: Recent drug shortages have required the occasional replacement of etomidate for endotracheal intubation (ETI) by helicopter emergency medical services (HEMS), with ketamine. The purpose of this study was to assess whether there was an association between ketamine vs etomidate use as the main ETI drug, with hemodynamic or clinical (airway) end points.

Methods: This retrospective study used data entered into medical records at the time of HEMS transport. Subjects, 50 ketamine and 50 etomidate, were accrued from 3 US HEMS programs. The study period was from August 2011 through May 2012. Data collection included demographics, diagnostic category, ETI drugs use, ETI success, and complications. Hemodynamic parameters were assessed for up to 2 sets of vital signs before airway management and up to 5 sets of post-ETI vital signs. Significance was defined at the $P < .05$ level.

Results: Patients on ketamine and etomidate were similar ($P > .05$) with respect to age, sex, scene/interfacility mission type, trauma vs nontrauma, neuromuscular blocking agent use, and rates of coadministration of fentanyl or midazolam. All patients had successful airway placement. Peri-ETI hypoxemia was seen in 10% of etomidate and 16% of ketamine cases ($P = .55$). The pre-ETI and post-ETI were similar between the ketamine and etomidate groups with respect to systolic blood pressure and heart rate at every vital signs assessment after ETI.

Conclusion: Initial assessment of ETI success and complication rates, as well as peri-ETI hemodynamic changes, suggests no concerning complications associated with large-scale replacement of etomidate with ketamine as the major airway management drug for HEMS.

Ketamine for prehospital use: new look at an old drug

James E. Svenson MD, MS*, Michael K. Abernathy MD

American Journal of Emergency Medicine (2007) 25, 977–980

Section of Emergency Medicine, University of Wisconsin, Madison, WI 53792, USA

- **Retrospective study of 40 patients over 3 years**
- **Physician staffed Aeromedical program**
  - **23 patients received ketamine during extrication**
  - **4 Burns (pain control)**
  - **4 Cardiac related (hypotensive & intubated)**
  - **9 Respiratory complaints**
- **No Adverse Events**

"Ideal drug for use in many prehospital situations"

Prehospital care

Ketamine sedation for patients with acute agitation and psychiatric illness requiring aeromedical retrieval

Minh Le Cong,[1] Bruce Gynther,[2] Ernest Hunter,[2] Peter Schuller[3]

- Physician based service aeromedical service
- 18 patients over 3 years given
- IV Ketamine for agitation
  - Hypertension: 4 patients
  - Vomiting: 1 patients
  - Airway Interventions: None
  - Worsened Psychiatric symptoms: None

"Valid and Safe"

Ketamine as an analgesic in the pre-hospital setting: a systematic review

Acta Anaesthesiol Scand 2011; 55: 638–643

P. A. Jennings[1,2], P. Cameron[2] and S. Bernard[1,2]
[1]Ambulance Victoria, Melbourne, Vic., Australia and [2]Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Vic., Australia

- 6 papers on EMS use of Ketamine for Analgesia
  - 340 patients total
  - Reported adverse effects:
  - Hallucinations, dizziness, dysphoria
  - "weak and brief"
- One study: 4 cases of mild in O2 saturation

"Safe and Effective"

Short report

Case report: prehospital use of intranasal ketamine for paediatric burn injury

Emerg Med J 2011;28:328e329

C Reid,[1] R Hatton,[1] P Middleton[2]

- Single patient, 9 years old
- Possibly first reported prehospital use of intranasal Ketamine (0.25-0.5mg/kg)
- Pain subjectively improved in 3 min
- Reported feeling "swimmy"
- Arousable but drowsy (RASS -1)
- No hypersalivation, dysphoria or laryngospasm

Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine

BioMed Central

Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2009, 17:61

Original research

Open Access

The effect of combined treatment with morphine sulphate and low-dose ketamine in a prehospital setting

Patric Johansson[1], Poul Kongstad[2] and Anders Johansson*[1,2,3]

- **Prospective pre-hospital study of 27 patients**
- **Analgesic doses given (0.2mg/kg IV)**
- **All patients remained awake**
- **No adverse drug effects**

Research Studies on Ketamine Use

	Studies	Patients
Analgesia	8	368
Airway	2	100
Sedation (Trauma)	3	69
Sedation (ExDS)	3	15

REVIEW

[West J Emerg Med. 2011;12(1):77-83.]

Excited Delirium

Asia Takeuchi, MD*
Terence L. Ahern, BA†
Sean O. Henderson, MD‡

* University of California, San Diego School of Medicine
† Keck School of Medicine of the University of Southern California
‡ Keck School of Medicine of the University of Southern California, Department of Emergency Medicine and Preventive Medicine

"Despite the promise of Ketamine, more structured research is needed to establish its safety and efficacy for emergent sedation of the agitated patient. "

EAGLES query on use of Ketamine for Excited Delirium

City	Ketamine	Dosage	Other drug
KCMO	No		Versed
OKC/Tulsa	No		Versed/Haldol
New York City	No		
New Orleans	No		Versed
Houston	No		
Memphis	No		Versed
Atlanta	No		
San Antonio	Will start	2mg IV 4mg IM	Now use Versed and Zyprexa
London	No		
Denver	Will start	2mg IV 4mg IM	Now use Versed and Droperidol
Cincinnati	No		
Wichita	No		
Las Vegas	Will start	1-2 mg/kg IV; or 4 mg/kg IM.	
San Francisco	No		
Honolulu	No		Versed
Vancouver	No		
Portland	No		Versed, Droperidol, Ziprazadone
Chicago	No		
Greenville SC	No		
Albuquerque	Will start		
Salt Lake City	No		
Louisville	No		
St. Paul	Yes		
Hennepin County	Yes		

So why did Columbus add Ketamine??

- Two words! Mark Debard

Dr. Mark DeBard

White Paper Report on Excited Delirium Syndrome

ACEP Excited Delirium Task Force

TASK FORCE CHAIR

Mark L. DeBard, MD, FACEP, Chair
Professor of Emergency Medicine
Ohio State University College of Medicine
Columbus, Ohio

EMERGENCY MEDICINE NEWS Exclusively for EMNow's ACEP Scientific Assembly Edition: October 2009

ACEP Recognizes Excited Delirium Syndrome

Dr. DeBard said his drug of choice is ketamine, which is far faster-acting than the benzodiazepines and antipsychotics usually used. "These drugs buy you time," he said. EMN

White Paper Report on Excited Delirium Syndrome and Ketamine Use

The dissociative agent ketamine can also be administered by the IV or IM route and appears advantageous due to very rapid onset (especially by the IM route when compared to other medications), and lack of significant respiratory and cardiovascular effects. Case reports have indicated excellent results and safety when used in ExDS patients. Potential disadvantages include rare side effects such as increased oral secretions, laryngospasm, hypertension, and distress from emergence phenomena.

CFD EMS Protocol Committee

- Presented to EMS Protocol Committee April 2010
- Voted to put it on our seven EMS Officer vehicles

The Ketamine club:

EMS Officers Only

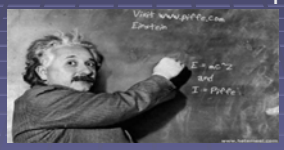
Ketamine Implementation

- Inquiry to DEA regarding storage:
  - Could store in vehicle or on person

- Inquiry into concentration and pricing:
  - 50MG/ML 10MLVials $63.75 a Vial

Ketamine Implementation

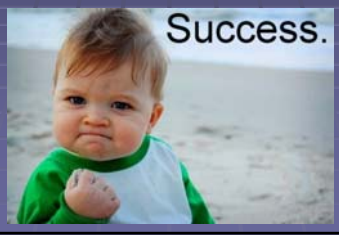
- Did extensive CME on Excited Delirium and Ketamine to all EMS personnel

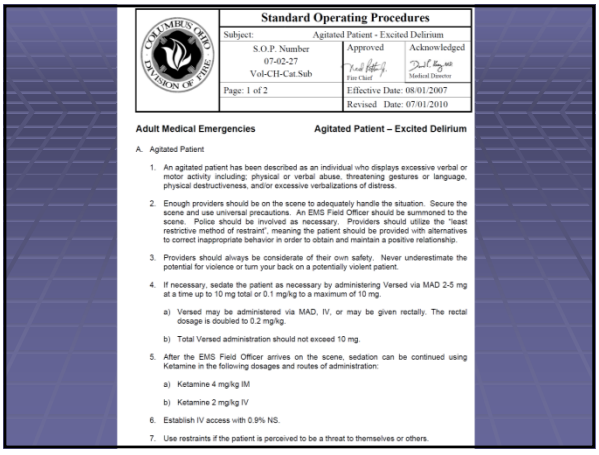


- Notified all of our receiving hospitals of intent to use Ketamine

Ketamine Implementation

- Put into EMS protocol changes effective July 2010





Standard Operating Procedures

Subject:	Agitated Patient - Excited Delirium		
S.O.P. Number 07-02-27 Vol-CH-Cat.Sub		Approved Fire Chief	Acknowledged Medical Director
Page: 1 of 2		Effective Date: 08/01/2007	
		Revised Date: 07/01/2010	

Adult Medical Emergencies **Agitated Patient – Excited Delirium**

A. Agitated Patient

1. An agitated patient has been described as an individual who displays excessive verbal or motor activity including; physical or verbal abuse, threatening gestures or language, physical destructiveness, and/or excessive verbalizations of distress.
2. Enough providers should be on the scene to adequately handle the situation. Secure the scene and use universal precautions. An EMS Field Officer should be summoned to the scene. Police should be involved as necessary. Providers should utilize the "least restrictive method of restraint", meaning the patient should be provided with alternatives to correct inappropriate behavior in order to obtain and maintain a positive relationship.
3. Providers should always be considerate of their own safety. Never underestimate the potential for violence or turn your back on a potentially violent patient.
4. If necessary, sedate the patient as necessary by administering Versed via MAD 2-5 mg at a time up to 10 mg total or 0.1 mg/kg to a maximum of 10 mg.
   a) Versed may be administered via MAD, IV, or may be given rectally. The rectal dosage is doubled to 0.2 mg/kg.
   b) Total Versed administration should not exceed 10 mg.
5. After the EMS Field Officer arrives on the scene, sedation can be continued using Ketamine in the following dosages and routes of administration:
   a) Ketamine 4 mg/kg IM
   b) Ketamine 2 mg/kg IV
6. Establish IV access with 0.9% NS.
7. Use restraints if the patient is perceived to be a threat to themselves or others.

Ketamine Utilization by EMS Officers

1. How many times have you used Ketamine?

	Response Percent	Response Count
0-1	43.8%	7
2-5	31.3%	5
6-10	12.5%	2
>10	12.5%	2
answered question		16
skipped question		0

Ketamine Utilization by EMS Officers

2. What indications have you given Ketamine?

	Response Percent	Response Count
Excited Delirium	85.7%	12
Agitated patient not in Exceited Delirium	71.4%	10
Sedation for purpose of airway control	14.3%	2
Other	7.1%	1
answered question		14
skipped question		2

Ketamine Utilization by EMS Officers

3. What complications have you encountered in administering Ketamine?

	Response Percent	Response Count
Laryngospasm	0.0%	0
Respiratory depression requiring endotracheal intubation	7.1%	1
Hypotension	0.0%	0
Nausea and vomiting	0.0%	0
Hallucinations	0.0%	0
No complications	92.9%	13
answered question		14
skipped question		2

Ketamine Utilization by EMS Officers

4. Ketamine provided adequate patient control:

	Response Percent	Response Count
Never	7.7%	1
Always	61.5%	8
less than 10% of the time	0.0%	0
less than 50% of the time	0.0%	0
More than 50%	7.7%	1
More than 90%	23.1%	3
answered question		13
skipped question		3

ADEQUATE PATIENT CONTROL >83% OF TIME

Ketamine Utilization by EMS Officers

5. What route did you adminster Ketamine?

	Response Percent	Response Count
Intramuscular	84.6%	11
Intravenous	46.2%	6
Intranasal	0.0%	0
answered question		13
skipped question		3

Ketamine Utilization by EMS Officers

What difficulties have you had in giving Ketamine?

	Response Count
16 out of 16 answered "NONE"	16
Some individual responses below:	
answered question	16

- *None. Typically, patients with certain street drugs on board require the maximum dose to achieve sedation. Have had zero difficulties. Maybe consider an optional second dose if first one isn't effective within 3-5 minutes*
- *I have needed to inject multiple time due to quantity of fluid. I have heard about issues at the receiving hospital but have not experienced these myself. This has been a very useful drug. I wish it were more concentrated. It has no doubt prevented injuries to the patient and the crews and allowed for a better pre-hospital evaluation of the patient*
- *Would like a predosed syringe*

Ketamine Utilization by EMS Officers

7. Ketamine has been a helpful adjunct to my practice as a paramedic:

	Response Percent	Response Count
Yes	80.0%	12
No	13.3%	2
Unsure	13.3%	2
answered question		15
skipped question		1

Ketamine disadvantages

- Cost of drug
- Need to draw it up and give it "under duress"
- Prominent member on the Drug Shortage list
- Maybe better alternatives??
  - Droperidol
  - Zyprexa
  - Geodon
  - Others??

GEODON
Ziprasidone HCl

Hospital Reactions to EMS Utilization of Ketamine

- You're giving the patients WHAT???????
- Do you realize what Ketamine does to:
  - ICP
  - Blood pressure
  - Respiratory drive
  - Hair loss, acne, and the heartbreak of psoriasis
  - YOURE KILLING THEM WITH KETAMINE!

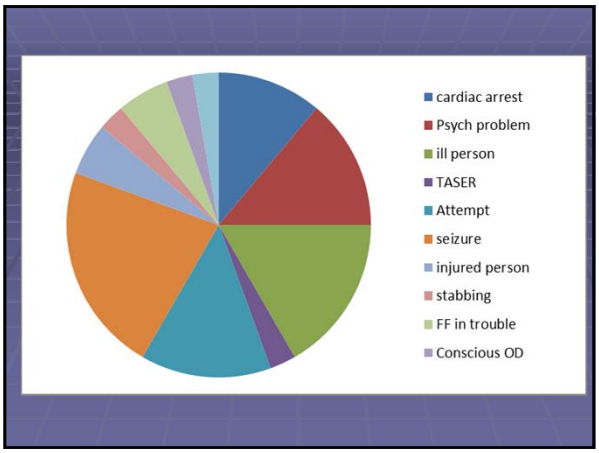
CFD Ketamine Hospital Data: 7/2010 to 7/2012

- 35 total patients given Ketamine for Agitation and transported
  - Seven "required" endotracheal intubation
  - Four of these at same hospital
  - All patients discharged to home either from the ED or after several days in hospital
  - None died
  - 9/35 had "adverse incidents"

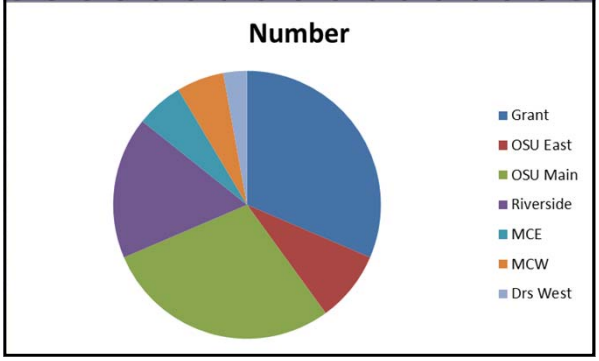
Demographic Information for Patients Receiving Ketamine and Reason for Ketamine Administration (n=35)

Male	N =27	77%
Age	Mean = 32.8	SD = 12.9
Race		
African American	15	43 %
Caucasian	12	34 %
Hispanic	1	2.9 %
Unavailable	7	20 %
Reason for Ketamine Administration		
Combative	14	40 %
Intubation	1	2.9 %
Agitation	16	46 %
Hostile	1	2.9 %
Violent	1	2.9 %
Excited Delirium	1	2.9 %
Suicidal with Weapon	1	2.9 %

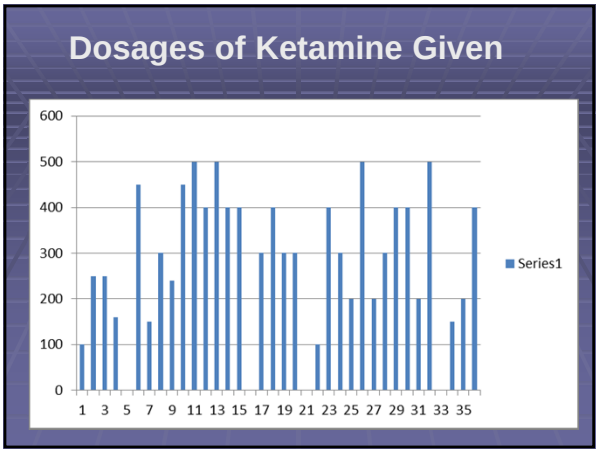
Incident Type	Number
cardiac arrest	4
Psych problem	5
ill person	6
TASER	1
Attempt	5
seizure	8
injured person	2
stabbing	1
FF in trouble	2
Conscious OD	1
Free way assignment	1



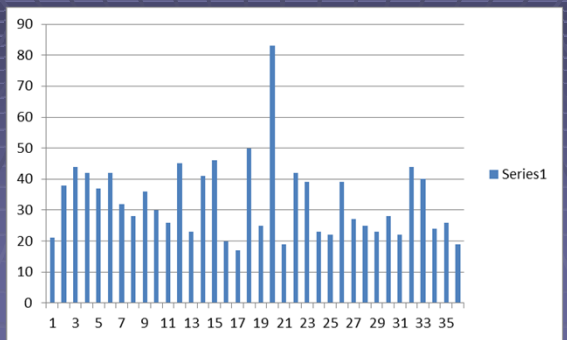
Receiving Hospitals for Ketamine patients



Dosages of Ketamine Given



Ages of patients given Ketamine



Ketamine Dosing and Need for Additional Restraints

Mean IV Dose	138 mg
Mean IM Dose	327 mg
Improvement in condition after ketamine	32/35 (91%)
Additional physical or chemical restraints required	14/35 (40%)
Additional restraints required post-ketamine administration	6

ED Interventions

Intubation

Geodon

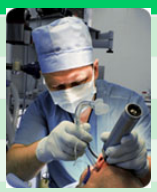
Ativan

Padded side rails

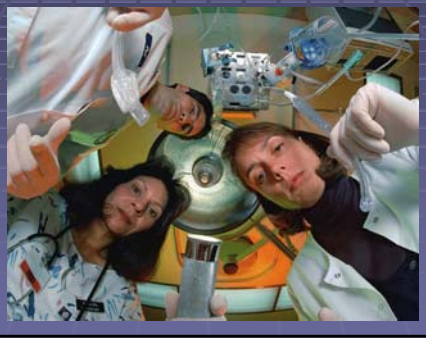
Sitter

Four point restraints

Adverse Incidents	9/35
Cardiac arrest	0/35
Respiratory failure	7/35
Emergence reaction	5/35
Hypotension	0/35
ED interventions	11/35

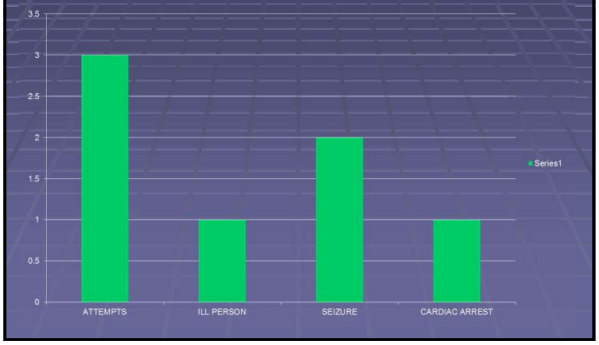


Ketamine patients intubated in the ED

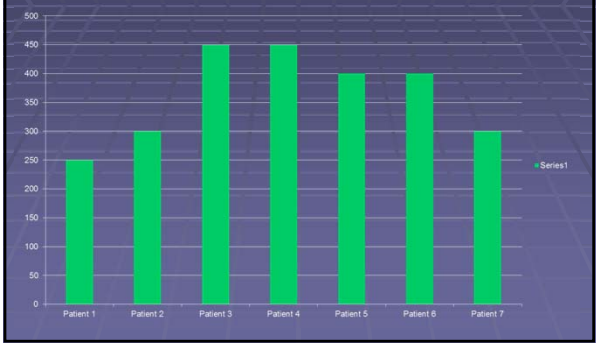


Ketamine patients intubated in the Emergency Department-Age

Ketamine patients intubated in the Emergency Department-Call type



Ketamine patients intubated in the Emergency Department- Ketamine Dose



Ketamine patients intubated in the Emergency Department-other drugs

Name	EMS Intervention #2
Patient 1	Narcan 2 mg/Versed 5mg
Patient 2	
Patient 3	Narcan 4 mg
Patient 4	Narcan 2 mg
Patient 5	
Patient 6	
Patient 7	Narcan 2 mg

Ketamine patients intubated in the Emergency Department-ED DX

Name	ED Diagnosis
Patient 1	altered mental status
Patient 2	altered mental status
Patient 3	
Patient 4	
Patient 5	ICH
Patient 6	Ketamine OD causing CNS depression/respiratory arrest
Patient 7	altered mental status/unresponsive

Ketamine patients intubated in the Emergency - DC DX

Name	DC Diagnosis
Patient 1	Primary respiratory failure, schizophrenia, hyperglycemia
Patient 2	Acute respiratory failure, borderline personality, polysubstance abuse
Patient 3	Primary aspiration pneumonia, depression, ETOH abuse
Patient 4	Atypical seizure vs. post-ictal state, encephalopathy
Patient 5	ICH and seizure
Patient 6	alcohol intoxication/cocaine abuse
Patient 7	respiratory failure/polysubstance abuse

Ketamine patients intubated in the Emergency Department-final disposition

Name	FINAL DISPOSITION
Patient 1	DC to self
Patient 2	DC to self
Patient 3	DC after 3 days to self
Patient 4	DC after 4 days to self
Patient 5	DC after extended hospital stay
Patient 6	discharged to home
Patient 7	discharged to home

Post-Ketamine Endotracheal Intubations

Age (years)	Gender	Intubation Type and Location	Reason for Intubation	Final ED Diagnosis	Additional Sedation	Ketamine Dose and Route
21	M	ET Field	Cardiac Arrest	Cardiac Arrest	-	300 IM
50	M	ET ED	Agitation	CVA	-	400 IM
44	M	ET ED	Agitation	AMS	Midazolam 5 mg IV	250 IM
37	F	ET ED	Lethargic	Ethanol Intoxication	-	120 IV
42	M	ET ED	Lethargic	Aspiration Pneumonia	TASER	450 IM
39	F	ET ED	Agitation	Ketamine Overdose	-	200 IM/200 IV
23	M	ET ED	Unresponsiveness	AMS	-	300 IM
30	M	ET ED	Agitation	Agitation	-	450 IM

Does giving Ketamine to Excited Delirium patients predispose them to endotracheal intubation?

- ***Is it the Ketamine or other drugs?***
- ***Is it the combination with other drugs/ETOH?***
- ***Would these patients have been intubated anyway?***
- ***Would patient bagging have prevented the ETT?***
- ***Are some hospitals "intubation happy"???***

The Wisdom of RJ Frascone MD

Medical Director, Regions Hospital Emergency Medical Services; Associate Professor, Department of Emergency Medicine, University of Minnesota

"The last drug given to a patient with Excited Delirium will be blamed for any adverse consequences"


QUESTIONS?????????????
COLUMBUS OHIO
DIVISION OF FIRE