Difficult Airway Management: Poor Decisions or Lack of Technical Knowledge?

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Aims

Increase awareness about airway management challenges outside the operating room

Identify the limitations of some conventional airway management algorithms

Propose strategies to respond more effectively in these cases
OR and Outside

- Patient
  - OR
    - Other
  - OR
    - Other

- Environment
  - OR
    - Other
  - OR
    - Other

- Delivery of Care
  - OR
    - Other
• Incidence of difficult mask ventilation is:
  – 2 to 8%
• Incidence of difficult laryngoscopy:
  – 1.5 to 8%
• Failed intubation:
  – 0.1 to 0.3%
• In the ICU:
  – 20% of critical incidents are airway related

4th National Audit Project of
The Royal College of Anaesthetists and The Difficult Airway Society

Major complications of airway management in the United Kingdom

Report and findings
March 2011
• One in four major airway events was in the ICU
• Failure to use capnography = 70% of ICU related deaths
• Displaced tracheostomy and displaced ETT were the greatest cause of major morbidity and mortality in the ICU
• Most events in the ED were associated with rapid sequence induction
NAP4

- Poor airway assessment contributed to poor airway outcomes.
- Failure to plan for failure. In some circumstances when airway management was unexpectedly difficult the response was unstructured.
- The project identified numerous cases where awake fiberoptic intubation (AFOI) was indicated but was not used.
# Accuracy of models predicting difficult laryngoscopic tracheal intubation

<table>
<thead>
<tr>
<th>Study samples</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
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<tbody>
<tr>
<td>Naguib et al.</td>
<td>95</td>
<td>91</td>
</tr>
<tr>
<td>Arne et al.</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>Nath et al.</td>
<td>96</td>
<td>82</td>
</tr>
<tr>
<td>El-Ganzouri et al.</td>
<td>60</td>
<td>94</td>
</tr>
<tr>
<td>Jacobsen et al.</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Tse et al.</td>
<td>55-66</td>
<td>65-99</td>
</tr>
<tr>
<td>Descoins et al.</td>
<td>100</td>
<td>95</td>
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<td>Pottecher et al.</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>Wilson et al.</td>
<td>75</td>
<td>88</td>
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Airway Assessment

• Meta-Analysis:
  – Included 35 studies
  – 50,760 patients
  – Incidence of DI was 5.8% (95% CI, 4.5-97%)
  – Sensitivity was POOR (20-62%)
  – Specificity was MODERATE to fair (82-97%)
  – Best: Mallampati + thyromental distance (positive likelihood ratio 9.9 with 95% CI 3.1-31.9)
  – Conclusion: Limited use

• Predicting difficult intubation in apparently normal patients: a meta-analysis of bedside screening test performed. Shiga T et al. Anesthesiology 2005;103(2):429-37
Airway Assessment

- Airway assessment is just not feasible in 70% of the critically ill patients in the emergency departments

- Close to 80% of patients requiring emergency intubation have a complication
Airway Assessment

• **What is the real value?**
  
  – “The accurate prediction of airway difficulty is a myth but that exercise is useful in focusing attention on potential airway strategies”

• Problems arose when difficult intubation was managed by multiple repeat attempts at intubation.
• Events were reported where supraglottic airway devices were used inappropriately.
• There was a high failure rate of emergency cannula cricothyroidotomy, approximately 60%!
• Failure to correctly interpret a capnograph trace led to several oesophageal intubations going unrecognised in anaesthesia.
DIFFICULT AIRWAY ALGORITHM

1. Assess the likelihood and clinical impact of basic management problems:
   A. Difficult Ventilation
   B. Difficult Intubation
   C. Difficulty with Patient Cooperation or Consent
   D. Difficult Tracheostomy

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:
   A. Awake Intubation
   B. Non-Invasive Technique for Initial Approach to Intubation
   C. Preservation of Spontaneous Ventilation

4. Develop primary and alternative strategies:

   A. AWAKE INTUBATION
      - Airway Approached by Non-Invasive Intubation
      - Invasive Airway Access
      - Succeed
      - Cancel
   - Consider Feasibility of Other Options
   - Invasive Airway Access

   B. INTUBATION ATTEMPTS AFTER INDUCTION OF GENERAL ANESTHESIA
      - Initial Intubation Attempts Successful
      - Initial Intubation Attempts UNSUCCESSFUL
      - FROM THIS POINT ONWARDS CONSIDER:
        1. Calling for Help
        2. Returning to Spontaneous Ventilation
        3. Awakening the Patient

   FACE MASK VENTILATION ADEQUATE
      - LMA ADEQUATE
      - Consider / Attempt LMA
      - LMA NOT ADEQUATE OR NOT FEASIBLE
      - Emergency Non-Invasive Airway Ventilation

   FACE MASK VENTILATION NOT ADEQUATE
      - Emergency Non-Invasive Airway Ventilation

   NON-EMERGENCY PATHWAY
      - Ventilation Adequate, Intubation Unsuccessful
      - Alternative Approaches to Intubation
      - Successful Intubation
      - Fail After Multiple Attempts
      - Invasive Airway Access
      - Consider Feasibility of Other Options
      - Awaken Patient

   EMERGENCY PATHWAY
      - Ventilation Not Adequate, Intubation Unsuccessful
      - Emergency Non-Invasive Airway Ventilation

* Confirm ventilation, tracheal intubation, or LMA placement with expired CO₂

a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, local anesthesia intubation or regional nerve block. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of limited value if this step in the algorithm has been reached via the Emergency Pathway.
b. Invasive airway access includes surgical or percutaneous tracheostomy or cricothyotomy.
c. Alternative non-invasive approaches to difficult intubation include (but are not limited to): rigid bronchoscope, esophageal-tracheal comb tube ventilation, or transcricothyroid intubation.
d. Consider re-preparation of the patient for awake intubation or canceling surgery.
e. Options for emergency non-invasive airway ventilation include (but are not limited to): rigid bronchoscope, esophageal-tracheal comb tube ventilation, or transcricothyroid intubation.
Failed intubation, increasing hypoxaemia and difficult ventilation in the paralysed anaesthetised patient: Rescue techniques for the "can't intubate, can't ventilate" situation

Failed intubation and difficult ventilation (other than laryngospasm)

- Face mask
- Oxygenate and Ventilate patient
- Maximum head extension
- Maximum jaw thrust
- Assistance with mask seal
- Endotracheal tube array
- Reduce cricoid force - if necessary

Oxygenation with face mask (e.g. SpO₂ < 90% with FiO₂ 1.0)

**Call for help**

- LMA®: Oxygenate and ventilate patient
- Maximum 2 attempts at insertion
- Reduce any cricoid force during insertion

- Oxygenation satisfactory
  - Endotracheal tube array
  - Maintain oxygenation and aspiration patient

"Can't intubate, can't ventilate" situation with increasing hypoxaemia

**Plan D: Rescue techniques for can't intubate, can't ventilate" situation**

**Cannula cricothyrotomy**

- Equipment: larynx retractor, e.g. Plastibell® or Barrettes (
- High-pressure ventilation system, e.g. Manujet™ IVEN™

**Technique**

1. Insert cannula through cricothyroid membrane
2. Maintain position of cannula - assistant's hand
3. Confirm tracheal position by all aspiration
4. 20ml syringe
5. Attach ventilation equipment to cannula
6. Commence artificial ventilation
7. Confirm ventilation of lungs and ventilation
8. Begin resuscitation
9. If ventilation fails, or unexpected complications or any other complication develops - convert immediately to surgical cricothyrotomy

**Surgical cricothyrotomy**

- Equipment: Scalpel - short and rounded (no. 10 or Millinno scalpel)
- Small e.g. 5 or 7 mm) cutdown technique

**Technique**

1. Identify cricothyroid membrane
2. Soft incision through skin and membrane
3. Elevate incision with blunt dissection (e.g. scapel handle, forceps or dissector)
4. Skin incision on cricothyroid membrane
5. Insert tube and inflate cuff
6. Verify tube position and satisfactory ventilation

**Notes**

1. These techniques can have several complications - use only in life-threatening situations
2. Convert to definitive airway as soon as possible
3. Endotracheal intubation may offer delayed airway control and prevention
4. From cannula with low-pressure ventilation may be successful in patient with fibular spasm or spasm

**Difficult Airways Society**

(Reference: ASA 2014 - Difficult Airway Guidelines)
DAM-IT: 'Can't ventilate' Algorithm

CAN'T VENTILATE

Step 1
- Basic manoeuvres
- Reposition
- Simple airways etc
- Cricoid adjustment
- Laryngoscopy (if not already)

Step 2
- LMA

Step 3
- Cricothyrotomy

CAN VENTILATE

OXYGENATE

Wake patient
Airway choices

Attempt oxygenation with face mask / airway before moving on to next step.
CALL FOR HELP EARLY

Failed intubation alone is not a crisis if the lungs can still be ventilated, whereas failed ventilation may well be. The priority is to oxygenate the lungs.

If ventilation cannot be achieved, rapidly follow the steps in the Figure:

i) Step 1: basic manoeuvres
ii) Step 2: LMA (may have to release cricoid pressure to insert)
iii) Step 3: cricothyrotomy

Once ventilation is achieved, there should be time to consider the options: either wake the patient or continue using one of a variety of airway choices:

i) Laryngeal mask
ii) Intubating laryngeal mask + tube
iii) Fibreoptic intubation through mouth / nose / laryngeal mask
iv) Other device

In most cases, wake the patient unless his/her life is in imminent danger, and seek more senior help.

If a tracheal tube is in place, its position should always be checked. Extubation (when, where and how) should also be considered.
Aspiration was the single commonest cause of death in anesthesia events.

One third of events occurred during emergence or recovery and obstruction was the common cause in these events.

The proportion of obese patients in case reports submitted to NAP4 was twice that in the general population, this finding was even more evident in the morbidly obese.
Anesthesia for head and neck surgery featured frequently in cases reported to NAP4; 39.1% had head and neck pathologies.

- Excellent teamwork is required as when any part of this process fails the risk of adverse outcomes is high.

Management of the obstructed airway requires particular skill and co-operation between anesthetist and surgeon.
Difficult Airway – Upper High

Courtesy of Dr. Michael Kupferman
Difficult Airway - Lower

Courtesy of Dr. Carlos Jimenez
Airway Challenges

Urgent intubation: Case # 1

• Male, 55-years-old
• Hypoxemic respiratory failure, O2 sat 87%
• Obesity, 130 kilograms
• Thrombocytopenia, platelets 10,000
• Lock jaw, status post neck-face radiotherapy
• On Bi-PAP ventilation, 100% FiO2 and EPAP 10 cmH2O
• What do you do?
To address

Urgent intubation: Case # 1 issues

• Why was the difficult airway not identified earlier?
• Why was this patient on NIV for so long?
• Why was the decision to intubate made at 6:30 PM?
• Was our response adequate?
• Could we do better next time?
Airway Challenges

Urgent intubation: Case # 2

- Female, 75-years-old
- Acute respiratory distress, O2 sat 85%
- History of pharyngeal tumor
- Stridor, tumor known to involve glottis
- Patient had recently refused tracheostomy
- Platelets 20,000
- What do you do?
To address

Urgent intubation: Case # 2 issues

• Why was the difficult airway not identified earlier?
• Why was the Head and Neck team not consulted in the EC?
• Why was the patient considered for ICU transfer only when she was saturating <90%?
• Why the plan of care was not limited once the patient refused an essential procedure such as tracheostomy?
Airways Challenges

Urgent intubation: Case # 3

- Female, 65-years-old
- History of gynecological tumor
- Acute respiratory distress, O2 sat <90%
- On Bi-PAP 100%, PEEP 8 cmH2O
- Anticoagulated for suspected PE, PTT >200
- Airway team called to intubate, first attempt failed
- Resources requested “not available”, ran to the OR for equipment while fellow mask ventilated the patient
- LMA placed, Head and Neck fellow arrived
- Two ICU attendings arrived from home, heparin reversed
- Aintree catheter placed through LMA
To address

Urgent intubation: Case #3 issues

• Were the LMA and Airtraq really not available?
• Why did the RT not know of all this equipment?
• Did anesthesia receive enough support?
• How do we prevent a similar event to happen again?
Airways Challenges

Urgent intubation: Case # 4

- Male, status post head and neck surgery including tracheal resection and end-to-end anastomosis
- Anesthesia attending refused extubation because the patient did not meet criteria and had to argue with primary team
- Patient is transferred to ICU, primary team insists on extubating the patient and convinces ICU attending
- The patient developed acute respiratory distress, and despite advice against the patient is placed on Bi-PAP
- The patient deteriorates overnight and in the morning needs urgent intubation for expanding neck diameter
- Primary team attending intubates the patient FOB and takes him to the OR stat
To address

Urgent intubation: Case # 4 issues

• Why was the patient extubated if the anesthesia attending considered the decision unsafe?

• Why was the patient not intubated when deteriorated and instead was placed on Bi-PAP?

• Was this a case of poor sign out or something else?

• Is the ICU the best place for this patient during the pre- and immediate post-extubation period?
Airway Challenges

Urgent intubation: Case # 5

- Male with an easy airway admitted to ICU following thymectomy and subclavian graft by thoracic surgery
- Primary team attending requests extubation early in the morning
- ICU attending on service refuses due to SVC syndrome
- Two days later ICU attending rotates and new attending agrees to extubate because primary team thinks is only swelling and he is getting better
- In <1 hr the patient develops acute respiratory distress and is rushed stat out of the ICU for intubation in the OR
To address

**Urgent intubation: Case # 5 issues**

- Attending variability? Or unsafe practice?
- Why are the primary teams intervening in these decisions?
- What was the best option available to extubate this patient?
- Why wasn’t a tracheostomy performed as recommended?
- Was the ICU the place to extubate this patient?
Superior Vena Cava Syndrome
Difficult Airway I

Most common problems identified:

• Lack of time (e.g., called late)

• Lack of access to airway (e.g., thrombocytopenia, limited mouth opening)

• Mask or other non-invasive ventilation are not enough to maintain oxygenation in presence of difficult airway

• Remote location:
  – limited experienced or incompetent assistance
  – Limited resources (e.g., equipment not available)
Difficult Airway II

Most common problems identified:

• Lack of knowledge or awareness among practitioners leading to late identification of problems

• Inadequate communication during events

• Allowing others to direct care where we are the experts

• Abuse of NIV by not properly trained individuals

• Poor judgment

• Drug limitations (e.g., acute renal failure)
Most common problems identified:

- ICU attending training background and degree of experience with airway management
- Different approaches by each one of them or clinician variability despite same background
- No standardized approach to extubate patients with difficult airway
- Some of the “easy airways” at intubation are difficult re-intubations following surgery
- Not all the difficult airways are identified before extubation
Difficult Airway IV

Most common problems identified:

• Patients with difficult airway are also at risk of self extubation and sometimes it happens

• Patients with difficult airway remain longer on the ventilator (e.g., over sedation to avoid self extubation by night teams, not awake enough for proper evaluation before extubation, need for experience operator around before extubation)

• Refusal by primary teams to perform early tracheostomy in many instances
Strategies to Consider
Strategies To Improve Airway Management

Education:

• Train medical and surgical fellows to recognize difficult airways, to call earlier, etc.
• Train EC personnel to consider the airway in their evaluation of patients

Performance Improvement:

• Start documenting these events in a “dedicated” data management tool (e.g., PICIS?)
• Tracking outside OR events and outcomes
• Adjust interventions according to results
Strategies...

Practice changes:

• Limit use of NIV to experienced practitioners
• Place limitations of care when patients refused key interventions such as tracheostomy
• Develop consistent difficult airway practices
• Further develop the “airway team”
  – DA emergency kit?
  – DA Team?
  – Develop standardized management protocols
Strategies....

Practice changes:

• Stop allowing others to direct airway management; own airway management and the process

• Establish adequate surgical airway solution for the cases that need it
  – Establish a responsible clinician group or groups to support anesthesia in the DA cases
  – The needs may be different during the day and at night (e.g., day head and neck surgery fellow, night surgical oncology fellow)
  – Have the kits needed in the emergency response DA kit
Conclusion?
Discussion
Thank you!

Res, non verba