Top 5 EMS Challenges
In Pediatric Medical Care

Peter Antevy MD

EMS Medical Director

Broward, Miami-Dade, Palm Beach Counties

PEM Physician

Joe DiMaggio Children's Hospital

Disclosures

- Founder & Chief Medical Officer

  Handtevy - Pediatric Emergency Standards, Inc.

Objectives

- What is the best pediatric Airway option?
- What should we use for Pain Control?
- What should we do for Seizure Control?
- How should we treat Hypoglycemia?
- Access (IO)

Objectives

- What is the best pediatric Airway option?
- What should we use for Pain Control?
- What should we do for Seizure Control?
- How should we treat Hypoglycemia?
- Should we withhold Fluids in Kids?

What is the Best Airway Option?

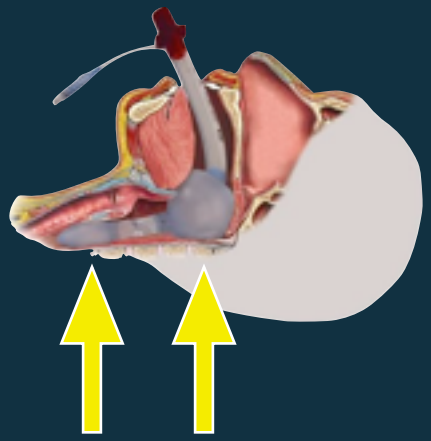
- Bag-Valve-Mask (BVM)
  - Complications of Intubation

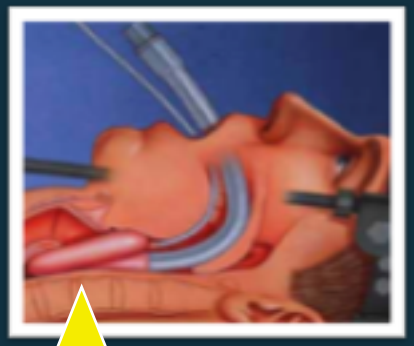
<u>Supraglottic Airways</u>

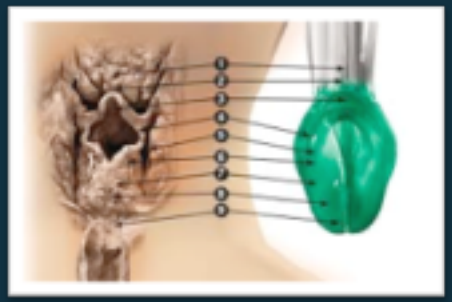
- LMA
- King LT
- iGel

The Pediatric Airway

KING LTD | LMA | i-Gel





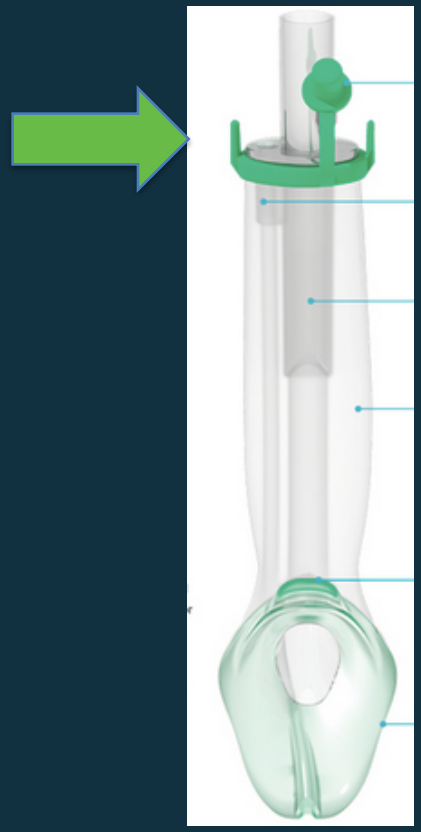


Require Inflation

ETT vs SGA

Fig. 2. Real time tracing during one experiment. Pink: carotid blood flow (CBF); blue: thoracic aortic pressure (AO pressure); green: airway pressure. The figure shows that every time a supraglottic airway device is used carotid blood flow significantly decreases without any differences in aortic pressure. Ventricular fibrillation (VF), cardiopulmonary resuscitation (CPR). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article.)

I-Gel – Things to Know



NeoBar

Gastric Tube 12 Fr – I-Gel Size 1.5 & above

Pediatric King LT

Prehosp Emerg Care. 2011 Jul-Sep;15(3):401-4. Epub 2011 Apr 11.

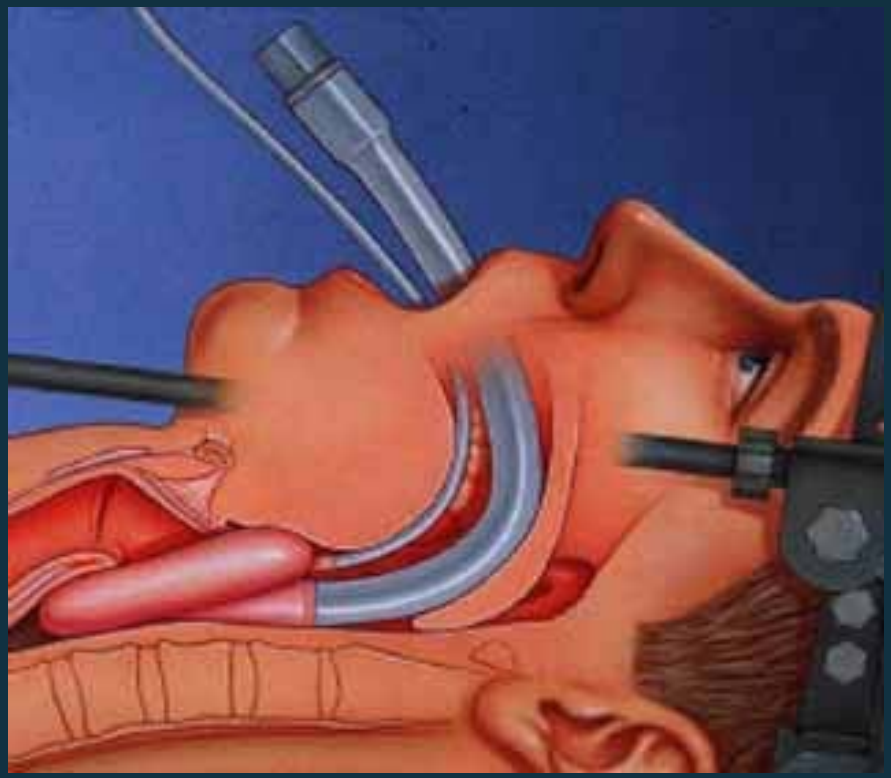
Prehospital pediatric King LT-D use: a pilot study. Ritter SC, Guyette FX.

45 Attempts

43 Success

95.5%

LMA



LMA Video

ORIGINAL ARTICLE

Comparison of Direct Laryngoscopy to Pediatric King LT-D in Simulated Airways

Donald V. Byars, MD,† Richard A. Brodsky, MD,‡ David Evans, MD,* Bruce Lo, MD,*§ Theresa Guins, MD,‡ and Amy M. Perkins, MS//*

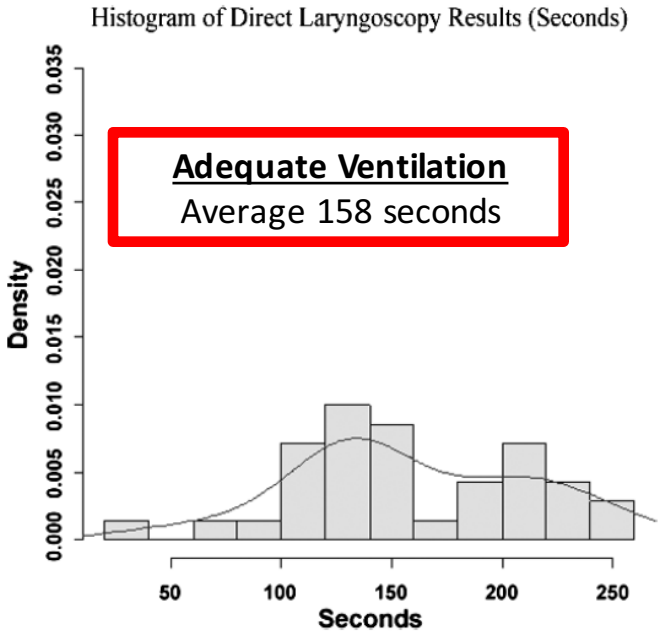


FIGURE 1. Adequate ventilation time (in seconds) using direct laryngoscopy.

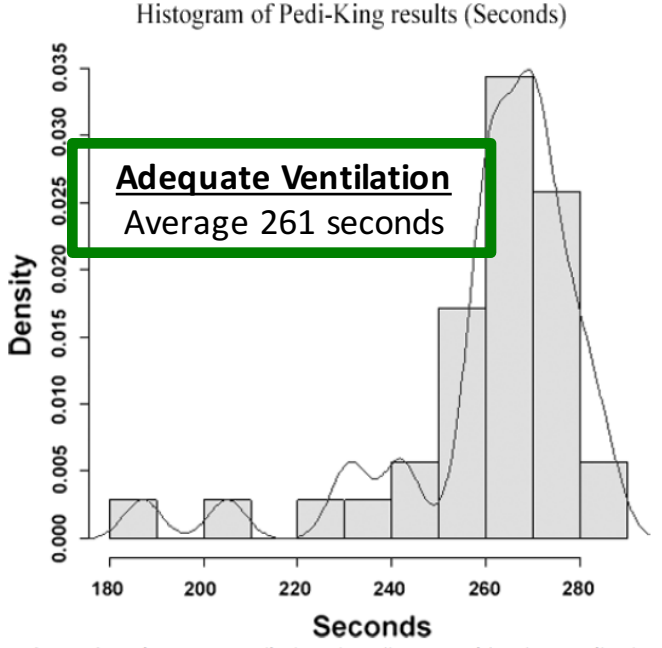


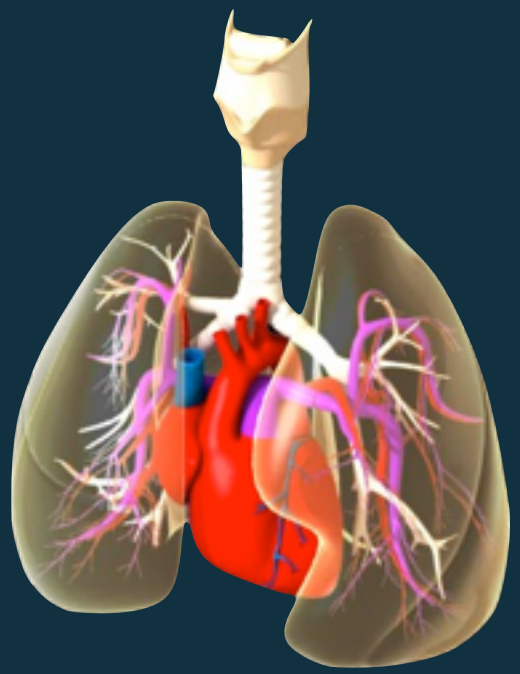
FIGURE 2. Adequate ventilation time (in seconds) using pediatric King Airway Device.

Pediatric Emergency Care & Volume 28, Number 8, August 2012

Pediatric Resuscitation

Why Not Just Intubate?

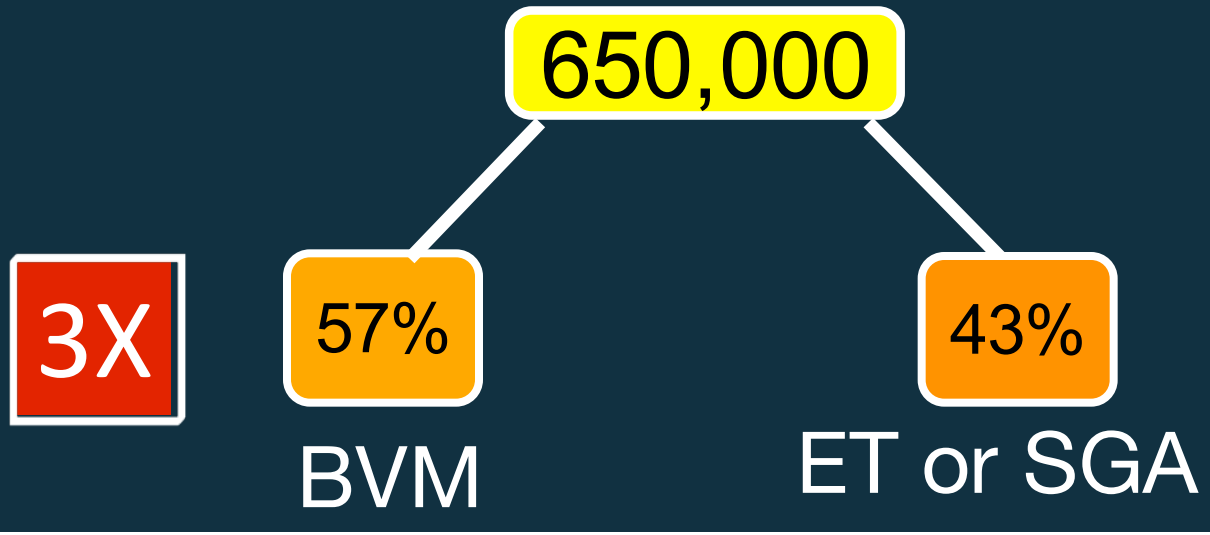
- Negative vs Positive pressure
- Cardiovascular effect
- Cerebral effect
- Human effect
  - Rate of ventilation



Why Not Just Intubate?

JAMA January 2012

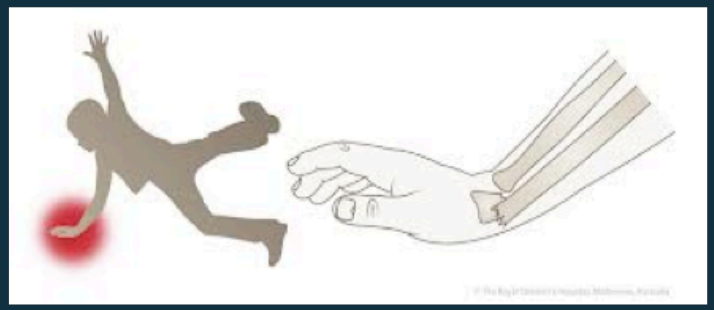
Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest



BVM is Still King

What Should We Use for Pain?

5 year old fell while running



Meaningful Use

Coming Soon…Very Soon!

Treatment?

Yes

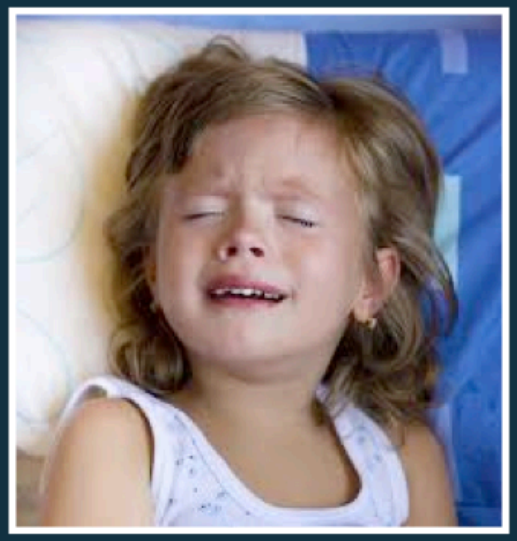
$$$

No

$

Pain Control

The Realities

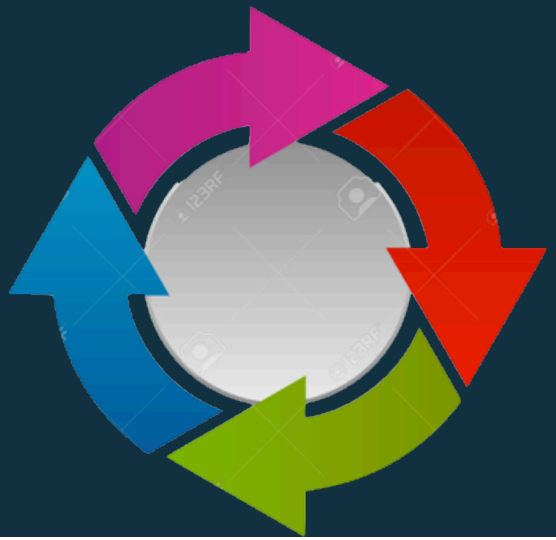


WHY NOT?

Pain Control

The Number One Reason

Trace the Steps from the Start



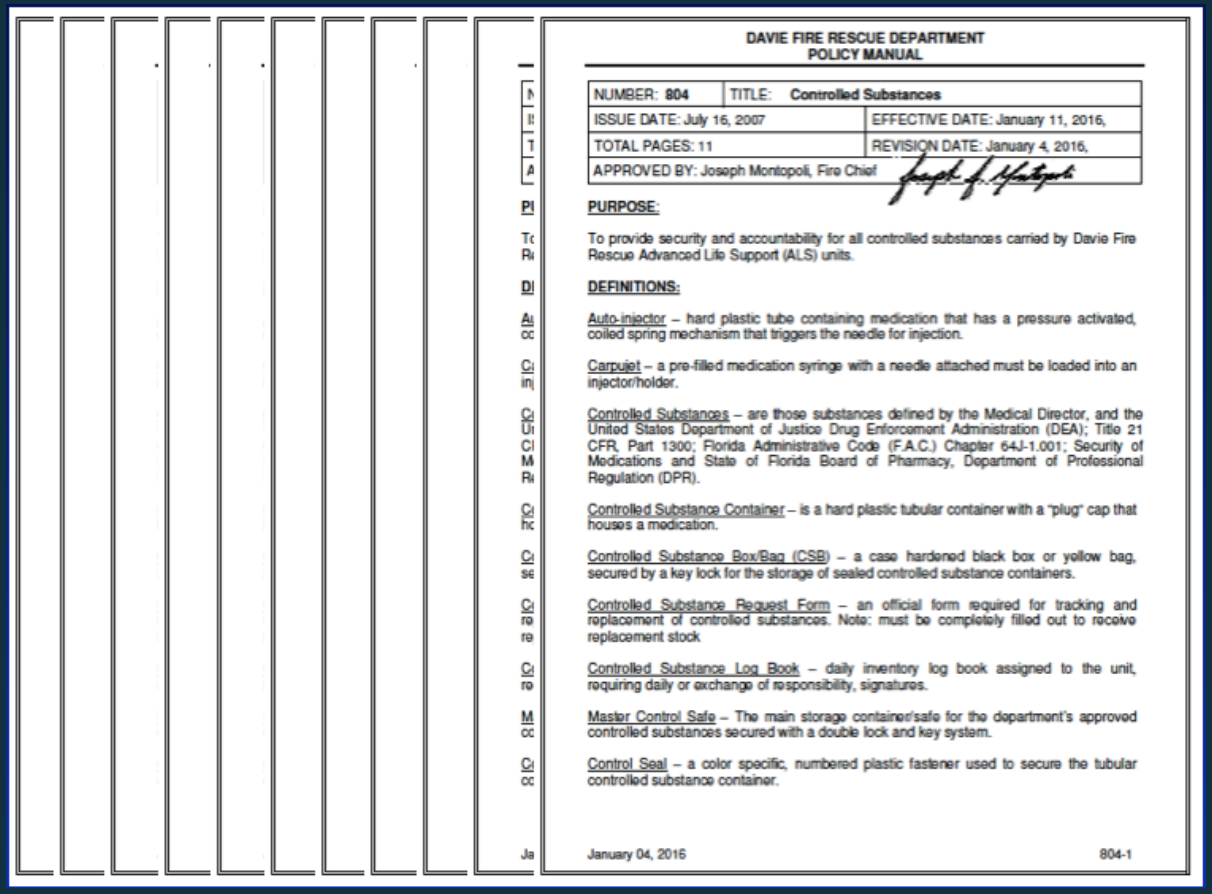
Pain Control

The Number One Reason

What is the Process at Your Shop?

1. Retrieve the medication - Locked Box
2. Fill out paperwork
3. Dispose of additional medication
4. Restock the vehicle

Pain Control Policy



DAVIE FIRE RESCUE DEPARTMENT
POLICY MANUAL

NUMBER: **804**	TITLE: **Controlled Substances**
ISSUE DATE: July 16, 2007	EFFECTIVE DATE: January 11, 2016,
TOTAL PAGES: 11	REVISION DATE: January 4, 2016,
APPROVED BY: Joseph Montopoli, Fire Chief	

PURPOSE:

To provide security and accountability for all controlled substances carried by Davie Fire Rescue Advanced Life Support (ALS) units.

DEFINITIONS:

Auto-injector – hard plastic tube containing medication that has a pressure activated, coiled spring mechanism that triggers the needle for injection.

Carpujet – a pre-filled medication syringe with a needle attached must be loaded into an injector/holder.

Controlled Substances – are those substances defined by the Medical Director, and the United States Department of Justice Drug Enforcement Administration (DEA); Title 21 CFR, Part 1300; Florida Administrative Code (F.A.C.) Chapter 64J-1.001; Security of Medications and State of Florida Board of Pharmacy, Department of Professional Regulation (DPR).

Controlled Substance Container – is a hard plastic tubular container with a "plug" cap that houses a medication.

Controlled Substance Box/Bag (CSB) – a case hardened black box or yellow bag, secured by a key lock for the storage of sealed controlled substance containers.

Controlled Substance Request Form – an official form required for tracking and replacement of controlled substances. Note: must be completely filled out to receive replacement stock

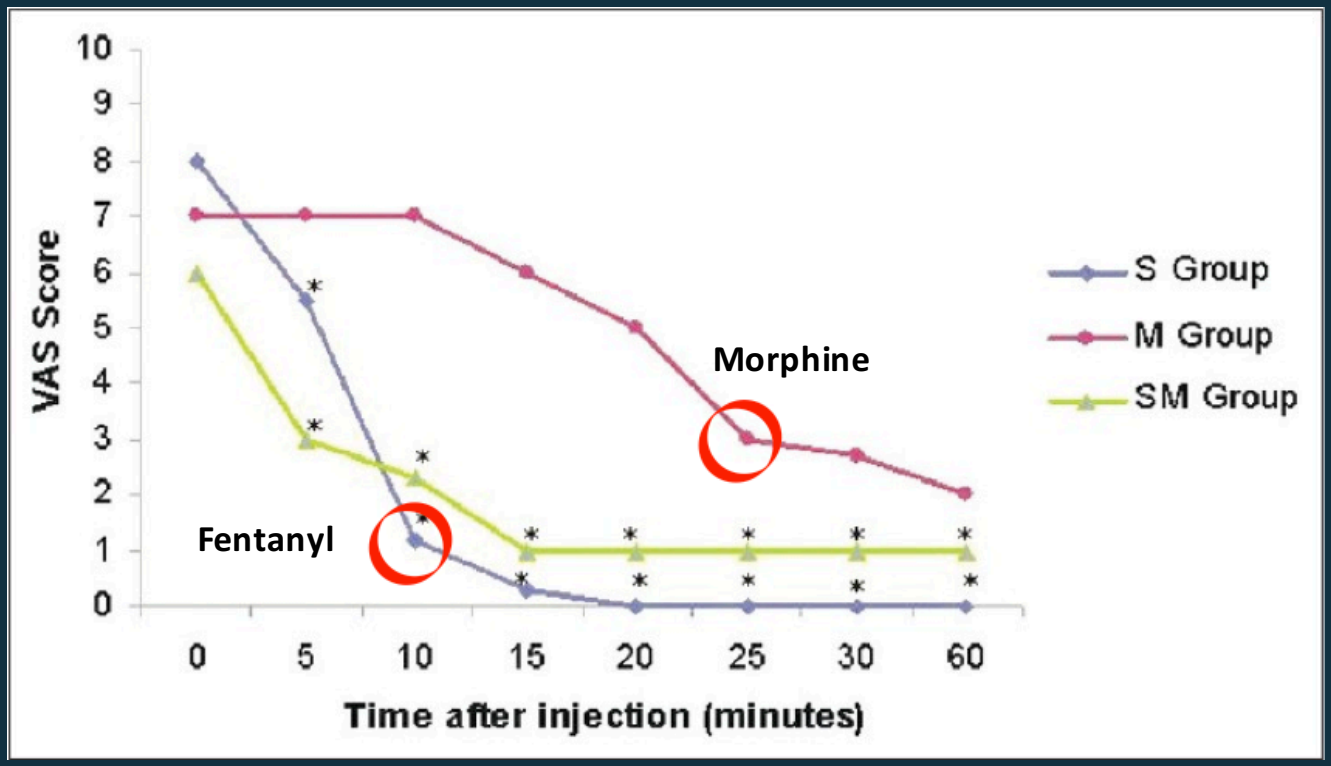
Controlled Substance Log Book – daily inventory log book assigned to the unit, requiring daily or exchange of responsibility, signatures.

Master Control Safe – The main storage container/safe for the department's approved controlled substances secured with a double lock and key system.

Control Seal – a color specific, numbered plastic fastener used to secure the tubular controlled substance container.

	Adult Concentration	Concentration	Pediatric Concentration
Morphine	10 mg/mL	4 mg/mL	2 mg/mL
Fentanyl	50 mcg/mL		
Hydromorphone	10 mg/mL	4 mg/mL	2 mg/mL
Ketamine	100 mg/mL	50 mg/mL	10 mg/mL

Speed Matters



Fentanyl

1.5 – 2 mcg/kg Intranasal

0.5 – 1 mcg/kg IV

Dead Space Caution

= 0.1 mL

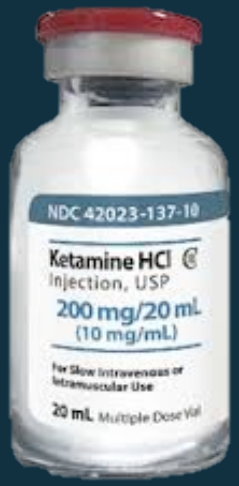
4 month old =	0.18 mL	(55%)
6 month old =	0.24 mL	(42%)
1 YR old =	0.3 mL	(33%)
3 YR old =	0.45 mL	(22%)
5 YR old =	0.6 mL	(17%)

Ketamine Insight

=

500 mg/5 mL **IM or IN**

Ketamine Insight



=

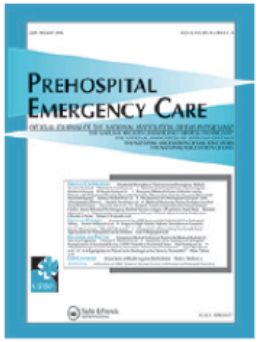
200 mg/20 mL **IV**

5 Year Old (20 kg)

Give This Over 60 Seconds!

Ketamine Concentration	**Analogy**	**Pain Dose** 0.25 mg/kg	**RSI/Sedation** 2 mg/kg
100 mg/mL		0.05 mL	0.4 mL
10 mg/mL		0.5 mL	4 mL

What should we use for Seizure Control?



Prehospital Emergency Care

ISSN: 1090-3127 (Print) 1545-0066 (Online) Journal homepage: http://www.tandfonline.com/loi/ipec20

Impact of High-Fidelity Pediatric Simulation on Paramedic Seizure Management

Manish I. Shah MD, MS, John M. Carey MD, Sarah E. Rapp MD, Marina Masciale MD, Wendy B. Alcanter MD, Juan A. Mondragon BS, Elizabeth A. Camp PhD, Samuel J. Prater MD & Cara B. Doughty MD, MEd

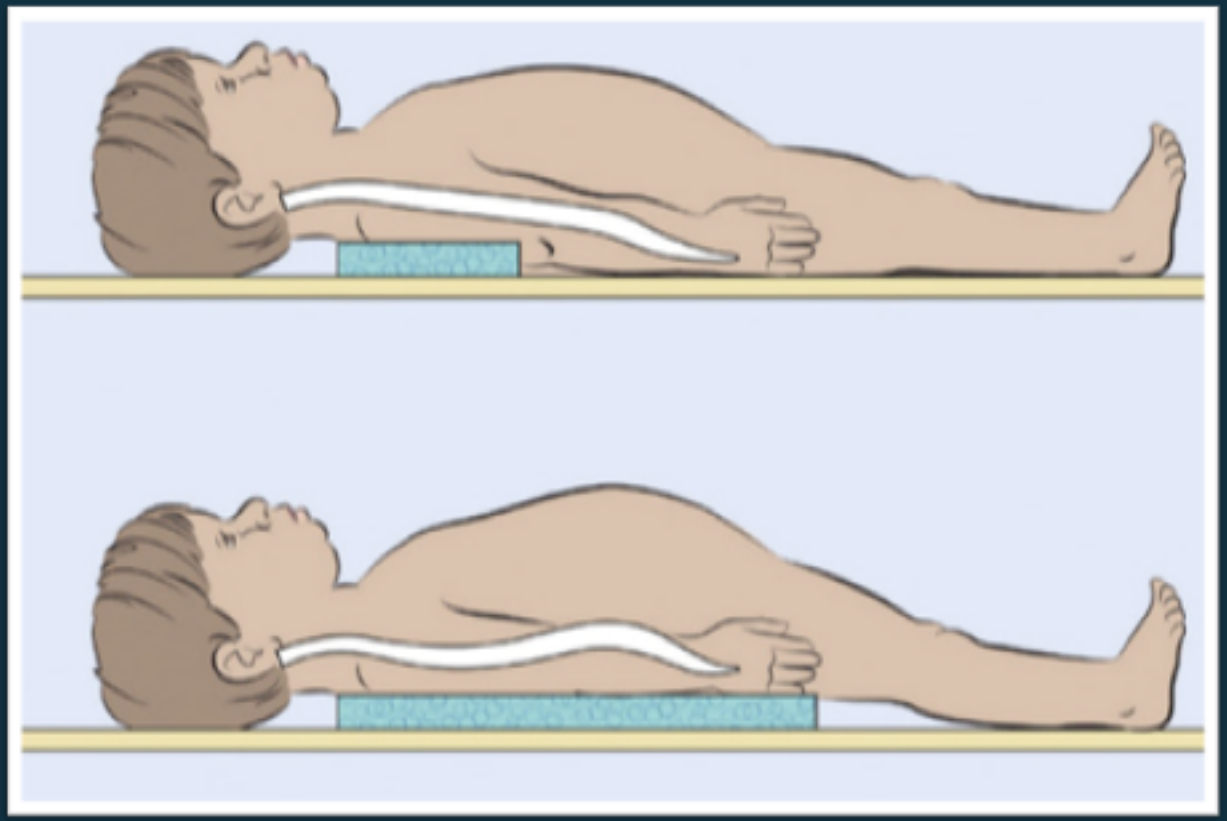
Does Education Matter?

Impact of High-Fidelity Pediatric Simulation on Paramedic Seizure Management

TABLE 4. Prehospital secondary outcomes

	Total ($n = 250$)	Non-trained paramedics ($n = 185$)	PediSTEPPs trained paramedics ($n = 65$)	p value
Received 1st midazolam dose	144 (58%)	103 (56%)	41 (63%)	0.30
Route, 1st dose of midazolam				0.23
IV	98 (68%)	67 (65%)	31 (76%)	
PR	17 (12%)	16 (16%)	1 (2%)	
IM	16 (11%)	12 (12%)	4 (10%)	
IN	11 (8%)	7 (7%)	4 (10%)	
IO	2 (1%)	1 (1%)	1 (2%)	
Received 2nd midazolam dose	19 (8%)	13 (7%)	6 (9%)	0.75
Route, 2nd dose of midazolam				0.31
IV	10 (53%)	6 (46%)	4 (67%)	
IM	5 (26%)	3 (23%)	2 (33%)	
PR	4 (21%)	4 (31%)	0 (0%)	
IN	0 (0%)	0 (0%)	0 (0%)	
IO	0 (0%)	0 (0%)	0 (0%)	
Correct dose given[a] (midazolam)	82/161 (51%)	58/114 (51%)	24/47 (51%)	0.98
Correct dose given[a] (dextrose)	1/2 (50%)	0/1 (0%)	1/1 (100%)	1.00
Respiratory failure	25 (10%)	21 (11%)	4 (6%)	0.34
IV line attempted	200 (80%)	144 (78%)	56 (86%)	0.15
Seizure recurrence	54 (22%)	40 (22%)	14 (22%)	0.99
Median time on-scene (IQR) (minutes)	34 (27, 41)	34 (27–41)	35 (27.5–42)	0.66
Median time to 1st treatment (IQR) (minutes)	14 (7, 20)	14 (7–22)	14 (6.5–19.5)	0.56

Most Important Step



Benzodiazepines

Name	Concentrations	
Midazolam (Versed)	1 mg/mL	5 mg/mL
Diazepam (Valium)		5 mg/mL
Lorazepam (Ativan)	2 mg/mL	4 mg/mL

Benzodiazepines

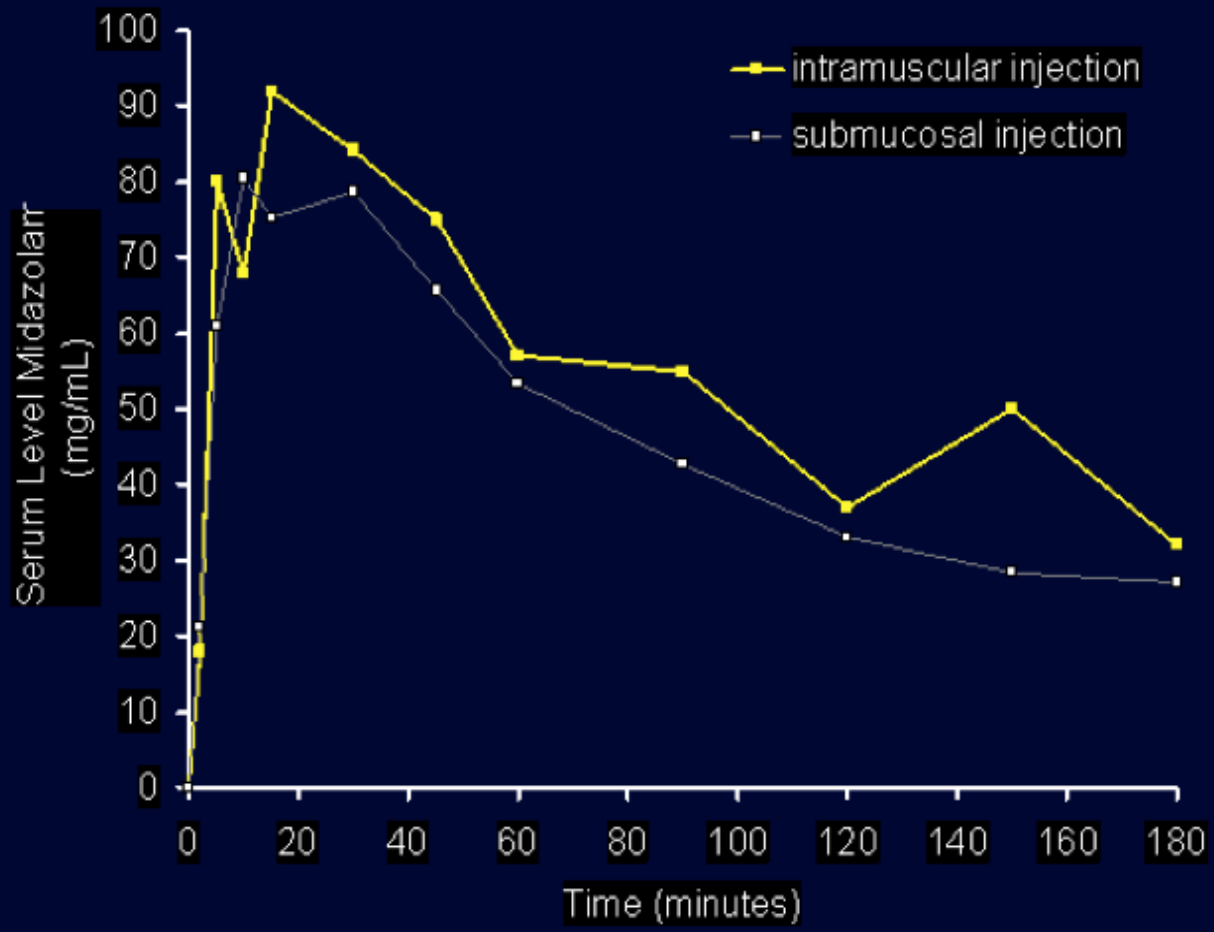
Name	Concentrations	
Midazolam (Versed)	1 mg/mL	5 mg/mL
Diazepam (Valium)		5 mg/mL

Benzodiazepines

Name	Concentrations	
Midazolam (Versed)	1 mg/mL	5 mg/mL

- Fast On – Fast Off
- Any Route (IM, IN, IV)
- Few Active Metabolites

Midazolam levels near 80% of peak as early as 5 minutes after IM administration



Alfonzo-Echeverri, Anesth Prog 1990;37:277-281

An Evidence-based Guideline for Pediatric Prehospital Seizure Management Using GRADE Methodology

Manish I. Shah, MD, Charles G. Macias, MD, MPH, Peter S. Dayan, MD, MSc, Tasmeen S. Weik, DrPh, MPH, Kathleen M. Brown, MD, Susan M. Fuchs, MD, Mary E. Fallat, MD, Joseph L. Wright, MD, MPH, Eddy S. Lang, MDCM, CCFP (EM)

Strong Recommendation

Recommendation #7:
We recommend that prehospital protocols for seizure management in children utilize alternative (non-IV) routes of drug administration as first-line therapy for treating children with status epilepticus.

Evidence quality: Moderate
Recommendation strength: Strong

Prehosp Emerg Care. 2014;18 Suppl 1:15-24.

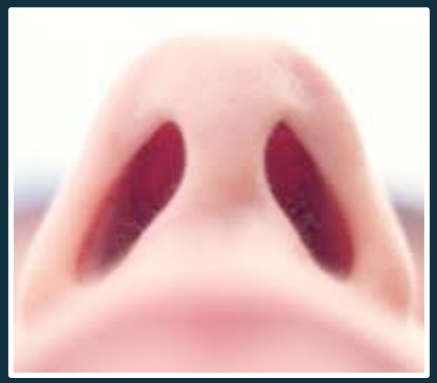
Midazolam Dosing

0.2 mg/kg

Intramuscular

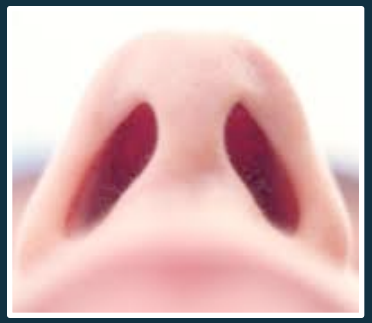
10 mg/2mL

Intranasal



DOUBLE THE IV DOSE

Who Was That?



How should we treat Hypoglycemia?

Variability in the Treatment of Prehospital Hypoglycemia: A Structured Review of EMS Protocols in the United States

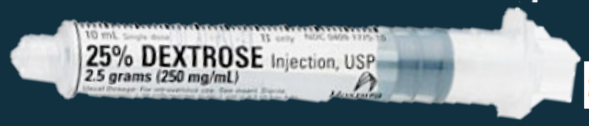
Paul Rostykus, MD, MPH, Jamie Kennel, MS, Kristian Adair, EMT, Micah Fillinger, EMT, Ryan Palmberg, EMT, Amy Quinn, EMT, Jonathan Ripley, EMT, Mohamud Daya, MD, MS

Prehospital Emergency Care, Published online: 01 Mar 2016.

Pediatric	>0.5–1 g/kg	39	21%	13	7%
	0.5 g/kg	130	70%	32	17%
	<0.5 g/kg	6	3%	3	2%
	Not listed	10	5%	137	74%
Neonatal	>0.5–1 g/kg	17	9%	3	2%
	0.5 g/kg	83	45%	7	4%
	0.25–<0.5 g/kg	10	5%	2	1%
	<0.25 g/kg	23	12%	6	3%
	Not listed	52	28%	167	90%

*Percentages may not total 100% due to rounding.

50 %



25 %

10 %

Best Option – D10W

<u>Cradle to Grave</u>

0.5 g/kg

Max of 10 g (100 mL)

Repeat as Needed

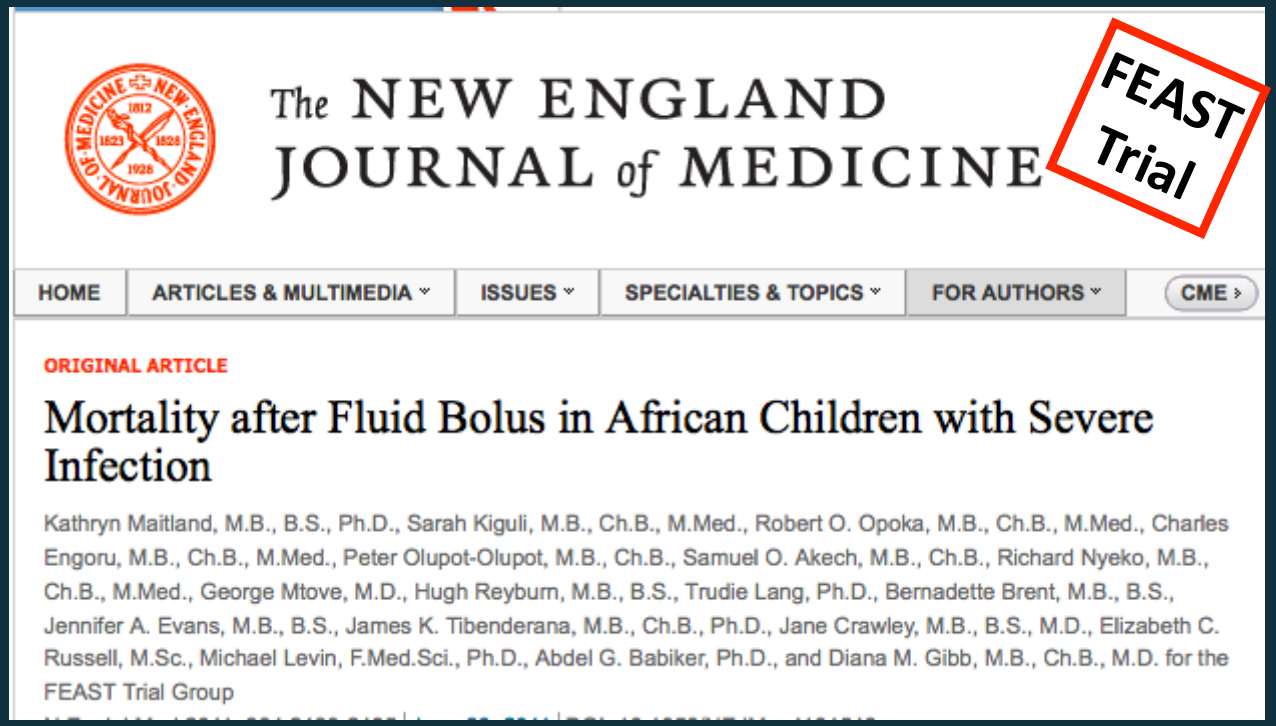
Fluid Restriction

	Studies	Survival to Hospital Discharge	Need for Transfusion or Diuretics	Need for Rescue Fluid	Mechanical Ventilation or Vasopressor	Time to Resolution of Shock	Total IV Fluids
Severe sepsis/ septic shock	Santhanam 2008; Carcillo 1991	No Benefit	No Benefit	No Studies Available	No Benefit	No Benefit	No Studies Available
Severe malaria	Maitland 2005; Maitland 2005	No Benefit	No Benefit	Harm	No Studies Available	No Benefit	No Benefit
Severe febrile illness with some but not all signs of shock	Maitland 2011; Maitland 2013	Benefit	No Benefit	No Studies Available	No Studies Available	Harm	No Benefit

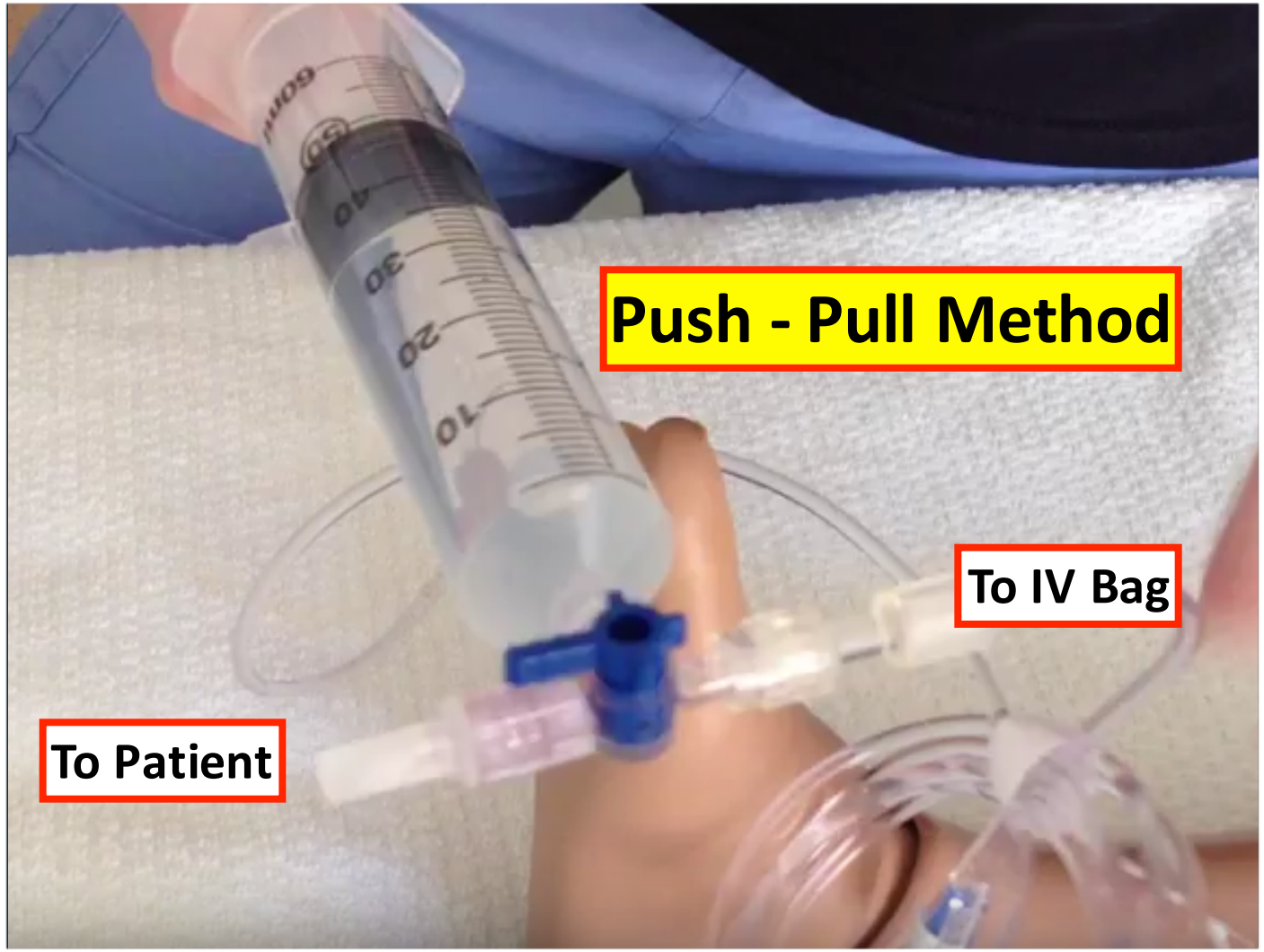
Recommend against boluses for children not in shock

PALS Evidence

Fluid resuscitation



Fluid boluses significantly increased 48-hour mortality in critically ill children with impaired perfusion in these resource-limited settings in Africa.


Push - Pull Method
To IV Bag
To Patient

500 mL in < 2.5 minutes

Top 5 EMS Challenges
In Pediatric Medical Care

Peter Antevy MD

EMS Medical Director

Broward, Miami-Dade, Palm Beach Counties

PEM Physician

Joe DiMaggio Children's Hospital