Rapid Sequence Intubation in Pre-Hospital Care

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CV

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• Emergency Medicine, Anaesthetics, Critical Care
  John Radcliffe Hospital  Oxford
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  Addenbrooke’s Hospital  Cambridge
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• Pre-Hospital and Retrieval
  Essex and Herts Air Ambulance
  East Anglian Air Ambulance
  Children’s Acute Transport Service
  London’s Air Ambulance
For the purposes of this talk...

• Accept that pre-hospital RSI is beneficial to certain seriously injured patients

• Think about robust systems and safe techniques
Things to think about...

• London’s Air Ambulance
  – Description of the process
  – Latest statistics

• Pre-hospital rapid sequence intubation
  – Who benefits?
  – Do we need drugs?
  – Do we need doctors?
  – Do we need a system?
London’s Air Ambulance

Philosophy for pre-hospital intubation:
1. None of our patients should have to wait to get an anaesthetic if they need one
2. Technique must be safe and reproducible
3. The first attempt at intubation must have the maximum chance of success
London’s Air Ambulance

• 25,000 missions since launch in 1989
• 20-30% of all patients seen get RSI
• Experience of over 6000 pre-hospital RSIs
London’s Air Ambulance

• Simple algorithm for RSI:
  – RSI required?
  – If yes, perform standard RSI technique
  – Fail to intubate after failed intubation drills?
    • Surgical airway or supraglottic device

EXACTLY THE SAME EVERY TIME
The Process

1. Decision
2. Form a team
3. Maximum pre-oxygenation
4. Kit dump and equipment preparation
5. Check list
6. Anaesthetic drugs
7. Intubation
8. Confirmation
9. Maintenance of anaesthesia
10. Journey to hospital
11. Handover to hospital team
1. Decision

Simple criteria:

1. Unconscious
2. Agitated head injuries

3. Airway compromise
4. Ventilatory failure

5. Anticipated clinical course

6. Humanitarian reasons

Traumatic brain injury
Pre-hospital mortality
In-hospital mortality
2. Form a team
3. Maximum Pre-oxygenation
4. ‘Kit Dump’
Move the patient to the kit...

- Create a working space to deliver anaesthetic
- 360 access to patient
- Shaded from sunlight
- Lit at night
- Quiet (engines, phones, radios turned off)
- Paramedic lays out equipment while doctor finishes patient assessment and briefs team
- Near to ambulance for loading
5. RSI Checklist

HEMS pre-RSI challenge-response check list

Note: This checklist is for stable patients. Time should not be wasted on agonal patients who require precipitant RSI (where pre-oxygenation and obtaining a set of obs may not be possible).

- Oxygen mask on tight & reservoir bag moving with ventilation……………………Check
- Oxygen cylinder >half full & spare cylinder next to patient……………………Check
- Propaq on turbocuff & baseline BP seen……………………Check
- Baseline saturation seen………………………………………………………..Check

IV / Drugs
- Cannula connected to fluid and runs easily……………………………………Check
- Spare cannula in situ…………………………………………………………Check
- Induction agent dose chosen………………………………………x mg Check
- Suxamethonium dose chosen………………………………………x mg Check
- Drug giver briefed………………………………………………………..Check

- In-line immobiliser briefed……………………………………………Check
- Cricoid pressure person briefed…………………………………………Check

Laryngoscopes
- Laryngoscope: blade size chosen & bulb working………………………Check
- Alternate laryngoscope blade size chosen………………………………Check
- Back-up laryngoscope bulb working……………………………………Check
- McCoy working…………………………………………………………Check

Suction working………………………………………………………………Check
- Hand-held back-up suction available……………………………………Check

ET tubes
- Bougie size chosen…………………………………………………………Check
- Tube size chosen………………………………………………………size x Check
- Tube cuff tested…………………………………………………………Check
- Syringe for cuff…………………………………………………………Check
- Alternate tube size chosen………………………………………………Check

BVM connected to oxygen………………………………………………………Check
- Circuit: filter, CO₂ detector and EasyCap………………………………Check
- Tube tie…………………………………………………………………Check
- Intubating LMA available………………………………………………Check
- Surgical airway kit available…………………………………………….Check
- Guedel airway & 2 nasopharyngeal airways for rescue ventilation….Check

- Allows period of oxygenation
- Equipment present
- Equipment working
- Optimise first attempt
- Back up plan understood
6. Anaesthetic drugs
Choice of drugs

- Etomidate
- Suxamethonium
- Pancuronium
- Morphine and Midazolam

*Pick suitable drugs for the service and make sure all personnel know them in detail*

**EXACTLY THE SAME EVERY TIME**
7. Intubation
Maximising chance of success

• Preparation
  – Good team work and using a check list

• Positioning
  – 360 access to the patient
  – Patient at waist height on ambulance trolley
  – Operator kneeling at head of patient
  – Cervical spine collar removed

• Help
  – Bougie every time
  – Skilled assistant
  – Well rehearsed failed intubation drill
8. Confirmation
9. Maintain anaesthesia and monitor
10. Load and convey
11. Handover to the hospital
RSI and the ‘anaesthetic package’

• Full monitoring
• Maximum pre-oxygenation
  – adjuncts and sedation
• Drugs to induce anaesthesia and paralyse
• Intubation and confirmation of placement
• **A failed airway drill**
• Maintenance of anaesthesia
• Appropriate ventilation strategy
Failure to intubate

• 30 second drills
  – Small changes that may make a huge difference
  – Can be read out as a check list
• Decision:
  – Surgical airway
  – Supraglottic device (iGel)
Failed Intubation 30 Second Drill

- Adjust your position
- Adjust patient position
- Suction
- Insert blade to maximum and slowly withdraw under vision
- Backward upward rightward pressure
- Release cricoid pressure
- Longer blade/ McCoy blade
Roles in the team?

• HEMS Doctors
  – Intubation

• HEMS Paramedics
  – Very unusual for paramedic to intubate
  – Highly skilled assistant
    • Equipment laid out and immediately to hand
    • Passes tube over bougie and attaches anaesthetic circuit
    • Failed intubation drills done together
    • Support, ideas, reminders
    • Retrieves equipment to ensure quick departure
481 intubated patients cared for by HEMS in study period

402 patients intubated by HEMS \( \rightarrow \) 2 immediate surgical airways

400 intubated orally \( \rightarrow \) 42 in cardiac arrest

350 (87.5%) intubated 1st pass;

395 (98.8%) intubated with 2 attempts

399 (99.8%) intubated with three attempts

1 patient intubated by Emergency surgical cricoidotomy (0.25%)
Snapshot of a different system

  - Paramedic-performed RSI
  - Head injury with GCS <8
  - 209 patients, matched with 627 controls
### Table 1 Rapid Sequence Intubation Medication Protocols Used During the Trial

<table>
<thead>
<tr>
<th>Medication</th>
<th>Small 80–140 lbs. (35–63 kg)</th>
<th>Average 141–225 lbs. (63–100 kg)</th>
<th>Large &gt;225 lbs. (&gt;100 kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midazolam</td>
<td>2 mg</td>
<td>2.5 mg</td>
<td>3.0 mg</td>
</tr>
<tr>
<td>Succinylcholine</td>
<td>4 ml (80 mg)</td>
<td>6 ml (120 mg)</td>
<td>8 ml (160 mg)</td>
</tr>
<tr>
<td>Rocuronium</td>
<td>4 ml (40 mg)</td>
<td>6 ml (60 mg)</td>
<td>8 ml (80 mg)</td>
</tr>
<tr>
<td>Morphine</td>
<td>2 mg every 10 min for “stress response” (SBP &gt;140 mmHg, HR &gt;100 BPM)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SBP, systolic blood pressure; HR, heart rate; BPM, beats per minute.

### Table 6 Primary Outcome Measures for the RSI Cohort (n = 209) Versus Controls (n = 627)

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Controls (%)</th>
<th>RSI (%)</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>24.2</td>
<td>33.0</td>
<td>1.6 (1.1–2.2)*</td>
</tr>
<tr>
<td>Head/neck AIS 3 or greater</td>
<td>30.3</td>
<td>41.1</td>
<td>1.6 (1.1–2.3)*</td>
</tr>
<tr>
<td>Non-aeromedical</td>
<td>24.3</td>
<td>33.0</td>
<td>1.6 (1.1–2.2)*</td>
</tr>
<tr>
<td>Good outcome(\text{f})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>57.9</td>
<td>45.5</td>
<td>1.6 (1.2–2.3)(\dagger)</td>
</tr>
<tr>
<td>Head/neck AIS 3 or greater</td>
<td>49.3</td>
<td>37.5</td>
<td>1.6 (1.1–2.3)(\dagger)</td>
</tr>
<tr>
<td>Non-aeromedical</td>
<td>58.3</td>
<td>45.8</td>
<td>1.7 (1.2–2.3)(\ddagger)</td>
</tr>
<tr>
<td>Total days in ICU</td>
<td>6.0</td>
<td>7.1</td>
<td>NS</td>
</tr>
<tr>
<td>Total days in hospital</td>
<td>14.5</td>
<td>12.2</td>
<td>NS</td>
</tr>
</tbody>
</table>

* p < 0.05
\(\dagger\) p < 0.01
\(\ddagger\) p < 0.001
54 patients:

31 desaturated to <90%

160 seconds

Median decrease in SpO2 was 22%
<table>
<thead>
<tr>
<th>San Diego RSI Trial</th>
<th>London’s Air Ambulance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• New system introduced</td>
<td>• &gt;6000 RSIs completed</td>
</tr>
<tr>
<td>• Single Paramedic</td>
<td>• Doctor-Paramedic team</td>
</tr>
<tr>
<td>• 8 hours training</td>
<td>• Senior doctors</td>
</tr>
</tbody>
</table>
  – RSI | – At least 6 months anaesthetics |
  – Medications | – Consultants or senior registrars |
  – Failed airway device | – Ongoing training |
  – GCS scoring | – 30-40 RSIs over 6 months |
  – Ventilation strategies | – Constant review of outcomes |
| • ± Very low dose Midazolam | • Induction dose Etomidate |
| • Cricoid pressure for all | • Low threshold for release |
| • 60 seconds pre-oxygenation | • Maximum pre-oxygenation |
| • No ETCO2 monitoring | • Full monitoring |
  – Inadvertent hyperventilation | – ETCO2 key end-point |
  – ‘standard’ settings for all | – Ventilation titrated |
Robust systems and safe techniques

• London’s Air Ambulance
  – Description of the process
  – Latest statistics

• Pre-hospital rapid sequence intubation
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  – Do we need doctors?
  – Do we need a system?