“Can’t Intubate, Can’t Oxygenate”: Does an airway algorithm improve Non-Technical Skills in a crisis?

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Outline

• Fixation errors in airway management
• Can cognitive aids help?
• The effects of a cognitive aid to modify team behaviours
Effects of crises

- Impaired memory recall

- Potential for ‘cognitive tunnelling’
  Tversky & Kahneman, 1974
Fixation errors

“Too much time was taken trying to intubate the trachea rather than concentrating on ensuring adequate oxygenation. The clinicians became oblivious to the passing of time and thus lost opportunities to limit the extent of damage caused by the prolonged period of hypoxia.”

(UK Coroner’s Inquest Verdict into the death of Elaine Bromiley, 2005)
How can we avoid fixation?
DIFFICULT AIRWAY ALGORITHM

1. Assess the likelihood and clinical impact of basic management problems:
   - Difficulty with patient cooperation or consent
   - Difficult mask ventilation
   - Difficult supraglottic airway placement
   - Difficult laryngoscopy
   - Difficult intubation
   - Difficult surgical airway access

2. Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management.

3. Consider the relative merits and feasibility of basic management choices:
   - Awake intubation vs. intubation after induction of general anesthesia
   - Non-invasive technique vs. invasive techniques for the initial approach to intubation
   - Video-assisted laryngoscopy as an initial approach to intubation
   - Preservation vs. ablation of spontaneous ventilation

4. Develop primary and alternative strategies:

   **AWAKE INTUBATION**
   - Airway approached by Noninvasive Intubation
     - Succeed
     - Fail
     - Cancel Case
     - Consider feasibility of other options
   - Invasive Airway Access

   **INTUBATION AFTER INDUCTION OF GENERAL ANESTHESIA**
   - Initial intubation attempts successful
   - Initial intubation attempts unsuccessful

   FROM THIS POINT ONWARDS CONSIDER:
   - Calling for help.
   - Returning to spontaneous ventilation.
   - Awakening the patient.

   **FACE MASK VENTILATION ADEQUATE**
   - Nonemergency Pathway
     - Ventilation adequate, intubation unsuccessful
     - Alternative approaches to intubation

   **FACE MASK VENTILATION NOT ADEQUATE**
   - Emergency Pathway
     - Ventilation not adequate, intubation unsuccessful
     - Call for help

   **IF BOTH FACE MASK AND SGA VENTILATION BECOME INADEQUATE**
   - Emergency noninvasive airway ventilation

   **INVASIVE AIRWAY ACCESS**
   - Consider feasibility of other options
   - Awaken patient
   - Emergency invasive airway access
Cognitive aids should:

• Have up to date content
• Be familiar to the users
• Have a simple design
  – Obey cognitive engineering design principles
• Be able to be used in the context of work

Team context

Cognitive aids need to support teams not just individuals

- Help coordination and information sharing
- Minimise cognitive workload - help NTS
### Types of Checklist

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Parallel</td>
<td>One operator reads and performs tasks</td>
<td>Example Pre-anesthesia machine checkout</td>
</tr>
<tr>
<td>Static Sequential with Verification</td>
<td>A second person reads items and an operator confirms</td>
<td>Example: ‘Flight deck’ pilot and co-pilot checklist.</td>
</tr>
<tr>
<td>Static Sequential with Verification and Confirmation</td>
<td>Multiple team members respond to a series of items and cross-check</td>
<td>Example: WHO Pre-incision ‘Time Out’ checklist</td>
</tr>
<tr>
<td>Dynamic</td>
<td>One or more team members develop a plan using a branching decision tree</td>
<td>Example: ASA difficult airway algorithm</td>
</tr>
</tbody>
</table>

CAUTION

THIS SIGN HAS
SHARP EDGES

DO NOT TOUCH THE EDGES OF THIS SIGN

ALSO, THE BRIDGE IS OUT AHEAD
Team context

Cognitive aids need to support teams not just individuals

- Help coordination and information sharing
- Minimise cognitive workload - help NTS
Does the use of a cognitive aid improve Non-Technical Skills in CICO crisis?

- Randomised controlled trial (CA or control)
- Immersive simulation scenario (in ED setting)
- Primary outcome measure – ANTS score
- Secondary outcome – time to oxygenate patient

Marshall, S.D., Mehra, R. 2013 (in preparation)
Based on Heard, A. Green, R., Eakins, P. Anaesthesia 2009
<table>
<thead>
<tr>
<th>Clinical Specialty</th>
<th>Control (No cognitive aid) n=41</th>
<th>Intervention (Cognitive aid) n=34</th>
<th>P value (Pearson’s Chi squared or Fisher’s exact test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaesthetics</td>
<td>34 (82.9%)</td>
<td>24 (70.6%)</td>
<td></td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>3 (7.3%)</td>
<td>4 (11.8%)</td>
<td>p=0.594</td>
</tr>
<tr>
<td>Intensive Care</td>
<td>2 (4.9%)</td>
<td>2 (5.9%)</td>
<td></td>
</tr>
<tr>
<td>Rural GP practice</td>
<td>2 (4.9%)</td>
<td>4 (11.8%)</td>
<td></td>
</tr>
<tr>
<td>Mean years of experience (range)</td>
<td>13.8 (1.0 – 37.5)</td>
<td>10.0 (0.5 – 35.0)</td>
<td>p=0.068</td>
</tr>
<tr>
<td>Prior training in infraglottic airway techniques</td>
<td>35 (85.4%)</td>
<td>26 (76.5%)</td>
<td>p=0.325</td>
</tr>
<tr>
<td>Previously performed an emergency infraglottic airway</td>
<td>3 (7.3%)</td>
<td>8 (23.5%)</td>
<td>p=0.058</td>
</tr>
<tr>
<td>Would use a cognitive aid if it were available</td>
<td>35 (85.4%)</td>
<td>26 (76.5%)</td>
<td>p=0.132</td>
</tr>
<tr>
<td>Observation</td>
<td>Control (No cognitive aid) n=41</td>
<td>Intervention (Cognitive aid) n=34</td>
<td>Inter-rater reliability Cohen’s κ (p value)</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------</td>
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</tr>
<tr>
<td><strong>Technical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean time in seconds to provide oxygenation (SEM)</td>
<td>184.5 (9.9)</td>
<td>161.3 (11.3)</td>
<td>-</td>
</tr>
<tr>
<td>Oxygenation provided within 3 minutes</td>
<td>22 (53.7%)</td>
<td>25 (73.5%)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Non-technical</strong></td>
<td>[Observe the ellipses below]</td>
<td>[Observe the ellipses below]</td>
<td>[Observe the ellipses below]</td>
</tr>
<tr>
<td>Team Management</td>
<td>2.54</td>
<td>3.12</td>
<td>0.714 (&lt;0.001)</td>
</tr>
<tr>
<td>Team Working</td>
<td>2.59</td>
<td>3.28</td>
<td>0.638 (&lt;0.001)</td>
</tr>
<tr>
<td>Situation Awareness</td>
<td>2.63</td>
<td>3.38</td>
<td>0.608 (&lt;0.001)</td>
</tr>
<tr>
<td>Decision Making</td>
<td>2.67</td>
<td>3.27</td>
<td>0.713 (&lt;0.001)</td>
</tr>
<tr>
<td>Total ANTS score</td>
<td>10.4</td>
<td>13.0</td>
<td>-</td>
</tr>
<tr>
<td><strong>Evidence of conflict</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of episodes</td>
<td>6 (14.6%)</td>
<td>0 (0%)</td>
<td>0.881 (&lt;0.001)</td>
</tr>
</tbody>
</table>
Conclusions

• First prospective trial to show improved team behaviours and reduced conflict when a cognitive aid is provided
• Trend towards more rapid task completion
• Further work is required on design and other presentations (e.g. smartphones / tablets)
• More research is needed on the effects of cognitive aids on team coordination
Anaphylaxis during Anaesthesia
Immediate Management

DR
Danger and Diagnosis
Response to stimulus
Unresponsive Hypotension or Bronchospasm
Cease triggers including Chlorhexidine & Colloid
Stop procedure. Use minimal volatile if GA.

S
Send for help and organise team
Call for Help and Anaphylaxis box
Assign a designated Leader and Scribe
Assign a Reader of this card

AB
Secure Airway
Breathing - 100% oxygen
Intubation: airway oedema or compromise
Confirm FiO₂ is 100%

C
Circulation: CPR if no pulse
Give IV fluid bolus
If no pulse give 1mg Adrenaline IV (Paed 10 mcg/kg) and follow ALS protocol
IV Fluid: 20mls/kg bolus repeat as required

D
Drugs: Adrenaline
IV Bolus, repeat if needed
Prepare Infusion

No IV access or haemodynamic monitoring:
Consider IM Adrenaline
1:1000 (1mg/ml) into lateral thigh
- Adult = 0.5ml (500mcg)
- <12 years = 0.3ml (300mcg)
- <6 years = 0.15ml (150mcg)

IV Adrenaline BOLUSES
Draw up 1mg in 10ml
Adrenaline (1:10,000) = 100mcg/ml
Give dose below every 1-2 minutes prn:

<table>
<thead>
<tr>
<th>Grade 2 – Moderate Hypotension or Bronchospasm</th>
<th>Grade 3 - Severe Hypotension or Bronchospasm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult 5-20 mcg = 0.05 - 0.2 ml</td>
<td>Adult 100-200 mcg = 1 - 2 ml</td>
</tr>
<tr>
<td>Child 1 - 5 mcg/kg = 0.01 - 0.05 ml/kg</td>
<td>Child 5 - 10 mcg/kg = 0.05 - 0.1 ml/kg</td>
</tr>
</tbody>
</table>

Adrenaline INFUSION If requiring repeated doses of Adrenaline prepare and start infusion:
Adult 0.05 to 0.4 mcg/kg/min
Child 0.1 to 5 mcg/kg/min

Example Infusion 3mg/50mls = 60mcg/ml with 1ml/hour = 1mcg/min (70 kg Adult 3.5 – 28 ml/hour)

If NOT RESPONDING see ‘Refractory Management’

Available to download from www.anzaag.com