# Confronting Combativeness Chemically

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## Extreme Agitation

- Medical emergency
  - Just like
    - STEMI
    - Stroke
- Pathophysiology
  - Profound metabolic acidosis
  - Unchecked catecholamine surge
  - Our job
    - Interrupt the downward spiral



## ACEP Task Force – Excited Delirium

#### ► White paper

- September, 2009
  - "May be amenable to early therapeutic intervention in some cases in the pre-mortem state"
  - "Physical restraints should be rapidly supplemented with chemical restraints..."
- Hyperactive delirium with severe agitation in emergency settings
  - ▶ June, 2021
    - Ketamine, droperidol, olanzapine, midazolam



#### ▶ Options

- Benzodiazepines
- Anti-psychotics
  - ► Droperidol
  - ► Haloperidol
- ► Dissociatives
  - ▶ Ketamine
- Dexmedetomidine
  - ► Precedex



- Benzodiazepines work
  - Particularly for cocaine/methamphetamines
  - Midazolam
    - ▶ 0.05 to 0.1 mg/kg IV/IM
      - Typical dose 2-8 mg
  - Diazepam
    - 0.2 0.5 mg IV/IM
      - Typical dose 5-10 mg
  - Lorazepam
    - 0.1 0.3 mg/kg IV/IM
      - Typical dose 2-5 mg
  - Careful when combined with alcohol
    - Knott et al, Ann Emerg Med 2006





- Droperidol (Inapsine)
  - Butyrophenone
  - Binds to GABA and dopamine receptors
  - Dose
    - ▶ 2.5 10 mg IV/IM
  - Cardiovascular effects
    - ► QTc prolongation (<1%)
    - ▶ TdP (<1%)
      - Dose dependent risks
  - Anti-emetic





## Droperidol

#### Safe

- Chase PB, Biros MH, Acad Emerg Med 2002
- Richards JR et al, J Emerg Med 1998
- Szuba et al, J Clin Psychiatr 1992
- Watcha M, Anesthesiol Clin North Am, 2002
- Silverstein JH et al, Anesthesiology, 2002
- Cohen J et al, Gastrointest Endosc, 2000
- Magee LA et al, Am J Obstet Gynecol 2002



## Droperidol

- Safe and effective in the treatment of agitation
  - Perkins et al
    - ► AAEM position paper
      - ▶ J Emerg Med, 2015
- Longest latency from initial FDA approval to black box warning
- No clinical trial or systematic review has reported any adverse cardiac events



#### Haloperidol (Haldol)

- Butryophenone
- Blocks post-synaptic mesolimbic dopaminergic D1 and D2 receptors in the brain
- Dose
  - ► 5 mg IV/IM



#### ► Ketamine

- First-line agent for severely agitated ED patients
  - Riddell et al
    - Am J Emerg Med, 2017
  - Lin et al
    - Am J Emerg Med, 2020
- Safe and effective in the field
  - Burnett et al
    - Prehosp Emerg Care, 2012
  - Cole et al
    - Clin Toxicol, 2016



## Increased ICP?

- Evaluated the available evidence on the effects of ketamine on intracranial and cerebral perfusion pressures
  - Cohen at al
    - ► Ann Emerg Med, 2014

Annals of Emergency Medicine An International Journal

## Increased ICP?

#### Conclusions

- ► No adverse effect on
  - ► ICP
  - ► CPP
  - ► Neurologic outcome
  - ► ICU stay
  - Mortality

Retamine X > ^ICP

## Ketamine in Head Injury

No increase in ICP

#### Improved CPP

- $\blacktriangleright CPP = MAP ICP$
- Possibly
  - Neuro-protective
  - Neuro-regenerative
- Safe in head injury
  - Himmelseher et al
    - Anesth and Analg, 2005
  - Torres et al
    - ▶ Cureus, 2020

#### Pourocritical Neurocrit Care (2014) 21:163–173 core boclety DOI 10.1007/s12028-013-9950-y

REVIEW ARTICLE

The Ketamine Effect on ICP in Traumatic Brain Injury

F. A. Zeiler · J. Teitelbaum · M. West · L. M. Gillman

#### Published online: 11 February 2014 © Springer Science+Business Media New York 2014

Abstract Our goal was to perform a systematic review of the literature on the use of ketamine in trammite brain injury (TBI) and its effects on intracronial pressure (ICP). All articles from MIDLINE, IGONSI, EMINASE, Giobal and Control (1998), and the state of the systematic system national Clinical Trials Registry Patform (inception to November 2013), reference lists of relevant articles, and gray literature were searched. Two reviewers independently identified all manuscripts pertaining to the administration of ICP. Secondary outcomes of effect on cerebral perfusion pressure, mean anterial pressure, patient outcome, and

Electronic supplementary material The online version of this article (doi:10.1007/s12028-013-9950-y) contains supplementary material, which is available to authorized users.

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L. M. Gillman Section of General Surgery, Department of Surgery, University of Manitoba, Winnipeg, MB, Canada adverse effects were recorded. Two reviewers independently extracted data including population characteristics and treatment characteristics. The strength of evidence was adjudicated using both the CMroft and GRADE methods in the strength of the strength of the strength of the generative strength of the strength of the strength (and the strength of the strength of the strength strength of the strength of the strength of the studies, of the 101 adult and 55 pediatric patients described. (CP did not increase in any of the studies during the transformation of the studies of the strength of the studies, of the 101 adult and 55 pediatric patients described. (CP did not increase in any of the studies during the transformation of the studies during the strength of the studies. Outcome data were poorly documented. There studies that are solated and ventilated, and in fact may lower it in selected cases.

Keywords Ketamine · ICP · Traumatic brain injury

#### Introduction

Ketamine's use as a dissociative anesthetic agent has afforded its application in a variety of instances where the side effect profile of standard anesthetics has negated their use [1, 2]. The quick action and lack of significant hemodynamic derangements with ketamine make it attractive as an agent for procedural sedation and induction [3] in those patients suffering from shock. However, despite the

⁄ Springer

## Head Injury

- Greatest predictors of bad outcome
  - ► Hypotension
  - ► Hypoxia



## Head Injured Trauma Patient

- Intoxicated
- Combative
- Uncooperative
- Non-compliant
  - Spinal immobilization
- End-result
  - Raised ICP
  - Risk of spinal injury
  - Risk to providers





## Head Injury

#### Benzodiazepines

- Drop MAP
- Decrease respiratory drive
  - Especially with high levels of alcohol!
    - ► Knott et al, Ann Emerg Med 2006
- ► Ketamine
  - Increases MAP
    - ► Weak sympathomimetic
  - ► No decrease in respiratory drive



## Ketamine in Trauma

- Ketamine use in prehospital and hospital treatment of the acute trauma patient: a joint position statement
  - Morgan et al
    - ▶ Prehosp Emerg Care, 2020
  - ACEP, ACS-COT, NAEMSP, NASEMSO, NAEMT consensus statement
  - Endorsed by AAST, EAST, WTA, PTS, ASHP, ACCP



## Ketamine in Trauma

#### Consensus statement

- ► Indications
  - Analgesia
    - Alone or with opioids
  - Procedural sedation
  - ► Intubation
  - ► Acute agitation/excited delirium
- ► Safe and effective
  - ► TBI
    - Minimal effect on ICP
    - No effect on CPP or neurologic outcomes
  - ► Eye injuries
    - ► No clinically significant effect on IOP



## Ketamine in Trauma

#### Dosing

#### Analgesia

- ▶ 0.1-0.3 mg/kg IV
  - ▶ 0.5-1 mg/kg IN
- Procedural Sedation
  - ▶ 1 mg/kg IV
    - ► Max 100 mg
- ► Induction/RSI
  - ► 2 mg/kg IV
- Acute agitation
  - ▶ 3-5 mg/kg IM
  - ▶ 1-2 mg/kg IV



## Dexmedetomidine

- ► PRECEDEX
- Dose
  - ▶ 0.6-0.7 mg/kg/hr
    - No bolus
    - ► Onset in 5-10 minutes
    - ▶ Off 15 minutes after stopping
      - Bring to CT and stop as you start the CT scan



## Comments, thoughts, frustrations.....

- My E-mail:
  - Christopher.Colwell@ucsf.edu

# Management of the Agitated Patient in a WRAP

Gaither, 2024

## Disclosures

- No conflicts
  - No relationships with Safe Restraints, Inc.
  - No pharmaceutical connections
- The City of Tucson experienced 2 in custody deaths between 2019-2020
  - Our group provides medical direction for TFD not TPD

## The Task... Make Restraints Safer

# Step 1: Selecting a restraint method... a partnered approach

- PD Responsibilities
  - Officer driven application
  - Scene safety
- Medical Responsibilities
  - Ensure device allows adequate ventilation
  - Ensure device allows patient assessment
  - Ensure device allows safe transport

## **Demo the options**

### The Wrap Device



## Step 2: A Patient Care Policy for System Management of Acute Agitation



# When Does the EMS Care Start and LEO Care End?

**Chief of Police & Fire Chief** 

# When EMS Arrives

## What are EMS Responsibilities

## Which Individuals in the WRAP Need a Medical Evaluation

All of Them are Patients

- All Patients
  - Full set of Vital Signs
  - Full ePCR and narrative on every encounter
  - All offered transport to Emergency Department

# PART 3: Its one thing to have a policy... compliance is completely different

## Tucson Fire Department Agitated Patient QI Program

All Patients in WRAP Device

- 100% case Review
- Was care compliant with protocol

All Patients given Versed

- Appropriate Dosing
- Appropriate post medication administration monitoring

## **WRAP Device Used**

### DOCUMENTATION

120% 100% 100% 100% 89% 88% 75% 80% Percentage 67% 64% 63% 60% 50% 44% 36%36% 40% 33%33%33% 33% 30% 27% 25% 25% 22% 18%18% 16%17% 20% 13% 13% 11% 10% 0% 0% 0% 0% 0% 0% 0% 0% Year Total January February March April May June July August September October November Month Documented Appropriately - Appropriate % Documented Appropriately - Inappropriate % Documented Appropriately - Questionable %

TFD WRAP QI - Documented Appropriately%

## What About the Individual Patients

**263 Individual Patient** 

No In-custody Deaths

One Cardiac Arrest During EMS Transport after WRAP restraint, WRAP Removal and Versed Administration

## Conclusion

- Police & EMS must be on the same page at the highest level
- A QI program protects patients, providers & agencies



- Never meet a colleague for the first time in a disaster
- Why it was done matters too...a lot
- One size does *not* fit all
- A culture of empowerment





## Jacob Nacht, MD

Improved Montgomery County Richmond Agitation Sedation Scale (IMC-RASS)			
Score	Term	Description	EMS Activity
+4	Combative	Overtly combative, violent, immediate danger to staff	Unsafe to care for patient without maximal assistance, require law enforcement assistance
+3	Very agitated	Pulls or removes tubes and catheters, aggressive	Struggles aggressively and forcefully against care. Routine EMS care impossible.
+2	Agitated	Frequent, non-purposeful movements, fights interventions	Resists EMS care, requires gentle physical redirection to allow for routine EMS care
+1	Restless	Anxious but movements are not aggressive or vigorous	Verbally redirectable, follows commands, routine EMS care possible
0	Alert and Calm		
-1	Drowsy	Not fully alert but has sustained awakening and eye contact to voice (>10 seconds)	Awakens to voice
-2	Light sedation	Briefly awakens with eye contact to voice (<10 seconds)	Awakens to bumps/potholes in roadway during transport or application of oxygen via NC or NRB
-3	Moderate Sedation	Movement or eye opening to voice (no eye contact)	Eyes open to physical exam, venous tourniquet application and/or BP cuff inflation
-4	Deep Sedation	No response to voice but movement or eye opening to physical stimulation	Responds to insertion of NPA or IV start
-5	Unarousable	No response to voice or	No response to insertion of OPA/NPA

• RASS +3/+4

• RASS +4

Max 2 doses before base contact



#### **Post Sedation Resuscitation and Monitoring**

- Maintain airway
- Administer oxygen
- Monitor capnography: Maintain respiratory rate >8 breaths per minute
- Monitor SpO<sub>2</sub>: Goal of 100%
- Establish IV access, if not already in place
- Cardiac monitoring

## Is the SAT better than the RASS?





### Is There a True Prehospital Score

- Quick
- Easy to administer
- Widely Applicable
- Reproducible



### Is There a True Prehospital Score

Sedation Assessment Tool (SAT) <sup>1</sup>				
Score	Responsiveness	Speech		
+3	Combative, violent, out of control	Continual loud outbursts		
+2	Very anxious and agitated	Loud outbursts		
+1	Anxious/restless	Normal -> talkative		
0	Awake and calm/cooperative	Speaks normally		
-1	Asleep but rouses if name is called	Clurring or prominent slowing		
-2	Responds to physical stimulation	Few recognizable words		
-3	No response to stimulation	Nil		







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## **Robert Lowe, MD FACEP FAEMS**

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## **Behavioral Severity Index**

Level	Item	Description	
1	Confused	Appears obviously confused and disoriented. May be unaware of time, place, or person.	
2	Irritable	Easily annoyed or angered. Unable to tolerate the presence of others.	
3	Boisterous	Behavior is overtly "loud" or noisy. e.g. Slams doors, shouts out when talking etc.	
4	Verbally Threatening	A verbal outburst which is more than just a raise voice, and where there is a definite intent to intimidate or threaten another person. e.g. Verbal attacks, abuse, name-calling, verbally comments uttered in a snarling aggressive manner.	
5	Physically Threatening	Where there is a definite intent to physically threaten another person. e.g. Aggressive stance, grabbing another person's clothing, raising of an arm or leg, making of a fist or modeling of a head-butt directed at another	
6	Attacking Objects	king cts An attack directed at an object and not an individual. e.g. Indiscriminate throwing of an object, banging or smashing windows, kicking, banging or head- butting an object, or the smashing of furniture.	
7	Attacking People	Any physical assault on another person or persons. e.g. Kicking, punching, striking, biting, throwing objects at a specific living target, brandishing or use of any object as a weapon.	

\*R/D with permission from North Memorial Ambulance Service and Dr. John Lyng

# **BSI Dosing Parameters**

	Level	Approved Interventions The interventions listed at each BSI level represent the MAXIMUM intervention allowed. Providers may use their discretion to apply interventions listed in lower-acuity BSI levels but may not exceed the recommended interventions for the highest-acuity classification the patient meets.			MIDAZOLAM Intramuscular: 5-10mg once. Reassess after 3 minutes, and consider administering another 5mg IM q3 min to maximum of 20mg. Intravenous / Intraosseous: 2.5 - 5.0mg once. Reassess after 1 minute, and consider Administering an additional 2.5mg IV, if necessary.
	0	0 Keep patient informed of plan of care and involved in decision making.			Or Administer Droperidal 5mg-10mg IM ONCE or IV 5mg-10mg ONCE
		Coaching, reassurance, or verbal de-escalation - AND, IF NEEDED -			PLUS - All gurney seat belts with buckle guards AND limb restraints x4
	1-3	MIDAZOLAM Intramuscular: 2.5 - 5mg once. Reassess after 10 minutes, and consider administering an additional 5mg IM, if necessary. Intravenous / Intraosseous: 1.0 - 2.5mg once. Reassess after 5 minutes, and consider Administering an additional 2.5mg IV, if necessary. Or			Pediatric dosing <u>Midazolam</u> .1mg/kg (max dose 5mg) See <u>Pediatric Dosing Chart</u> . Avoid giving <u>Benzodiazepines/IM to kids with autism/developmental delay if possible</u> . For these patients an extra home dose of their Clonidine, Olanzapine, or Benadryl. OR If BSL Score of 6-7 WITH Signs of Delirium with Severe Agitation*:
		PLUS - All gurney seat belts with buckle guards			*A state of psychomotor agitation and/or dissociation from reality that is <b>immediately</b>
	4-5	MIDAZOLAM Intramuscular: 5-10mg once. Reassess after 3 minutes, and consider administering another 5mg IM q3 min to maximum of 20mg. Intravenous / Intraosseous: 2.5 - 5.0mg once. Reassess after 1 minute, and consider Administering an additional 2.5mg IV, if necessary. Or Administer <u>Droperidol</u> IM 5mg ONCE or IV 5mg ONCE - PLUS - All gurney seat belts with buckle guards AND limb restraints x4	6-7	threatening to the patient, general public, or EMS provider's well-being. Defined by clinical features, such as paranoia, hyperaggression, violence, hallucinations, sympathetic tone (e.g. tachycardia, hypertension, hyperthermia, increased strength). Frequently associated with stimulant / sympathomimetic drug use. Consider: KETAMINE (***AAS PARAMEDIC ONLY***) Intramuscular: 4mg/kg once, to maximum of 500mg.	

- Standardized language
- Standardized dosing
- Improved documentation
- Easy to generate QA report

