PCCL Session: Summary Report and Resources

PCCL session topic: "*Going Bananas - a complicated case of foreign body aspiration*"

Date: April 17, 2026

Learning objectives:

1. Review the acute management of a suspected foreign body aspiration in a child and explore how a pre-existing LRTI/pneumonia would change your management.
2. Identify effective strategies for sedation for a vigorous, intubated toddler with review of the indications for neuromuscular blockers.
3. Discuss the management of pulmonary hemorrhage in the context of foreign body aspiration.

Case:

- Care Context:
  - Respiratory arrest occurring in a remote community, on a highway while driving.
  - EMT's involved do not routinely resuscitate children
  - Transported via ground ambulance to an urban referral centre 3 hours 20 minutes away.
  - Urban referral centre with ER and staff, Pediatrics on call, adult ICU
  - Local ENT available on call but do not routinely management airways in children in acute circumstances under 2 years.
- Patient Demographics:
  - 15-month-old previous well male child travelling with family.
  - Presents with respiratory arrest and cyanosis while in the car driving on a remote highway.
- History and Presenting Illness:
  - History of respiratory illness with 3 days of progressive cough and fever 39 ^{o}C
  - Becoming drowsy in the last 24 hours, increasing secretions so parents report propping him up to sleep. Rousable the morning of presentation.
  - Then parents report sudden onset of difficulty breathing and blue lips, and became unresponsive in the car
  - 911 called and EMTs arrive at the scene. Hypotonic, breathing but cyanotic.
  - 1st attempt: cuffed 3.5 ETT but unable to ventilate, removed and note large amount of yellow green debris in ETT. 2nd attempt successful with 4.0 ETT sats increase to 89%
  - Ketamine infusion initiated and patient transported.
- Presentation at Hospital (vitals and physical exam):
  - 3-hour ground transport
  - Arrival in ER at 1220h: ETT, ventilated, sedated with ketamine infusion
  - Temp 37 ^{0}C HR 175 BP 118/72 FiO_2 1.0, Sats 90%. No signs of trauma.
  - Good AE bilaterally, some crackles. Abdomen distended.
  - Pupils 5 mm and reactive, + gag reflex with some spontaneous movement
  - GCS: E=1, V=1, M=1 total 3
  - POCUS good cardiac contractility, no pericardial fluid, no fluid in abdomen

- Initial Investigations (1305):
  - VBG: pH 7.2 PCO_2 52 HCO_3 20 lactate 2.9
  - Hgb 131 PLT 201 WBC 4.8
  - Na 142, K 4.6, TCO2 17, AG 12, Urea 4.2 Cr 30 BGM 11.7
  - AST 58, ALT 47 Bili 5 CRP 57
- Initial Management:
  - Ventilation: VC set rate 50, actual 55, Tv 5ml/kg PEEP 5, Ti 0.5 MAP 7.3 $ETCO_2$ 48
  - PSV 10, rate 36, FiO2 0.8 PEEP 5 MAP 9.4 peak P 16
  - Blood cultures then IV ceftriaxone and azithromycin
  - Contacted BCCH- PICU on call to assist with management.
  - 2 hours after presentation: Change sedation: wean ketamine to 30 mcg /kg/min, start dexmedetomidine 0.5- 0.7 mcg /kg/hr and morphine 10 mcg /kg/hr
  - Co-ordinated teleconference with PICU, ENT locally and ENT- BCCH
  - For presumed banana aspiration: dexamethasone 0.3 mg /kg q6h in first 24 h
  - NS instillation in ETT and suctioning prn
- Summary of Management:
  - Initially mean BP's 95->66 but at 5.5 h after presentation mean BP 49
  - At 6 hours mean BP 50 so repeat NS bolus 20 ml / kg
  - At 6 hours epinephrine 0.05 mcg /kg/min
  - At 7 hours blood returns from ETT sats 52%
  - At 7 hours epinephrine 0.11 mcg /kg/min, ketamine 30 mcg /kg/min, midazolam 150 mcg /kg/hour
  - Vitamin K 1 mg IV for INR 1.5
  - 8 hours HR 181 sats 99% BP 87/41
  - ITT prior to transport rocuronium added and immediate reduction in FiO2

Learnings:

Prehospital and Initial Airway Management

- Emergency intubation can be performed without sedative or paralytic agents, with this case recognizing appropriate prehospital prioritization of rapid airway control in the setting of profound hypoxia and cardiovascular instability.
- There was understandable hesitation to use neuromuscular blockade early, due to:
  - Concern about loss of airway control in suspected foreign body aspiration.
  - Transport-related risks and limited resources at the roadside.
- Once the airway is secured, reassessment for early paralysis should occur to optimize ventilation and reduce physiologic stress.
- Initial post-intubation sedation using a ketamine infusion appeared adequate:
  - The child had a depressed level of consciousness, likely related to severe hypoxia.
  - Ketamine's hemodynamic profile was appropriate given instability.

Ventilation Strategy Discussion

Respiratory therapy review highlighted that:

- Initial ventilator settings used:
  - High respiratory rates (~50/min)
  - Low tidal volumes (~5 mL/kg)
- These settings may be non-physiologic for a toddler and potentially harmful in obstructive pathology.

Recommended Approach

- Use more physiologic ventilator parameters:
  - Respiratory rate: ~20–25/min
  - Tidal volume: 7–8 mL/kg
- Rationale:
  - Reduces risk of air trapping and hyperinflation.
  - Avoids converting partial obstruction into functional complete obstruction.
  - Particularly important in suspected or confirmed foreign body aspiration.
- Blood gas normalization should not supersede airway mechanics and obstructive physiology in ventilator management.
- Hypotension in ventilated toddlers requires etiologic differentiation, not reflex vasopressor use.
- Sedation strategies must balance ventilator synchrony, neurologic protection, and hemodynamics.
- Clinical improvement does not rule out retained or migrating foreign material.

Nature of the Foreign Body

- The aspirated material (banana) was:
  - Organic and soft
  - Macerated ("morselized"), rather than a single discrete object
  - Distributed throughout the airway
  - Organic aspiration can cause delayed, intermittent, and position-dependent deterioration.
- This explains:
  - Intermittent symptoms
  - Difficulty achieving complete clearance
  - Periods of normal bronchoscopy findings

- Organic foreign bodies behave dynamically:
  - They break down
  - Migrate
  - Intensify airway inflammation
- They pose greater diagnostic and therapeutic challenges than solid objects.

Bronchoscopy Decision-Making

Rigid Bronchoscopy

- Best suited for:
  - Clearly identified solid foreign bodies
  - Central airway obstruction (trachea, right main bronchus)
- Advantages:
  - Direct visualization
  - Definitive removal
  - Superior airway control

Flexible Bronchoscopy

- Primarily diagnostic
- Useful for:
  - Distal airway evaluation
  - Fragmented or diffuse material
- In this case, flexible bronchoscopy was favored because:
  - Aspiration was morselized and diffuse
  - The child was intubated and stable
  - Co-existing viral pneumonia increased anesthesia risk
- Flexible bronchoscopy helped avoid an unnecessary OR trip when rigid bronchoscopy was unlikely to be therapeutic.

Pulmonary Hemorrhage

- Management included:
  - Prompt suctioning
  - Increased PEEP (up to ~10 cmH_2O)
  - Gentle ventilation and supportive care
- Likely secondary to:
  - Inflamed lungs from RSV and influenza
  - Mechanical irritation from aspirated organic material
- Nebulized Tranexamic acid:
  - Not routinely used
  - Reserved for select severe cases
  - Not indicated in this context

Additional Management Considerations

- Saline instillation:
  - Not typically recommended in foreign body aspiration
  - Justified here due to soft, fragmented material, functioning as a mini lavage
- Steroids (e.g., dexamethasone):
  - Recommended for organic foreign body aspiration
  - Reduce inflammatory response and airway edema, especially if present >24 hours
- Antibiotics:
  - Considered when:

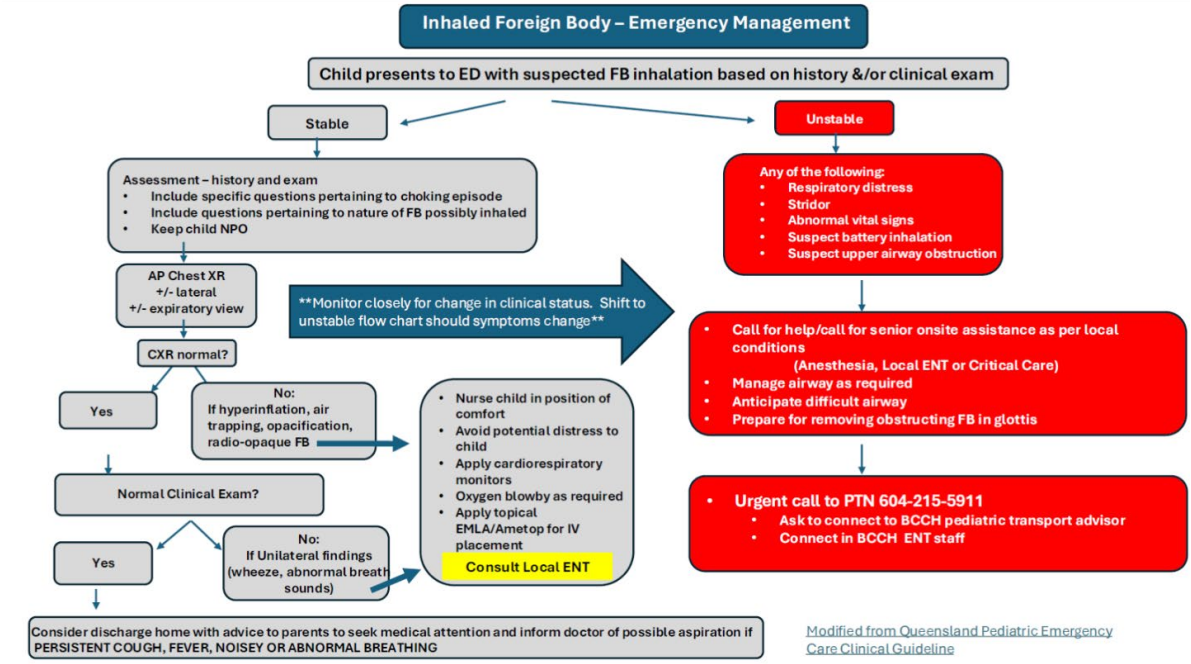
- Fever or infection is present
- Foreign body retention exceeds 24 hours

Key Learning Points

1. Foreign body aspiration can be intermittent
    - Children may appear well between episodes
    - Absence of symptoms ≠ resolution
2. Organic materials behave differently
    - Break down, spread, migrate
    - Cause inflammation and recurrent obstruction
3. Co-existing infection amplifies risk
    - RSV/influenza increase instability, bleeding risk, and ventilatory complexity
4. Ventilation strategy matters
    - Avoid high respiratory rates in obstructive physiology
    - Use age-appropriate, physiology-based settings
5. Airway strategy is context-dependent
    - Rigid vs flexible bronchoscopy depends on:
        - Stability
        - Nature of aspirated material
        - Distribution
6. Sedation and paralysis
    - Early hesitation understandable
    - Once intubated, neuromuscular blockade likely beneficial for ventilator control

Resources:

- BCCH Bronchial Foreign Bodies - October 24th 2007 Version.doc
- Queensland Pediatric Emergency Foreign body Flowchart
- Intubation – In a Hurry Resource
- Intubation checklist – In a Hurry Resource
- Ventilation Goals – In a Hurry Resource
- Virtual Support Pathways
- Critical Care Outreach RN and RT
- Weight based drug sheets
- Pediatric Vital Signs Lanyard Card
- Pedmed – dosing of pediatric drugs
- June 2025 PCCL – difficult airway obstruction



Here's how to download the free ZOOM App on your mobile device:

For Android (Chrome Browser):

1. Open the **Google Play Store**
2. Search **"Zoom Cloud Meetings"**
3. Tap **Install**
4. Open the app
5. **Sign in** or **Join a Meeting**

For iPhone (Safari Browser):

1. Open the **App Store**
2. Search **"Zoom Cloud Meetings"**
3. Tap **Get**
4. Open the app
5. **Sign in** or **Join a Meeting**

Tip: Allow camera and microphone access for full meeting participation.

Here's how to **bookmark the Pediatric Critical Care Resources Website as a shortcut on your smartphone home screen**, depending on your device and browser:

For iPhone (Safari Browser):

1. **Open Safari** and go to the website you want to save.
2. Tap the **Share icon** (square with an arrow pointing up) at the bottom of the screen.

3. Scroll down and tap **"Add to Home Screen."**
4. You can edit the name if you like, then tap **Add**.
5. The shortcut will appear on your **Home Screen** like an app icon.

☑ *Only Safari supports this on iPhone (not Chrome or Firefox).*

🤖 **For Android (Chrome Browser):**

1. Open **Google Chrome** and go to the website.
2. Tap the **three-dot menu** in the upper-right corner.
3. Tap **"Add to Home screen."**
4. Edit the name if desired, then tap **Add.**
5. Confirm by tapping **Add automatically** or drag it to your preferred location.

☑ *Works with most Android devices using Chrome. Firefox has a similar option under its menu.*

The resources shared throughout this session are for reference purposes only. Please consult your health authority leaders for guidance on adoption and use of these resources within your local context. The advice provided during the PCCL sessions is not intended to replace the clinical judgment of the healthcare providers who are with the patient. While PCCL sessions may suggest recommendations, the final decisions regarding a child's care and treatment should always rest with the healthcare professionals involved in their care at both the referring and receiving centres.
If you need additional in the moment support refer to the Provincial Real Time Virtual Support Pathways: If you need additional in the moment support refer to the Provincial Pediatric Virtual Support Pathways: https://childhealthbc.ca/pcc/provincial-pediatric-virtual-support-pathways