

Safe emergency airway management, Workshop outline

This is a workshop designed to explore:

1. Ways in which APLS providers can safely manage a compromised airway in a critically ill infant until appropriate expertise can be mobilised
2. The team approach to airway management and failed management including use of checklists, algorithms and non-technical skills.

Key Learning Objectives

At the end of the session candidates will be able to

- Optimize oxygenation with airway manoeuvres and oxygen delivery devices
- Understand the importance and optimization of BVM as the primary resuscitation and rescue skill
- Using a structured approach, formulate a shared plan for advanced airway management, including
 - physiological optimization and
 - actions in the event of failure
- Consider the rescue role of the supraglottic airway (LMA or iGel)

Environment

6 candidates, 2-3 instructors.

Infant manikins

ALSi monitor attached to the manikin (Safe Emergency Airway Management)

Full scenario kit

Algorithm/Checklist laminates for use – e.g. RCH guidelines, Vortex guidelines

Laminates of Grade 3/4 larynx for visual prompts

The workshop is ideally run using 'pause and discuss' based around the case.

How complex the clinical problems become, will depend upon the group. One of the instructors can play the "arriving airway expert help" if no one is suitable within the group. This will allow safe intubation and "failed intubation" practice. There is a second scenario available to progress to if time allows.

Set & Dialogue

This workshop will focus on ways to manage expected and unexpected difficulties in oxygenation, ventilation and the securing of an adequate airway. The emphasis will be on ensuring adequate oxygenation.

The workshop will be based around a clinical case. All candidates can participate in management according to their usual and allocated role. All team members are urged to actively contribute to the team showing initiative. **At times the management of the case will be stopped for a 'pause & discuss'.**

The candidates will remind the group of their current clinical roles and then will quickly allocate team roles in preparation for managing the case eg airway 1, airway 2, airway assistant, circulation, leader, scribe/reader etc.

If there is no participant capable of intubating then the second instructor will role-play the "arriving airway expert".

Safe emergency airway management, Scenario 1

History

- 3/12 old girl, 5 kg, presents with increasing lethargy over 24hrs
- Poor feeding, vomit by 3, no bile stain
- Mother reports: "very sleepy, not normal", no wet nappies
- Previously well

(Video of child in parent's arms on ALSi)

Examination:

- A normal looking baby, no dysmorphic features
- Pale and floppy, T 38.7
- **Resp rate 72/min** with recession, grunt and flare. Occasional snoring
- **SaO₂ 86%** in air that will rise to 92% with O₂ via FM but then deteriorates further requiring OPA and respiratory support
- HR 173/min with cool and mottled peripheries, thready pulses, low BP

Clinical course:

- SpO₂ improves with O₂, airway opening
- Then deteriorates requiring OPA/NPA +/- Neopuff
- Circulation can be adjusted to improve/deteriorate depending on the group's expertise/progress.
- Further deterioration with apneas, decreased GCS, requiring BVM ventilation
- Proceed with or plan for RSI including use of intubation checklist
- "Failed intubation", management including BVM/LMA/alternative intubation plans

Scenario 1, Infant, 5 kg, Hypoxemic, Septic shock				
	ALSI Settings			Instructor prompts/cues
Airway				Snoring intermittently, clears with jaw thrust, OPA
Breathing	RR	SaO₂	ETCO₂	
	72	86%	Change with optimizations	Incr WOB, recession
	Sat improves with O ₂ , NPA/OPA/Neopuff PEEP			
	Then deteriorates requiring BVM +/- LMA/ETT			Apnoes, decreased GCS, decreasing SpO ₂
Circulation	HR	BP	ECG	
	173/min	40/31	SR	Capillary return 6 sec, improves to 3
	Improves with fluid boluses x 2			
Disability				AVPU-pain
Extremity				Pale, mottled, T 38.7
Airway options	Optimizations			Outcome/Instructor cues
FM/BMV	Manipulations, shoulder roll, 2 handed, OPA, suction			Adequate airway/oxygenation/ETCO ₂ depending on interventions/group
LMA	Manipulations, jaw thrust, laryngoscope, 1/1.5			Adequate airway/oxygenation/ETCO ₂ depending on interventions/group
ETT	Manipulations, bougie, straight/curved, suction, RSI, Checklist			Grade 3 larynx (only epiglottis seen), failed intubation, prompt group for plan for failure?

Workshopping of the case:

The team's initial priorities should be to safely:

- Ensure adequate oxygenation
 - Manage the airway, support the circulation
 - Give broad spectrum antibiotics
 - Mobilise expertise – local / retrieval service / tertiary paediatric etc.
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- Depending on the skill mix the team can undertake necessary management that might range from BVM to LMA to intubation. **Whatever option chosen the initial attempt should "fail" so that the team's response can be explored. Ideally management will include RSI and initial failed intubation by team or with assistance of "arriving airway expert"**. Circulation can be adjusted to improve/deteriorate depending on the group's expertise/progress. The focus should be on airway management.

Knowledge, skills and non-technical skills to be explored during the scenario and discussion include

- **the structured approach including optimizing oxygenation, circulation and positioning**
- **understand the importance and optimization of BVM as the primary rescue skill and optimizations of intubation and supraglottic airway use**
- **formulating a shared plan and plan for failure including calling for help, teamwork skills, the use of checklists/algorithms and avoidance of fixation**

Depending on team make up this scenario will probably occupy the session. If necessary, scenario 2 (accidental extubation of this case) can be used. See page 5/6.

Brief discussion of "Can't intubate, can't oxygenate" (CICO) resources

Re-iterate that front of neck techniques will most often not be necessary if the supraglottic techniques are applied effectively and further, that front of neck techniques are most likely to fail as an airway rescue intervention, in small children and infants.

Point out resources available to guide airway management using the RCH guidelines provided as an example, but direct the candidates to identify what resources are available in their clinical context.

Show the Vortex diagrams provided as an example of a set of principles in management of a difficult airway.

Close

Close the session by summarizing the key objectives;

- Oxygenation is the prime goal, ensure with airway manoeuvres and oxygen delivery devices
- Systematically optimize BVM, LMA/iGel and intubation. BVM is the primary airway rescue skill
- Use a structured team approach, formulate a shared plan for airway management including physiological optimization and plan for failure

Potential issues for the team to consider during pause and discuss

- What is the urgency?
 - Is there time to seek more expert advice & support?
 - What skill set is needed?
 - What assistance is appropriate?
- What human factors/teamwork issues need to be considered?
 - Leadership, communication, shared mental model and role allocation
 - Alternative plans and plan for failure
 - Use of checklists and algorithms
 - Avoidance of fixation
- Oxygen delivery to the patient
 - Is increasing the FiO₂ appropriate / adequate?
 - Is positive pressure likely to be required, CPAP/PEEP, IPPV
 - Use of “Neo Puff” to provide PEEP, increase FIO₂ and IPPV
 - Oxygen delivery devices
 - HHFNO is suitable for humidified oxygen delivery but is not a resuscitation device. Its use outside management of bronchiolitis is not well investigated. While it may improve oxygenation concerns include delays in initiating therapy, hypotension and air leak. Its advantages over conventional low flow nasal cannula oxygenation before/during intubation is unclear
- Optimization techniques (potentially using Vortex approach) for
 - BVM
 - LMA/iGel
 - Intubation
- Equipment and monitoring that can help achieve the above goals including end tidal CO₂ monitoring
- Drugs that can facilitate achieving the above goals?
 - What are the consequences of the drug and dose choices for this patient?
 - Hemodynamic optimization

Safe emergency airway management, Scenario 2

While the lead instructor re-iterates the key points and takes any questions, the second instructor changes the setup to the intubated manikin (oesophageal intubation) for scenario 2 **if required**.

The allocated roles can potentially be changed to maintain participant engagement. The lead instructor explains that considerable time has now passed. The infant is now stable. She has received appropriate antibiotics and is intubated, ventilated (attached to an imaginary ventilator), sedated and muscle relaxed with stable ABC.

(Second ALSi Quick Pick)

- Temp 38.3^oC
- Pulse 122/min, BP 82/53
- Ventilated at 30/min with ETCO₂ of 47.
- SaO₂ 95% in 30%

The lead instructor can direct the team to confirm the features that indicate the baby is now stable. Once stability is confirmed by the team, the instructor changes to the "Deteriorating" Quick Pick (the ETT has now become dislodged and the ALSi parameters will reflect this by deteriorating over 60 seconds).

Scenario 2, Accidental extubation					
	ALSi Settings			Instructor prompts/cues	
Airway				ETT, placed in oesophagus before	
Breathing	RR	SaO₂	ETCO₂	Normal chest rise and fall until extubation No chest rise, no breath sounds after extubation Ventilated, FIO ₂ 30%, 20/5 by 30	
	30/min	95%, detrriorating	47 to 0 after extubation		
	Sat deteriorates to 50-60% depending on resus O ₂ sat and CO ₂ improves with appropriate management				
Circulation	HR	BP	ECG	Capillary return 3 sec	
	122/min	82/53	SR		
Disability				Sedated, unresponsive	
Extremity				Warm, well perfused, T 38.3	
Airway options	Optimizations			Outcome/Instructor cues	
FM/BMV	Manipulations, shoulder roll, 2 handed, OPA, suction			Adequate airway/oxygenation/ETCO ₂ depending on interventions/group	
LMA	Manipulations, jaw thrust, laryngoscope, 1/1.5			Adequate airway/oxygenation/ETCO ₂ depending on interventions/group	
ETT	Manipulations, bougie, straight/curved, suction			Grade 4 larynx (no recognizable structures), failed intubation, prompt group for plan for failure?	

The team now manage this deterioration with subsequent reflection:

Key steps would include:

- Recognise the deterioration
- Remove all potential ventilator related problems, manual ventilation
- Recognise that the ETT has been dislodged and reverting to BVM ventilation
- Ensure the adequacy of oxygenation
- Explore options for airway management