Critical Care Airway Management

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Thanks

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• David Wong
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Outline

• how does critical care a/w management differ?
• identification of high-risk airways
• preparation for intubation/extubation including alternate strategies
• backup strategies

• we will not be discussing devices and techniques
Case

- 30 yo f, blocked VP shunt--for revision
- “some difficulty with intubation” accomplished by DL with stylet (“anterior, decreased cervical extension”)
- remained intubated and ventilated because of pulmonary infiltrates
- POD3 15:00 “ready to be extubated”

• to be continued…
ICU intubation outcome

- complications frequent and serious—up to 40%
  - > 3 attempts —11%
  - esophageal intubation—8%
  - aspiration—4%
  - death subsequent to intubation effort

Schwartz et al. Anesthesiol 1995; 82: 367
National Audit Project
Cook TM et al. BJA 2011

- Major complications resulting from airway management from 309 NHS hospitals over 1 yr (2008-09)
  - death, brain injury, emergency surgical airway and unplanned ICU admission
  - 184 events (36 from ICU/ 15 ED)
    - 14 tracheostomy-related
    - 7 failed intubations
    - 3 esophageal intubations
  - accounted for only 20% of intubations but nearly 50% of deaths
  - 60% of events led to death or brain damage
ICU Airway Management

Jaber S. et al  CCM 2006; 34(9): 2355

• 253 consecutive ICU intubations

• > 1 serious complication in 28%
Jaber S. et al. CCM 2006
Impact of “intubation bundle”

Jaber et al. Inten Care Med 2010; 36: 248

- 3 MICUs (France)
- 2 consecutive 6 month trials (Control-121 pt v. Intervention-123 pt); groups were similar
- 10-bundle management protocol
- primary end points: life-threatening complications within 60 min of intubation
Impact of “intubation bundle”
Jaber et al. Inten Care Med 2010; 36: 248

- 2 operators present
- fluid loading
- long-term sedation
- pre-oxygenation with NIPPV
- RSI with etomidate or ketamine + ScH
- cricoid pressure
- capnography
- norepinephrine if DBP<35
- long-term sedation
- protective ventilation (Vt/ PEEP)
life-threatening complications reduced from 34% to 21%
Prospective multi-center study: practice and outcome

Bowles et al. BJA 2011; 107: 687

• 9 hospitals; 164 non-OR intubations in one month

  • intubator: 83% were “experienced”; mostly anesthetists
    ‣ 5 intubations by inexperienced unsupervised operators;

  • NMB: 157/164; propofol 75%

  • airway rescue device available 87%

  • capnography used 68%

• >1 adverse event: 39% of attempted intubations (35% were severe)
  ‣ SBP<65mmHg, SpO2<80%, ≥3 attempts, >10 minutes, rescue device/personnel
Urgent Endotracheal Intubation

- Scotland: multi-center national study over 4 months
- 794 intubations (70% in ICU; 18% in ED)
  - 1st pass success—91%
  - SpO₂ <80%—22%
  - esophageal intubation—2%
- results significantly better than those reported by others
- most intubations carried out by MDs with >24 months training in anesthesia

*Simpson et al BJA 108 (5), 792; 2012*
What’s different about ICU Airway Management?

• physiologically marginal
• less tolerant of medications and PPV
• agitated and “unreasonable”
• non-fasted and delayed gastric emptying
• incomplete information
• insufficient time for preparation (resources)
### Intubation Difficulty Scale

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Attempts &gt;1</td>
<td>$N_1$</td>
</tr>
<tr>
<td>Number of Operators &gt;1</td>
<td>$N_2$</td>
</tr>
<tr>
<td>Number of Alternative Techniques</td>
<td>$N_3$</td>
</tr>
<tr>
<td>Cormack Grade - 1</td>
<td>$N_4$</td>
</tr>
<tr>
<td>Lifting Force Required</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>$N_5=0$</td>
</tr>
<tr>
<td>Increased</td>
<td>$N_5=1$</td>
</tr>
<tr>
<td>Laryngeal Pressure</td>
<td></td>
</tr>
<tr>
<td>Not applied</td>
<td>$N_6=0$</td>
</tr>
<tr>
<td>Applied</td>
<td>$N_6=1$</td>
</tr>
<tr>
<td>Vocal Cord Mobility</td>
<td></td>
</tr>
<tr>
<td>Abduction</td>
<td>$N_7=0$</td>
</tr>
<tr>
<td>Adduction</td>
<td>$N_7=1$</td>
</tr>
</tbody>
</table>

TOTAL: IDS = SUM OF SCORES

<table>
<thead>
<tr>
<th>IDS Score</th>
<th>Degree of Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Easy</td>
</tr>
<tr>
<td>$0 &lt; IDS \leq 5$</td>
<td>Slight Difficulty</td>
</tr>
<tr>
<td>5</td>
<td>Moderate to Major Difficulty</td>
</tr>
<tr>
<td>$IDS = \infty$</td>
<td>Impossible intubation</td>
</tr>
</tbody>
</table>

**Rules for Calculating IDS Score:**

- $N_1$: Every additional attempt adds 1 pt.
- $N_2$: Each additional operator adds 1 pt.
- $N_3$: Each alternative technique adds 1 point: Repositioning of the patient, change of materials (blade, ET tube, addition of a stylette), change in approach (nasotracheal/orotracheal) or use of another technique (fibroscopy, intubation through a laryngeal mask).
- $N_4$: Apply Cormack grade for 1st oral attempt. For successful blind intubation $N_4 = 0$.
- $N_6$: Sellick's maneuver adds no points.

**Impossible intubation:** IDS takes the value attained before abandonment of intubation attempts.

---

IDS>5 mod-major difficulty
- 6.3% in OR
- 16.1% pre-hosp
## Intubations outside OR

Based on the complication variables, the incidence of total patients and 18% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemic patients) versus 2 or fewer attempts (1.9% of total patients and 40% of the total hypoxemia

<table>
<thead>
<tr>
<th>Complication</th>
<th>2 or fewer attempts (90%)</th>
<th>&gt;2 attempts (10%)*</th>
<th>Relative risk for &gt;2 attempts</th>
<th>95% CI for risk ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoxemia</td>
<td>10.5%</td>
<td>70%</td>
<td>9X</td>
<td>4.20 – 15.92</td>
</tr>
<tr>
<td>Severe hypoxemia</td>
<td>1.9%</td>
<td>28%</td>
<td>14X</td>
<td>7.36 – 24.34</td>
</tr>
<tr>
<td>Esophageal intubation</td>
<td>4.8%</td>
<td>51.4%</td>
<td>6X</td>
<td>3.71 – 8.72</td>
</tr>
<tr>
<td>Regurgitation</td>
<td>1.9%</td>
<td>22%</td>
<td>7X</td>
<td>2.82 – 10.14</td>
</tr>
<tr>
<td>Aspiration</td>
<td>0.8%</td>
<td>13%</td>
<td>4X</td>
<td>1.89 – 7.18</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>1.6%</td>
<td>18.5%</td>
<td>4X</td>
<td>1.71 – 6.74</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>0.7%</td>
<td>11%</td>
<td>7X</td>
<td>2.39 – 9.87</td>
</tr>
</tbody>
</table>

Mort TC  Anesth Analg 2004; 99: 607
• in UK serious adverse outcomes related to airway management more common (x58) and more serious in ICU

• 61% events resulted in brain damage or death

• failure to use (or interpret) capnography was a contributing factor in 74% of cases resulting in brain damage or death

• inadequate preparation

• delayed recognition of events and

• failed rescue
NAP4
Cook TM et al. BJA 2011; 106: 632

- higher prevalence of poor/mixed quality care
- obese patients disproportionately involved in adverse events
- tracheostomy-related problems more common than failed/delayed intubation
- lack of backup plans and resources (DA cart)
- emergent surgical airway frequently failed
So what can we do?
Prepare

- Provide better training (workshops/simulations)
- Anticipate and prepare for failure
- Have backup plans
- Be prepared to deploy backup plans quickly
  - Cognitive aids and algorithms (simple)
Anticipate

Prepare for failure
**Emergency induction checklist**

<table>
<thead>
<tr>
<th>Prepare Patient</th>
<th>Prepare Equipment</th>
<th>Prepare Team</th>
<th>Prepare for difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>❑ Is preoxygenation optimal?</td>
<td>❑ What monitoring is applied?</td>
<td>❑ Who is ...?</td>
<td>❑ If the airway is difficult, could we wake the patient up?</td>
</tr>
<tr>
<td>❑ Is the patient’s position optimal?</td>
<td>❑ ECG</td>
<td>❑ Team leader</td>
<td>❑ If the intubation is difficult, how will you maintain oxygenation? (Plans A,B,C,D)</td>
</tr>
<tr>
<td>❑ Can the patient’s condition be optimised any further before intubation?</td>
<td>❑ Blood pressure</td>
<td>❑ First Intubator</td>
<td>❑ Where is the relevant equipment, including alternative airway?</td>
</tr>
<tr>
<td>❑ How will anaesthesia be maintained after induction?</td>
<td>❑ Sats probe</td>
<td>❑ Second Intubator</td>
<td>❑ Are any specific complications anticipated?</td>
</tr>
<tr>
<td></td>
<td>❑ Capnography</td>
<td>❑ Cricoid Pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ What equipment is checked and available?</td>
<td>❑ Intubator’s Assistant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Self-inflating bag</td>
<td>❑ Drugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Suction</td>
<td>❑ MILS (if indicated)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ 2 ET tubes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ 2 laryngoscopes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>❑ Bougie</td>
<td></td>
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*This Checklist is not intended to be a comprehensive guide to preparation for induction*

**Call for help early!**

*Cook et al: Current Opinion in Anaesthesiology 2012; 25:461*
Intubations in the OR
Shiga T et al. Anesthesiol 2005; 103: 429-37

- Meta-analysis of Bedside screening to predict difficult DL (in apparently normal adults)
- 35 studies involving >50,000 surgical adults
  - inability to visualize glottis: 5.8% (CI 4.5-7.5%)
  - our bedside test lack sensitivity and specificity
Fig. 2. Summary receiver operating characteristic curve analysis of six different bedside screening tests for difficult intubation. Weighted summary receiver operating characteristic curve is expressed by a solid line. Individual study estimates of sensitivity and (1 – specificity) are shown by open circles. Each circle is proportional to the inverse of the variance. Diamonds indicate pooled point estimates of sensitivity and specificity. AUC = area under the curve; Combination = Mallampati classification and thyromental distance in combination.
Predictors of difficult DL

CAFG II Law et al. CJA 2013

- Limited mouth opening
- Limited mandibular protrusion
- Narrow dental arch
- Decreased thyromental distance
- Decreased submandibular compliance
- Decreased sternomental distance
- Limited head and neck extension
- Increased neck circumference
Predictors of difficult GVL

CAFG II Law et al. CJA 2013

• Cormack-Lehane III or IV with DL
• Abnormal neck anatomy (radiation, prior surgery, neck pathology)
• limited mandibular protrusion
• decreased sternothyroid distance
Predictors of difficult FM ventilation

CAFG II Law et al. CJA 2013

- higher BMI
- older age
- male
- limited mandibular protrusion
- decreased thyromental distance
- Mallampati III or IV
- beard
- lack of teeth
- snoring or OSA
- neck irradiation
Predictors of difficult SGA use

CAFG II Law et al. CJA 2013

- reduced mouth opening
- supra/subglottic pathology
- fixed cervical spine
- applied CP
- male
- increase BMI
- poor dentition
- alteration of table or patient positioning during procedure
Lack of specificity

Doyle DJ et al. JCA 2007; 19: 367
Prepare patient

• **Preoxygenation**

  • Mort TM: preoxygenation for 4 or 8 minutes of marginal benefit in preventing desaturation (CCM 2005)

  • Boussignac or NIV: oral/nasal airway, FiO$_2$

  • Weingart SD: “**Delayed Sequence Intubation**”—some patient at high risk of desaturation during apnea and laryngoscopy despite pre oxygenation (JEM 2011)

  ‣ high-flow O$_2$ with nasal prongs during apnea/laryngoscopy
Boussignac CPAP
Positioning

• anatomical alignment of axes

• sniffing position thought to be helpful

• with obese patients, head up position helpful re ventilation

• tragus aligned with sternal angle

• Troop pillow
Induction

• awake vs. “induced”

• ketamine, benzodiazepine, etomidate, dexmedetomidine, remifentanil, propofol, “ketofol”

• NMB or spontaneous ventilation

• post-procedural sedation

• resuscitation drugs immediately available
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<td>Intubator's Assistant</td>
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</tr>
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<td>Drugs</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>MILS (if indicated)</td>
<td></td>
</tr>
<tr>
<td>- Is the patient’s position optimal?</td>
<td>- What equipment is checked and available?</td>
<td>- How do we contact further help if required?</td>
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<td>- Can the patient’s condition be optimised any further before intubation?</td>
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<td>- How will anaesthesia be maintained after induction?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Do you have all the drugs required, including vasopressors?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Cook TM et al. Curr Opin Anesthesiol 2012; 25:461
Prepare equipment

• Equipment must be familiar and immediately available

• Difficult airway cart reduces delays and fixation errors

• monitors: EKG, BP, SpO$_2$, capnography

• meds: sedatives/hypnotics, NMB, resuscitation

• SLOPESSS
**Emergency Induction Checklist**

### Prepare Patient
- Is preoxygenation optimal?
- Is the patient’s position optimal?
- Can the patient’s condition be optimised any further before intubation?
- How will anaesthesia be maintained after induction?

### Prepare Equipment
- What monitoring is applied?
  - ECG
  - Blood pressure
  - Sats probe
  - Capnography
- What equipment is checked and available?
  - Self-inflating bag
  - Suction
  - 2 ET tubes
  - 2 laryngoscopes
  - Bougie
- Do you have all the drugs required, including vasopressors?

### Prepare Team
- Who is ...?
  - Team leader
  - First Intubator
  - Second Intubator
  - Cricoid Pressure
  - Intubator’s Assistant
  - Drugs
  - MILS (if indicated)
- How do we contact further help if required?

### Prepare for difficulty
- If the airway is difficult, could we wake the patient up?
- If the intubation is difficult, how will you maintain oxygenation? (Plans A,B,C,D)
- Are any specific complications anticipated?

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*Cook TM et al. Curr Opin Anesthesiol 2012; 25:461*
Rapid sequence intubation

- pre-determined dose of hypnotic followed immediately by NMB (consider DSI)

- Cricoid pressure
  - Cricoid cartilage frequently misidentified
  - CP may impair laryngeal view—if this happens reduce pressure
  - CP may obstruct airway and prevent insertion of SGA
  - benefit uncertain
Succinylcholine

Benumof JL Anesthesiol 1997; 87
“It’s not about the plastic”
Neither is it about the ego
### Emergency Induction Checklist

#### Prepare Patient
- Is preoxygenation optimal?
- Is the patient’s position optimal?
- Can the patient’s condition be optimised any further before intubation?
- How will anaesthesia be maintained after induction?

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- What monitoring is applied?
  - ECG
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- How do we contact further help if required?

#### Prepare for Difficulty
- If the airway is difficult, could we wake the patient up?
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- Are any specific complications anticipated?

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*Cook TM et al. Curr Opin Anesthesiol 2012; 25:461*
Invasive airway access includes surgical or percutaneous (e., utilizing face mask or supraglottic airway (SGA) anesthesia. Other options include (but are not limited to): surgery. Consider feasibility of other options (a). Consider feasibility of other options (a). Video-assisted laryngoscopy, alternative intubation techniques (a). Consider feasibility of other options (a). Consider feasibility of other options (a). Consider feasibility of other options (a). Consider feasibility of other options (a). Consider feasibility of other options (a).
An alternative approach should be used after no more than two failed attempts at tracheal intubation using the primary approach and should employ a different device or operator. Numerous alternatives to DL, used alone or in combination, have been proven effective in obtaining an improved view of the larynx and/or enabling successful tracheal intubation when DL is unsuccessful (Table 2). Many of the devices presented in Table 2 are indirect (e.g., video) laryngoscopes, although other techniques are also effective in experienced hands. Equally, there is also some evidence that DL-facilitated intubation may succeed should primary use of some of these same alternatives fail. As such, an argument can be made that these alternative devices should complement and not necessarily replace DL at this time. Irrespective of the technique chosen, proficiency demands elective experience in human subjects.

There should be a reasonable expectation that the selected ‘Plan B’ technique will address the reason, anatomic or otherwise, for failure of the primary approach. As with the primary approach, each use of the alternative device should be optimized, and a second attempt using the same device should occur only if made with a substantive change, e.g., a change in the size of the device, altered endotracheal tube/stylet conformation, or use by a more experienced operator. All clinicians with a mandate for airway management should be familiar with at least one alternative technique (e.g., video laryngoscopy) to enable tracheal intubation (Strong recommendation for, level of evidence C), and such equipment should be immediately available. When difficult or failed DL is encountered, proceeding with a ‘Plan B’ alternative intubation technique without awakening the elective surgical patient is common practice and is probably safe, provided that oxygenation remains unchallenged.

Failed tracheal intubation in the adequately oxygenated patient: exit strategies

Limits to tracheal intubation attempts

Evidence continues to emerge that patient morbidity increases with the number of attempts at tracheal intubation (Table 3). Mainly derived from the critically ill population, it must be acknowledged that there is marked heterogeneity in harmful ‘outcomes’ reported in these studies (e.g., aspiration, hypoxemia, hypotension, trauma etc.), including composite outcomes. Furthermore, there is variable use of neuromuscular blockade, and it is unclear if the apparent risk relates to the number of attempts required, additional exerted force, or the associated delay in successful intubation. Nevertheless, the studies do provide a warning that the number of attempts at tracheal intubation should be minimized, irrespective of practice location. Incremental risk must be assumed with each failed attempt such that a second or third tracheal intubation attempt should occur only if a second attempt at SGD if not already tried

Succeeds

Fails

Cricothyrotomy

Fig. 1

Flow diagram: difficult tracheal intubation encountered in an unconscious patient.

SGD = supraglottic device

The difficult airway with recommendations – Part I

Canadian Airway Focus Group II: CJA 2013; 60, 1089
The Vortex

For Each NSA Technique Consider:
1. Manipulations:
   - Head & Neck
   - Larynx
   - Device
2. Adjuncts
3. Size/Type
4. Suction/O₂ Flow
5. Muscle Tone

Maximum three tries at each non-surgical airway technique. At least one try should be had by most experienced available clinician.
The Vortex Airway Management Checklist

**Prepare Interventions**

**Intravenous Access**
- Adequate Running

**Drugs:**
- Agent Dose Labelled
  - Intubation:
    - Induction
    - Paralysis
    - Adjuncts
    - Emergency
  - Post Intubation:
    - Anaesthesia
    - Analgesia
    - Paralysis

**Monitoring:**
- Confirm Optimise
  - ETCO₂
  - SaO₂
  - BP
  - ECG
  - Alarms

**Intubation:**
- Induction
- Paralysis
- Adjuncts
- Emergency

**Post Intubation:**
- Anaesthesia
- Analgesia
- Paralysis

**Prevent Hypoxia**

**Safe Apnoea Time**
- PreOx:
  - 100% O₂ Connected/Flowing
  - Optimise FRC
  - PreOx Complete
- ApOx:
  - O₂ Connected/Flowing
- ReOx:
  - BVM/Ventilator
  - Ventilator Settings
  - Consider PEEP

**Vortex Approach**
- Position
- Suction

**Face Mask:**
- Adjuncts
- FM: size/type

**Supraglottic Airway:**
- SGA: size/type

**Endotracheal Tube:**
- Adjuncts
- Laryngoscope: size/type (incl VL), functioning
- ETT: size/type
- Syringe/Cuff Test
- Tape/Ties

**Emergency Surgical Airway:**
- ESA Kit

**Promote Teamwork**

**Additional Staff:**
- Supervision
- Help: Senior/Antaesthetics/ENT

**Roles:**
- Capable Briefed
  - Team Coordinator
  - Vortex
  - Airway Operator
  - Airway Assistant
  - Cricoid
  - Manual In-Line Stabilisation
  - Drugs
  - Monitors/Time
  - Emergency Surgical Airway

**Plan:**
- Discussed
  - Anticipated Difficulties: FMV/ETT/SGA/ESA
  - Vortex Sequence
  - Vortex Optimisations
  - Green Zone Options
  - Questions/Concerns?
Difficult airway cart

- rigid direct laryngoscope
- videolaryngoscope
- tracheal tubes and guides (stylets, introducers)
- SGA
- flexible bronchoscope
- emergency invasive airway
- capnograph
Extubation

- Extubation is always elective
- Required reintubation of an elective surgical patient is 0.1-0.2%
- Reintubation of an ICU patient is 10-30%
- Impaired oxygenation, ventilation, neurological status, pulmonary toilet or obstruction
- Reintubation of some patients may be difficult or life-threatening
Risk stratification

Risk of requiring reintubation

Low risk

Risk of failing reintubation

High risk
Continuous Airway Access for Extubation
Mort—Anesth & Analg 2007;105(5): 1357

- Retrospective study of pt extubated over AEC for presumed/known DA who failed trial of extubation
  - 354 pt extubated over AEC in 9 years
  - AEC in situ for mean of 3.9 hr (5 min – 72 hr)
  - 51 required reintubation while AEC in situ
  - 47/51 successfully reintubated over AEC
  - 3 failed due to inadvertent removal during reintubation
<table>
<thead>
<tr>
<th>Condition</th>
<th>AEC present n= 51</th>
<th>AEC removed n= 36</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>First pass success</td>
<td>87%</td>
<td>14%</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>SpO2 &lt;90%</td>
<td>8%</td>
<td>50%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>SpO2 &lt;70%</td>
<td>6%</td>
<td>19%</td>
<td>=0.05</td>
</tr>
<tr>
<td>HR &lt;40</td>
<td>4%</td>
<td>14%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>≥ 3 attempts</td>
<td>10%</td>
<td>77%</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Esoph intub</td>
<td>0</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Rescue a/w</td>
<td>6%</td>
<td>90%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>
Visualized Tracheal Tube Exchange

Mort TC Anesth Analg 2009; 108: 1228

- high-risk ETT exchange in pt with difficult airways (over 20 month period)
  - cuff leak, ETT occlusion, kinking
  - 51 patients:
    - 37 known difficult a/w
    - 14 suspected difficult a/w
  - BMI: >30 (32 pt) >35 (17 pt)
  - pt received sedatives, narcotics, NMB
  - screening DL: no laryngeal view in 51/72 (71%)
  - AEC introduced, VL performed
  - excellent laryngeal view with Airtraq, GVL and McGrath
Communication

• patients with airway difficulties may be transferred to ICU from ER or OR

• essential that the problems encountered be thoroughly discussed with receiving physician

• airway responsibility is a team effort and may require involvement of anesthesia/surgical teams

• if problem may recur, patient, surgeon, FD and an accessible registry should be notified

• consideration of MedicAlert Airway Registry (24/7)
Case cont’d

• Anesthesiology called but no response
• RT certified to intubate, elected to extubate
• patient desaturated despite attempts at BVM
• repeated attempts to intubate unsuccessful; Anesth STAT
• prompt arrival and further attempts at DL were unsuccessful
• mother still in the room; Anesthesia persisted
• patient eventually intubated but failed to recover consciousness
How might this have been better managed?
Summary

• airway complications in ICU are more common and more serious

• identification of high-risk airways not perfect

• preparation of patient, equipment and team

• never fail to plan for failure (Plan B, C, D)

• it’s not about the plastic

• avoid repeating ineffective techniques

• extubation strategies

• communication
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