

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 and
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 are two scenarios to explore airway management in the "normal" child and with airway pathology. Depending on the group one scenario only, may be required.

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 clinical cases. 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'.**

Success of interventions will be communicated by the instructor and SpO₂/ETCO₂ monitoring. Participants should be reminded to ignore cues from the mannequin as it may be misleading due to mannikin function. Laryngoscopy grade will be communicated using photos. Participants should respond to laryngoscopy grade depicted rather than actual view on manikin.

The candidates will remind the group of their current clinical roles and then will quickly allocate team roles in preparation for managing the case e.g., airway 1, airway 2, 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

- 4/12 old girl, 4 kg, presents with severe bronchiolitis and occasional apnoeas
 - Mother reports: "very sleepy, not normal, poor feeding"
 - Born at 28 weeks gestation, adjusted age 4 weeks, previously well
- (Video of child in parent's arms on ALSi)**

Examination:

- Resp rate 72/min. Snoring and in resp distress
- SaO₂ 75% with intermittent apnoeas
- HR 180/min, CRT 6 sec, BP 55/39

Clinical course:

- SpO₂ improves with O₂, airway opening
- Increasing desaturations requiring +/- OPA +/- Neopuff +/- HHFNO
- Prolonged apnoea, decreased GCS, requiring BVM ventilation
- Shocked, dehydrated with tachycardia, hypotension and prolonged CRT. Optimize before RSI
- Plan and proceed with rapid sequence induction (RSI), intubation including use of checklist
- "Failed intubation", management including BVM/LMA/alternative intubation plans
- Stable airway, effective oxygenation with LMA/i-gel, in "safe zone" until help arrive, other options available

Scenario 1, Infant, 4 kg, bronchiolitis, apnoea						
	ALSI Settings				Instructor prompts/cues	
Airway					Snoring intermittently, clears with jaw thrust, OPA	
Breathing	RR	SaO ₂	ETCO ₂			
	72	75%	Change with optimizations		Snoring	
	Sat improves with O2, airway opening. Further desaturation requiring +/- Neopuff, +/- HHFNO					
	Then deteriorates requiring BVM				Apnoes, decreased GCS, decreasing SpO2	
	+/- LMA/ETT					
Circulation	HR	BP		ECG		
	180/min	55/39		SR	Responds to fluid bolus x 2	
Disability					AVPU-pain	
Extremity					T 38, cyanosis with low SpO2	
Airway options	Optimizations				Outcome/Instructor cues	
FM/BMV	Manipulations, shoulder roll, 2 handed, OPA, suction				Adequate airway/oxygenation/ETCO2 depending on interventions/group	
LMA/i-gel	Manipulations, jaw thrust, laryngoscope, 1/1.5				Good ventilation/CO2 trace with LMA/i-gel In "safe zone" until help arrives	
ETT	Manipulations, bougie, straight/curved, suction, RSI, Checklist				Grade 4 larynx, 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
- Call for help and prepare and plan for respiratory deterioration
- Mobilise expertise – local / retrieval service / tertiary paediatric etc.

Initial intubation will “fail” so that the team's response can be explored.

BVM ventilation with two hands, OPA, NPA and shoulder roll will be difficult but improves SpO₂. LMA/i-gel effective with some manipulation.

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 Scenario 1 may occupy the session. Scenario 2 can be covered also to reinforce practice with a more difficult case. 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/i-gel 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/i-gel
 - 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

History

- Same patient as case 1
- 4/12 old girl, 4 kg, presents with severe bronchiolitis and occasional apnoeas
- Mother reports: "very sleepy, not normal, poor feeding"
- Born at 28 weeks gestation, adjusted age 4 weeks, previously well

Examination:

- On assessment of the airway the infant is micrognathic, show laminated image (see below)
- Resp rate 72/min. Snoring and in resp distress
- SaO₂ 75% with intermittent apnoeas
- HR 180/min, CRT 4 sec, BP 79/51

Clinical course:

- Prolonged apnoea, decreased GCS, requiring BVM ventilation which is very difficult
- Stable airway, effective oxygenation with LMA/i-gel, in "safe zone" until help arrives, other options available
- Plan for intubation with alternative plans and options including video-laryngoscopy
- Prepare for RSI, intubation including use of checklist
- "Failed intubation", management including BVM/LMA/alternative intubation plans

Scenario 2, Infant, 4 kg, micrognathia, bronchiolitis, apnoea					
	ALSI Settings			Instructor prompts/ cues	
Airway				Snoring intermittently, clears with jaw thrust, OPA	
Breathing	RR	SaO ₂	ETCO ₂		
	72	75%	Change with optimizations	Snoring	
	Sat improves with O2, airway opening. Further desaturation requiring +/- Neopuff, +/- HHFNO				
	Then deteriorates requiring BVM which is difficult			Apnoes, decreased GCS, decreasing SpO2	
	+/- LMA/ETT				
Circulation	HR	BP	ECG		
	180/min	79/51	SR	CRT 4 sec, improves with fluid bolus	
Disability				AVPU-pain	
Extremity				T 38, cyanosis with low SpO2	
Airway options	Optimizations			Outcome/Instructor cues	
FM/ BMV	Manipulations, shoulder roll, 2 handed, OPA, suction			Very difficult, poor CO2 trace	
LMA/i-gel	Manipulations, jaw thrust, laryngoscope, 1/1.5			Good ventilation/CO2 trace with LMA/i-gel In "safe zone" until help arrives	
ETT	Manipulations, bougie, straight/curved, suction, RSI, Checklist			Grade 4 larynx, failed intubation, prompt group for plan for failure?	

