

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



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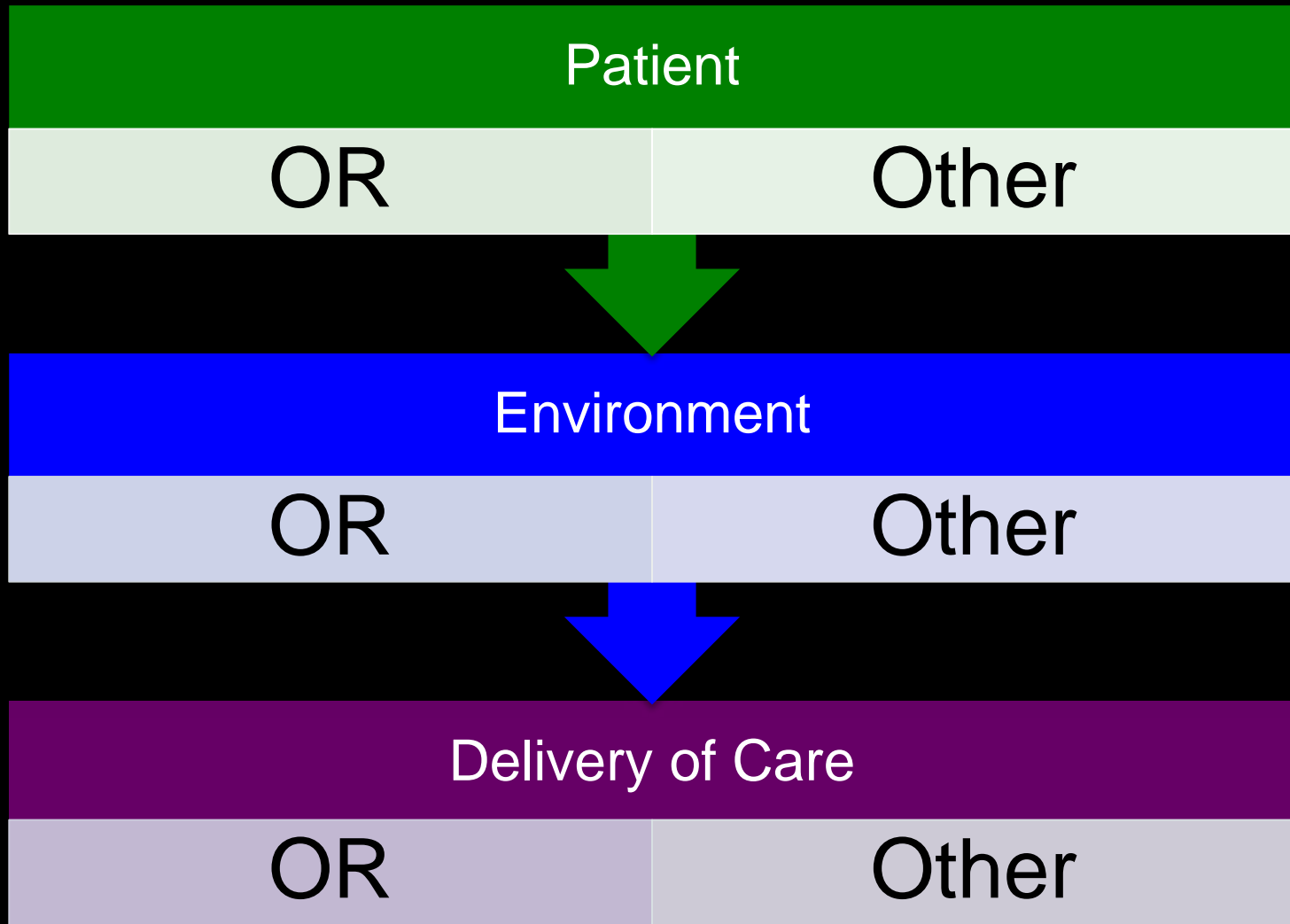
Aims

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



Statistics?

- 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



The Royal College
of Anaesthetists



The Difficult
Airway Society

NAP4

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

NAP4

- **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

Study samples

Sensitivity
(%)

Specificity
(%)

Naguib et al.

95

91

Arne et al.

94

96

Nath et al.

96

82

El-Ganzouri et al.

60

94

Jacobsen et al.

100

86

Tse et al.

55-66

65-99

Descoins et al.

100

95

Pottecher et al.

70

65

Wilson et al.

75

88

Mallampati to predict difficult intubation: ROC 0.58 +/-0.12 and even worse for difficult mask ventilation

Systematic review/meta-analysis of the accuracy of the Mallampati test to predict DA.
Lee A. et al. Anesth&Analg 2006;102:1867-78.

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
 - Levitan et al. Acad Emerg Med 2003;10:468.
- Close to 80% of patients requiring emergency intubation have a complication
 - Li et al. Am J Emerg Med 1999;17:141-3

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”

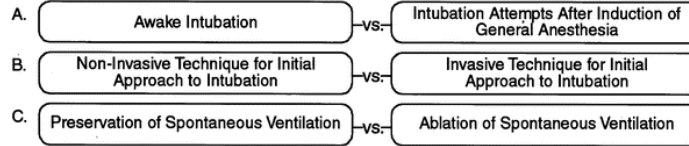
- Yentis SM et al. Anaesthesia 1998;53:1041-44.

NAP4

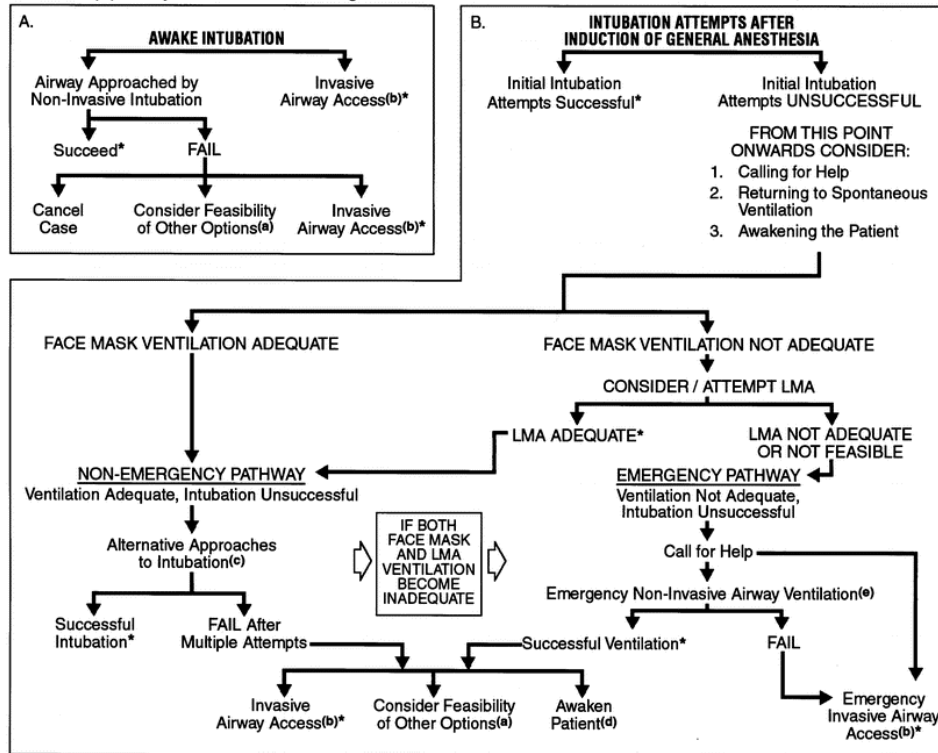
- Problems arose when difficult intubation was managed by **multiple repeat attempts** at intubation.
- Events were reported where **supraglottic airway devices were used inappropriately**.
- There was a **high failure rate of emergency cannula cricothyroidotomy**, approximately **60%**!
- **Failure 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:



4. Develop primary and alternative strategies:



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

- a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, local anesthesia infiltration or regional nerve blockade. 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 cricothyrotomy.
- c. Alternative non-invasive approaches to difficult intubation include (but are not limited to): use of different laryngoscope blades, LMA as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation, intubating stylet or tube changer, light wand, retrograde intubation, and blind oral or nasal 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 combitube ventilation, or transtracheal jet ventilation.

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
Oral + 8mm nasal airway
Reduce cricoid force - if necessary

Failed oxygenation with facemask (e.g. SpO₂ < 90% with FiO₂ 1.0)

call for help

LMAY Oxygenate and ventilate patient
Maximum 2 attempts at insertion
Reduce any cricoid force during insertion

success

Oxygenation satisfactory and stable. Maintain oxygenation and awaken patient.

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

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

or

Cannula cricothyroidotomy

Equipment: Link assistant cannula, e.g. Pelt (Crank) or Krasson (PRM)
High pressure ventilator system, e.g. Manujet II (VEN)

Technique:

1. Insert cannula through cricothyroid membrane
2. Maximal position of cannula - assistant's hand
3. Confirm tracheal position by air aspirator - 20ml syringe
4. Adjust ventilation system to cannula
5. Commence positive ventilation
6. Confirm ventilation of lungs and relaxation through nasal airway
7. If ventilation fails, or surgical complications or any other complication develops - convert immediately to surgical cricothyroidotomy

fail

Surgical cricothyroidotomy

Equipment: Scalpel - short and rounded (no. 20 or MiniGreen scalpel)
Small (e.g. 6 or 7 mm) cuffed tracheal or tracheostomy tube

4-step Technique

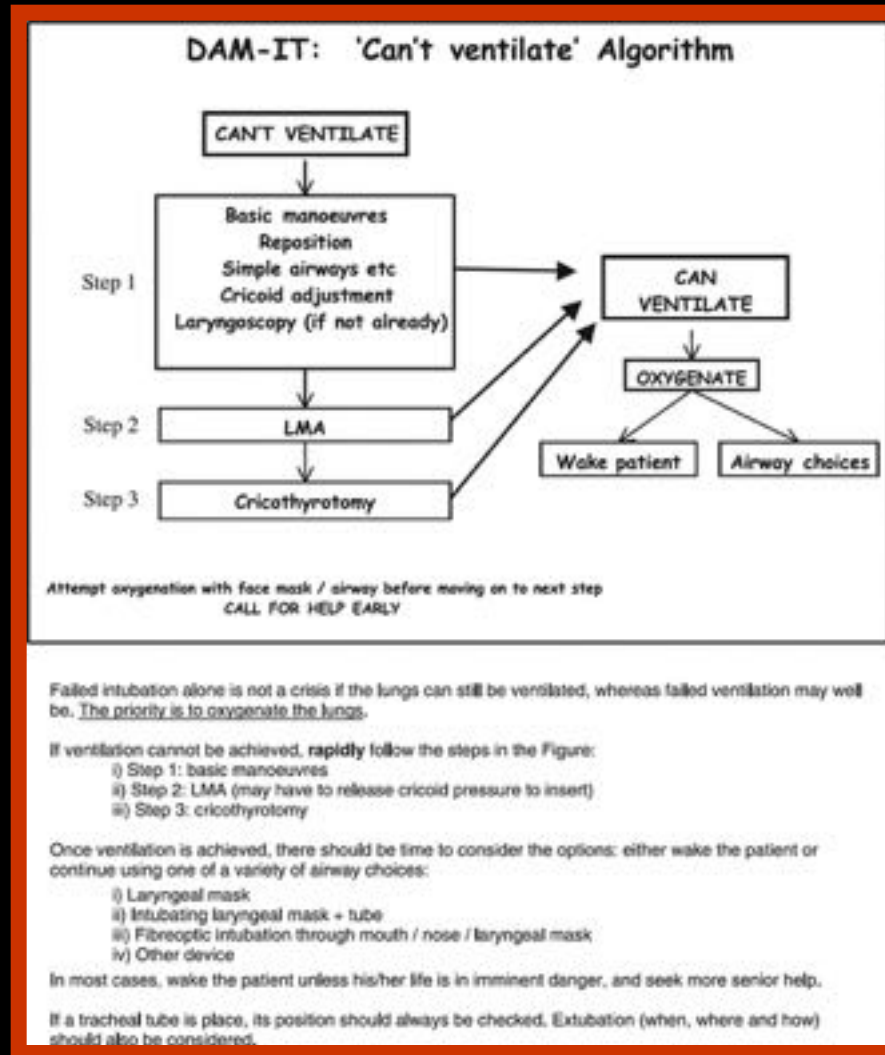
1. Identify cricothyroid membrane
2. Stab incision through skin and membrane
Enlarge incision with blunt dissection (e.g. scalpel handle, forceps or dissector)
3. Caudal traction on cricoid cartilage with tracheal hook
4. Insert tube and inflate cuff
Ventilate with low-pressure source
Verify tube position and pulmonary ventilation

Notes:

1. These techniques can have serious complications - use only in life threatening situations
2. General intubation always preferred, if possible
3. Hypotensive management - see other difficult airway guidelines and flow charts
4. Firm cannula with low pressure ventilation may be successful in patient breathing spontaneously



“DAM-IT”



NAP4

- **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**.

NAP4

- 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

Bad Planning



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

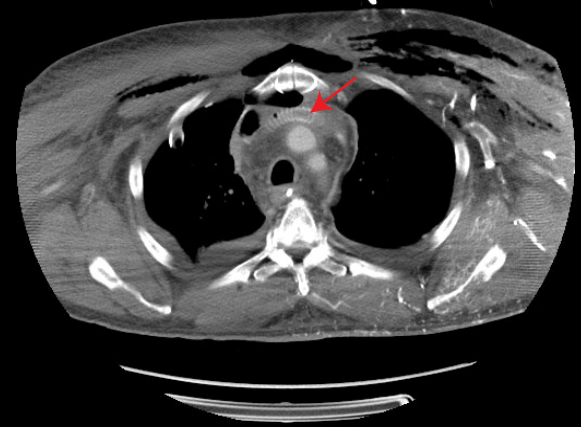
- Male with an easy airway admitted to ICU following thymectomy and subclavian graft by thoracic surgery
- Primary team attending requests extubation early in the morning
- ICU attending on service refuses due to SVC syndrome
- Two days later ICU attending rotates and new attending agrees to extubate 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)

Difficult Airway III

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....

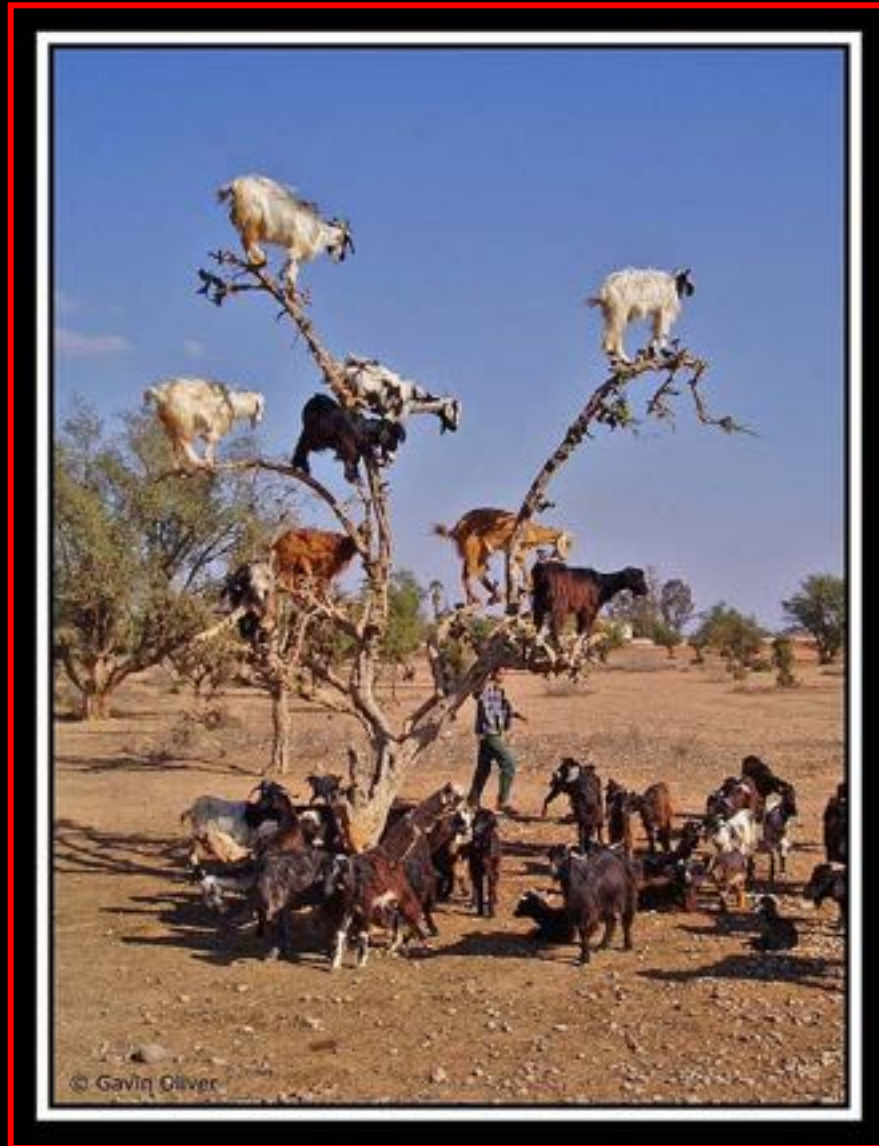
Practice changes:

- 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



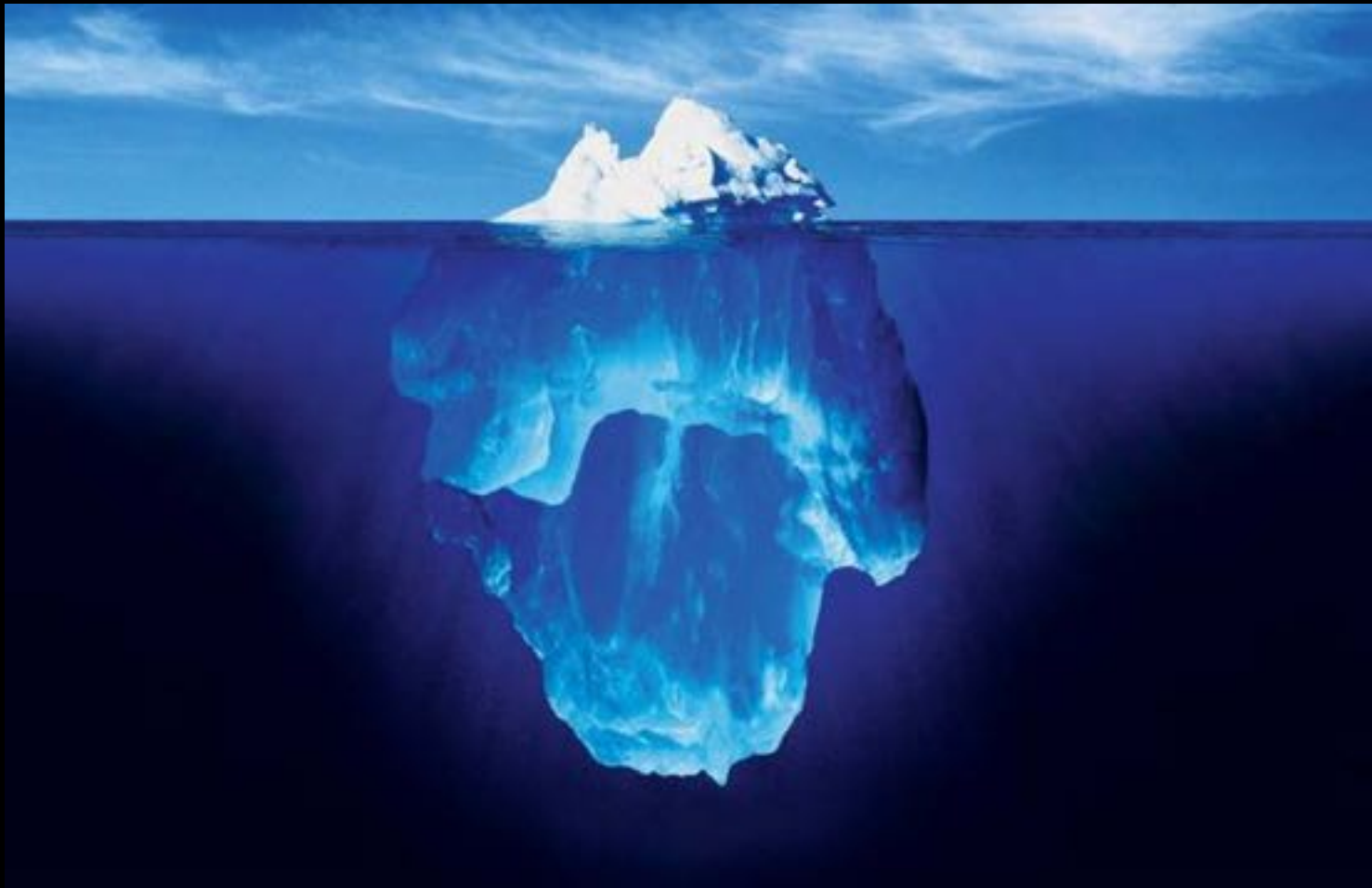
Conclusion?

Discussion



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Thank you!



Res, non verba