Speaker Introduction

- Chris Kyper has been a pediatric nurse practitioner for 25 years. She is certified in both primary and acute care. Ms. Kyper spent the first nine years practicing in primary care then transitioned into emergency and critical care medicine. Most of her career was spent in Pittsburgh, but currently she is practicing in Anchorage, Alaska, in the PICU at the Alaska Native Medical Center. In May, Ms. Kyper will graduate from Robert Morris University with her DNP. Her capstone project focused on the long-term outcomes of burn injured patients at the Alaska Native Medical Center.

Learning Objectives

- Describe the various modes of non-invasive ventilation.
- Recognize the risks and benefits, indications and contraindications, and potential complications of NIV as they pertain to the pediatric population.
- Describe how to initiate NIV and how NIV is used for specific disease states.
- Identify the predictors of NIV failure

How did we get here?

- Galen second century A.D.
- Vesalius 1543
- Hook 1667

Disclosures

I have no disclosures.
• 1774 Oxygen discovered
• 1864 first body enclosing device
• Late 1800s ventilators based on current physiologic principles

• 1876 Alfred Woillez built the first workable iron lung
• The spirophore

Polio
• 1929 Drinker and Shaw invented first iron lung in Boston
• Mortality from polio initially >80%
• Bjorn Ibsen, anesthesiologist, changed thinking
• Mortality dropped from 87% to 40% overnight

Definitions
• Heated and humidified high flow nasal cannula (HHHFNC)
• Bubble CPAP
• Continuous positive pressure (CPAP)
• Bi-level positive airway support (BPAP)
Primary physiologic benefits

• Decreases WOB
• Maintains patency of respiratory tract
• Recruits alveoli
• Less risk of airway trauma
• Decreased need for sedation and neuromuscular blockers

High Flow Nasal Cannula (HFNC)

• Form of NIV
• Allows patient to expectorate and eat and drink
• Minimal positive pressure
• Definition
• Sedation
• Feeding

Interface

Common conditions where NIV may be used

• Bronchiolitis
• Status asthmaticus
• Pneumonia
• Cystic fibrosis
• Acute chest syndrome
• Upper airway obstruction caused by tracheomalacia, larygomalacia, and PRS

Contraindications

• Cardiac arrest
• Impaired mental status
• Aspiration risk
• Need for airway protection
• Hemodynamic instability
• Upper GI bleed
• Facial injuries
• Facial anomalies
• Untreated pneumothorax

Patient Selection

• Contraindications
• Ability to tolerate
• Will it stabilize or reverse the problem
Initiation

- Monitoring
- Interface selection
- Sedation
- Skin protection
- Child life
- Slow and easy
- Don’t delay intubation

Set-up

- Mode
  - CPAP
  - BPAP

- Settings
  - CPAP - 6 and titrate up quickly, max 10
  - BPAP – EPAP 5, IPAP 5-10 up to 20
  - FIO2 - 100%, can titrate down rapidly
  - Back up rate

Frequent assessment and adjustment

- RR and HR
- Dyspnea
- Oxygen requirement
- Hypercarbia

Predictors of Failure

- Underlying diagnosis
- Primary diagnosis is not respiratory
- High PRISM or PLOD score
- Lack of response in 1-2 hours

Benefits

- Avoid intubation
- Short length of stay

Complications

- Major
  - Barotrauma
  - Aspiration
- Minor
  - Skin break down
  - Nasal mucosa trauma
  - Gastric distention
  - Eye irritation or injury
Extubation Management

- HFNC
- Underlying lung disease

Common Conditions where NIV is helpful

- Obstructive Sleep Apnea
- Neuromuscular disease
- Bronchiolitis
- Croup

Summary

- We’ve come a long way!!
- Becoming more widely used in pediatrics
- Significantly reduced need for intubation in certain conditions
- Requires negotiation skills to be successful
- Quality of life improvement for some childhood diseases

Child with croup, had one racemic neb and decadron but still working hard.

A. HFNC
B. CPAP
C. BPAP
D. Nothing

Teenager involved in a motor vehicle accident with an open femur fracture and increased WOB but following commands?

A. HFNC
B. CPAP
C. BPAP
D. Intubate

Same patient now has a CGS of 7 but breathing fine.

A. HFNC
B. CPAP
C. BPAP
D. Intubate
3-year-old asthmatic on continuous albuterol with significant WOB.

A. HFNC  
B. CPAP  
C. BPAP  
D. Intubate

If you choose BPAP which interface would you choose?

A. Nasal Mask  
B. Face Mask  
C. Scuba Mask

Thank you

References


