Predicting the need for tracheostomy in infants with severe bronchopulmonary dysplasia

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Bronchopulmonary Dysplasia

- Most common complication of prematurity with the severe form affecting 10,000-15,000 infants each year
- Sequela of being born extremely premature
- Multifactorial: substantial impact of individual susceptibility (genetic, epigenetic)
- Fibrosis and metaplasia within the lungs. Fewer, larger ”alveoli”, decreased pulmonary vascular development = “simplified lung”

BPD: Definitions

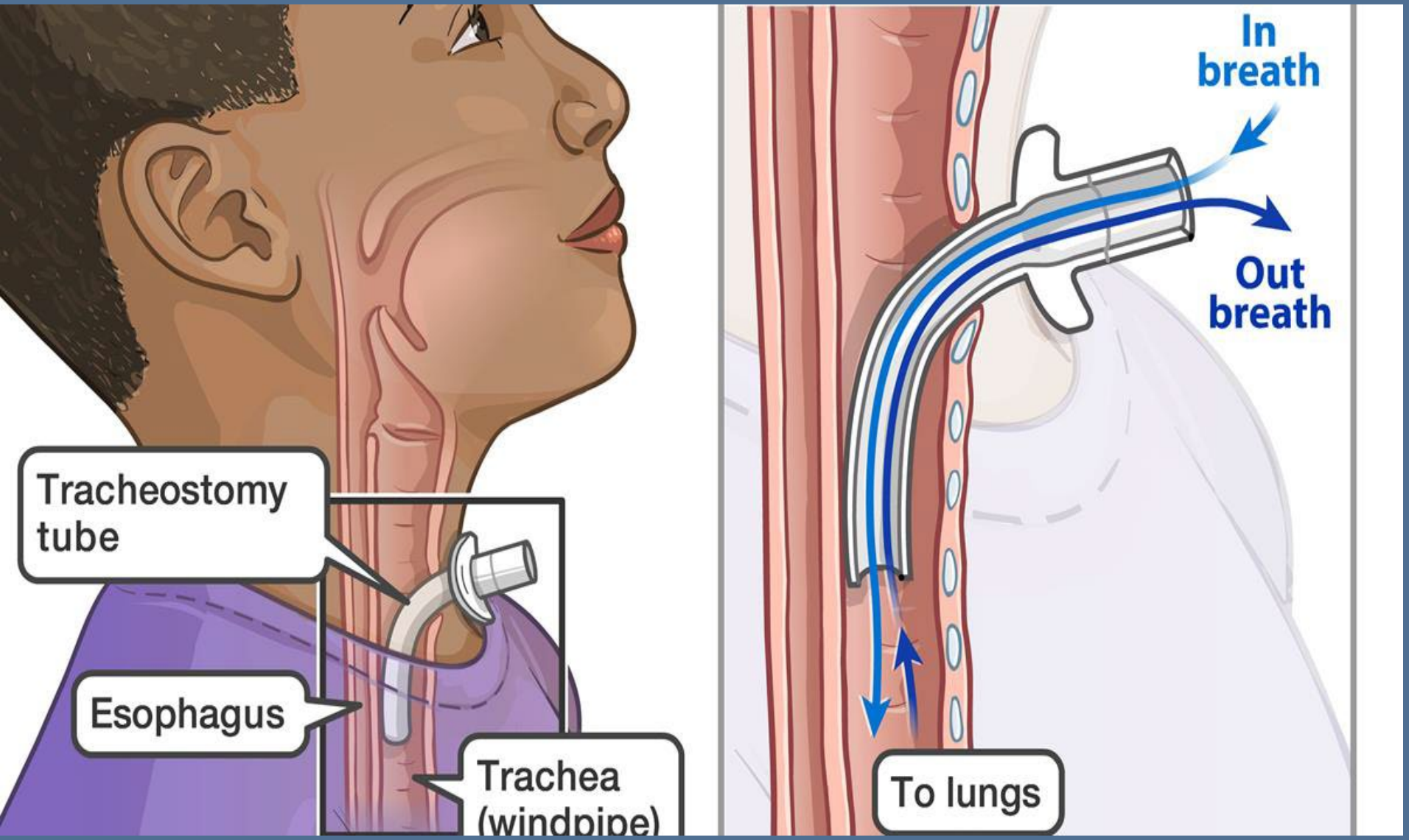
BPD	NHLBI (2001) At 36 weeks PMA	NHLBI (2018) At 36 weeks PMA	Jensen (2019) At 36 weeks PMA
Mild (Grade 1)	≥28 days of O_2 Room air at 36 wks	NIPPV (21%) NC (≥1LPM, <30%) NC (<1LPM, ≤70%)	NC (≤2LPM)
Moderate (Grade 2)	≥28 days of O_2 <30% O_2 at 36 wks	IPPV (21%) NIPPV (22-29%) NC (≥1LPM, ≥30%) NC (<1LPM, >70%)	NC (>2LPM) NIPPV
Severe (Grade 3)	≥28 days of O_2 >30% O_2 at 36 wks OR PPV	IPPV (>21%) NIPPV (≥30%)	IPPV
Very Severe (Grade 4)		Death between 14 days and 36 weeks	

Severe BPD

- Grade 3 BPD – dependent on a ventilator at 36 weeks corrected gestational age
  - 75% of these patients will remain on a ventilator when they are discharged from the hospital
  - But 25% will not need a ventilator

Severe BPD

- To be discharged from the hospital on a ventilator the patient needs a tracheostomy
- A surgical hole in the neck that allows them to be hooked up to a ventilator
- Doesn't need to be permanent


Tracheostomy tube
Esophagus
Trachea (windpipe)
In breath
Out breath
To lungs

Bronchopulmonary Dysplasia

- Approximately 2-4% of infants with BPD require a tracheostomy
  - up to 12% with severe or grade 3 BPD
- Benefits to performing a tracheostomy include:
  - providing a stable airway
  - weaning sedation requirements
  - improving ventilator synchrony
  - improving growth
  - promoting age-appropriate interactions
  - improving participation in developmental care
  - tracheostomy performed within 4 months of age is associated with improved outcomes

Bronchopulmonary Dysplasia

- Risks associated with a tracheostomy
  - Increased risk of death (vs no tracheostomy)
  - Accidental decannulation – can lead to death
  - Cannula obstruction – can lead to death
  - Increased rates of infection (skin, trachea and lungs)
  - Tracheal stenosis

The Problem

- Who really needs a tracheostomy?
- What is the ideal time frame to refer a patient for tracheostomy?

Our goal

- To develop statistical models using clinical data at 36 and 44 weeks post-menstrual age (PMA) to predict eventual need for tracheostomy or death prior to discharge

The Data Set

- Multicenter, retrospective case-control study across 9 centers of the BPD Collaborative
- The data set includes infants born at ≤32 weeks PMA
- Birth and demographic data
- Respiratory support at 36 weeks and 44 weeks PMA
- Outcomes at discharge

Variables of Clinical Interest

- Birth Variables
  - Weight (was the baby small for gestational age?)
  - gestational age
  - prenatal steroids
  - maternal race
  - gender
  - chorioamnionitis

Variables of Clinical Interest

- Variables at 36 and 44 weeks CGA
  - Weight
  - Tracheostomy?
- Respiratory support variable
  - Level of support (nothing, FiO_2, non-invasive support, invasive support)
  - PEEP
  - Fraction of inspired O_2 (FiO_2)
  - Peak inspiratory pressure
- Pulmonary Hypertension (associated with worse outcomes)

Outcome of Interest

- Tracheostomy at discharge?
- Death before discharge?

Questions

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