

# Organisational Aspects of Airway Equipment

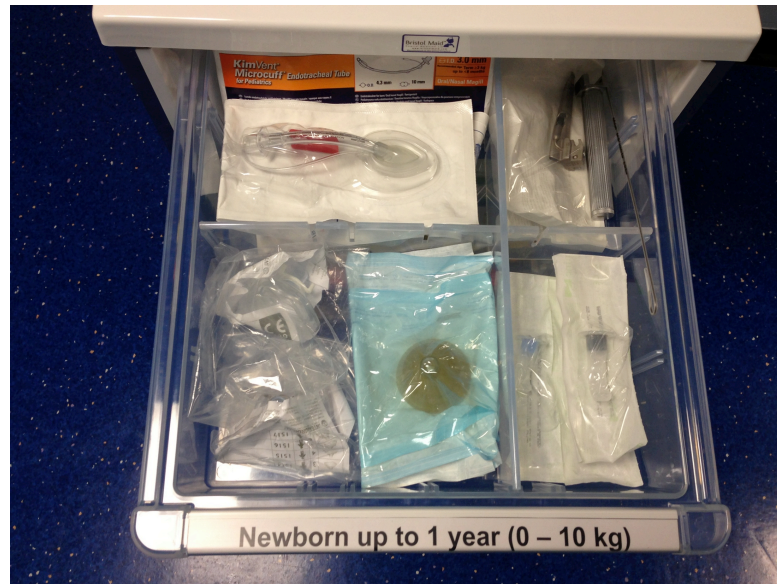
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# Using the Universal Translator:

- “Organisational Aspects of Airway Equipment”



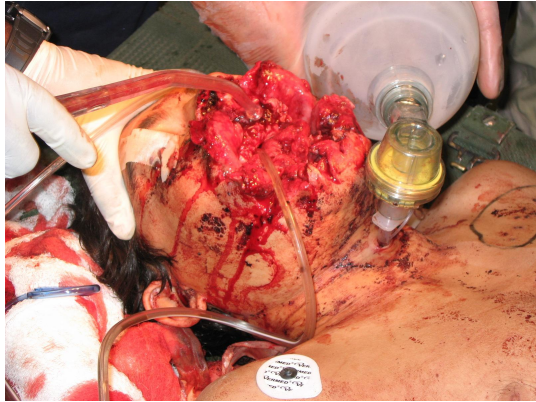
# What is our Aim?

- Safety
- Oxygenation (Ventilation)
- Appropriate Staff, Location and Timing





# First, What to Stock?





**Difficult MV**
**Give 100% oxygen**
**Call for help**
**Step A Optimise head position**

Consider:

- Adjusting chin lift/jaw thrust
- Inserting shoulder roll if <2 years
- Neutral head position if >2 years
- Adjusting cricoid pressure if used
- Ventilating using two person bag mask technique

**Check equipment**

Consider changing:

- Circuit
- Mask
- Connectors

If equipment failure is suspected, change to self-inflating bag and isolate from anaesthetic machine promptly

**Depth of anaesthesia**

Consider deepening anaesthesia  
Use CPAP

**Step B Insert oropharyngeal airway**

Assess for cause of difficult mask ventilation

- Light anaesthesia
- Laryngospasm
- Gastric distension – pass OG/NG tube

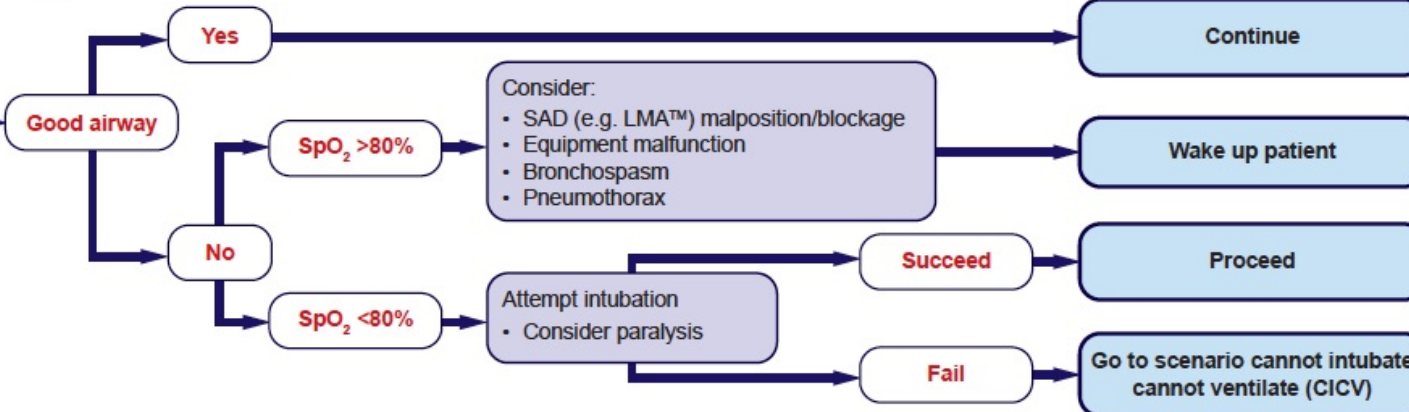
**Call for help again if not arrived**

Maintain anaesthesia/CPAP  
Deepen anaesthesia (Propofol first line)

- If relaxant given – intubate
- If intubation not successful, go to unanticipated difficult tracheal intubation algorithm

**Step C Second-line: Insert SAD (e.g. LMA™)**

- Insert SAD (e.g. LMA™) – **not > 3 attempts**
- Consider nasopharyngeal airway
- Release cricoid pressure



SAD = supraglottic airway device

- Oxygen
- Facemask
- Shoulder Roll
- Circuit
- Oropharyngeal Airway
- Gastric Tube
- SAD/LMA
- Nasopharyngeal Airway
- Laryngoscope
- Endotracheal Tube
- Hypnotic Agent
- Neuromuscular Blocker

Difficult direct laryngoscopy



Give 100% oxygen and maintain anaesthesia



Call for help

## Step A Initial tracheal intubation plan when mask ventilation is satisfactory

Ensure: Oxygenation, anaesthesia, CPAP, management of gastric distension with OG/NG tube

Direct laryngoscopy – not > 4 attempts

Check:

- Neck flexion and head extension
- Laryngoscopy technique
- External laryngeal manipulation – remove or adjust
- Vocal cords open and immobile (adequate paralysis)

If poor view – consider bougie, straight blade laryngoscope\* and/or smaller ETT

Succeed

Tracheal intubation

Verify ETT position

- Capnography
- Visual if possible
- Auscultation

If ETT too small consider using throat pack and tie to ETT

If in doubt, take ETT out

Failed intubation with good oxygenation

## Step B Secondary tracheal intubation plan

Call for help again if not arrived

Insert SAD (e.g. LMA™) – not > 3 attempts

- Oxygenate and ventilate
- Consider increasing size of SAD (e.g. LMA™) once if ventilation inadequate

Succeed

- Consider modifying anaesthesia and surgery plan
- Assess safety of proceeding with surgery using a SAD (e.g. LMA™)

Unsafe

Safe

Postpone surgery  
Wake up patient

Proceed with surgery

Failed oxygenation e.g. SpO<sub>2</sub> <90% with FiO<sub>2</sub> 1.0

- Convert to face mask
- Optimise head position
- Oxygenate and ventilate
- Ventilate using two person bag mask technique, CPAP and oro/nasopharyngeal airway
- Manage gastric distension with OG/NG tube
- Reverse non-depolarising relaxant

Succeed

Failed intubation via SAD (e.g. LMA™)

Postpone surgery  
Wake up patient

Failed ventilation and oxygenation

Go to scenario cannot intubate  
cannot ventilate (CICV)

Following intubation attempts, consider • Trauma to the airway • Extubation in a controlled setting

\*Consider using indirect laryngoscope if experienced in their use

SAD = supraglottic airway device

- Oxygen
- Laryngoscope(s)
- Endotracheal Tube
- Throat Pack
- Circuit
- SAD/LMA
- Face Mask
- Oropharyngeal Airway
- Nasopharyngeal Airway
- Gastric Tube
- Intubating Bronchoscope
- Hypnotic Agent
- Neuromuscular Blocker





# Cannot intubate and cannot ventilate (CICV) in a paralysed anaesthetised child aged 1 to 8 years



Failed intubation  
inadequate ventilation



Give 100% oxygen



Call for help

## Step A Continue to attempt oxygenation and ventilation

- FiO<sub>2</sub> 1.0
- Optimise head position and chin lift/jaw thrust
- Insert oropharyngeal airway or SAD (e.g. LMA™)
- Ventilate using two person bag mask technique
- Manage gastric distension with an OG/NG tube

## Step B Attempt wake up if maintaining SpO<sub>2</sub> >80%

If rocuronium or vecuronium used, consider suggamadex (16mg/kg) for full reversal

Prepare for rescue techniques in case child deteriorates

## Step C Airway rescue techniques for CICV (SpO<sub>2</sub> <80% and falling) and/or heart rate decreasing

Call for specialist  
ENT assistance

- Oxygen
- Circuit
- Oropharyngeal Airway
- SAD/LMA
- Gastric Tube
- Modified  $\gamma$ -cyclodextrin
- ENT Surgeon





# Unexpected Difficult Ventilation/Oxygenation

## Basic Principles – Good technique

Ensure adequate level of anaesthesia ± neuromuscular block

Failed

## Exclude/treat anatomical airway obstruction

Re-open airway / Insert Oro-pharyngeal airway  
Use 2-hand/2-person bag-mask-ventilation

Failed

Call for help

## Exclude/treat functional airway obstruction

Deepen anaesthesia ± Paralyse  
I.V. epinephrine/Gastric decompression

Failed

## Failed Oxygenation Plan A

### Direct laryngoscopy

Exclude/remove foreign body in/from hypopharynx/larynx  
Intubate trachea

Failed

## Failed Oxygenation Plan B

Insert LMA

Wake-up

Ventilate through LMA\*

Emergency surgery with LMA

\*In a child with previously no signs, no symptoms and no history of / for a difficult airway → invasive ventilation techniques are not needed

- Magill Forceps
- Indirect Laryngoscope

# Unexpected Difficult Intubation

## Basic Principles – Good Technique

Ensure adequate depth of anaesthesia and neuromuscular blockage  
Apply laryngeal pressure or BURP

Failed

Ensure oxygenation, ventilation and anaesthesia

Call for help

## Failed Intubation Plan A\*

Use improved direct laryngoscopic technique/conditions  
Use alternative indirect laryngoscopic technique  
Limit to 2 intubation attempts

Failed

Ensure oxygenation, ventilation and anaesthesia

Consider surgery with LMA

## Failed Intubation Plan B

Use alternative indirect laryngoscopic technique OR  
Perform fiberoptic tracheal intubation through the LMA  
Limit to 2 intubation attempts

Failed

Ensure oxygenation, ventilation and anaesthesia

Wake-up

Ventilate through LMA

Emergency surgery with LMA

\*Rapid sequence induction intubation – Ensure deep anaesthesia and neuromuscular block, oxygenate and ventilate via face mask or via LMA

# So, to simplify;

- Oxygen
- Facemask
- Shoulder Roll
- Circuit
- Oropharyngeal Airway
- Gastric Tube
- SAD/LMA
- Nasopharyngeal Airway
- Laryngoscope
- Endotracheal Tube

- Oxygen
- Laryngoscope(s)
- Endotracheal Tube
- Throat Pack
- Circuit
- SAD/LMA
- Face Mask
- Oropharyngeal Airway
- Nasopharyngeal Airway
- Gastric Tube
- Intubating Bronchoscope

- Oxygen
- Circuit
- Oropharyngeal Airway
- SAD/LMA
- Gastric Tube
  
- ENT Surgeon

- Magill Forceps
- Indirect Laryngoscope

- Endotracheal Tube Guides

- Hypnotic Agent
- Neuromuscular Blocker
  
- Hypnotic Agent
- Neuromuscular Blocker
  
- Modified  $\gamma$ -cyclodextrin

# So, to simplify even further;

## Equipment

- Oxygen
- Facemask
- Shoulder Roll
- Circuit
- Oropharyngeal Airway
- Gastric Tube
- Magill Forceps
- SAD/LMA
- Nasopharyngeal Airway
- Laryngoscopes: Direct and Indirect
- Endotracheal Tube
- Endotracheal Tube Guide(s)
- Throat Pack
- Intubating Bronchoscope
- ENT Surgeon

## Drugs

- Hypnotic Agent
- Neuromuscular Blocker
- Modified  $\gamma$ -cyclodextrin



# Essential Equipment

- Minimum selection of equipment which *must* be available in *all* areas where airway management occurs



# ESSENTIAL AIRWAY EQUIPMENT

- Oxygen
- Facemask
- Shoulder Roll
- Circuit
- Oropharyngeal Airway
- Gastric Tube
- Magill Forceps
- SAD/LMA
- Nasopharyngeal Airway
- Laryngoscope: Direct and Indirect
- Endotracheal Tube
- Endotracheal Tube Guide(s)
- Throat Pack
- Intubating Bronchoscope
- (ENT Surgeon)

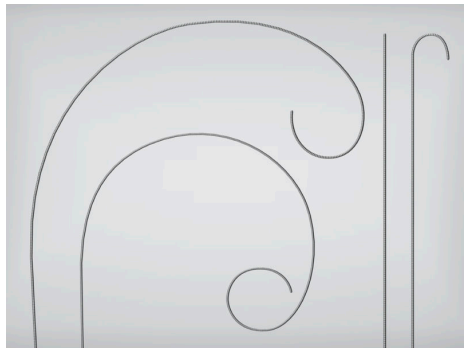
# Desirable equipment

- Equipment that is non-essential but can be viewed as potentially desirable, depending on local case mix and expertise

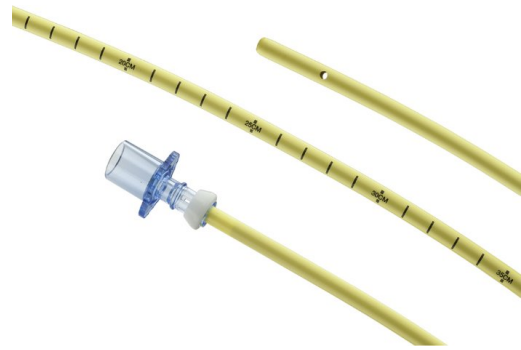


# Desirable equipment

- (Advanced) airway equipment which is to be used **must** be familiar to all staff, and efforts must be made to ensure exposure for all staff to maintain skills



Guidewire



Airway Exchange Catheter



iGel



iLMA



Endoscopy Mask & Guided Oral Airway



Rigid Bronchoscope



Bonfils



Shikani



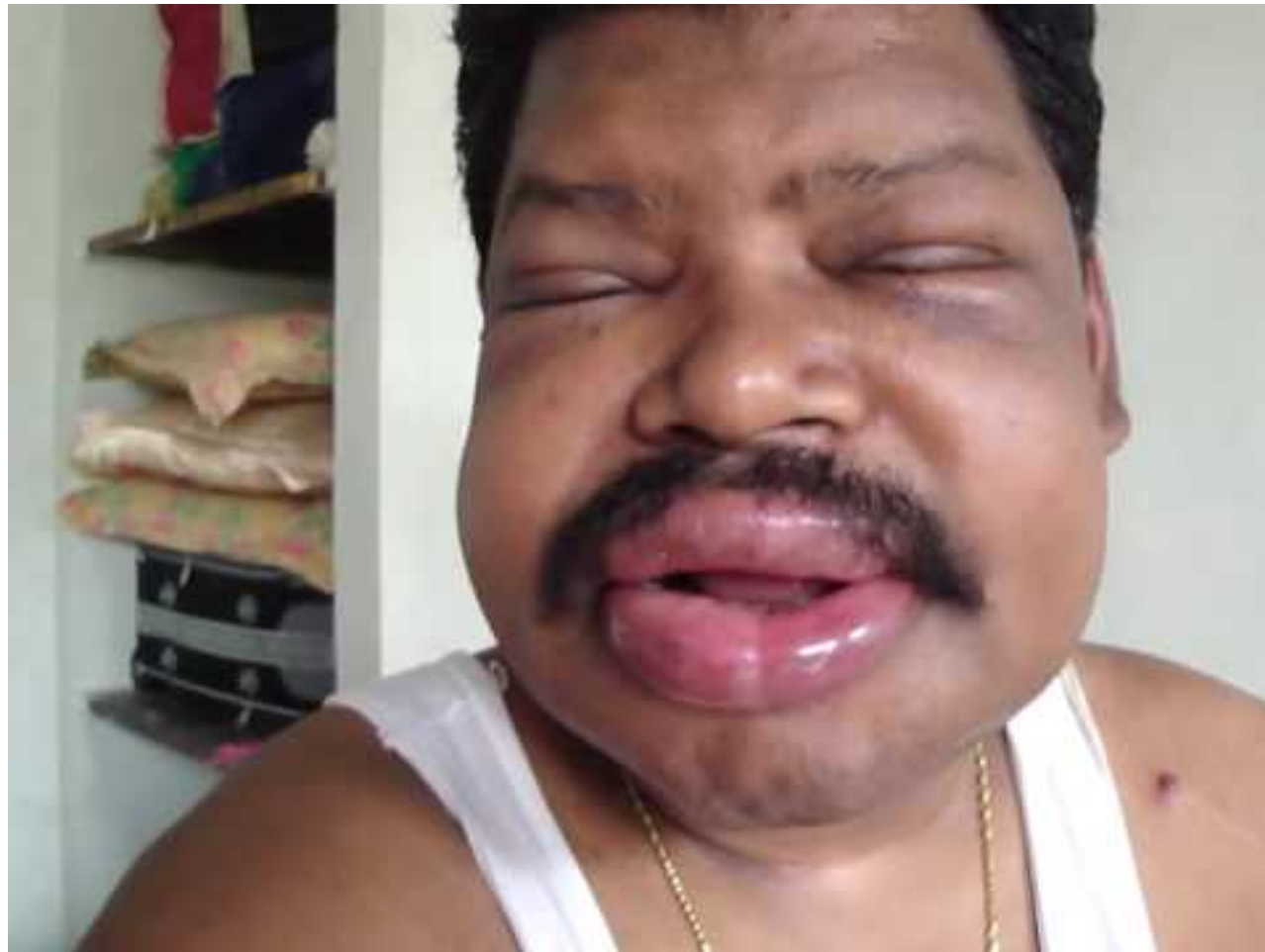
Proseal LMA



# What About Videolaryngoscopes?



[www.marmart.co.uk](http://www.marmart.co.uk)





# Videolaryngoscopes



C-MAC (Karl Storz)



Glidescope (Verathon)



McGrath MAC (Aircraft Medical)

- These 3 devices all have a place in both adult and paediatric airway management





# Can't Intubate, Can't Ventilate

## NAP 4

- 184 total incidents (adults and children)
- 13 children
- 5 CICV
- Successful FoNA was managed by ENT

# Can't Intubate, Can't Ventilate

## SPAN Survey 2014

- 3 reported incidences of CICV requiring intervention
- Further details of 2 only
- Both rescued by tracheostomy performed by surgeons (one general surgeon, one ENT surgeon)

# Can't Intubate, Can't Ventilate

- Lack of firm evidence to support any one technique in the hands of an anaesthetist
- The most likely methods to succeed will be tracheal intubation via rigid bronchoscopy or surgical tracheostomy, both performed by a skilled surgeon

However

- Must carefully consider the options in the absence of resident skilled ENT/general surgical assistance

Back to Trolleys...





# Need to Consider;

## Airway Rescue

- Unanticipated airway difficulty with physiological disturbance
- Requires urgent/emergency intervention

## Difficult Airway/Intubation

- *Popat et al*: The clinical scenario when safe oxygenation and ventilation cannot be achieved in the desired way with the use of an individual's usual practice

# Airway Rescue Trolley

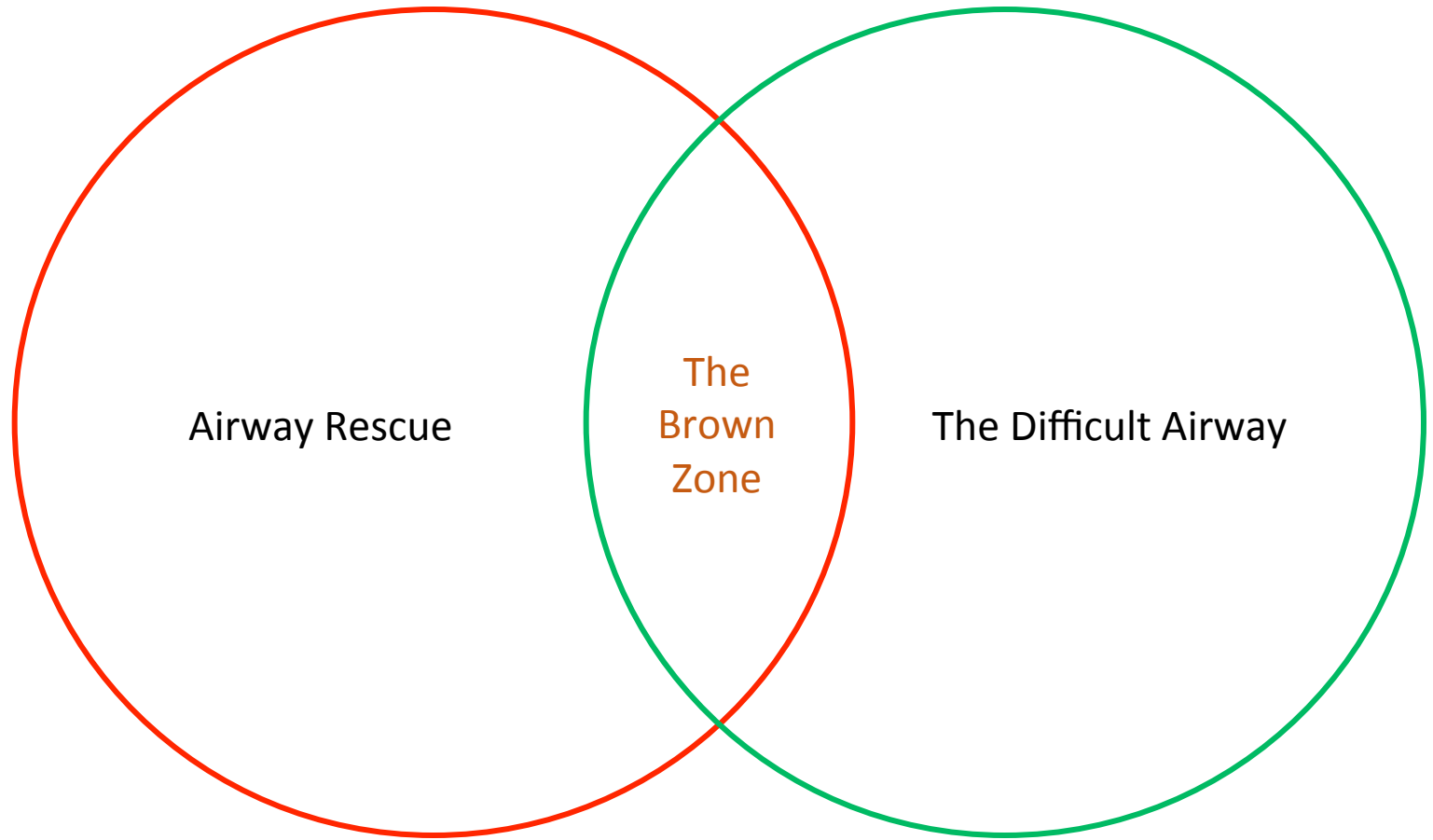
- Remedy anatomical and functional problems
- Often resolved with basic airway equipment +/- drugs
- Less likely to require advanced airway equipment in a hurry



# The Difficult Airway/Intubation Trolley

- **May be** anticipated e.g. certain syndromes
- **Hopefully will be** anticipated and less urgent/emergent
- May choose to refer to specialist centre
- Otherwise, likely to have appropriate advanced airway equipment available from the outset





Airway Rescue

The  
Brown  
Zone

The Difficult Airway



# So, how many trolleys?

- Everything on one 'difficult airway' trolley?
- May be suitable for specialist centre with no need for separate airway rescue equipment setup

## Advantages

- Everything in one place
- Less trolleys to check
- Reduce risk of getting 'wrong' trolley

## Disadvantages

- Everything in one place
- Cluttered
- Need big trolley
- Remembering where everything is



# What's the Alternative?

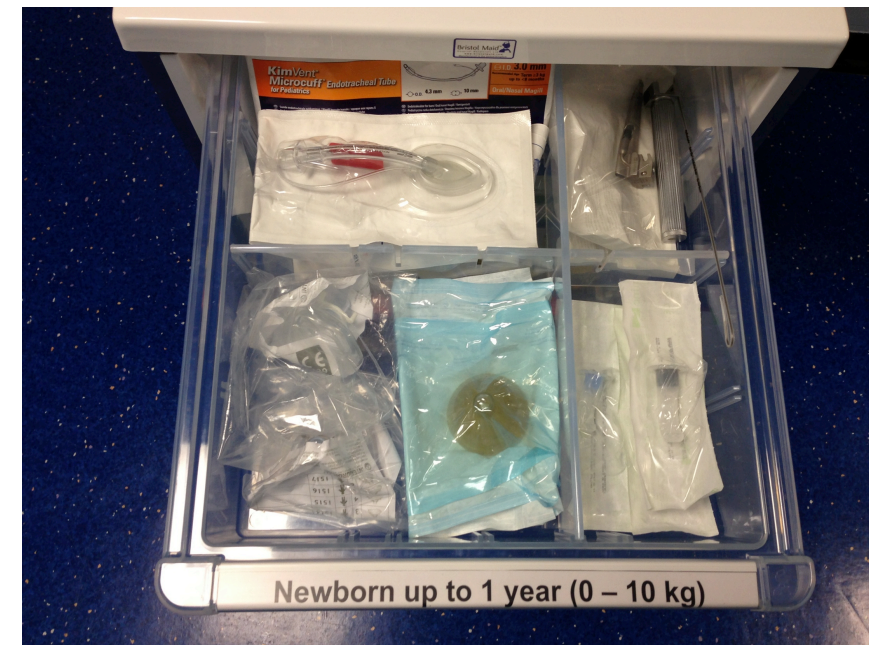
- Separate Airway Rescue Equipment from Difficult Intubation Equipment
- May be suitable for non-specialist centre with separate areas, especially if co-existing adult practice

## Advantages

- Separates advanced equipment from basic
- Less variety of equipment on trolley
- Easier to standardise

## Disadvantages

- Trolley fatigue
- Potential for confusion
- May need 2 trolleys in succession



There is a third option...

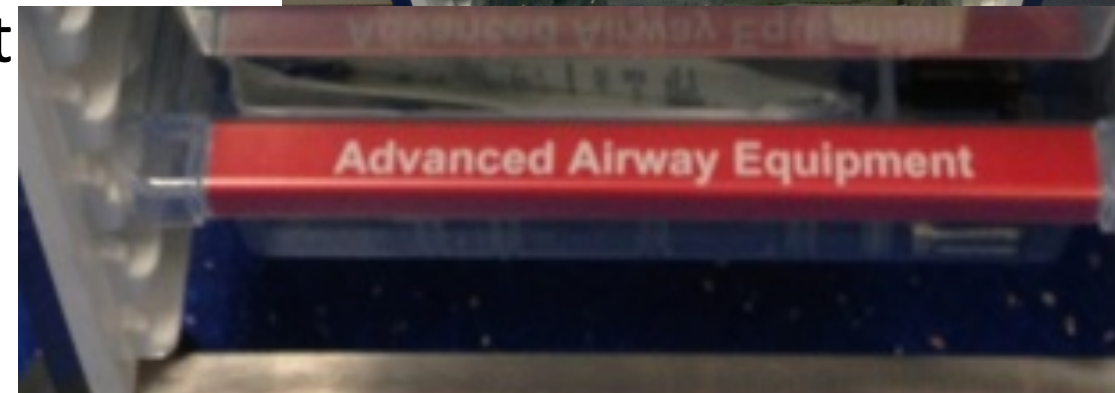


Sorry...



# There Really is a Third Option...

- A combination of Airway Rescue and Difficult Airway Equipment
- Keep the advantages of 'one-trolley' but limit volume of kit
- Again, more easily standardised due to simplicity
- Probably not suitable for large specialist centres



# Contrasting Setups





# Where?

- Areas of the hospital to consider include ED, ICU, HDU, Ward, Theatre, Theatre Recovery +/- Transfer
- Standardisation will become proportionally more difficult with more people involved



# Other Factors to Consider;

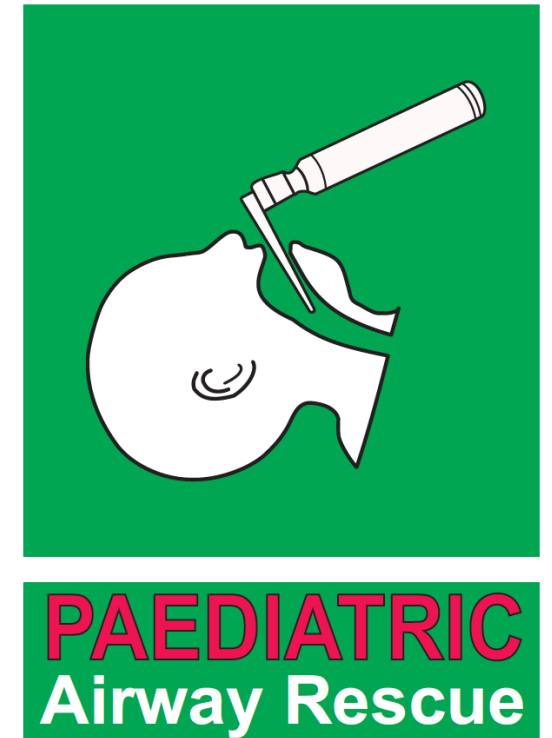
- Communication
- Small working group
- One person in charge overall
- Checking of Equipment





# Other Factors to Consider;

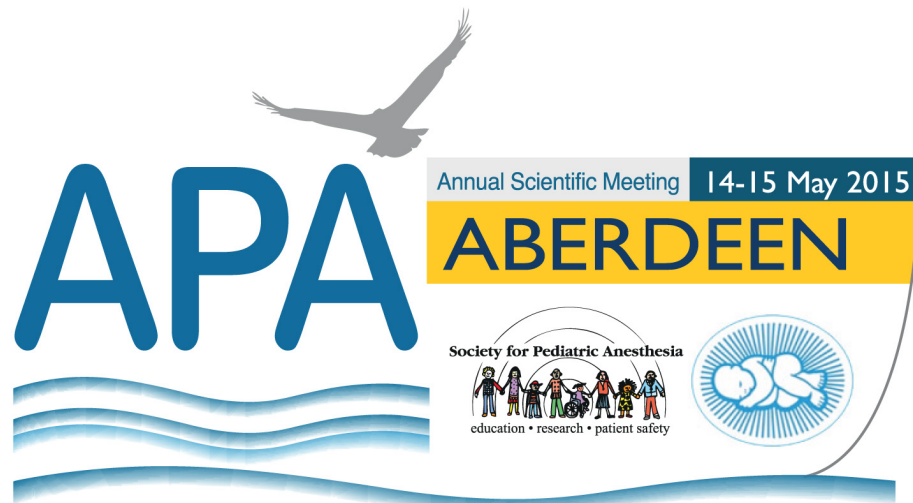
- Communication
- Small working group
- One person in charge overall
- Checking of Equipment
- Training
- Simulation
- Signage





# The Take-Home Message

- *(Advanced) airway equipment which is to be used **must** be familiar to all staff, and efforts must be made to ensure exposure for all staff to maintain skills*



# ANNUAL SCIENTIFIC MEETING

**Aberdeen Exhibition & Conference Centre**

**14<sup>th</sup>-15<sup>th</sup> May 2015**

Joint meeting with Society of Pediatric Anesthesia, providing an opportunity to compare and contrast practice on both sides of the Atlantic

## Programme Highlights:

Parallel specialist and general streams

Workshops on human factors and surgical skills plus a special one on Highland hospitality!

Annual Dinner at the Beach Ballroom



**Plus 13<sup>th</sup> May 2015**

**Half day meeting on Congenital Cardiac Anaesthesia**

Jointly presented by the Congenital Cardiac Anaesthesia Network and Congenital Cardiac Anesthesia Society

Website opening soon  
[www.apagbi2015.co.uk](http://www.apagbi2015.co.uk)