The importance of pre-intubation resuscitation

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Outline

• Discuss the “sequence” of resuscitation
• Overview of hypotension during intubation
• Evidence for pre-intubation resuscitation
• Bedside strategies
The “A” in the ABC’s

• The “ABC’s” are only a framework

• Useful reference for the initial approach to resuscitations

• It is unlikely the optimal order for all resuscitations

• Little investigation
Emergent ETI is different.

- Emergent ETI
  - Little time for planning
  - Little time for optimization
  - Uncooperative
  - Physiologically challenged
  - Non-experts airway personnel

- ETI can cause further deterioration in critically ill patients
ETI and Adverse events

Jaber (2006 France)

- “Severe” AE’s: 28%
- Most commonly
  - hypoxemia (26%)
  - Hypotension (25%)
- Death (2%)

Griesdale (2008 Canada)

- “Severe” AE’s: 24% (Any AE 39%)
- Most commonly
  - hypoxia (19.1%)
  - hypotension (9.6%)
- Death (0%)

Table 4: Complications and outcomes following endotracheal intubation

<table>
<thead>
<tr>
<th>Complication</th>
<th>Total (n = 136)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any complication, n (%)</td>
<td>53 (39.0)</td>
</tr>
<tr>
<td>Severe complications</td>
<td>33 (24.3)</td>
</tr>
<tr>
<td>SaO2 &lt; 80%, n (%)</td>
<td>26 (19.1)</td>
</tr>
<tr>
<td>SBP &lt; 70 mmHg, n (%)</td>
<td>13 (9.6)</td>
</tr>
<tr>
<td>Technical complications, n (%)</td>
<td>29 (21.3)</td>
</tr>
<tr>
<td>Esophageal intubation, n (%)</td>
<td>10 (7.4)</td>
</tr>
<tr>
<td>Endobronchial intubation, n (%)</td>
<td>5 (3.7)</td>
</tr>
<tr>
<td>Aspiration, n (%)</td>
<td>8 (5.9)</td>
</tr>
<tr>
<td>&gt;3 attempts, n (%)</td>
<td>6 (4.4)</td>
</tr>
<tr>
<td>&gt;10 min, n (%)</td>
<td>14 (10.3)</td>
</tr>
<tr>
<td>Dental injury</td>
<td>1 (0.7)</td>
</tr>
<tr>
<td>Median days of mechanical ventilation, (SD)</td>
<td>4.6 (7.0)</td>
</tr>
<tr>
<td>ICU mortality, n (%)</td>
<td>21 (15.4)</td>
</tr>
<tr>
<td>Hospital mortality, n (%)</td>
<td>40 (29.4)</td>
</tr>
</tbody>
</table>

SD standard deviation, SaO2 arterial oxygen saturation, SBP systolic blood pressure.
**Death and Other Complications of Emergency Airway Management in Critically Ill Adults**

*A Prospective Investigation of 297 Tracheal Intubations*

David E. Schwartz, M.D., * Michael A. Matthay, M.D., † Neal H. Cohen, M.D., ‡

<table>
<thead>
<tr>
<th>Group</th>
<th>Preintubation Systolic BP (mmHg)</th>
<th>No. of Intubations</th>
<th>No. of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>≤90</td>
<td>34</td>
<td>5*</td>
</tr>
<tr>
<td>3</td>
<td>&gt;90</td>
<td>236</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>297</td>
<td>21</td>
</tr>
<tr>
<td>Adverse Event</td>
<td>Incidence (best guess, Range)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>3% (0-7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td>40% (0-43%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypoxia</td>
<td>20% (0.9-26%)</td>
<td></td>
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</tbody>
</table>
What is post-intubation hypotension (PIH)?

- the development or increase in hemodynamic instability during or immediately after endotracheal intubation (ETI)

- Likely multifactorial in nature
  - Medications
  - Laryngoscopy skill
  - PPV (venous return)
  - Patient illness

Timeline of Rapid Sequence Induction Protocol for Oral Endotracheal Intubation

- Preparation
  - Pre-Induction
  - Induction
  - Paralysis
- Pre-O2
- PreRx
- 30 sec* positioning
- 45 sec** tube placement
- 60 sec*** post-intubation management
Why may PIH be important?

- Patients requiring ETI are (usually) critically ill
- Further physiologic compromise is (likely) poorly tolerated
- Hemodynamic instability increases mortality and other poor outcomes
How common is PIH?
Incidence of PIH: 11%
(6.5-16.7%)
Does 11% seem right??
Incidence of PIH: 44%
44% seems more accurate.

But, is this an “EM” phenomenon or does it occur in ICU intubations as well?
Postintubation hypotension in intensive care unit patients: A multicenter cohort study

Robert S. Green
Lauralyn A. McAlpine
Dean A. Ferguson
Mete Erdogan

Incidence of PIH: 46%
Can we predict who will develop PIH?

- Pre-ETI instability is important:
  - PIH patients more commonly received a vasopressor prior to ETI
  - 39% vs. 25%

- Otherwise, unpredictable:
  - Age, gender, APACHE II, diagnosis were not more common in patients who developed PIH
Did it matter who or how the patients were intubated?

- No difference in
  - ETI method (RSI)
  - Device used
  - Who intubated
It must be the medications?!?

- No differences in any medications
  - Sedatives
  - Paralytics
- Propofol: Patients who developed PIHI were administered propofol less often
  - 59% vs. 67%

<table>
<thead>
<tr>
<th>Medications used to facilitate ETI</th>
<th>PIH (n = 218)</th>
<th>No PIH (n = 261)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opioid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>142 (65%)</td>
<td>153 (59%)</td>
<td>.14</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>25 (12%)</td>
<td>24 (9%)</td>
<td>.41</td>
</tr>
<tr>
<td>Morphine</td>
<td>4 (1%)</td>
<td>8 (3%)</td>
<td>.39</td>
</tr>
<tr>
<td>Any opiate</td>
<td>146 (67%)</td>
<td>164 (63%)</td>
<td>.35</td>
</tr>
<tr>
<td>Sedatives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propofol</td>
<td>128 (59%)</td>
<td>174 (67%)</td>
<td>.07</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>123 (56%)</td>
<td>151 (58%)</td>
<td>.75</td>
</tr>
<tr>
<td>Ketamine</td>
<td>18 (8%)</td>
<td>10 (4%)</td>
<td>.04</td>
</tr>
<tr>
<td>Etomidate</td>
<td>1 (0.5%)</td>
<td>0 (0%)</td>
<td>.27</td>
</tr>
<tr>
<td>Any sedative</td>
<td>189 (87%)</td>
<td>227 (87%)</td>
<td>1.0</td>
</tr>
<tr>
<td>Paralytics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocuronium</td>
<td>22 (10%)</td>
<td>34 (13%)</td>
<td>.32</td>
</tr>
<tr>
<td>Succinylcholine</td>
<td>19 (8%)</td>
<td>29 (11%)</td>
<td>.38</td>
</tr>
<tr>
<td>Other (vecuronium, atracurium, pancuronium)</td>
<td>0 (0%)</td>
<td>1 (0.4%)</td>
<td>.36</td>
</tr>
<tr>
<td>Any paralytic</td>
<td>35 (16%)</td>
<td>58 (22%)</td>
<td>.10</td>
</tr>
</tbody>
</table>
And, what about PIH and patient outcomes?

**Composite end-point of poor patient outcomes:**

- prolonged ventilation (>7 days)
- Renal dysfunction (any new ARF)
- ICU LOS (>14 days)
- Death (in-hospital)

**OR 2.00 (1.30-3.07)**

Trends towards increased mortality:

**OR 1.47 (0.97-2.22, p=0.07)**
But, I know we all resuscitate before we intubate...
“Any” pre-intubation resuscitation: 54%
Very little vasopressor use (<5%)
So, how should this change your approach in resuscitation?
Pre-intubation resuscitation in 2016: restore hemodynamic stability prior to ETI

- Volume resuscitation

- Crystalloid
  - Balanced solution
  - Ringer’s Lactate, Normosol, NS

- 1, 2, 3 L....
Vasopressors

- Vasopressor infusion or immediately available
- Peripheral IV vs. central IV
- Norepinephrine
- Phenylephrine
Before/After study to determine if the use of an intubation protocol would reduce ETI AE’s

3 ICU’s in France 12 month (6 before/6 after)

10 point bundle

1. Pre-oxygenation with noninvasive positive pressure ventilation
2. Fluid loading
3. Preparation and early administration of sedation and vasopressor use if needed
4. Rapid sequence intubation
5. Protective ventilation
Pre-intubation resuscitation reduced AE’s

Fig. 1 Life-threatening complications occurring after all intubations performed during the control ($n = 121$) and the intervention ($n = 123$) phases. $^* p < 0.05$ versus control phase. NS not significant
Summary

• Endotracheal intubation may cause/exacerbate hemodynamic instability

• Traditional “A-B-C’s” may not be appropriate for all patients

• Post-intubation hypotension is common, unpredictable, and may be associated with poor patient outcomes

• Pre-intubation resuscitation/stabilization is an important component in the management of the critically ill patient
  o IV fluids & vasopressor medications
  o Titrate medications