



# HOT TOPICS IN EMS

RACHEL MUNN, DO

ASSISTANT CLINICAL PROFESSOR OF EMERGENCY  
MEDICINE

UNIVERSITY OF ARIZONA TUCSON

ASSOCIATE MEDICAL DIRECTOR OF EDUCATION

NORTHWEST FIRE DEPARTMENT



# DISCLOSURES



No financial disclosures



No active research



# OBJECTIVES: FLY THROUGH SOME FUN TOPICS

- CARDIAC ARREST:
  - AIRWAY MANAGEMENT
  - USE OF ETCO<sub>2</sub>
  - FIELD TERMINATION
- TRAUMATIC BRAIN INJURY
  - THE “H BOMBS”
- NEWSWORTHY EMS
  - LAYPERSON CPR
  - KETAMINE
  - ECMO







# CARDIAC ARREST (AND ALSO NEWSWORTHY...)

AIRWAY MANAGEMENT



**A 911 EMERGENCY**

# **EMS Crews Brought Patients to the Hospital With Misplaced Breathing Tubes. None of Them Survived.**

In the world of emergency medicine, an unrecognized esophageal intubation is a “never event,” meaning that it shouldn’t happen under any circumstances. In Rhode Island, it’s occurred 12 times in the last three years. In each case, the patient died.

by Lynn Ardit, The Public’s Radio, Dec. 3, 2019, 5 a.m. EST





# BASIC VS ADVANCED

BASIC AIRWAY TECHNIQUES HAVE LONG DOMINATED  
TEACHING AND PREHOSPITAL AIRWAY MANAGEMENT

— FOR GOOD REASON, BUT IS GOING BACK TO THE  
BASICS THE RIGHT ANSWER?







# SGA VS ETI

ADVANCED AIRWAY TECHNIQUES,  
WHILE OFFER A MORE “SECURE”  
AIRWAY AND CAN ASSIST IN  
VENTILATION, ARE NOT WITHOUT  
TECHNICAL DIFFICULTIES AND  
COMPLICATIONS.

BUT, WHICH IS BETTER?



**Original Investigation**

FREE

February 27, 2018

## **Effect of Bag-Mask Ventilation vs Endotracheal Intubation During Cardiopulmonary Resuscitation on Neurological Outcome After Out-of-Hospital Cardiorespiratory Arrest**

**Arrest**

**A Randomized Clinical Trial**

**ETI = BVM**

THE DATA

JAMA | **Original Investigation**

## **Effect of a Strategy of Initial Laryngeal Tube Insertion vs Endotracheal Intubation on 72-Hour Survival in Adults With Out-of-Hospital Cardiac Arrest**

**A Randomized Clinical Trial**

**SGA > ETI**

Henry E. Wang, MD, MS; Robert H. Schmicker, MS; Mohamud R. Daya, MD, MS; Shannon W. Stephens, EMT-P; Ahamed H. Idris, MD; Justin N. Carlson, MD, MS; M. Riccardo Colella, DO, MPH; Heather Herren, MPH, RN; Matthew Hansen, MD, MCR; Neal J. Richmond, MD; Juan Carlos J. Puyana, BA; Tom P. Aufderheide, MD, MS; Randal E. Gray, MEd, NREMT-P; Pamela C. Gray, NREMT-P; Mike Verkest, AAS, EMT-P; Pamela C. Owens; Ashley M. Brienza, BS; Kenneth J. Sternig, MS-EHS, BSN, NRP; Susanne J. May, PhD; George R. Sopko, MD, MPH; Myron L. Weisfeldt, MD; Graham Nichol, MD, MPH

JAMA | **Original Investigation**

## **Effect of a Strategy of a Supraglottic Airway Device vs Tracheal Intubation During Out-of-Hospital Cardiac Arrest on Functional Outcome**

**The AIRWAYS-2 Randomized Clinical Trial**

**ETI = SGA**

Jonathan R. Berger, MD; Kim Kirby, MRes; Sarah Black, DClinRes; Stephen J. Brett, MD; Madeleine Clout, BSc; Michelle J. Lazaroo, MSc; Jerry P. Nolan, MBChB; Barnaby C. Reeves, DPhil; Maria Robinson, MEd; Lauren J. Scott, MSc; Helena Smartt, PhD; Adrian South, BSc (Hons); Elizabeth A. Stokes, DPhil; Jodi Taylor, PhD; Matthew Thomas, MBChB; Sarah Voss, PhD; Sarah Wordsworth, PhD; Chris A. Rogers, PhD



> [Ann Emerg Med.](#) 2020 May;75(5):627-636. doi: 10.1016/j.annemergmed.2019.12.003.  
Epub 2020 Jan 23.

## **Comparing Effectiveness of Initial Airway Interventions for Out-of-Hospital Cardiac Arrest: A Systematic Review and Network Meta-analysis of Clinical Controlled Trials**

[Chih-Hung Wang](#)<sup>1</sup>, [An-Fu Lee](#)<sup>2</sup>, [Wei-Tien Chang](#)<sup>1</sup>, [Chien-Hua Huang](#)<sup>1</sup>, [Min-Shan Tsai](#)<sup>1</sup>,  
[Eric Chou](#)<sup>3</sup>, [Chien-Chang Lee](#)<sup>4</sup>, [Shyr-Chyr Chen](#)<sup>1</sup>, [Wen-Jone Chen](#)<sup>5</sup>

Affiliations + expand

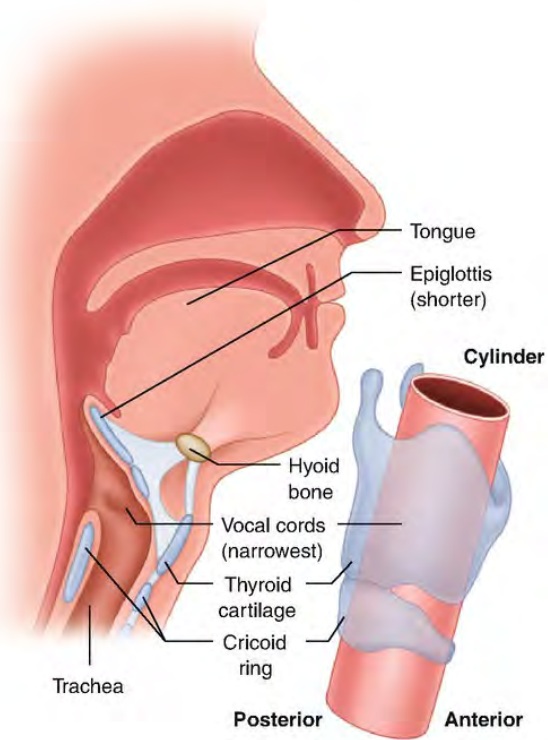
PMID: 31983493 DOI: [10.1016/j.annemergmed.2019.12.003](https://doi.org/10.1016/j.annemergmed.2019.12.003)

IS THERE A  
FINAL  
ANSWER?

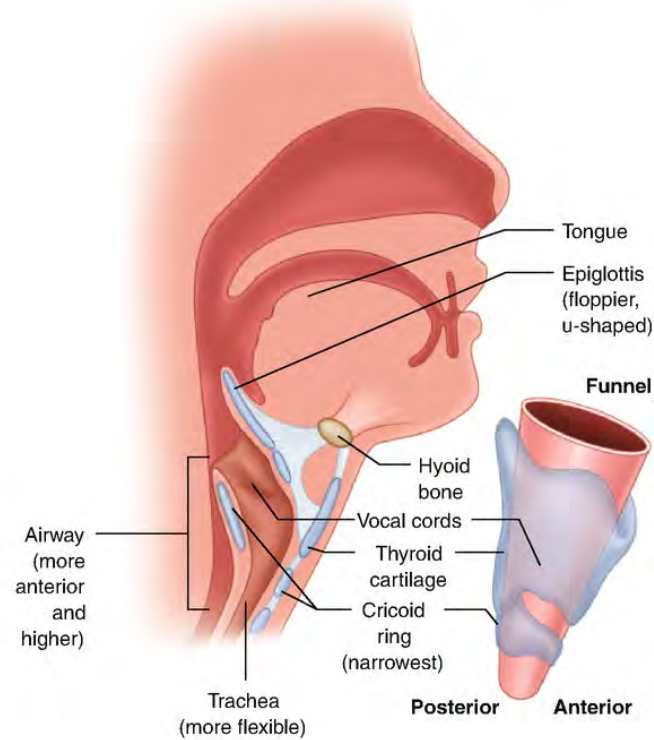


## Adult vs pediatric airway

### Anatomy of adult airway



### Anatomy of pediatric airway



# WHAT ABOUT PEDIATRICS?

Zeretzke-Bien C.M. (2018) Airway: Pediatric Anatomy, Infants and Children. In: Zeretzke-Bien C., Swan T., Allen B. (eds) Quick Hits for Pediatric Emergency Medicine. Springer, Cham. [https://doi.org/10.1007/978-3-319-93830-1\\_1](https://doi.org/10.1007/978-3-319-93830-1_1)





# CARDIAC ARREST

ETCO<sub>2</sub>

Source: [physio-control.com](http://physio-control.com)



# THE MANY USES OF ETCO<sub>2</sub>

- CONFIRMING SGA FUNCTIONALITY OR ETT PLACEMENT
- SIGNALING ROSC DURING CARDIAC ARREST
- USE IN TERMINATION OF CARDIAC ARREST
- MONITORING FOR RESPIRATORY DECOMPENSATION (IN NON CARDIAC ARREST CASES)





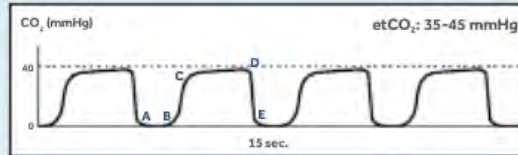
# NORMAL AND ABNORMAL $etCO_2$ /CAPNOGRAPH WAVEFORMS

## Normal Capnogram

The normal capnogram is a waveform which represents the varying  $CO_2$  level throughout the breath cycle.

### Waveform Characteristics:

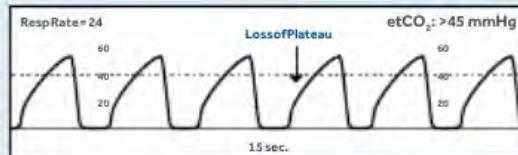
- A-B: Baseline
- B-C: Expiratory Upstroke
- C-D: Expiratory Plateau
- D-E: Inspiration
- E: End-Tidal Concentration



## Bronchospasm/Asthma

### Other Possible Causes:

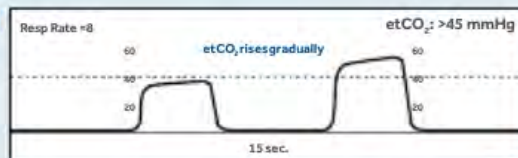
- Bronchospasm/COPD
- Obstruction in the expiratory limb of the breathing circuit
- Presence of a foreign body in the upper airway
- Partially kinked or occluded artificial airway



## \*Increasing $etCO_2$ (Hypoventilation)

### Other Possible Causes:

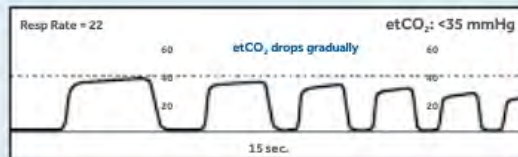
- Decrease in respiratory rate
- Decrease in tidal volume
- Increase in metabolic rate
- Rapid rise in body temperature (malignant hyperthermia)



## \*Decreasing $etCO_2$ (Hyperventilation)

### Other Possible Causes:

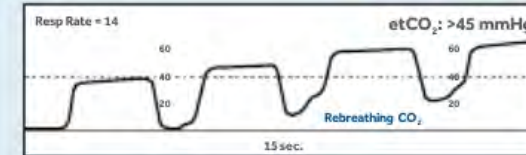
- Increase in respiratory rate
- Increase in tidal volume
- Metabolic acidosis
- Fall in body temperature



## Rebreathing $CO_2$

### Other Possible Causes:

- Faulty expiratory valve
- Inadequate inspiratory flow
- Partial rebreathing
- Insufficient expiratory time



## Curare Cleft

### Other Possible Causes:

- Patient is mechanically ventilated
- Depth of cleft is proportional to degree of muscle relaxants



## Cardiac Arrest

### Other Possible Causes:

- Decreased or absent cardiac output
- Decreased or absent pulmonary blood flow
- Sudden decrease in  $CO_2$  values



## Return of Spontaneous Circulation

### Other Possible Causes:

- Increase in cardiac output
- Increase in pulmonary blood flow
- Gradual increase in  $CO_2$  production



\*Assumes adequate circulation and alveolar gas exchange

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**Medtronic**  
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LOCAL NEWS

# **Amid COVID-19 surge, L.A. County ambulance crews told not to transport patients who have little chance of survival**

CARDIAC ARREST (AND APPARENTLY  
NEWSWORTHY EMS)

FIELD TERMINATION




# WAIT, WHAT?

- FIELD TERMINATION OF CARDIAC ARREST IS NOT NEW:
- THE UNIVERSAL TERMINATION OF RESUSCITATION GUIDELINES SUGGEST THAT RESUSCITATION SHOULD BE TERMINATED IF, AFTER AT LEAST FOUR 2-MINUTE INTERVALS OF CARDIOPULMONARY RESUSCITATION, THREE CRITERIA ARE MET: 1) THE ARREST WAS NOT WITNESSED BY EMS; 2) THERE HAS BEEN NO ROSC; 3) NO SHOCKS WERE DELIVERED.

## 'Things Are Worse Than People Think': LA County Official On New Directives For EMS

January 5, 2021 - 3:52 PM ET  
Heard on All Things Considered

 AILSA CHANG

 6-Minute Listen

 PLAYLIST   



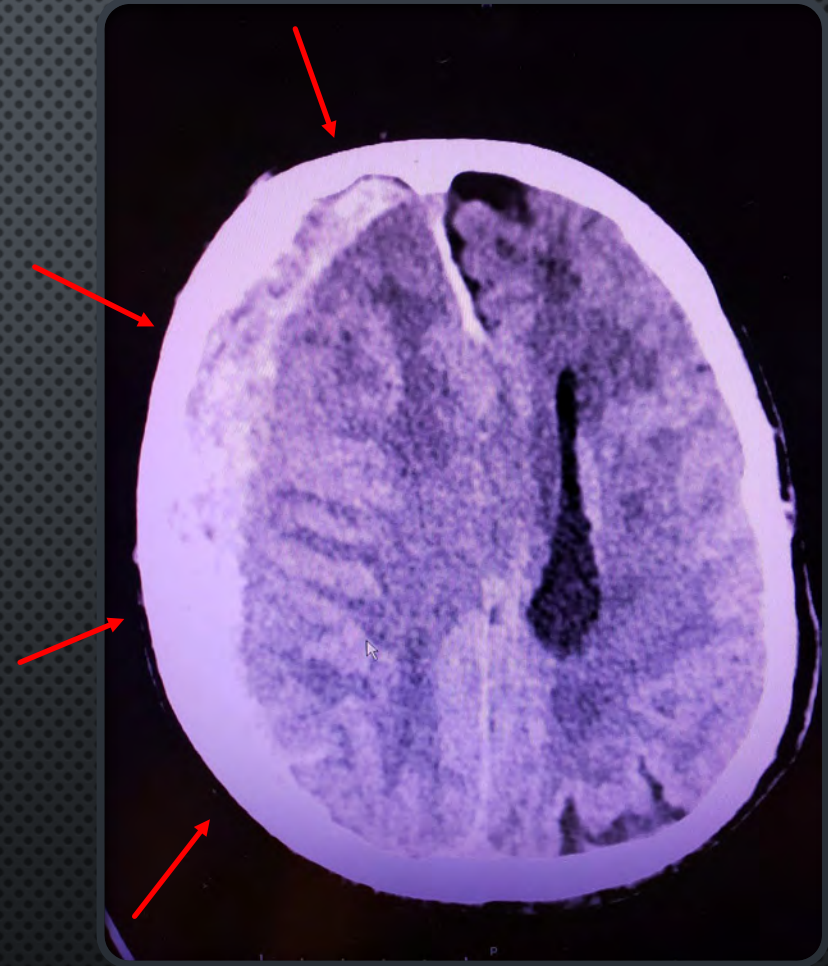
Los Angeles County paramedics examine a potential COVID-19 patient sitting on a curb before transporting him to a hospital in Hawthorne, Calif., on Dec. 29.

Apr Gomez/AFP via Getty Images



# TRAUMATIC BRAIN INJURY

THE H BOMBS



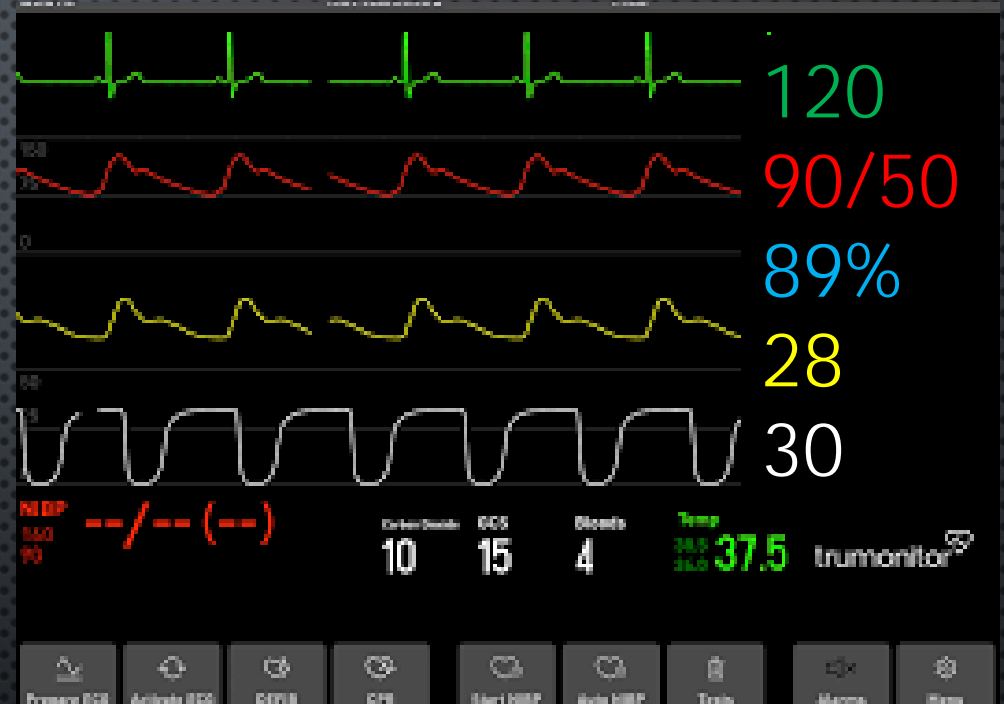


WHAT ARE THE H BOMBS?

Hypoxia

Hypotension

Hyperventilation







♪ Ah, Ah, Ah, Ah, stayin' alive, stayin' alive ♪

# NEWSWORTHY EMS

LAYPERSON CPR



CORONAVIRUS

## EMT Who Gave CPR to Man Possibly Infected With COVID-19 on Flight Says He Has Virus Symptoms

An EMT's training kicked in to help a man suffering from cardiac arrest on a flight from Orlando to LAX. The U.S. Navy veteran says he knew the risks when he performed CPR on the man.

By Christine Kim • Published December 21, 2020 • Updated on December 21, 2020 at 7:13 am



## Safe CPR options during the COVID-19 pandemic



Medics say cardiac arrest calls are going up, but fewer bystanders are providing CPR. Officials are encouraging everyone to learn hands-only CPR.



Face  
@TonyAldapa



By now most of you know I was on the @united flight that has been in the news. I made the decision to attempt to save the passengers life and along with 2 others performed CPR for close to an hour until we landed. And continued to help the firefighters when they came onboard.

2:53 PM · Dec 19, 2020



619 210 people are Tweeting about this



# Public Hands-Only CPR\*

during the COVID-19 pandemic. Four steps you can handle.



**Phone 9-1-1 and shout for an AED.**

**Don't delay – ACT!**  
If no one is around, use your mobile phone on speaker mode to call 9-1-1.

**Tell them if COVID-19 is suspected.**



**Prevent contamination by laying a cloth, towel, or clothing over the mouth and nose.**

**This will help prevent any potential spread of the virus through contaminated air or saliva.**



**Push hard and fast in the centre of the chest.**

**Think of the beat of Stayin' Alive or about 100-120 beats per minute.**

**Don't stop until help arrives or the person begins to respond.**



**Use an AED if available.**

**AEDs are safe and simple to use. Turn it on and follow the voice instructions.**

## After providing Hands-Only CPR

Wash or throw away the cloth, towel, or clothing used to cover the person's face. Wash your hands thoroughly with soap and water. An alcohol-based hand gel is an alternative.

If you see someone suddenly collapse or if they're unresponsive, you can save their life using your phone, your hands and your wits. **Don't hesitate – you can't hurt, you can only help.**

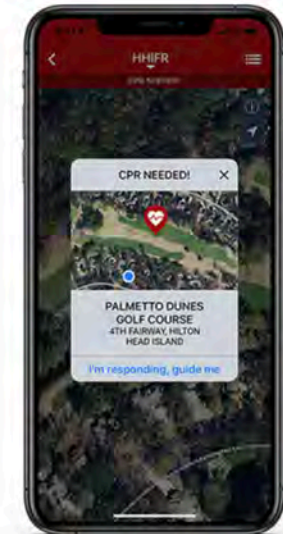
[heartandstroke.ca/cpr](https://heartandstroke.ca/cpr)



## PulsePoint Respond App

The [PulsePoint Respond app](#) is a free app that empowers CPR/AED trained bystanders to provide life-saving care in their communities. Individuals register as a trained responder and are then notified if someone nearby is having a cardiac emergency and may need CPR. PulsePoint is integrated with the local community emergency dispatch, allowing for immediate alerts to be sent out as soon as the 911 call is placed. Keep in mind that now all communities are connected to PulsePoint at this time, but more are being added every day.

PulsePoint also provides the location of the closest public access AED. For every minute that passes without an AED shock, the chance of survival decreases 7-10% — so knowing where to find one is crucial in an emergency. Registered users can help build the AED registry by reporting and updating AED locations when they are on the go. This information is then made available to anyone using PulsePoint, including emergency responders and local dispatchers that can direct callers to nearby AEDs. At this time, almost 85,000 AEDs have been registered.



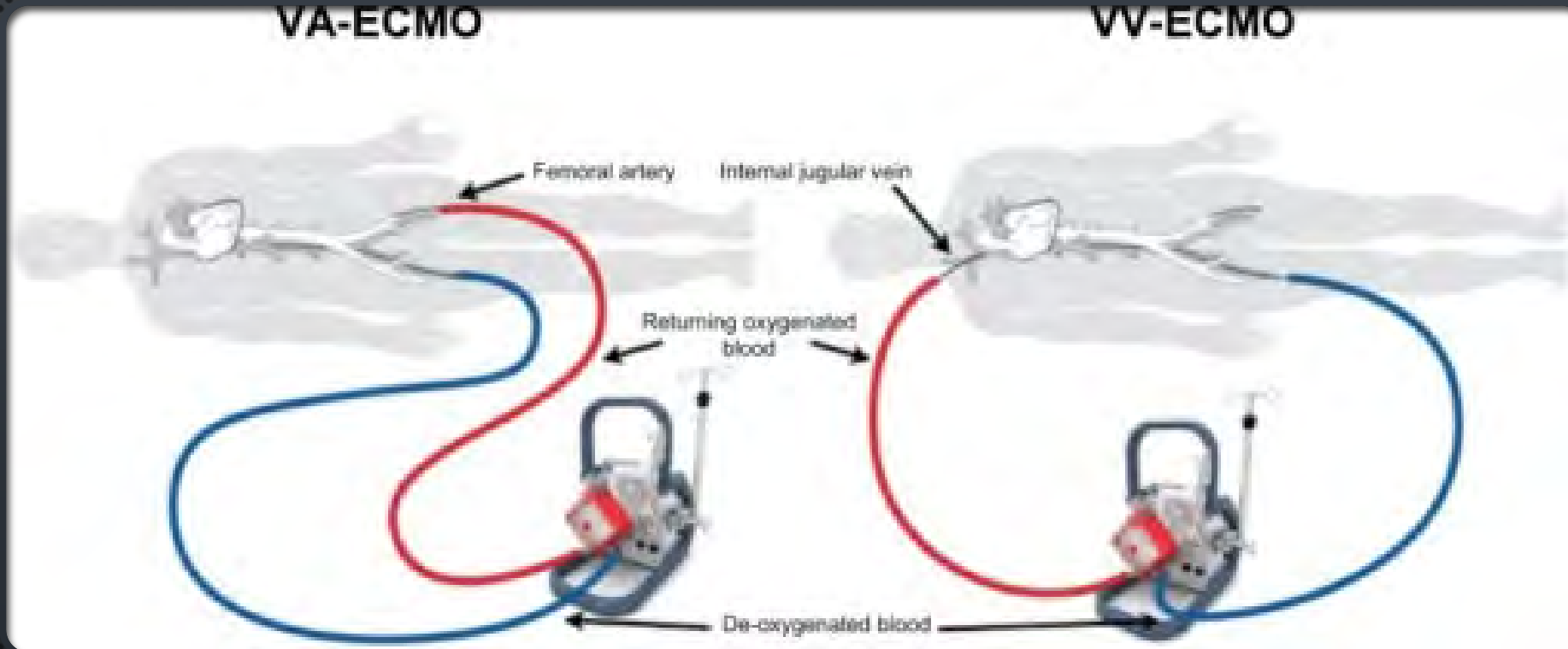




# NEWSWORTHY EMS


PREHOSPITAL ECMO





# ECMO – EXTRA CORPOREAL MEMBRANE OXYGENATION



CASE REPORT [Open Access](#) 

## Out-of-hospital extracorporeal membrane oxygenation cannulation for refractory ventricular fibrillation: A case report

Jon Marinaro MD , Sundeep Guliani MD, Todd Dettmer MD, Kimberly Pruett MD, Doug Dixon MD, Darren Braude MD, EMT-P



## Treatment Demonstrated 100% Success Rate in Cannulation

11.14.2020



An SUV from the Minnesota Mobile Resuscitation Consortium in front of McNamara Alumni Center at the U of M Twin Cities campus. (Photo/Angelicjewel Photography)

## How Physicians Perform Prehospital ECMO on the Streets of Paris

Alice Hutin, MD, MSc, Florian Loosli, CRNA, Lionel Lamhaut, MD, PhD, Barbara Mantz, CRNA, Romain Corrocher, MD - 12.1.2017



# ECMO IN THE FIELD





# NEWSWORTHY EMS

KETAMINE



Topics [Ketamine](#)

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## Colo. EMS agency to review police body camera footage after every ketamine use

Eagle County Paramedic Services officials said ketamine is an important tool for treating agitated patients and that they hope to address the public's concerns with the new protocol

Nov 10, 2020

Home [News](#) [MN Paramedic Files Whistleblower Lawsuit, Says He Refused Police Order to Inject...](#)

[News](#) [Patient Care](#)

## MN Paramedic Files Whistleblower Lawsuit, Says He Refused Police Order to Inject Patient with Ketamine

8.18.2020



“There were 902 reported instances of Colorado paramedics administering ketamine from 2018 to 2020, and almost 17% had complications, including cardiac arrest and oxygen deprivation, the state health department said.”

Home [News](#) [AP News](#) [Ketamine Use Draws New Scrutiny](#)

[News](#) [AP News](#) [Patient Care](#)

## Ketamine Use Draws New Scrutiny

8.24.2020



*FILE - In this July 25, 2018, file photo, is a vial of ketamine, which is normally stored in a locked cabinet, in Chicago. A drug called ketamine that's injected as a sedative during arrests has drawn new scrutiny since a young Black man named Elijah McClain died in suburban Denver. An analysis by The Associated Press of policies on ketamine and cases where it was used nationwide uncovered a lack of police training, conflicting medical standards and nonexistent protocols that have resulted in hospitalizations and even deaths. (AP Photo/Teresa Crawford, File)*



# WHAT DO THE NUMBERS ACTUALLY SAY?

- ESO (AN EMERGENCY SERVICES DATABASE) HAS RECORDS OF AROUND 15,000 KETAMINE ADMINISTRATIONS TO ABOUT 11,000 PATIENTS IN 2019, WITH 99% TAKEN TO HOSPITALS. MORE THAN HALF WERE ADMITTED, AND A TOTAL OF 6% DIED.
- BUT THAT WASN'T DUE TO THE KETAMINE; AMONG RECORDS WITH AVAILABLE MORTALITY DATA, THERE WERE JUST SIX DEATHS (0.3%) WHERE KETAMINE COULD NOT BE EXCLUDED AS A POSSIBLE CONTRIBUTING FACTOR—AND TWO OF THOSE SIX ALSO HAD ADVANCED END-OF-LIFE DISEASES.



# BALANCING ACT

- WE DEFINITELY NEED TO BALANCE PATIENT, PROVIDER, AND POLICE SAFETY WITH APPROPRIATE MEDICAL TREATMENT.
- KETAMINE IS AN EFFECTIVE MEDICATION FOR SEDATION AND TREATMENT OF EXCITED DELIRIUM, HOWEVER IT MAY HAVE A HIGHER RATE OF INTUBATION THAN OTHER SEDATIVES.
- THESE CASES BRING UP A LOT OF DIFFICULT TOPICS INCLUDING:
  - EMS RELATIONSHIP WITH POLICE
  - RACIAL DISPARITIES IN MEDICAL CARE
  - POLITICAL REGULATION OF EMS AND MEDICAL TREATMENT



# SUMMARY

- REMEMBER BASIC AIRWAY TECHNIQUES – THEY MAY ACTUALLY SERVE OUR CARDIAC ARREST PATIENTS BETTER, PARTICULARLY IN PEDIATRICS
- REGARDLESS OF THE AIRWAY TECHNIQUE DEPLOYED, USE ETCO<sub>2</sub> FOR CONFIRMATION AND MONITORING
- PREVENT AND AGGRESSIVELY TREAT HYPOTENSION, HYPOXIA IN TBI AND AVOID HYPERVENTILATION
- HANDS ONLY CPR SHOULD BE TAUGHT TO THE PUBLIC, ESPECIALLY IN THIS PANDEMIC
- ECMO IS REALLY COOL AND MAY HELP IMPROVE CARDIAC ARREST OUTCOMES WHEN & WHERE AVAILABLE
- KETAMINE MAY BE AN EFFECTIVE TREATMENT FOR PREHOSPITAL AGITATION AND EXCITED DELIRIUM, HOWEVER IS NOT WITHOUT RISK AND SHOULD BE USED CAUTIOUSLY





# THANK YOU

THIS IS MY DOG, AIDA, WHO LOVES BELLY RUBS AND  
CAR RIDES



QUESTIONS



CONTACT

[RACHEL.MUNN@BANNERHEALTH.COM](mailto:RACHEL.MUNN@BANNERHEALTH.COM)