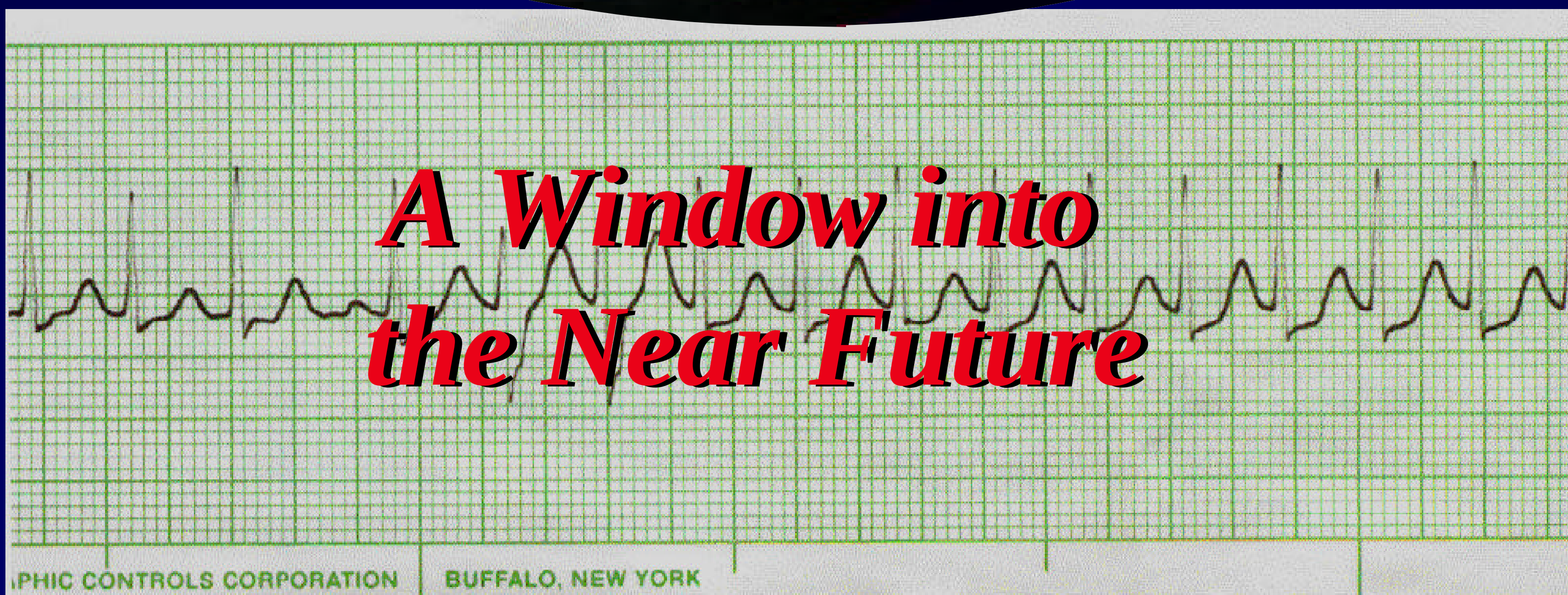
# The Future of EMS as Revealed through Research




## *A Window into the Near Future*

# Raymond L. Fowler, M.D., FACEP

**Co-Principal Investigator**
**National Institutes of Health**
**Resuscitation Outcomes Consortium**

--------------------

**Joint Investigator**
**National Heart, Lung, and Blood Institute**
**IMMEDIATE Trial**

--------------------

**Medical Director of Douglas County Fire Department**
**and Mid Georgia Ambulance Service**

--------------------

**Deputy Medical Director**
**Dallas Area BioTel System**


www.utsw.ws
www.rayfowler.com

# The emerging of a subspecialty:


## *EMS Medicine*

# Approaching the Patient

# “See what you see!”

***“People look, but they don’t see”***

***…A. Fowler, Jr.***

**Alertness?**

**Level of distress?**

**Noises?**

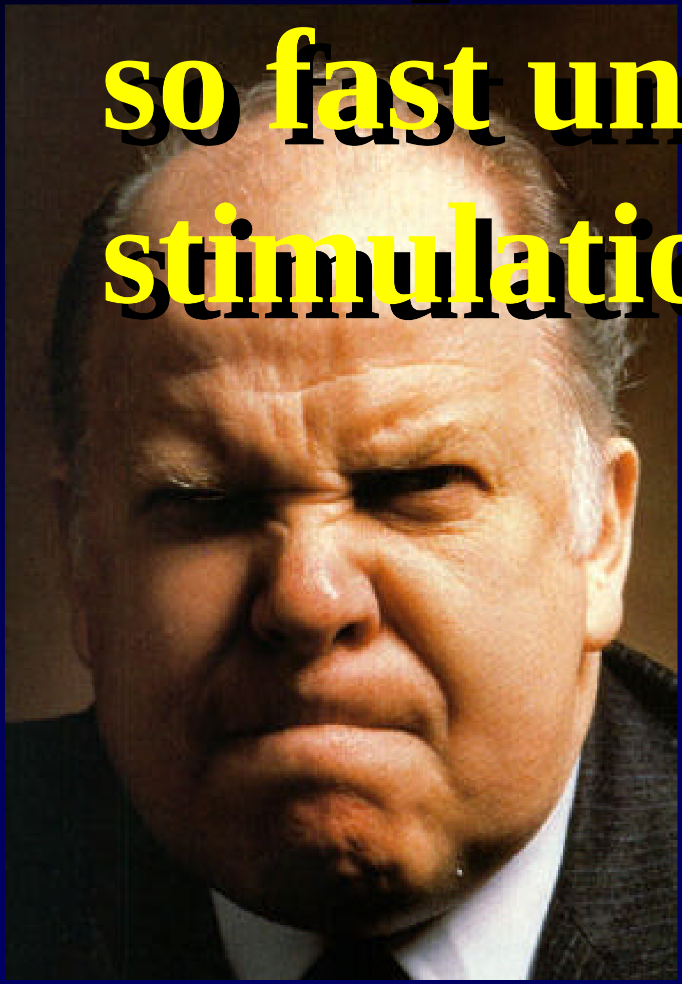
**Respirations?**

**The pulse rate?**

**Skin?**

**Obvious things (bleeding)**

# Our pulse can only go so fast under sympathetic stimulation:

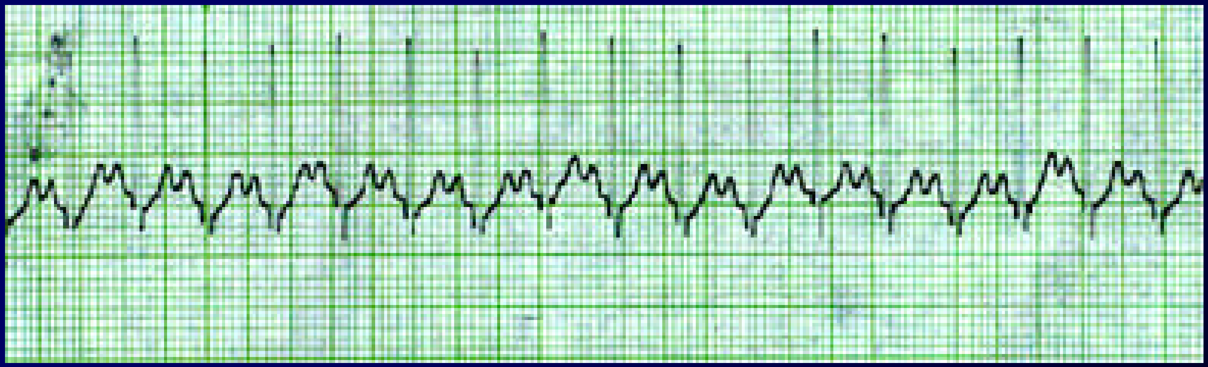


220 minus age

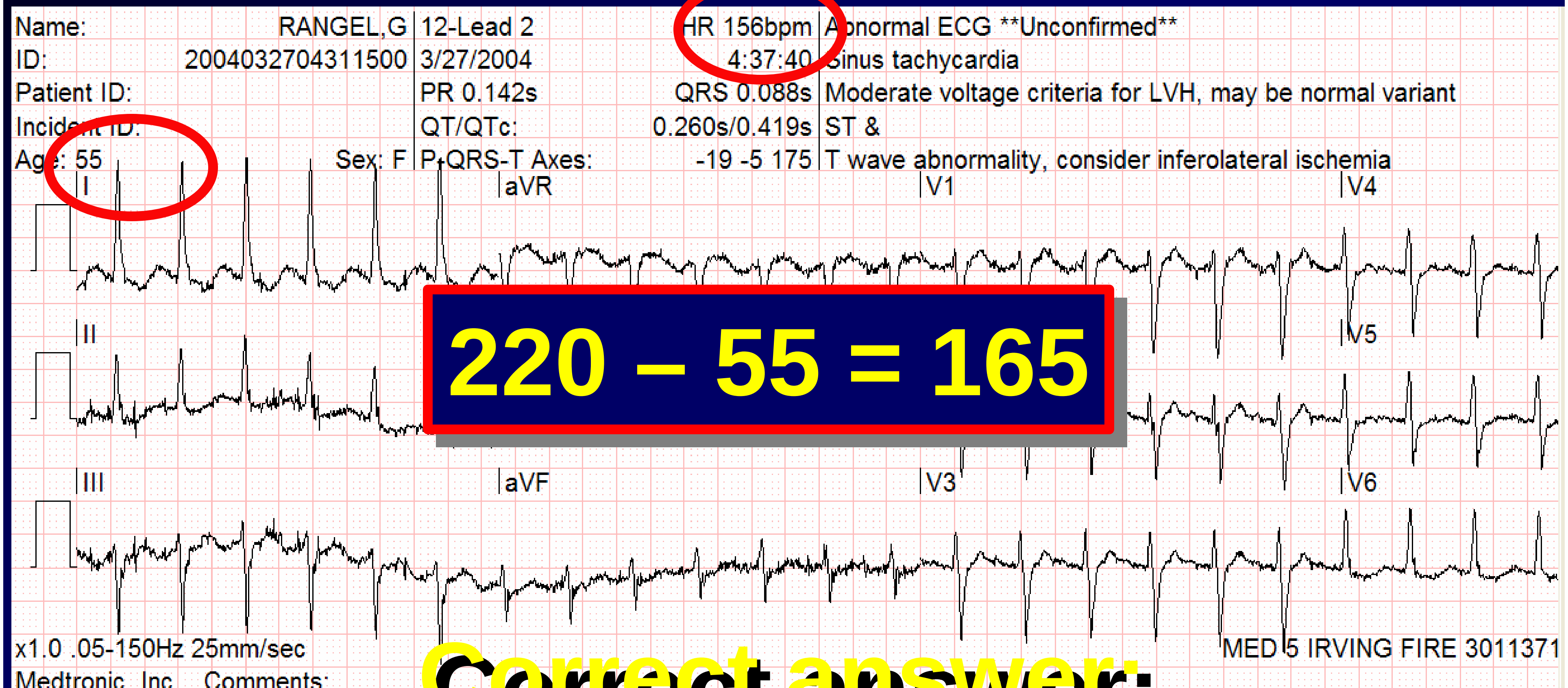
**Baby = (220 – 0) = 220**

**Snerd = (220 – 53) = 167**

**Aunt Minnie = (220 – 70) = 150**



# What is this rhythm?

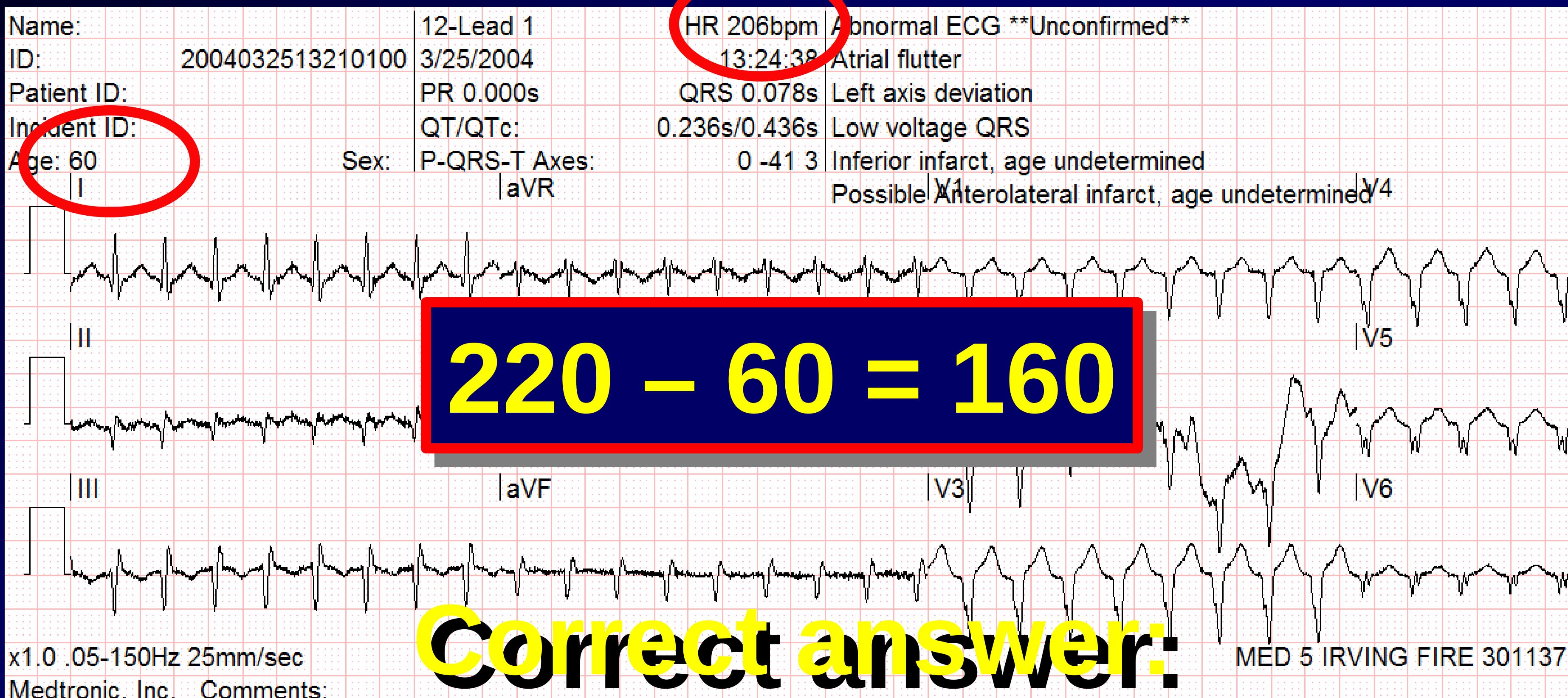



**220 – 55 = 165**

**Correct answer:**

***"It COULD be sinus tach"***

# What is this rhythm?




**220 – 60 = 160**

**Correct answer:**

***<u>"This HAS to be an arrhythmia</u>***

# If you forget everything else that I say:

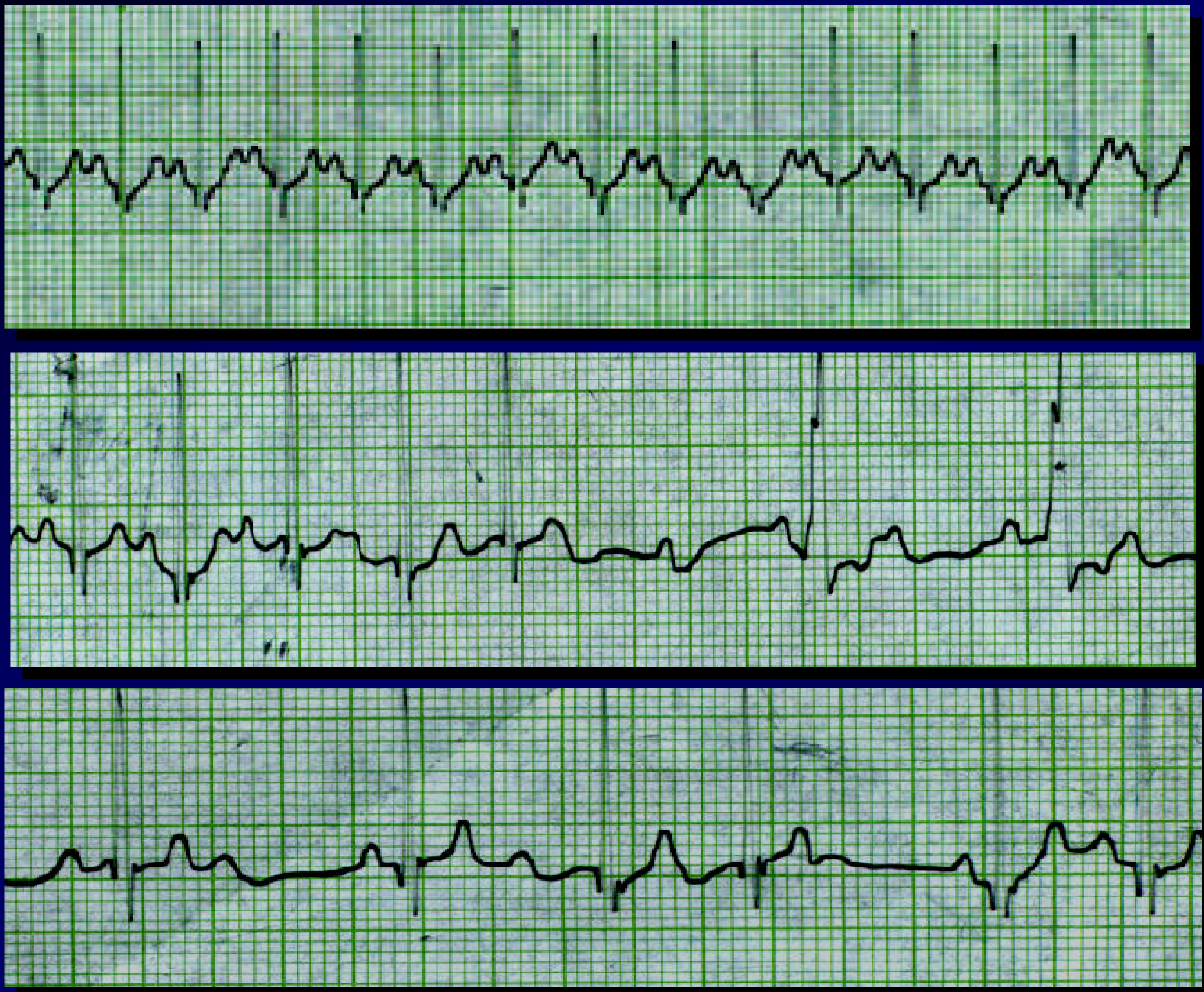
***<u>Remember that patients having near maximum sinus tachycardia at rest are dying!</u>***

# A “physiological response”

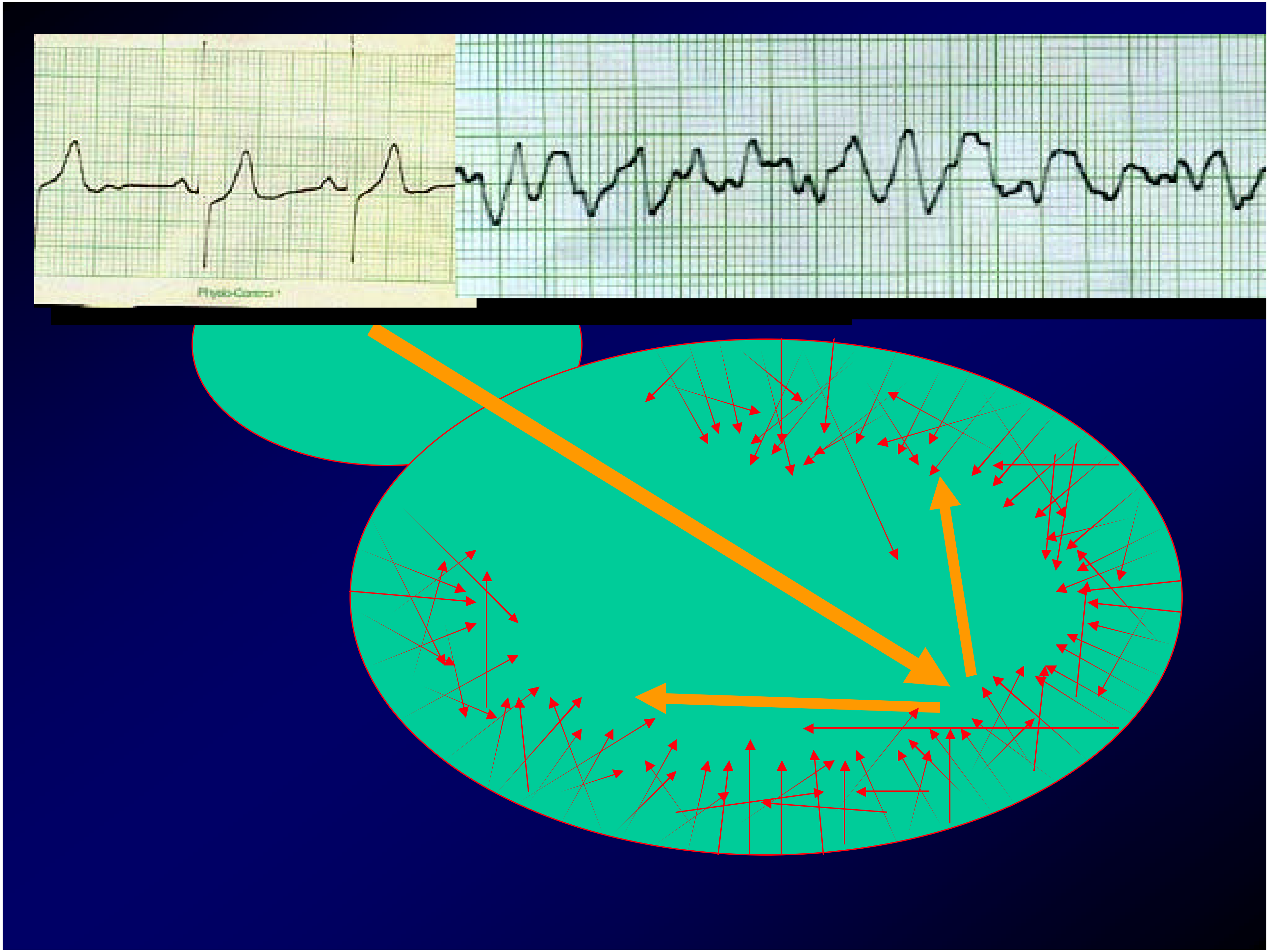
***Something mobilizing a massive physiological response***

**Your job is to determine if a rapid rhythm MAY be sinus tach**

***If it is, you must take action***



**Because so many EMS courses are too long, too boring, and teach difficult concepts to medics who will never use that information**


Physio-Control

- Airway
- Breathing
- Circulation
- Drugs
- Disaster
- Electrocardiography

# Airway

**It is not at all clear what the best airway devices are now or what they will be**

# Paramedic Drug Assisted Intubation (DAI) in Georgia

## Overview

The attached annotated bibliography contains most of the significant literature covering prehospital intubation and prehospital drug assisted intubation (DAI). Review of this literature will help to develop a policy on prehospital airway management and prehospital DAI.

## Fundamental Questions

- What is the definition of efficacious in the context of prehospital ETI?
- Is prehospital ETI feasible or efficacious?
- Is prehospital ETI facilitated with medications safe and efficacious?
- Can the characteristics of a safe and efficacious prehospital medication facilitated ETI program be defined and quantified?

Davis, D. P., J. Peay, et al. (2005). "The impact of prehospital endotracheal intubation on outcome in moderate to severe traumatic brain injury." Journal of Trauma-Injury Infection & Critical Care **58**(5): 933-9.

CONCLUSION:

Prehospital intubation is associated with a decrease in survival among patients with moderate-to-severe TBI. More critically injured patients may benefit from prehospital intubation but may be difficult to identify prospectively.

Davis, D. P., J. Stern, et al. (2005). "A follow-up analysis of factors associated with head-injury mortality after paramedic rapid sequence intubation." Journal of Trauma-Injury Infection & Critical Care **59**(2): 486-90.

CONCLUSION:
Paramedic RSI was associated with an increase in mortality compared with matched historical controls. The association between hyperventilation and mortality was confirmed. In addition, patients transported by helicopter after paramedic RSI had improved outcomes. Paramedic RSI did not seem to prevent aspiration pneumonia.

Mort, T. C. (2004). "Emergency tracheal intubation: complications associated with repeated laryngoscopic attempts.[see comment]." Anesthesia & Analgesia **99**(2): 607-13.

intubate the trachea outside the operating room. There was a significant increase in the rate of airway-related complications as the number of laryngoscopic attempts increased (</=2 versus >2 attempts): hypoxemia (11.8% versus 70%), regurgitation of gastric contents (1.9% versus 22%), aspiration of gastric contents (0.8% versus 13%) bradycardia (1.6% versus 21%), and cardiac arrest (0.7% versus 11%, P < 0.001). Although predictable, this analysis provides data that confirm the number of laryngoscopic attempts is associated with the incidence of airway and hemodynamic adverse events. These data support the recommendation of the ASA Task Force on the Management of the Difficult Airway to limit laryngoscopic attempts to three in lieu of the considerable patient injury that may occur.

Silvestri, S., G. A. Ralls, et al. (2005). "The effectiveness of out-of-hospital use of continuous end-tidal carbon dioxide monitoring on the rate of unrecognized misplaced intubation within a regional emergency medical services system." Annals of Emergency Medicine **45**(5): 497-503.

CONCLUSION: No unrecognized misplaced intubations were found in patients for whom paramedics used continuous ETCO2 monitoring. Failure to use continuous ETCO2 monitoring was associated with a 23% unrecognized misplaced intubation rate.

Ufberg, J. W., J. S. Bushra, et al. (2005). "Aspiration of gastric contents: association with prehospital intubation." American Journal of Emergency Medicine **23**(3): 379-82.

9.08). Patients endotracheally intubated in the PH setting are more likely to have aspirated gastric contents than those intubated in the ED.

# POSITION PAPER

NATIONAL ASSOCIATION OF EMS PHYSICIANS

## RECOMMENDED GUIDELINES FOR UNIFORM REPORTING OF DATA FROM OUT-OF-HOSPITAL AIRWAY MANAGEMENT:

### POSITION STATEMENT OF THE NATIONAL ASSOCIATION OF EMS PHYSICIANS

Henry E. Wang, MD, MPH, Robert M. Domeier, MD, Douglas F. Kupas, MD,
Mark J. Greenwood, DO, JD, Robert E. O'Connor, MD, MPH

Henry E. Wang, MD, MPH, Robert M. Domeier, MD, Douglas F. Kupas, MD, Mark J. Greenwood, DO, JD, Robert E. O'Connor, MD, MPH

Dr. Wang is at the Department of Emergency Medicine, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania; Dr. Domeier is at the Department of Emergency Medicine, St. Joseph Mercy Hospital, Ann Arbor, Michigan; Dr. Kupas is at the Department of Emergency Medicine, Geisinger Health System, Danville, Pennsylvania; Dr. Greenwood is at the Department of Medicine, Section of Emergency Medicine, University of Chicago, Chicago, Illinois, and AeroMed at Spectrum Health, Grand Rapids, Michigan; and Dr. O'Connor is at the Department of Emergency Medicine, Christiana Care Health System, Newark, Delaware.

# CONCLUSION

Airway management, including endotracheal intubation, is the most important procedure performed in the prehospital setting. EMS services should closely monitor the performance of ETI to ensure that the highest level of care is provided. EMS services should adhere to the recommended standards for defining, collecting, and reporting airway management data. Although there are many methods for collecting airway management data, systems should use methods that result in the most accurate reports of treatment courses and outcomes.

## Recommended Format for Reporting System-wide Performance of Airway Management

Prehospital services should use the following guidelines for summarizing systemwide performance of airway management:

1. ETI success rate (percentage and relative frequency) for all ETI (pooled [based on overall outcome of patient encounter], not per attempt)
2. ETI success rate (percentage and relative frequency) for subset of patients in cardiac arrest
3. ETI success rate (percentage and relative frequency) for subset of patients with a pulse (nonarrest)
4. For patients with a pulse (nonarrest), ETI success rates (percentage and relative frequency) stratified by overall ETI method:
   a. Orotracheal
   b. Nasotracheal
   c. Sedation-facilitated intubation
   d. Rapid-sequence intubation
5. ETI success rates (percentage and relative frequency) for subset of pediatric patients (<18 years of age) (Individual services may choose to further stratify this group by specific age ranges.)
6. ETI success rates (percentage and relative frequency) for subset of trauma patients
7. *Cumulative* success rates for consecutive ETI attempts
8. Frequencies of critical complications
9. Frequencies of rescue airway use
10. Patients receiving no ETI attempts but in whom airway or ventilatory support is required

## NAEMSP AIRWAY MANAGEMENT REPORTING TEMPLATE

**Patient demographic information:**

Date: ____/____/____ Dispatch Time: ____:____ am / pm

EMS Service Name/No.: ____________________

Pt age (yr): ______ Patient sex: ☐ M ☐ F

**1. Indication for invasive airway management (check one):**

- ☐ Apnea or agonal respirations
- ☐ Airway reflex compromised
- ☐ Ventilatory effort compromised
- ☐ Injury/illness involving airway
- ☐ Adequate airway reflexes/vent effort, but potential for compromise
- ☐ Other ____________

**2. Was endotracheal intubation (ETI) attempted?**

☐ Yes ☐ No

**3. If ETI not attempted – alternate method of airway support:**

- ☐ Bag-Valve-Mask (BVM)
- ☐ Needle Jet Ventilation
- ☐ Open Cricothyroidotomy
- ☐ CPAP/BiPAP
- ☐ Other: ____________
- ☐ Combitube
- ☐ LMA
- ☐ Other Cricothyroidotomy
- ☐ Not Applicable (ETI Attempted)

**4-6. Patient subsets (Select Yes/No):**

| | |
|---|---|
| Is patient in cardiopulmonary arrest on intubation? | ☐ Yes ☐ No |
| Is patient a victim of trauma? | ☐ Yes ☐ No |
| Is patient under 18 years old? | ☐ Yes ☐ No |

**7-11. Vital signs prior to ETI attempt (leave blank if not obtained):**

Pulse: ____ beats/min Blood Pressure: ____ / ____ mmHg

Resp Rate: ____ breaths/min $SaO_2$: ____ %

**12-14. Glasgow Coma Score (GCS) before intubation:**

Eye: ☐ none (1) ☐ pain (2) ☐ verbal (3) ☐ spontaneous (4)

Verbal: ☐ none (1) ☐ incomprehensible (2) ☐ inappropriate words (3) ☐ disoriented (4) ☐ oriented (5)

Motor: ☐ no response (1) ☐ extends to pain (2) ☐ flexes to pain (3) ☐ withdraws from pain (4) ☐ localizes pain (5) ☐ obeys commands (6)

**15. Monitoring and treatment modalities concurrent with intubation (check all that apply):**

- ☐ ECG monitor
- ☐ IV access
- ☐ CPR (chest compressions)
- ☐ BAAM
- ☐ Other: ____________
- ☐ Pulse-Oximetry
- ☐ C-spine immobilization
- ☐ Gum Elastic Bougie
- ☐ Endotrol Tube

**17. Level of training of each rescuer attempting intubation:**

| Rescuer | Level of Training (check one) |
|---|---|
| A[†] | ☐ EMT-P ☐ EMT-I ☐ EMT-B ☐ Medic Student ☐ Nurse/PHRN ☐ Phys Asst ☐ MD/DO (attend) ☐ MD/DO (res) ☐ Other: ______ |
| B[†] | ☐ EMT-P ☐ EMT-I ☐ EMT-B ☐ Medic Student ☐ Nurse/PHRN ☐ Phys Asst ☐ MD/DO (attend) ☐ MD/DO (res) ☐ Other: ______ |
| C[†] | ☐ EMT-P ☐ EMT-I ☐ EMT-B ☐ Medic Student ☐ Nurse/PHRN ☐ Phys Asst ☐ MD/DO (attend) ☐ MD/DO (res) ☐ Other: ______ |

**16-18. Provide information for each laryngoscopy attempt.**
**FOR ORAL ROUTE, EACH INSERTION OF BLADE (LARYNGOSCOPY) IS ONE "ATTEMPT."**
**FOR NASAL ROUTE, EACH PASS OF TUBE PAST NARES IS ONE "ATTEMPT."**

| Attempt | 16. ETI Method | 17. Who attempted?[†] | 18. Was attempt successful? |
|---|---|---|---|
| #1 | ☐ OTI ☐ NTI ☐ Sedation ☐ RSI | ☐A ☐B ☐C | ☐ Yes ☐ No |
| #2 | ☐ OTI ☐ NTI ☐ Sedation ☐ RSI | ☐A ☐B ☐C | ☐ Yes ☐ No |
| #3 | ☐ OTI ☐ NTI ☐ Sedation ☐ RSI | ☐A ☐B ☐C | ☐ Yes ☐ No |
| #4 | ☐ OTI ☐ NTI ☐ Sedation ☐ RSI | ☐A ☐B ☐C | ☐ Yes ☐ No |

Indicate drugs given to facilitate intubation:

- ☐ Midazolam ____ mg
- ☐ Lidocaine ____ mg
- ☐ Etomidate ____ mg
- ☐ Atropine ____ mg
- ☐ Diazepam ____ mg
- ☐ Morphine ____ mg
- ☐ Succinylcholine ____ mg
- ☐ Topical Spray
- ☐ Other – Specify: ____________ - ____ mg
- ☐ Other – Specify: ____________ - ____ mg

**19-24. Endotracheal tube confirmation.**

| | | | | | |
|---|---|---|---|---|---|
| 19. Auscultation | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| 20. Bulb Aspiration | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| 21. Syringe Aspiration | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| 22. Colorimetric $ETCO_2$ | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| 23. Digital $ETCO_2$ | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| 24. Waveform $ETCO_2$ | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |
| Other: ________ | ☐ Tracheal Placement | ☐ Esophageal Placement | ☐ Indeterminate | ☐ Not Assessed | ☐ Tube not placed. |

25. Peak ETCO2 value: ______ ☐ Indeterminate

**26. Was ETI successful for the overall encounter (on transfer of care to ED or helicopter)?**

☐ Yes ☐ No

**27. Who determined the final placement (location) of ET tube?**

- ☐ Rescuer performing intubation.
- ☐ Another rescuer on the same team.
- ☐ Receiving helicopter crew.
- ☐ Receiving hospital team.
- ☐ Other: ____________

**28-32. Vital signs after intubation attempt:**

Pulse: ____ beats/min Blood Pressure: ____ / ____ mmHg

Resp Rate: ____ breaths/min $SaO_2$: ____ %

**33. Critical complications encountered during airway management (Check all that apply):**

- ☐ Failed intubation effort.
- ☐ Injury or trauma to patient from airway management effort.
- ☐ Adverse event from facilitating drugs.
- ☐ Esophageal intubation – delayed detection (after tube secured).
- ☐ Esophageal intubation – detected in ED.
- ☐ Tube dislodged during transport/patient care.
- ☐ Other: ____________

**34. If all intubation attempts FAILED, indicate suspected reasons for failed intubation (check all that apply):**

- ☐ Inadequate patient relaxation
- ☐ Inability to expose vocal cords.
- ☐ Difficult pt anatomy.
- ☐ ETI attempted, but arrived at destination facility before accomplished.
- ☐ Not applicable - Successful field ETI
- ☐ Orofacial trauma.
- ☐ Secretions/blood/vomit.
- ☐ Unable to access pt.
- ☐ Other: ____________

**35. If all intubation attempts FAILED, indicate secondary (rescue) airway technique used (check all that apply):**

- ☐ Bag-Valve-Mask (BVM) Ventilation
- ☐ Combitube
- ☐ Not applicable – Successful field ETI
- ☐ Needle/Jet Ventilation
- ☐ Open Cricothyroidotomy
- ☐ Other: ____________

**36. Did secondary (rescue) airway result in satisfactory ventilation?**

☐ Yes ☐ No ☐ Not applicable

**37-38. Airway Management Times**

| | | |
|---|---|---|
| Time of decision to intubate: | ____:____ | am / pm |
| Time of successful intubation: | ____:____ | am / pm |
| Time intubation abandoned: | ____:____ | am / pm |

*Template Design by H. Wang, University of Pittsburgh, PA - May 23, 2003.*

Wang, H. E., A. B. Peitzman, et al. (2004). "Out-of-hospital endotracheal intubation and outcome after traumatic brain injury.[see comment]." <u>Annals of Emergency Medicine</u> **44**(5): 439-50.

(n=2,301, 56.1%). Adjusted odds of death were higher for out-of-hospital endotracheal intubation than ED endotracheal intubation (odds ratio [OR] 3.99; 95% confidence interval [CI] 3.21 to 4.93). Out-of-hospital endotracheal intubation was associated with an increased adjusted odds of poor neurologic outcome (OR 1.61; 95% CI 1.15 to 2.26), moderate or severe functional impairment (Functional Impairment Score 6 to 15; OR 1.92; 95% CI 1.40 to 2.64), and severe functional impairment (Functional Impairment Score 11 to 15; OR 1.80; 95% CI 1.29 to 2.52). CONCLUSION: Out-of-hospital endotracheal intubation was associated with adverse outcomes after severe traumatic brain injury. The implications for current clinical care remain undefined.

Wang, H. E., D. F. Kupas, et al. (2003). "Preliminary experience with a prospective, multi-centered evaluation of out-of-hospital endotracheal intubation." Resuscitation **58**(1): 49-58.

median per-service return rate was 75%. Non-response (data form not returned for attempted intubation) was problematic, with nine services demonstrating data return rates less than 50%. Data return rates could not be calculated for an additional nine services. The missing data entry rate was 0.5-22.2%. The overall reported ETI success rate was 86.8% (92.8% for cardiac arrests and 76.8% for non-arrests) and did not appear to vary between population settings. There were two cases of delayed

Wayne, M. A. and E. Friedland (1999). "Prehospital use of succinylcholine: a 20-year review.[see comment]." Prehospital Emergency Care 3(2): 107-9.

RESULTS: Paramedics successfully intubated 95.5% (1,582) of all patients receiving succinylcholine, 94% (1,045) of trauma patients, and 98% (538) of medical patients. They were unable to intubate 4.5% (74) of the patients. All of these were successfully managed by alternative methods. Unrecognized esophageal intubation occurred in six (0.3%) patients. The addition of capnography and a tube aspiration device, in 1990, decreased the incidence of esophageal intubations.
CONCLUSION: Paramedics trained to use succinylcholine, to assist the process of endotracheal intubation, can safely intubate a high percentage of patients.

# What does all of this mean?

# Endotracheal intubation in the field may be rarely indicated

**Endotracheal intubation in the field may be harmful…**

**…indeed, if you tracked your own survival data, you would likely find that people were less likely to survive with Field ETI**

# Why?

# Field ETI

- Prolonged attempts
- Hypoxia during attempts
- Multiple attempts
- Aspiration during attempts
- Hyperventilation AFTER intubation
- Instrumenting the airway in critical patients

# Example

Medic reports to Medical Director that an elderly patient in respiratory distress was cared for in the field, given nebs and oxygen, improved to GCS 8

On arrival to ED, Doc takes one look at her and makes 8 attempts to intubate her, during which she bradys down and dies

# Example

**What does that mean?**

**Did that patient need to be intubated who was improving with oxygen and supportive care?**

# Fowler's Maxim

# "The First Five Minutes"

# Fowler's Maxim

**In some patients you have to act right now:**

**Airway obstruction**
**Exsanguination**
**Cardiac Arrest**
**Profound respiratory distress**
**Shock**

# Fowler's Maxim

**In most patients, you have five minutes**

**The patient who seems stable for the moment, with a decent pressure, with a decent pulse ox, whose airway is not immediately threatened**

**TAKE A MINUTE OR TWO TO THINK**

# Delaney’s Corollary

If it took them a couple of days or more to get sick, then you probably have at least five minutes to stop and think

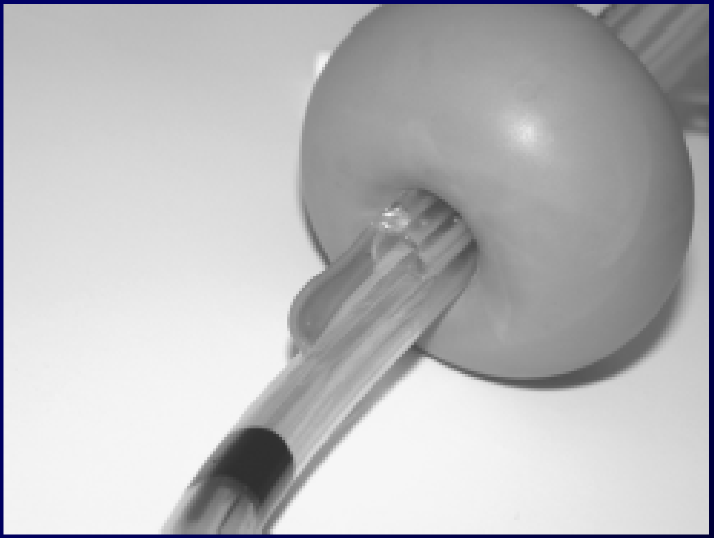
While you’re getting oxygen, IV’s, other supportive care, arranging for transport to the appropriate facility

# The Airway of the future will be fast, effective, and virtually hazard free

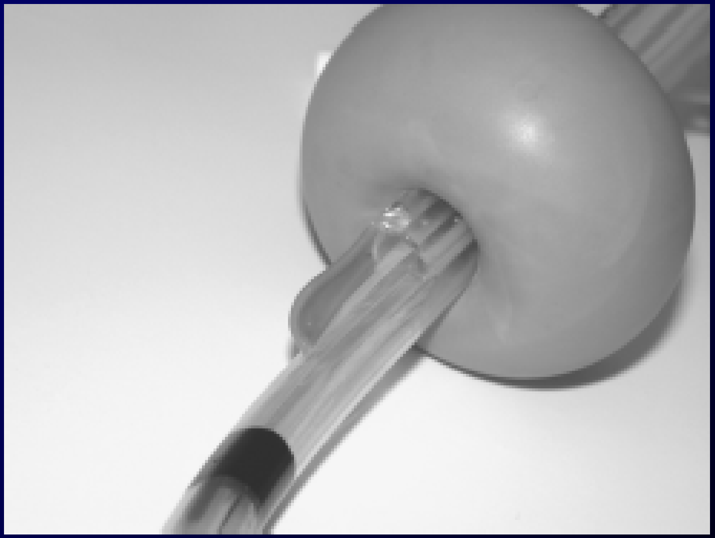
**Avoiding airway trauma**
**Virtually always goes in**
**Easy to train**
**Easy to remember**

# The Easy Tube

# The Easy Tube



# The Airway of the future will be fast, effective, and virtually hazard free



# Breathing and Circulation

# Resuscitation Outcomes Consortium

**A consortium of ten cities and states across North America designated by the National Institutes of Health to be the largest EMS research group in the history of medicine**

# Resuscitation Outcomes Consortium

**Will be initially looking at hypertonic saline infusions for traumatic brain injury and hemorrhagic shock due to trauma**

**Already in use in the military, just not studied in large civilian populations**

# Resuscitation Outcomes Consortium

**Will next look at the**
**Impedance Threshold Device**
**to improve negative intrathoracic pressure**
**during cardiac compressions**

# Resuscitation Outcomes Consortium

## Impedance Threshold Device

Turns chest compressions from a "one stroke engine" to a "two stroke engine"

# Resuscitation Outcomes Consortium

**Impedance Threshold Device**

**Makes use of chest recoil with tiny, momentary airway occlusion to increase venous return**

# Resuscitation Outcomes Consortium

**Impedance Threshold Device**

**Essentially normalizes blood pressure during chest compressions**

Medscape Medical News

# Impedance Threshold Device May Improve Survival in Out-of-Hospital Cardiac Arrest

**Peggy Peck**

Nov. 12, 2004 (New Orleans) — Use of an investigational inspiratory impedance threshold device (ITD) — ResQPod Circulatory Enhancer — during standard cardiopulmonary resuscitation (CPR) was associated with a doubling of short-term survival in patients with pulseless electrical activity (PEA) at any time during resuscitation, according to study results presented here at the American Heart Association 2004 Scientific Session.

Lead investigator Tom P. Aufderheide, a professor of emergency medicine at the Medical College of Wisconsin in Milwaukee, told Medscape he predicts the device "will have as great an impact on [CPR] efforts and treatment of out-of-hospital cardiac arrest as AEDs." He said use of the device increases blood supply to the brain and heart during the resuscitation.



The study compared the device, made by Advance Circulatory Systems Inc. in Eden Prairie, Minnesota, to a sham device for use during standard manual CPR. The device can be used with a face mask or can be attached to an endotracheal tube, and it is equipped with a timing light that flashes at a rate of 12 breaths a minute with each breath lasting a maximum of 1.5 seconds.

The primary end point was admission to an intensive care unit.

There were 116 patients randomized to the sham device and 114 were randomized to the ITD. Of the patients randomized to the active device, the one-hour survival rate was 26%, the ICU admission rate was 25%, and 24-hour survival rate was 17%. For patients in the sham device group the rates were lower — 18%, 17%, and 12%, respectively — but the differences were not statistically significant.

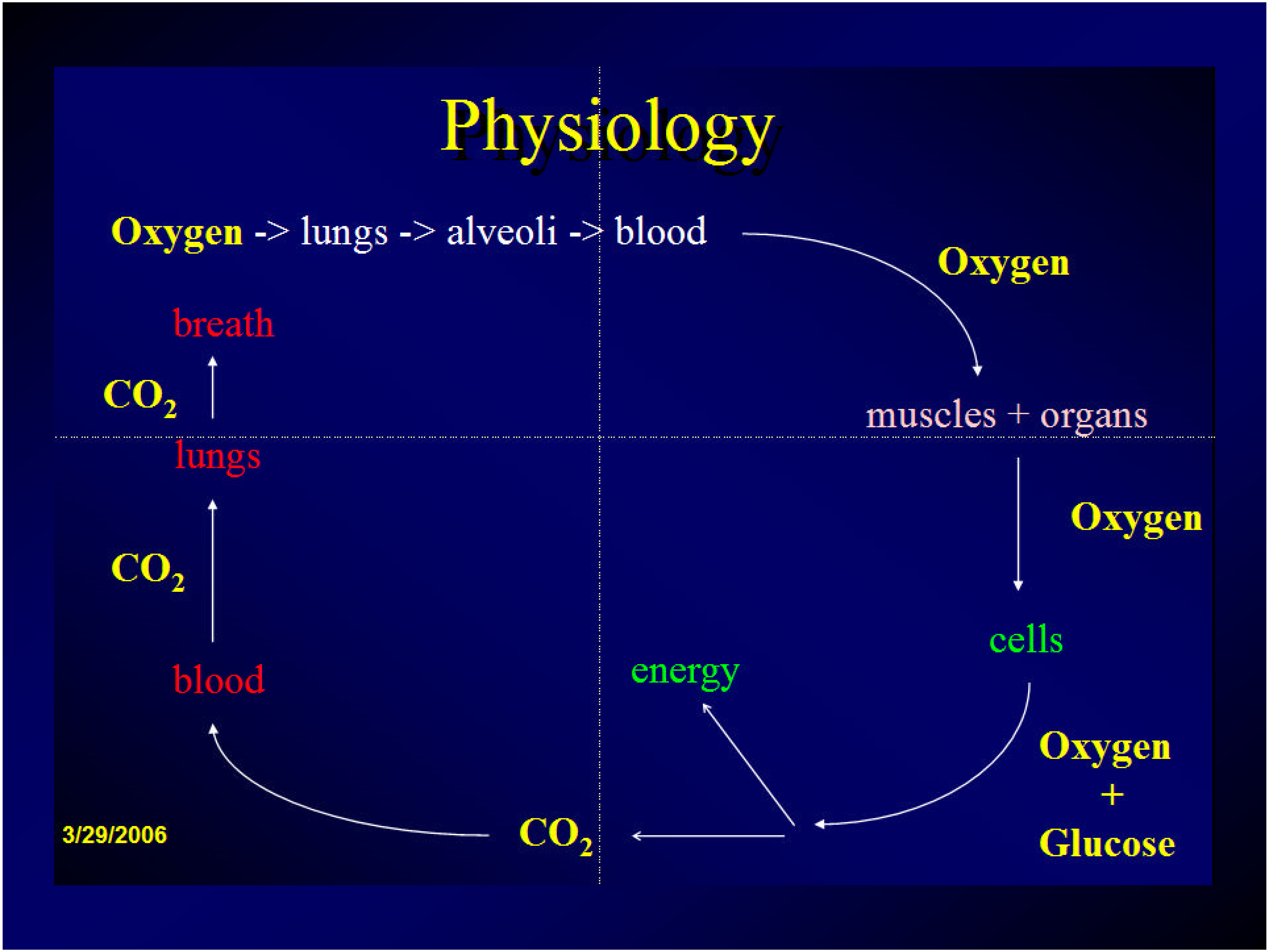
# ResQPOD Circulatory Enhancer ®

## Introducing the Most Advanced Device for Enhancing Circulation during Cardiopulmonary Resuscitation (CPR)

The ResQPOD Circulatory Enhancer*

- Increases blood flow to the heart and brain during CPR
- Increases the opportunity for survival and normal neurological outcome
- May be used with standard CPR or pump-assisted (active compression decompression - ACD) CPR
- Works in conjunction with standard resuscitation techniques and equipment


POD Circulatory
6,604,523 • EP0898485



Physiology
Oxygen -> lungs -> alveoli -> blood
Oxygen
muscles + organs
Oxygen
cells
Oxygen
+
Glucose
energy
$CO_2$
blood
$CO_2$
lungs
$CO_2$
breath
3/29/2006

# The negative pressure inside the thorax "pulls" blood back from the positive pressure areas.

Positive pressure

Negative pressure

Positive pressure

Maintaining the “negativity” of the pressure inside of the thorax is one of the most vital areas of understanding resuscitation


Negative pressure

3/29/2006

# Signs of Shock

**Early** →

- Weak, thirsty, lightheaded
- Pale, then sweaty
- Tachycardia
- Tachypnea
- Diminished urinary output

**Late** →

- Hypotension
- Altered LOC
- Cardiac arrest
- Death

# What does a low blood pressure mean?

***Either…***

***Or a combination of any of these***

***…from BTLS, editions 2, 3, 4, and 5 Fowler et al***

# Shock

## Cardiogenic

- Rapid pulse
- Distended neck veins
- Cyanosis

## Volume Loss

- Rapid pulse
- Flat neck veins
- Pale

## Vasodilatory

- Variable pulse
- Flat neck veins
- Pale or pink

**We have been overventilating patients in circulatory collapse to death for years, without knowing it**

**After all, if a little oxygen is GOOD, more is better, right?**

# WRONG!

**Overventilation raises intrathoracic pressure, decreasing venous return, and dropping cardiac output**

Blood pressure =

(Cardiac output) x
(Volume) x
(Peripheral resistance)

**If you drop venous return, cardiac output drops**

**That is, if the pump can't fill, then the pump can't pump**

**Research is clear on the fact that medics (and all providers) bag patients too fast with too big of a squeeze and too fast on the squeeze**

**Slow down the rate of ventilation until capnography begins to rise**

**Maintain a minute ventilation of approximately five liters and see where capnography goes from there**

**One hand squeeze every 8 seconds**

# CPAP

Vitaid *Aiding Life*

Home | Products ▾ | Departments ▾ | Order | About Us | Contact Us | Search

**Boussignac CPAP Resource Center**

- Boussignac CPAP System
- Boussignac CPAP + Nebulizer
- FAQ
- Education

## Boussignac CPAP System

### For Acute Pulmonary Edema (APE)

**Lowest O2 consumption rate of any CPAP system**

- Only 15-30L/min flow rate for 3.5-10cmH2O

**System doesn't require a flow generator**

- Eliminates investment in capital equipment and repair
- Boussignac CPAP only needs O2 source and flowmeter

**Only completely open CPAP system**

- Eliminates re-breathing
- Reduces risk of barotrauma
- Decreases the work of breathing
- Accomodates patient's high peak inspiratory flow demand
- Allows use of suction catheter or bronchoscope without loss of CPAP

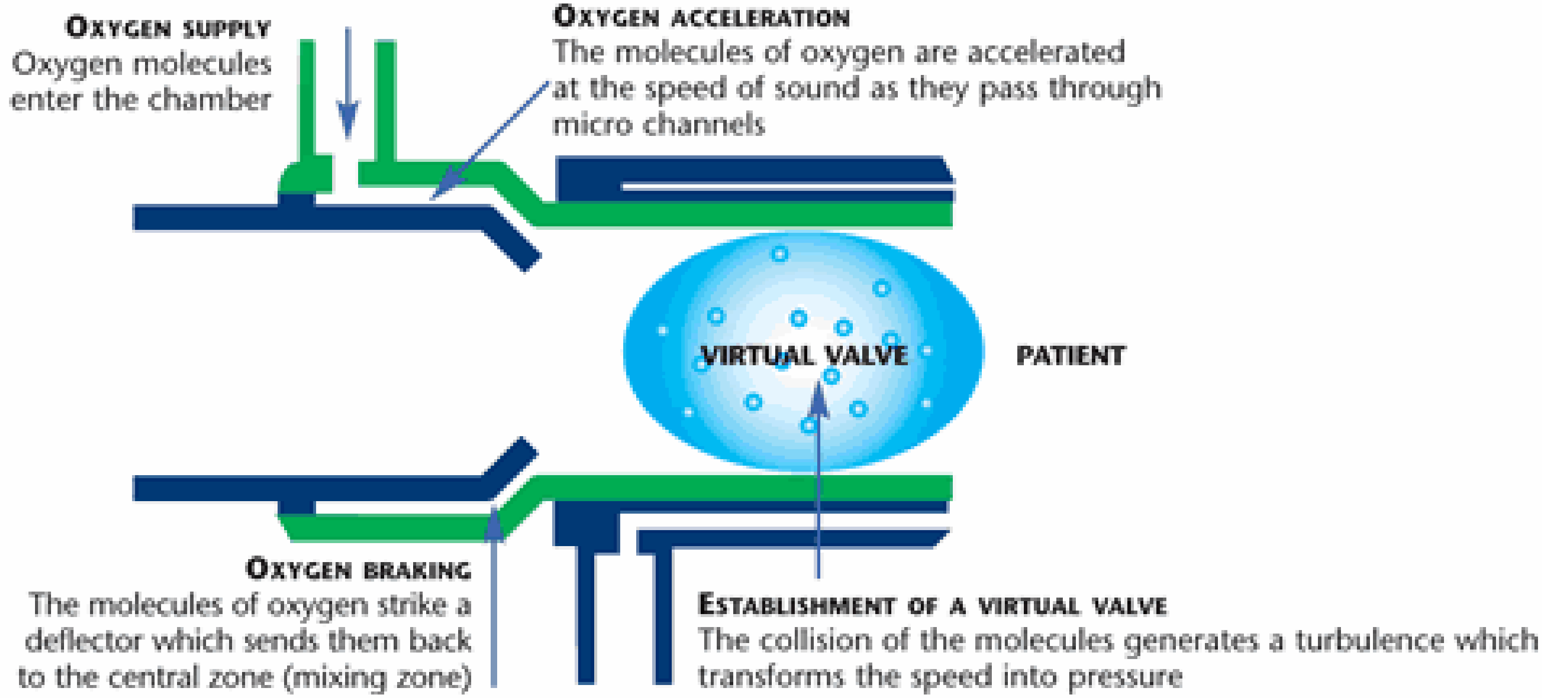
**Only CPAP system that depends entirely on the O2 flow rate**

- CPAP easily adjusts to patient's need (2.5-20cmH2O) simply by titrating O2 flow
- PEEP adjustable by changing flow rate, no valves to change
- Constant, accurate pressure measurement via optional manometer

**Complete, easy to use, portable, single use system**

- CPAP set up in <2 minutes, therefore ideal for all EMS and ED settings
- Requires 75% less space in field packs than competitive systems
- Boussignac CPAP weighs only 10grams, 2" long
- Permits CPAP without interruption during transport

# Boussignac CPAP works the same way as the turbines of a jet engine.



# What about the AutoPulse?

# Drugs and ECG's

# Drugs

**It is clear that overventilation has changed patient outcomes over the years and prevented us from seeing what drugs could**

# Which Drugs to Revisit?

**Antiarrhythmics in arrest**
**Pressors during arrest**

# Future Drugs

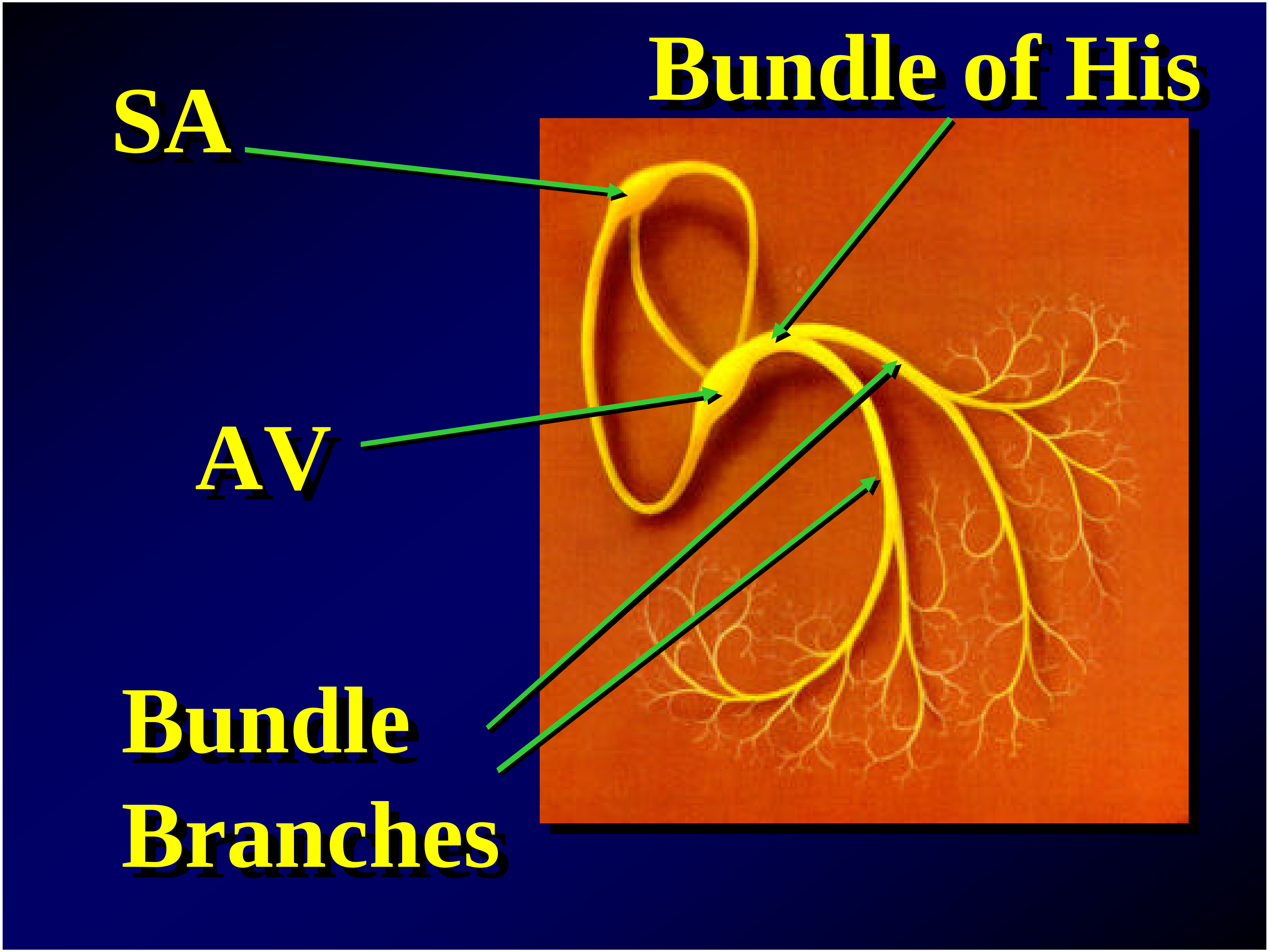
**Artificial hemoglobins?**
**Vasopressin?**

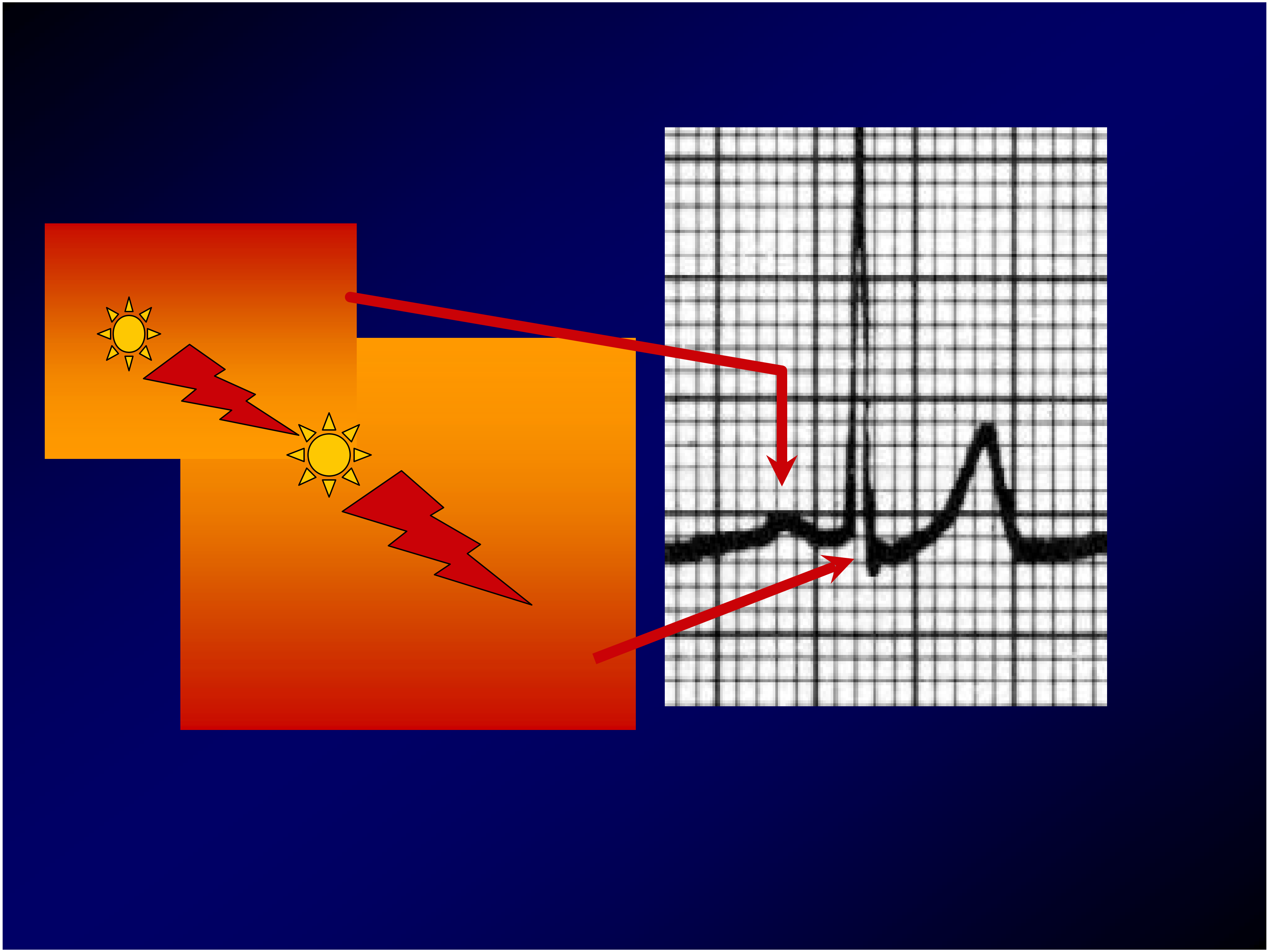
***…but just when we thought life was getting easier…***

# Electrocardiography

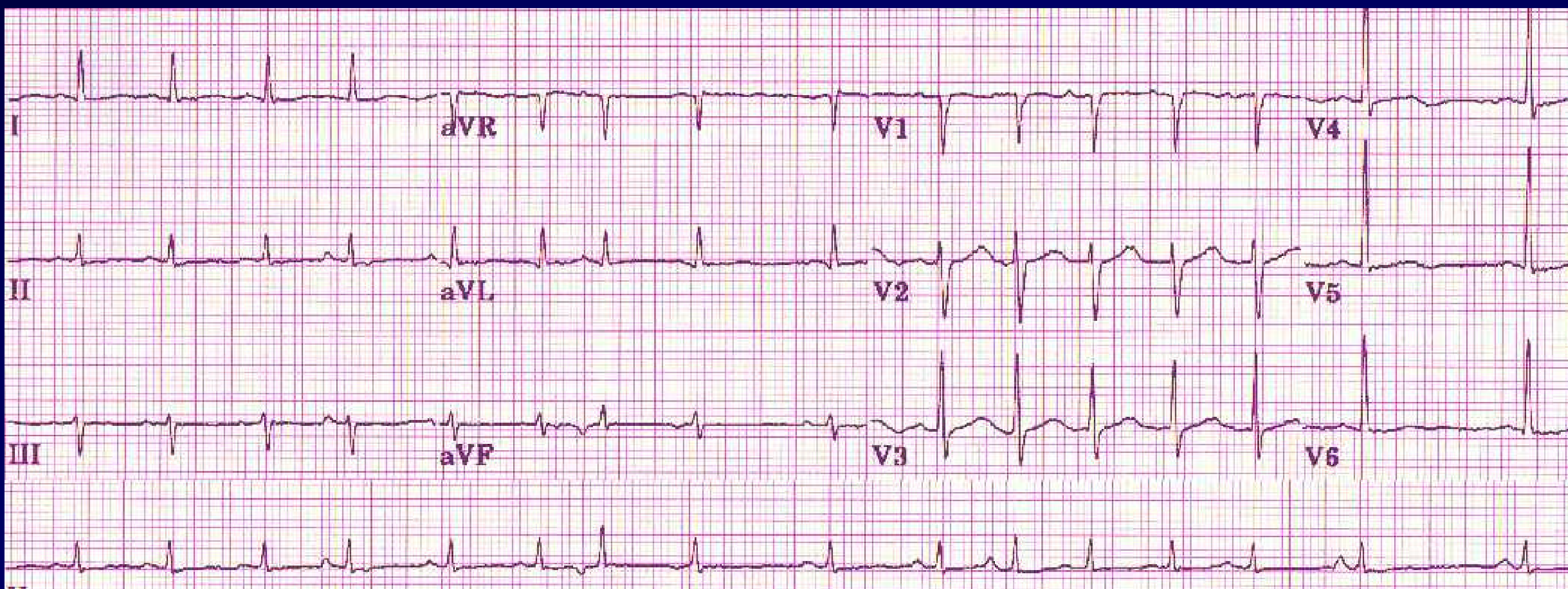
**12 Lead Interpretation**
**by medics**
**is now the standard of care**
**even if the 12 lead is NOT**
**on your rig**


ECG Interpretation
Anatomically speaking…


Bundle of His
SA
AV
Bundle
Branches



# Multifocal Atrial Tachycardia



# IMMEDIATE Trial

Immediate Myocardial Metabolic Enhancement

IMMEDIATE TRIAL

During Initial Assessment and Treatment in Emergency care

# IMMEDIATE Trial

**Medic identifies the Acute Coronary Syndrome through patient History and Physical and through 12 Lead Interpretation**

**Medic gets consent**

**Medic initiates an infusion of Glucose, Insulin, and Potassium in the field to limit incidence of sudden death and infarct size**

# IMMEDIATE Trial

**Over time EMS will likely be giving medication to limit infarct size and incidence of sudden death**

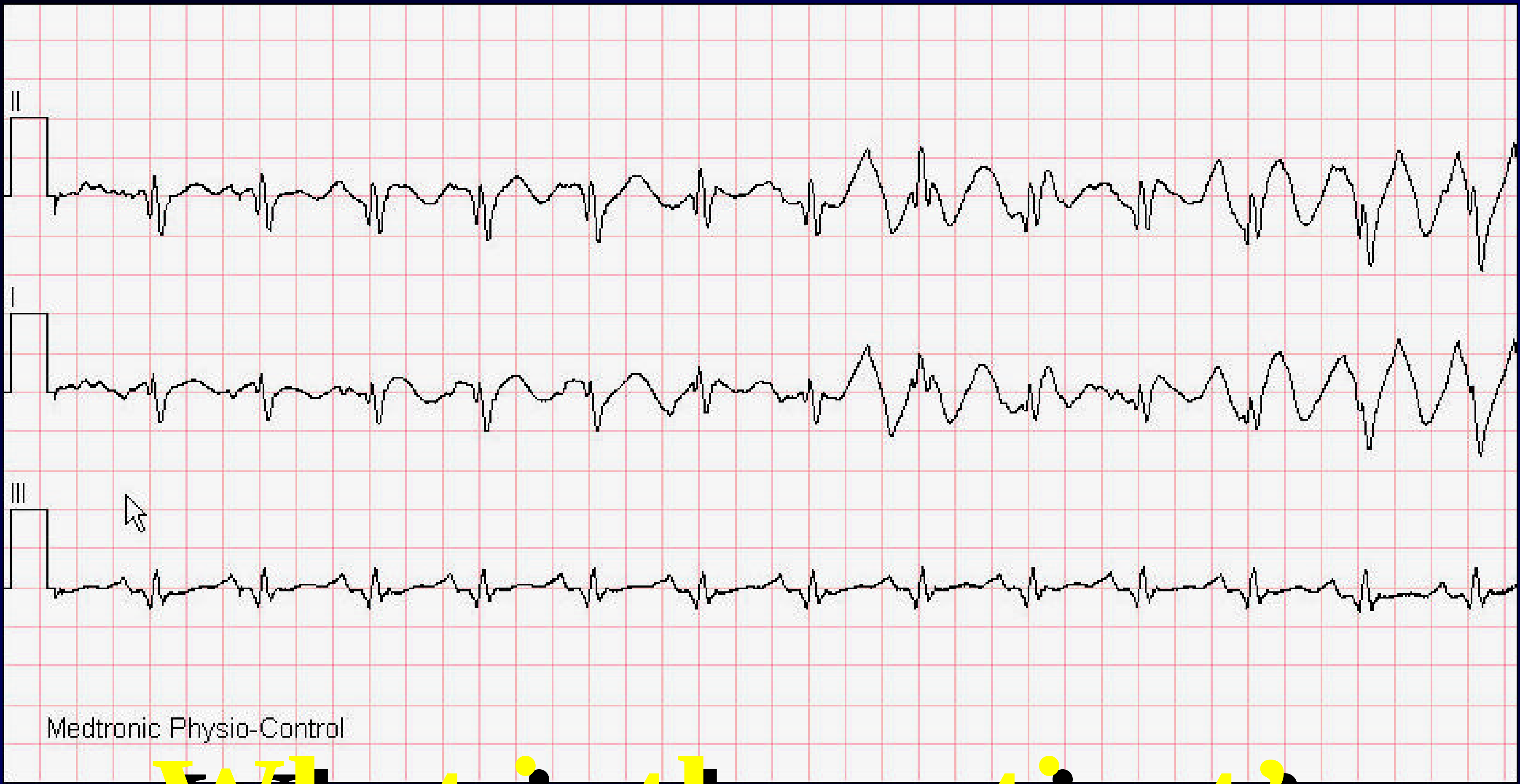
**This will ultimately increase survival from acute coronary syndrome and decrease the burden of CHF post infarct to patients and the community**

# IMMEDIATE Trial

**Turns out that sick tissue likes a little extra insulin around**

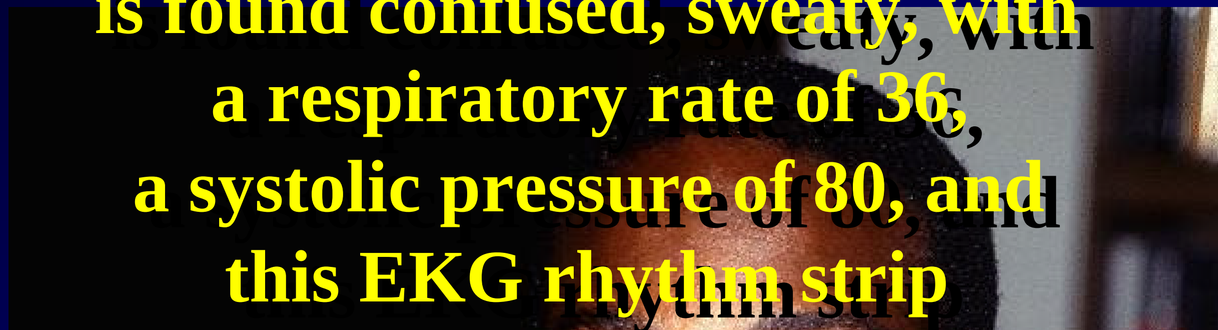
**Insulin turns off fat metabolism and turns on carbohydrate metabolism, giving more energy per gram of substrate to sick cells**

**This has been know for over 40 years**




# What is the patient's blood pressure?

**A 15 year old AA male**
**is found confused, sweaty, with**
**a respiratory rate of 36,**
**a systolic pressure of 80, and**
**this EKG rhythm strip**



# 60 year old Aunt Minnie presents with systolic of 90 and no cardiac history

**She has been ill for two days**

# 60 year old with rate of 158
# 220 – 60 = 160

## What statement can you make?

# 60 year old with rate of 158
# 220 – 60 = 160

# Does she need Adenosine?

# Synthesis


So,
Who’s
Foolin’
Who??

EMS professionals
are primary members
of the emergency medical team.

**The scope of practice**
**of these EMS professionals**
**continues to grow**
**with passing years**

Let us then

apply our best efforts

to monitor emerging research

with the sharpened focus

of clarity and simplification,

pooling our individual creativities

for the greater good

of those we serve.

## This Talk may be found at

**www.rayfowler.com**

**drray@doctorfowler.com**

# . . . *and Good Morning!*