7th Annual Contemporary Management of Aerodigestive Disease in Children:

Best Practices in Pediatric Decannulation

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Disclosures

I have no financial relationships or conflicts of interest to disclose.

Learning Objectives

After this lecture, attendees will be able to:

1. Summarize the current literature regarding **tracheostomy decannulation** in children
2. Develop a cautious **approach to decannulation** at your home institution
3. Identify risk factors for **persistent tracheocutaneous fistula** after decannulation that may require surgical closure

Pediatric Decannulation

- Children receive tracheostomies for many different conditions and indications
- In some cases, a tracheostomy is a life-extending intervention that is unlikely to be removed (e.g., progressive neuromuscular disease)
- However, for others, the original condition may improve over time and decannulation (planned removal of the trach) may be possible

Chronic / Neonatal Lung Disease

- 102 preterm infants with ventilator-dependent severe bronchopulmonary dysplasia (BPD)
- Liberation from mechanical ventilation occurred in 82 children (80%) at a mean age of 2.4 years
- For those no longer requiring mechanical ventilation, decannulation occurred at a mean age of 3.5 years *Cristea 2013 Pediatrics 132:e727*
- Tracheostomy may also be considered in other neonatal lung diseases (e.g., congenital diaphragmatic hernia) *Baroudi 2019 Pediatr Pulmonol (ePub)*

Upper Airway Obstruction

- Perinatal tracheostomy bypasses severe upper airway obstruction (e.g., Pierre Robin sequence, Treacher Collins syndrome)
- In less severe cases, polysomnography (PSG) may aid in decision-making: nonsurgical vs surgical management (mandibular distraction osteogenesis, tongue-lip adhesion, tracheostomy) *Runyan 2018 Plast Reconstr Surg Glob Open 6(5):e1688*
- Likelihood of tracheostomy decannulation after mandibular distraction may be lower in Treacher Collins (than PRS) *Ali-Khan 2018 Ann Plast Surg 81(3):305*

When to Decannulate – Standard Practice

Decannulation may be considered when the child is:

- No longer ventilator dependent
- Capping the tracheostomy tube (“during all waking hours”) for a period of time
- Important: One-Way Valve use is not the same as capping the trach (terminology matters)

One-Way Valves

- “Passy-Muir” or “speaking” (**closes during exhalation**)
- Can **increase volume** of voice
- Helps parents respond to their child’s needs
- Increases frequency of vocalizations; helps with expressive **language development**
- May reduce dysfunctional **vocal fold movement**
- Can help with **feeding** (redirection of air to the throat, mouth, nasal passages enhances **olfaction** and **taste**)
- Helps with **secretion management**
- May improve **swallow function**
- May assist in **ventilator weaning**

One-Way Valves

Passy Muir Valve

Shiley Valve

In-Line Valve (PM)

Tracoe Valve (adjustable)

When to Decannulate – Standard Practice

Decannulation may be considered when the child is:

- No longer ventilator dependent
- Capping the tracheostomy tube (during all waking hours) for a period of time
- Important: One-Way Valve (e.g., Passy Muir valve) use is not the same as capping
- Clinically stable for a period of time
- Traditionally, decannulation is deferred until after winter respiratory season has passed

When to Decannulate – Exceptions?

Everything I said is true except for when it isn't…

- Decannulating a child who is still ventilator dependent (requires transition to noninvasive ventilation) *Fauroux 2010 Pediatr Crit Care Med 11:31*
- Decannulate without tracheostomy capping (small children) *Wirtz 2016 Otolarygol Head Neck Surg 154(4):731*

  Henningfeld 2016 Pediatr Pulmonol 51(8):838
- Does the time of year matter?

Decannulation Protocols

"To PSG or not to PSG?" *Cristea 2019 Pediatr Pulmonol (E-pub)*

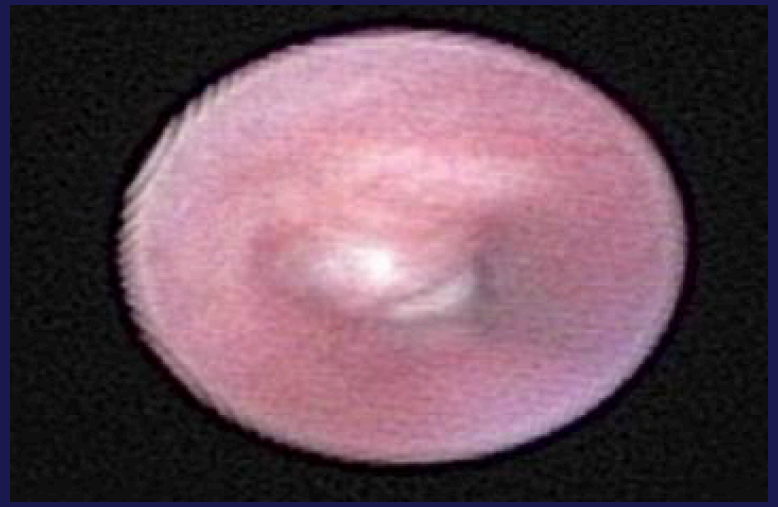
Clinical Case

- 2 yo F w/ severe BPD (25 wk preterm birth), chronic ventilation via tracheostomy
  - To CHCO at 7 mo due to difficulty transitioning to home ventilator at an outside hospital
  - ROS: resolved pulm hypertension, +g-tube, delays
  - Home at 12 mo (after 2.5 months on Trilogy)
  - Weaned from ventilation gradually during daytime/waking hours; liberated entirely at age 23 mo
  - 0.75 LPM O_2 via trach collar or HME
  - Capping advanced to all waking hours (+ O_2 via NC)

Next Steps are Center-Dependent

Bronchoscopy (Full Airway Evaluation)

- Consensus: decannulation should be preceded by a full airway evaluation
  - Tracheoscopy alone is insufficient
  - Size airway (rule out subglottic stenosis)
  - ENT (MLB), Pulm flex, or ENT/Pulm combined



Decannulation with PSG

- Bronchoscopy → nap PSG → overnight PSG
  - "the Indianapolis way"
  - 210 underwent protocol, 167 successful (only 4 recannulated later) *Cristea 2016 Pediatr Pulmonol 51(8):796*
- "The Wisconsin way" (Milwaukee)
  - 46 patients liberated from ventilator/decannulated
  - All had bronchoscopy and all had PSG
  - 65% had surgery *Henningfeld 2016 Pediatr Pulmonol 51(8):838*
- CHoP retrospective review (137 BPD patients)
  - 37% had PSG (no decan for 41%)

Quinlan 2019 Pediatr Pulmonol 54:1676

Decannulation without PSG

- Decannulation with inpatient observation (without PSG)
  - "the Colorado way"
  - Once capping all day (not with sleep), arrange for combined ML/B + flex bronchoscopy +/- downsize tracheostomy tube
  - Admit to Pulmonary service
    - Night 1: capped, CR monitor, SpO2, +/- $ETCO_2$, AM labs (blood gas, electrolytes)
    - Night 2: decannulated, same monitoring/studies
    - "Bare Neck Club"

Liptzin 2019 Pediatr Pulmonol 51(8):825

So… what should I do at my center?

- How readily available is PSG (wait times, distance traveled, timeliness of PSG interpretation)? *Flemons 2004 Am J Respir Crit Care Med 169(6):668*
- Is the specific patient at high risk for obstructive sleep apnea? Would an elevated AHI change the care plan? (Capped PSG may be essential.)
- “My” way is not necessarily the “right” way
- Guiding principal: “caution is the better part of valor”

After Decannulation

Stoma Care After Decannulation

- Keep stoma covered at all times:
  - Risk of inhaling foreign body, particulates
  - Limiting air movement helps stoma become smaller
  - Directs air movement through pharynx
- At CHCO, we use Mepilex Border Lite and create a soft “collar” using trach ties
- Sensitive skin can be a problem (tape, Tegaderm, adhesives may be worse)
- Change dressing 1-2 times/day
- Can switch to regular band-aid once stoma very small

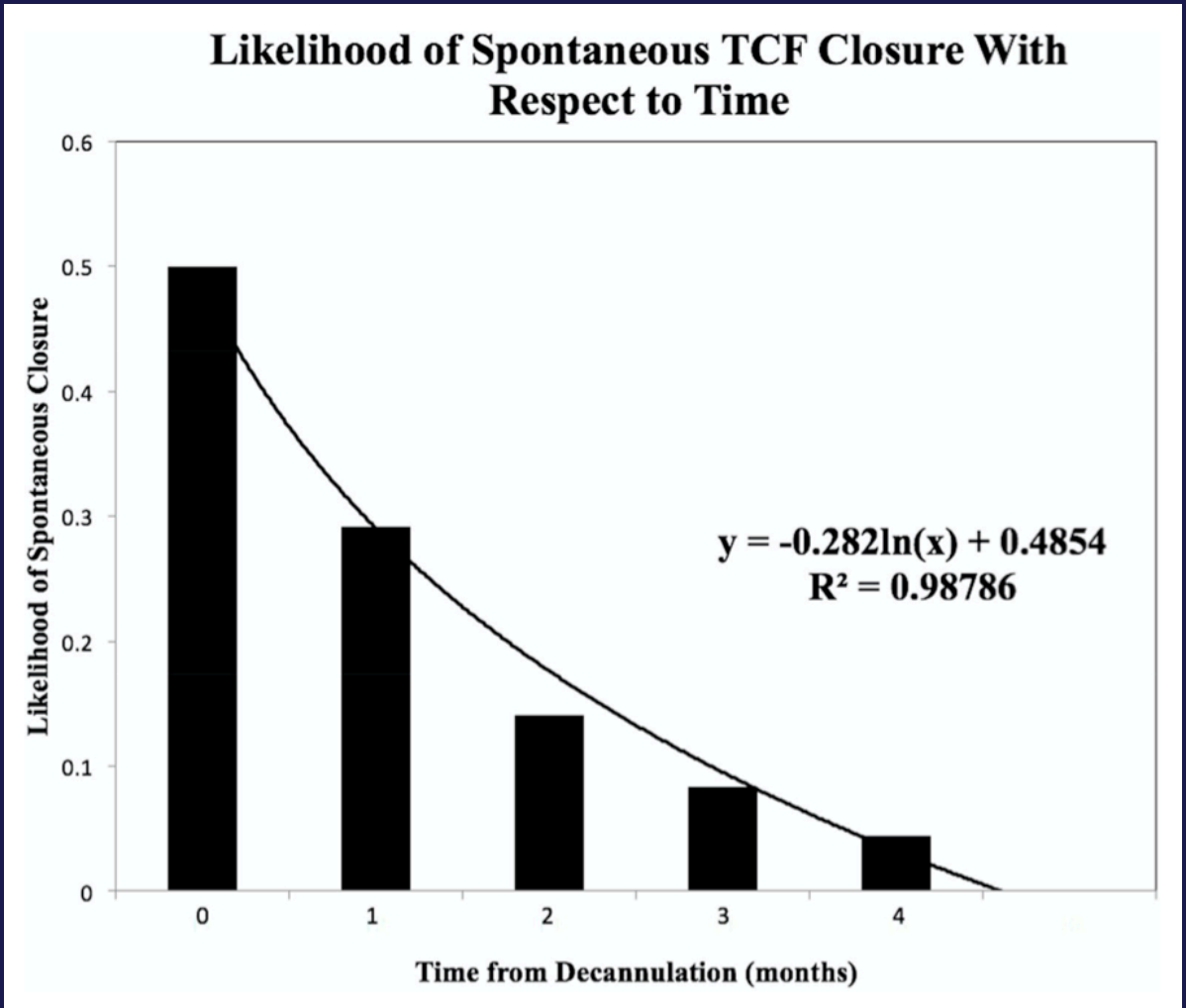
Stoma Care After Decannulation

Persistent Tracheocutaneous Fistula (TCF)

- Retrospective chart review
- 228 underwent tracheostomy decannulation over 7 years (1/1/2007 to 12/31/2013)
- 99 excluded (83 for insufficient documentation; 16 for laryngotracheal reconstruction)
- Of 129 subjects, 63 w/ spontaneous closure, 66 w/ surgical closure or persistent TCF

Wisniewski 2019 Int J Pediatr Otorhinolaryngol 125:122

Persistent Tracheocutaneous Fistula (TCF)



Wisniewski 2019 Int J Pediatr Otorhinolaryngol 125:122

Persistent Tracheocutaneous Fistula (TCF)

- Risk factors for TCF without spontaneous closure:
  - Age at tracheostomy placement
  - Duration of tracheostomy
  - Tracheobronchomalacia

Wisniewski 2019 Int J Pediatr Otorhinolaryngol 125:122

- TCF Closure: two methods
  - Primary closure (over drain; n=30)
  - Core excision of fistula (healing by secondary intent; n=22)
  - Closure in 30/30 in closure group; 20/22 in excision group
  - Excision associated with shorter OR time and hospital LOS

Wine 2014 JAMA Otolaryngol Head Neck Surg 140(3):237

Summary

- Tracheostomy decannulation is possible in many pediatric conditions
- Protocols vary (with or without PSG) and, more importantly, patients are unique
- About 50% of tracheostomy stomas will spontaneously close (less likely if younger, prolonged duration, tracheobronchomalacia)

Thank you.

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