Eagles 2015

BETTER BREATHING THRU QA

Neal J. Richmond, M.D., FACEP
Quick note to Brent Myers

Frequent Flyer

Brent Myers, M.D.

PLATINUM MEDALLION®

Delta SKYMILES

Brent Myers, M.D.
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 1st-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

“5, 5, 5, 5...”
A typical day at EMS

43 y/o female overdose

- BLS ambulance 1st unit on-scene
- 5-minute response time
- On-scene @ 21:55
**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 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.
BLS treatment

Treatment
• High flow O₂ by non-rebreather mask
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
- 2nd intubation successful but etCO2 ‘clogged’ & replaced
- 2nd etCO2 also becomes clogged & has to be removed
- During transport, the patient becomes bradycardic
- Progresses to asystolic and then PEA cardiac arrest
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)-1st patient assessment & vitals

<table>
<thead>
<tr>
<th>Body Area</th>
<th>Assessments and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Partially Obstructed - Tongue :</td>
</tr>
<tr>
<td></td>
<td>Partially Obstructed - Vomitus</td>
</tr>
<tr>
<td>Circulation</td>
<td>Pulses - Carotid - Normal (2+)</td>
</tr>
<tr>
<td>Blood Fluid Loss</td>
<td>0 - 100 ML</td>
</tr>
<tr>
<td>Capillary Refill</td>
<td>&lt; 2 Seconds</td>
</tr>
<tr>
<td>Pupil Equality</td>
<td>Equal</td>
</tr>
<tr>
<td>Pupil Size</td>
<td>Dilated</td>
</tr>
<tr>
<td>Skin Condition</td>
<td>Normal</td>
</tr>
<tr>
<td>Breathing</td>
<td>Agonal :</td>
</tr>
<tr>
<td>LOC</td>
<td>Shallow</td>
</tr>
<tr>
<td>Unresponsive</td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>Other : Lungs: Rhonchi all fields</td>
</tr>
<tr>
<td>Neuro</td>
<td>Decreased Sensation :</td>
</tr>
<tr>
<td></td>
<td>General Weakness</td>
</tr>
<tr>
<td>Pupil Reaction</td>
<td>Non-Reactive</td>
</tr>
<tr>
<td>Skin Color</td>
<td>Color - Normal</td>
</tr>
<tr>
<td>Skin Temperature</td>
<td>Normal</td>
</tr>
</tbody>
</table>
22:05: ALS back-up arrives
t-10 minutes after BLS
• 1st set of ALS vitals

<table>
<thead>
<tr>
<th>PTA</th>
<th>BP</th>
<th>Pulse</th>
<th>Monitor_Rate</th>
<th>Respiratory</th>
<th>SPO2</th>
<th>EtCO2</th>
<th>Glucose</th>
<th>GCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>22:05</td>
<td>134/107</td>
<td>130,</td>
<td>12 Agonal,</td>
<td>76%, Source:</td>
<td></td>
<td></td>
<td>E1 + V1 + M1 = 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NIBP</td>
<td>Strong,</td>
<td>&lt;None&gt;</td>
<td>Supplemental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine</td>
<td>Regular</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cap. Refill=Normal</td>
<td></td>
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</tbody>
</table>

- Monitor turned on
- Pulse oximeter attached
- No etCO2 or EKG
22:11 or 6-minutes later

\textit{t-16 minutes after BLS arrival}

- Airway positioned & patient moved to ambulance
- EKG shows sinus tachycardia
- etCO2 not attached
22:13 or 2-minutes later

t-18 minutes after BLS arrival
- ALS treatment initiated with BVM

<table>
<thead>
<tr>
<th>Time</th>
<th>PTA</th>
<th>Treatment</th>
<th>Who performed</th>
<th>Authorized by</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>22:13</td>
<td>No</td>
<td>Bag Valve Mask</td>
<td>Crew on Scene</td>
<td>Protocol</td>
<td>Complication Narrative</td>
</tr>
</tbody>
</table>

Complication Narrative
- 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
  - 2nd intubation successful (colorimetric & auscultation)
22:19 or 1-minute later

t-24 minutes after BLS arrival
• In-line etCO₂ hooked up at the ETT
• 1ˢᵗ etCO₂=0 (flat waveform)
• “Clogged” → removed & replaced
22:22 or 3-minutes later

- 27 minutes from BLS arrival
  - \( \text{etCO}_2 = 0 \)
  - \( \text{O}_2 \) saturation-66%

![Graph showing heart rate and \( \text{SpO}_2 \) readings]

![Medical record form indicating \( \text{Complication Narrative} \): Result=No Change]
22:24 or 2-minutes later

t-29-minutes from BLS arrival
• etCO2=0
• O2 saturation-65%
• QRS slowing & widening
22:36 or 6-minutes later

t-35 minutes after BLS arrival

- etCO2=0
- O2 saturation-63%
- Progressive QRS slowing & widening
22:33 or 3-minutes later

t-38 minutes
• etCO₂ 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

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 ≤ 25%
- Intubated patients transported to trauma center
- Continuous end-tidal CO₂ monitoring used 61%
- **Unrecognized** misplaced intubation
  - In the absence of capnography 23%
  - With capnography 0%


How about our feathered friends?

25 cities (most are using etCO2)

- 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 etCO2 reporting

Mandatory

• Document etCO2 value (capnometry) on pcr 44%
• Upload entire etCO2 tracing (waveform capnography) 44%
• No requirements 12%

Reporting Requirements

- Mandatory report of capnometry reading on e-PCR by provider
- Uploading of all etCO2 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%

* 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 etCO2 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 etCO2 line blockage looks

<table>
<thead>
<tr>
<th>3:CO2 (mmHg)</th>
<th>CO2 Filter Line Purging</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
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