

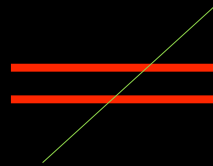


Eagles 2015

# BETTER BREATHING THRU QA

Neal J. Richmond, M.D., FACEP

# Quick note to Brent Myers



and then there's Ray Fowler..



# Three Eagles' schools of thought

## The really smart Eagles

- What's "latest & greatest" in EMS
- Use things like ultrasound & bispectral index monitoring
- Just so they can figure out who's really dead





# Three Eagles' schools of thought

## The not so smart Eagles

- Less interested in figuring out who's dead
- Than preventing our patients from getting dead in the 1<sup>st</sup>-place

*I piss on your  
ultrasound...*



# What we're interested in

## Avoiding the need for novel intubation techniques

- e.g., the Pepe 3-tube maneuver



# Three Eagles' schools of thought

## The Eagles who are completely out of their minds

- Keep saying the number "5" over & over
- Need to be carried out of here in straight-jackets



# A typical day at EMS

43 y/o female overdose

- BLS ambulance 1<sup>st</sup> unit on-scene
- 5-minute response time
- On-scene @ 21:55

CREW INFO	RESPONSE INFO	DISPOSITION	TIMES
Vehicle: 1252 Call Sign: Resp No: Primary Role: Crew #1 ID: Crew #1 Role: Crew #1 Level: EMT-Basic Crew #2 ID: Crew #2 Role: Crew #2 Level: EMT-Basic Crew #3 Role: Crew #3 Level: Disp Loon: Fairdale 2 Disp Zone: Channel 2 Disp GPS Loon: Other EMS Agency: Est First At Scene: First At Scene Time: Doc'd By: Assisted By: Police	Med/Trauma: Call Type: BLS Ambulance Resp Priority: Code 3 Resp Change: No Change Nature Of Call: Overdose/Poisoning/Ingestion EMD Performed: EMD Card No: Dispatch Delay: Resp. Delay: Distance Traffic Call Taken by: 911 Dispatch Resp. with: Police Loon Type: Home/Residence Location: 3 OR Scene Zone No: Scene GPS Loon: PL Found: In Chair/Couch No of Patients: 1 Sending For Med Res No: Mass Casualty: No Possible Injury:	Type of Service: Outcome: Treated & Transported by Other Crew Dest. Reason: Trans. Priority: Odometer Start: 0.1 At Scene Mileage: 2.1 At Dest. Mileage: Odometer End: Patients Tied from Amb: Cond at Dest.: Dest Type: Protocols Used: Level of care: ALS Barriers to Care: PL Transported: Scene Delay: Trans. Delay: Dest Delay: Destination: Dest Zone No: Dest GPS Loon: Dest Pac Med Res No: Reov Doorfor:	Injury: 2013-12-31 20:30:00 PSAP: Recvd: 21:49 12-31-13 Dispatch: 21:50 12-31-13 En route: 21:51 12-31-13 At scene: 21:55 12-31-13 At patient: 21:56 12-31-13 Trans of Care: Transport: At dest.: In service: 23:15 12-31-13 At base:

PATIENT INFORMATION		
Name: [REDACTED] SSN: [REDACTED] Sex: Female Race: Caucasian Ethnicity: [REDACTED] Broselow:	Phone: (502) [REDACTED] DOB: [REDACTED] (43 yrs) Weight: Emergency Info Form: DL Info: Advanced Directives:	Home Country: [REDACTED] Home Addr.: 3 [REDACTED] OR LOUISVILLE, JEFFERSON, KY 40201 Mailing Addr.: 3 [REDACTED] OR LOUISVILLE, KY 40201

# BLS

## Narrative & assessment

- Decreased level of consciousness (GCS-6)
- Clammy & cool
- Respirations-12; pulse-128 (strong & regular); BP-unable to get
- Finger-stick glucose-288

Pt is a 42 y/o female found seated on the couch at home, pt is decreased LOC, placed placed on o2, family stated the last time they seen her was 1 1/2 hr before calling, and they believe pt took approx 80 gabapentin, time is unknown. Family stated pt was a diabetic, blood sugar was checked. Unable to get a manual B/P. ALS arrived on scene and took over pt care. I rode in with ALS. All times are approx.

Body Area	Assessments and Comments	Body Area	Assessments and Comments
Airway	Patent	Breathing	Normal Respirations
Circulation	Pulses - Radial - Normal (2+)	LOC	Responsive to Pain
Head	Assessed with No Abnormalities	Face	Assessed with No Abnormalities
Left Ear	Assessed with No Abnormalities	Right Ear	Assessed with No Abnormalities
Left Eye	Assessed with No Abnormalities	Right Eye	Assessed with No Abnormalities
Nose	Assessed with No Abnormalities	Neck	Assessed with No Abnormalities
Trachea	Midline	Chest	Lung Sounds - L-Side - Upper - Rhonchi Lung Sounds - R-Side - Upper - Rhonchi
Back - Upper	Assessed with No Abnormalities	Back - Lower	Assessed with No Abnormalities
Pelvis	Not Assessed	Genitalia	Not Assessed
Upper Left Arm	Assessed with No Abnormalities	Upper Right Arm	Assessed with No Abnormalities
Lower Left Arm	Assessed with No Abnormalities	Lower Right Arm	Assessed with No Abnormalities
Left Hand	Assessed with No Abnormalities	Right Hand	Assessed with No Abnormalities
Upper Left Leg	Assessed with No Abnormalities	Upper Right Leg	Assessed with No Abnormalities
Lower Left Leg	Assessed with No Abnormalities	Lower Right Leg	Assessed with No Abnormalities
Left Foot	Assessed with No Abnormalities	Right Foot	Assessed with No Abnormalities
LLQ	Assessed with No Abnormalities	LUQ	Assessed with No Abnormalities
Pupil Equality	Equal	Pupil Size	Constricted
RLQ	Assessed with No Abnormalities	RUQ	Assessed with No Abnormalities
Skin Color	Color - Pale	Skin Condition	Clammy
Skin Temperature	Cool		

Past Medical History								
Psychiatric - Depression			GI Bleeding/Problems - GERD			Diabetes - Non-Insulin Dependent		
Allergies								
Iodine								
Medications								
Bentyl -			Gabapentin -			Metformin HCL -		Omeprazole
Other - Not Listed -			Prozac -					
Note: RISPERIDONE								

PTA	BP	Pulse	Monitor_Rate	Respiratory	SPO2	EtCO2	Glucose	GCS
No	0	128, Auscultated		12 Normal, Regular				E1 + V1 + M4 = 6
		Strong, Regular						

# BLS treatment

## Treatment

- High flow O<sub>2</sub> by non-rebreather mask

<u>PTA</u>	<u>Treatment</u>	<u>Who performed</u>	<u>Authorized by</u>	<u>Comments</u>
No	Oxygen	[REDACTED]	Protocol	
	<u>Complication</u>	<u>Complication Narrative</u>		
Device=Non-Rebreather		Indication=Other - See Comments		LPM=15 LPM
Result=No Change				



# ALS back-up arrives on-scene

## 10-minutes later: ALS PCR/narrative

- Patient found unresponsive
- Airway positioned & patient moved to ambulance
- BVM initiated is initiated in the truck
- 1st intubation unsuccessful
- 2<sup>nd</sup> intubation successful but etCO<sub>2</sub> 'clogged' & replaced
- 2<sup>nd</sup> etCO<sub>2</sub> also becomes clogged & has to be removed
- During transport, the patient becomes bradycardic
- Progresses to asystolic and then PEA cardiac arrest

ALS arrive on scene and receives report from BLS. Patient care is continued with BLS crew Lifepak. Family states that the patient took her meds prior to them leaving the residence. Patient was reported drowsy able to vocalize on their arrival. Patient's condition is stated to decline into unresponsiveness. It is estimated 1 1/2 hours have past since the patient took her medications. The patient's Seroquel bottle is noted to be short on pills. 29 1/2 pills are remaining in a 120 count bottle. (filled on 12/18/13 with a prescription of one pill four times daily). Assessment as noted. Patient is unresponsive to pain and has a dulled gag reflex. Wet sounding breathing is heard without auscultation. Airway is positioned sniffing and patient is extricated. Poison control is contacted and report given: Poison control reports no antidote, just support airway. Patient is ventilated via BVM and intubation is attempted. First intubation is unsuccessful and cannot be confirmed. Second attempt is successful. ETco2 does not read due to debris. EtCo2 is removed, patient is suctioned, and new EtCo2 device is used. Device becomes again clogged. During transport Patient's heart rate is noted to decrease, ETT is assessed and is noted to be dislodged and is removed. Patients heart rate is noted to decrease, and rhythm change occurs. Patient is in cardiac arrest with rhythm of asystole. CPR is started and Airway is managed via BVM with two rescuers. Defib pads are placed on the patient and lead view on the Lifepak is changed to paddles. Audubon is notified of condition change. CPR is continued with a rhythm check at two minute cycles. PEA is noted at each cycle. CPR is continued until patient care is transferred.

# QA & Medical Director review

## PCR

- No reason to suspect a confirmed EMS “kill”
- But did we miss an excellent opportunity to help someone?
- 100% mandatory waveform capnography & wireless upload



# A closer look

ALS back-up arrives on-scene 10-minutes later

- 22:05 (t-10 minutes)-1<sup>st</sup> patient assessment & vitals

<u>Body Area</u>	<u>Assessments and Comments</u>	<u>Body Area</u>	<u>Assessments and Comments</u>
Airway	Partially Obstructed - Tongue : Partially Obstructed - Vomitus	Breathing	Agonal : Shallow
Circulation	Pulses - Carotid - Normal (2+)	LOC	Unresponsive
Blood/Fluid Loss	0 - 100 ML	Chest	Other : Lungs: Rhonchi all fields.
Capillary Refill	< 2 Seconds	Neuro	Decreased Sensation : General Weakness
Pupil Equality	Equal	Pupil Reaction	Non-Reactive
Pupil Size	Dilated	Skin Color	Color - Normal
Skin Condition	Normal	Skin Temperature	Normal

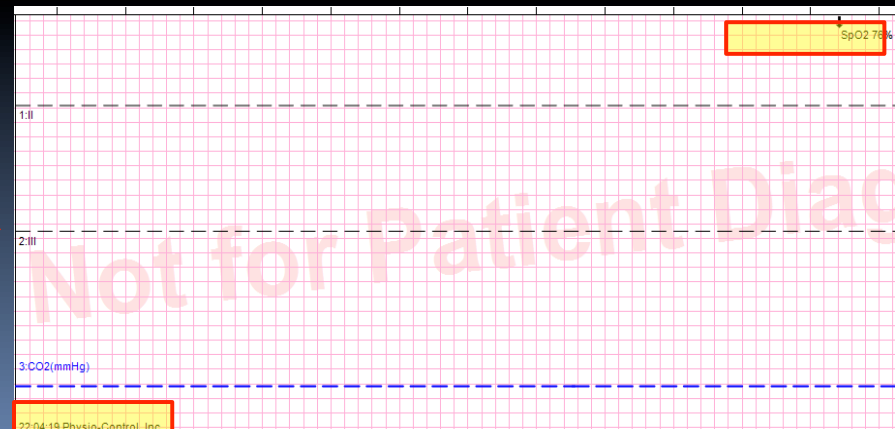
# 22:05: ALS back-up arrives

t-10 minutes after BLS

- 1<sup>st</sup> set of ALS vitals

<u>PTA</u>	<u>BP</u>	<u>Pulse</u>	<u>Monitor_Rate</u>	<u>Respiratory</u>	<u>SPO2</u>	<u>EtCO2</u>	<u>Glucose</u>	<u>GCS</u>
22:05	134/107 NIBP Machine	130, Strong, Regular		12 Agonal, <None>	76%, Source: Supplemental		→	E1 + V1 + M1 = 3
Cap. Refill=Normal		↑		↑	↑			

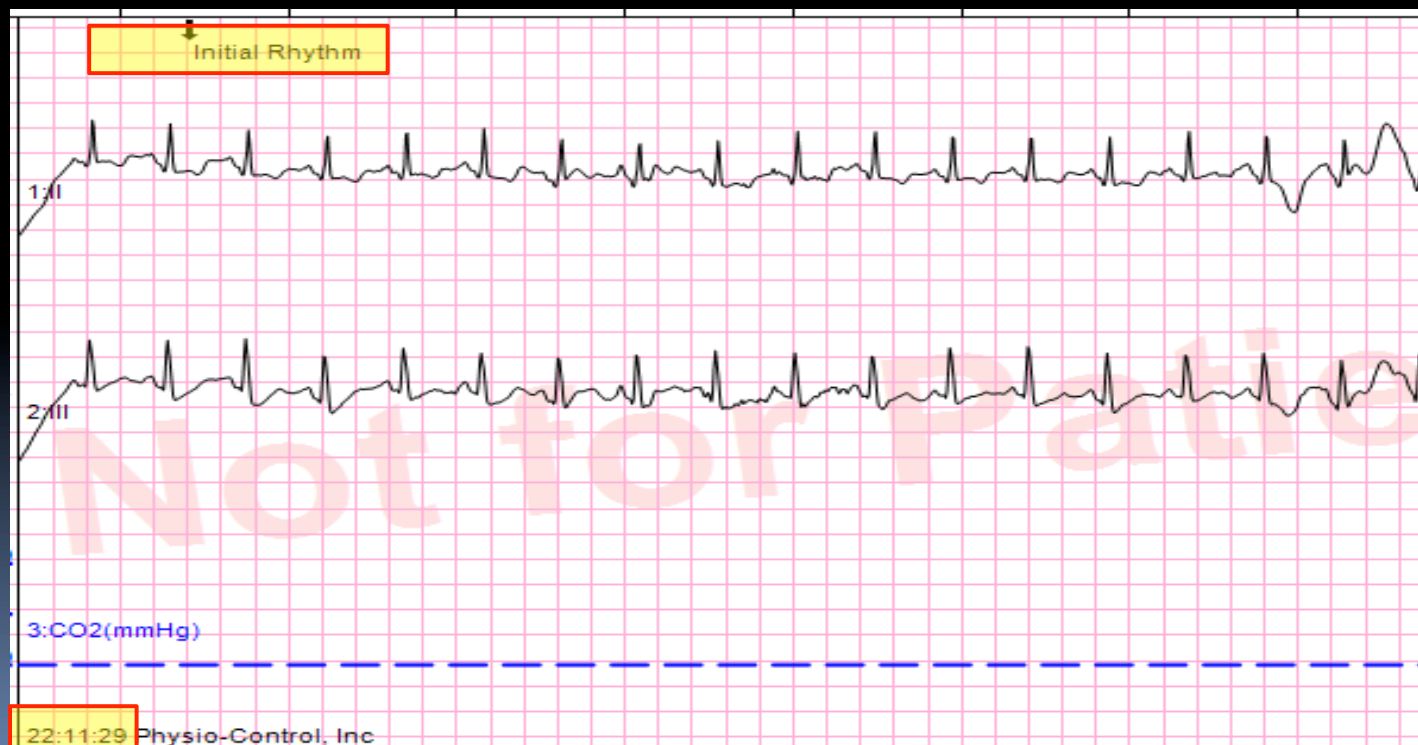
- Monitor turned on
- Pulse oximeter attached
- No etCO<sub>2</sub> or EKG



# 22:11 or 6-minutes later

t-16 minutes after BLS arrival

- Airway positioned & patient moved to ambulance
- EKG shows sinus tachycardia
- etCO<sub>2</sub> not attached



# 22:13 or 2-minutes later

t-18 minutes after BLS arrival

- ALS treatment initiated with with BVM

<u>Time</u>	<u>PTA</u>	<u>Treatment</u>	<u>Who performed</u>	<u>Authorized by</u>	<u>Comments</u>
22:13	No	Bag Valve Mask	Crew on Scene	Protocol	
		<u>Complication</u>	<u>Complication Narrative</u>		
		Indication=Maintain Airway	Result=Poor Exchange		Size=Adult



# 22:18 or 5-minutes later

t-23 minutes after BLS arrival

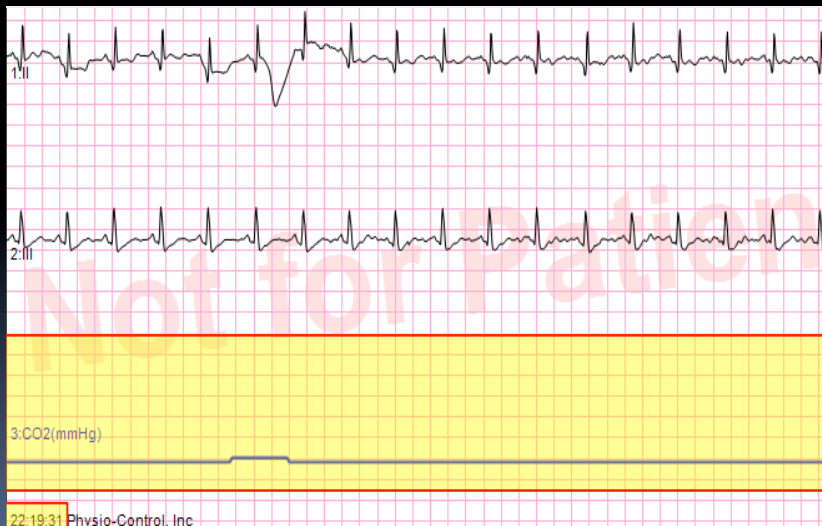
- Two intubation attempts
  - 1st intubation unsuccessful
  - 2<sup>nd</sup> intubation successful (colorimetric & auscultation)

<u>Time</u>	<u>PTA</u>	<u>Treatment</u>	<u>Who performed</u>	<u>Authorized by</u>	<u>Comments</u>
22:18	No	Intubation	[REDACTED]	Protocol	
	<u>Complication</u>	<u>Complication Narrative</u>			
	Size Tube=7	Attempts=2			Indication=Unconsciousness
	Breath Sounds Post Intubation=Equal Breath Sounds	Type=Nasal			Method of Confirmation=Auscultation
	Result=Successful	Secondary Method of Confirmation=Color Change Capnometry			Tertiary Confirmation=Color Change Capnometry

# 22:19 or 1-minute later

## t-24 minutes after BLS arrival

- In-line etCO<sub>2</sub> hooked up at the ETT
- 1<sup>st</sup> etCO<sub>2</sub>=0 (flat waveform)
- “Clogged” —→ removed & replaced

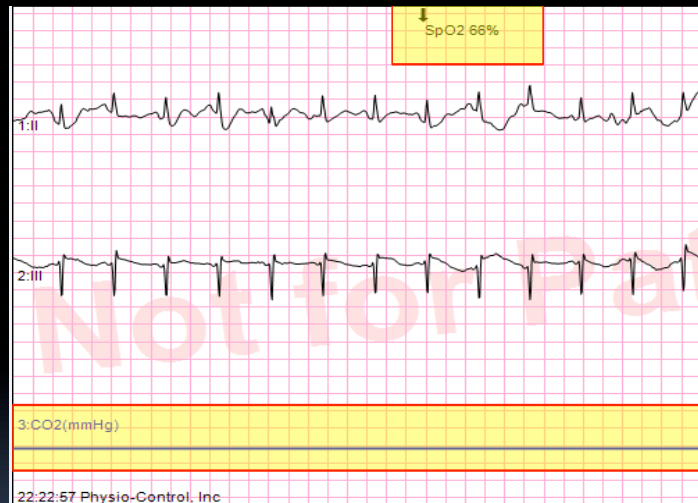


Complication			Complication Narrative	
Indication=Intubation			Result=No Change	
Time	PTA	Treatment	Who performed	Authorized by
22:22	No	End Tidal CO2	[REDACTED]	Protocol

# 22:22 or 3-minutes later

t-27 minutes from BLS arrival

- $\text{etCO}_2 = 0$
- $\text{O}_2$  saturation-66%

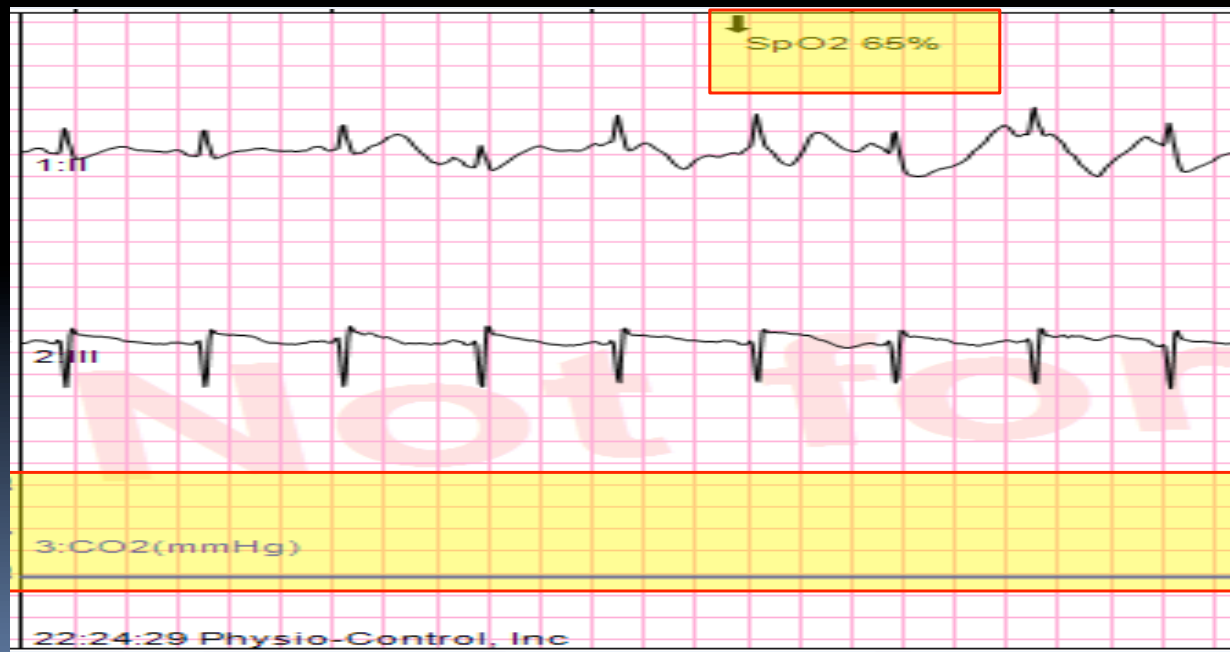


<u>Time</u>	<u>PTA</u>	<u>Treatment</u>	<u>Who performed</u>	<u>Authorized by</u>
22:22	No	End Tidal CO2	[REDACTED]	Protocol
<u>Complication</u>		<u>Complication Narrative</u>		
Indication=Intubation		Result=No Change		

# 22:24 or 2-minutes later

t-29-minutes from BLS arrival

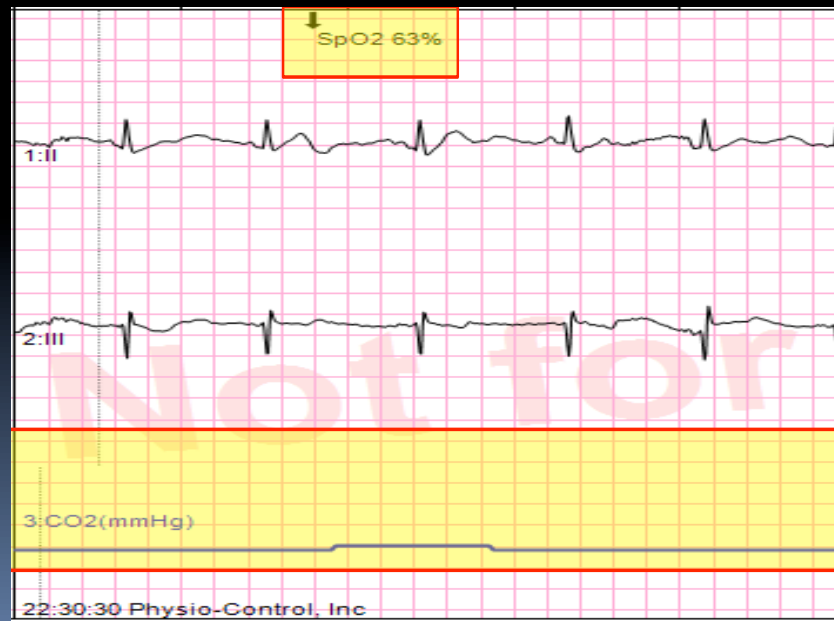
- $\text{etCO}_2=0$
- $\text{O}_2$  saturation-65%
- QRS slowing & widening



# 22:36 or 6-minutes later

## t-35 minutes after BLS arrival

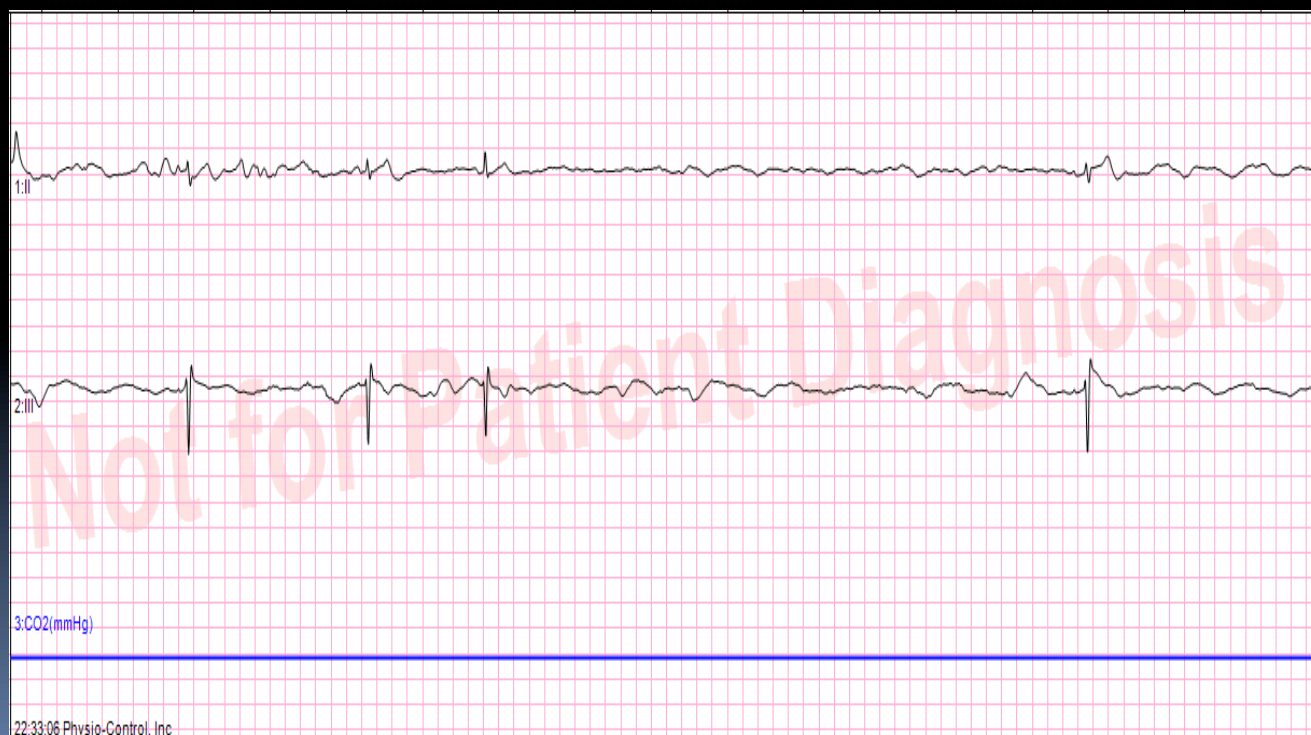
- $\text{etCO}_2=0$
- $\text{O}_2$  saturation-63%
- Progressive QRS slowing & widening



# 22:33 or 3-minutes later

t-38 minutes

- etCO<sub>2</sub> still = 0
- Patient progresses to full cardiac arrest





# So, how do we all do?

## 2010 PEC meta-analysis of prehospital intubation

- Identified 2005 articles on prehospital airway success rates
- 117 studies of orotracheal intubation (54,933 patients)
- Overall quality of the data was poor
- Intubation success rates likely over-estimated
  - Often self-verified, often inadequately
- Failed intubation = failed airway management
  - May have had BVM or rescue airway
  - But also didn't evaluate outcome/complications



Hubble MW, Brown L, et al. A Meta-Analysis of Prehospital Airway Techniques Part I; Orotracheal and Nasotracheal Intubation Success Rates. Prehosp Emerg Care 2010;14:377-401

# Results

## Orotracheal intubation\*

- Adult non-cardiac arrests 69.8%
- All adults (including arrests) 86.3%
  - Trauma 69.8%
  - Non-trauma 87.9%
- Pediatrics 83.2%\*\*
- Annual decline in success rates 0.49%

- \* performed by non-physicians and non-drug facilitated (no RSI or DFI)

- \*\* only 3 studies

# A few other results

## Verification of successful tube placement

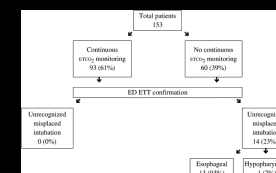
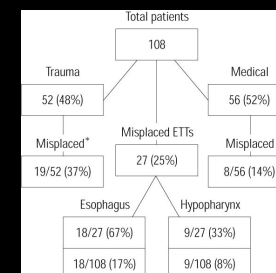
- Self/clinical assessment only 91.5%
- Independent (in ED) 82.9%
- Multiple objective means (capnography) 93.8%



# To add insult to Injury

## Not only ends up in the wrong hole

- Unrecognized esophageal intubations  $\leq 25\%$
- Intubated patients transported to trauma center
- Continuous end-tidal CO<sub>2</sub> monitoring used 61%
- Unrecognized misplaced intubation
  - In the absence of capnography 23%
  - With capnography 0%



- Katz SH, Falk JL. Misplaced endotracheal tubes by paramedics in an urban emergency medical services system. Ann Emerg Med. 2002;37:32-7
- Silvestri S, Ralls GA, et al. 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. Ann Emerg Med. 2005;45:497-503

# How about our feathered friends?

25 cities (most are using etCO<sub>2</sub>)

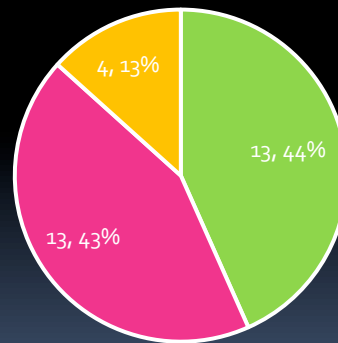
- Boston
- Kansas City, MO
- Atlanta
- St Louis
- Miami
- San Diego
- San Francisco
- Nashville
- San Antonio
- Anchorage
- Chicago
- Salt Lake City
- Hawaii
- New Orleans
- Oklahoma City / Tulsa
- Columbus
- Dallas
- Philadelphia
- Minneapolis
- Cincinnati
- Las Vegas
- St. Paul
- Cleveland
- Phoenix
- Acadian

# Requirements for etCO<sub>2</sub> reporting

## Mandatory

- Document etCO<sub>2</sub> value (capnometry) on pcr 44%
- Upload entire etCO<sub>2</sub> tracing (waveform capnography) 44%
- No requirements 12%

Reporting Requirements



- Mandatory report of capnometry reading on e-pcr by provider
- uploading of all etCO<sub>2</sub> capnography tracings
- No mandatory requirements for reporting

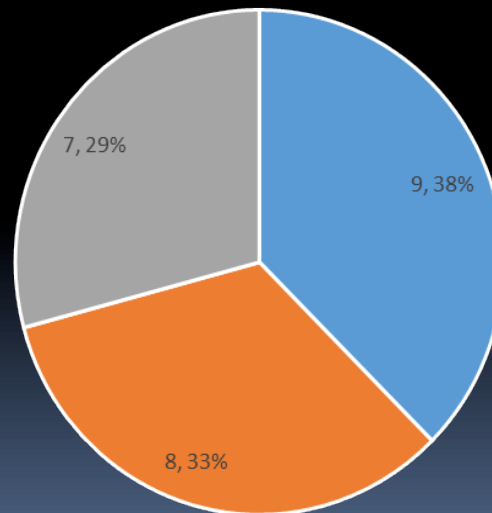


# System etCO2 monitoring/QA

## Mandatory review

- All intubations 38%
- All airway cases\* 33%
- Only sentinel cases (when referred) 29%

System Monitoring



■ All intubations ■ All airways cases ■ Sentinel cases

\* Mask, BVM, CPAP, supraglottic, ET

# A little spidey sense

“With great power, comes great responsibility”

- Of all the things we do as emergency medical providers
- Airway management
  - Potentially life-saving
  - Potentially very dangerous



# A plea

If you do EMS, then you should have mandatory

- Waveform etCO<sub>2</sub> capnography
- All endotracheal intubation & all airway management
- Wireless (or other) 'upload' of all cases
- Review of all capnography tracings

Bottom line

*"We should never miss an excellent opportunity to help someone"*



# How etCO<sub>2</sub> line blockage looks

