

Non-invasive ventilation

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Aims & Objectives

- Discuss the history of intervention
- Define what is meant by NIV
- Indications for NIV
- Contraindications of NIV
- Implications for NIV
- The Future

History of NIV

- And the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life and man became a living soul -**Genesis**
- First evolved with negative pressure ventilation in 1876 by Woillez. 1889 Alexander Graham Bell designed a prototype of an iron lung to use with a newborn.
- Polio epidemics of 1930's, 40s & 50s propelled the development of iron lung.
- Negative pressure ventilation fell out of favour in 1960s but in the past decade the use of positive pressure via a face/nasal mask was fuelled

Definition

- Delivery of ventilatory support without the need of an invasive artificial airway.
- Eliminates the need for intubation or tracheostomy and preserve normal swallowing, speech and cough mechanisms.



Definition contd.

- Negative-pressure ventilation
 - Lower the pressure surrounding the chest wall during inspiration and reversing the pressure to atmospheric level during expiration. These devices augment the tidal volume by generating negative extrathoracic pressure
- Non- invasive Positive-pressure ventilation
 - Provided by a volume ventilator, pressure-controlled ventilator, a bi-level positive airway pressure (BiPAP) or a continuous positive airway pressure device (CPAP)



Mechanisms of Action

- Decreases the work of breathing (WOB) and improves alveolar ventilation and simultaneously resting musculature
- Improvement in gas exchange due to increased alveolar ventilation
- Expiratory pressure (PEEP/CPAP) decreases WOB

Negative Pressure Ventilation

- ? Back in vogue
- Iron Lung & Hayek oscillator (Hayek & Sohar 1993)
- Method of ventilation for patient with progressive neuromuscular disease, severe chest deformities & broncho-pulmonary dysplasia (Knebel et al 1997)
- Augmentation of cardiac output in child with dysfunctional pulmonary blood flow (Shekerdemia & Bohl 1999) i.e. Fontan circulation

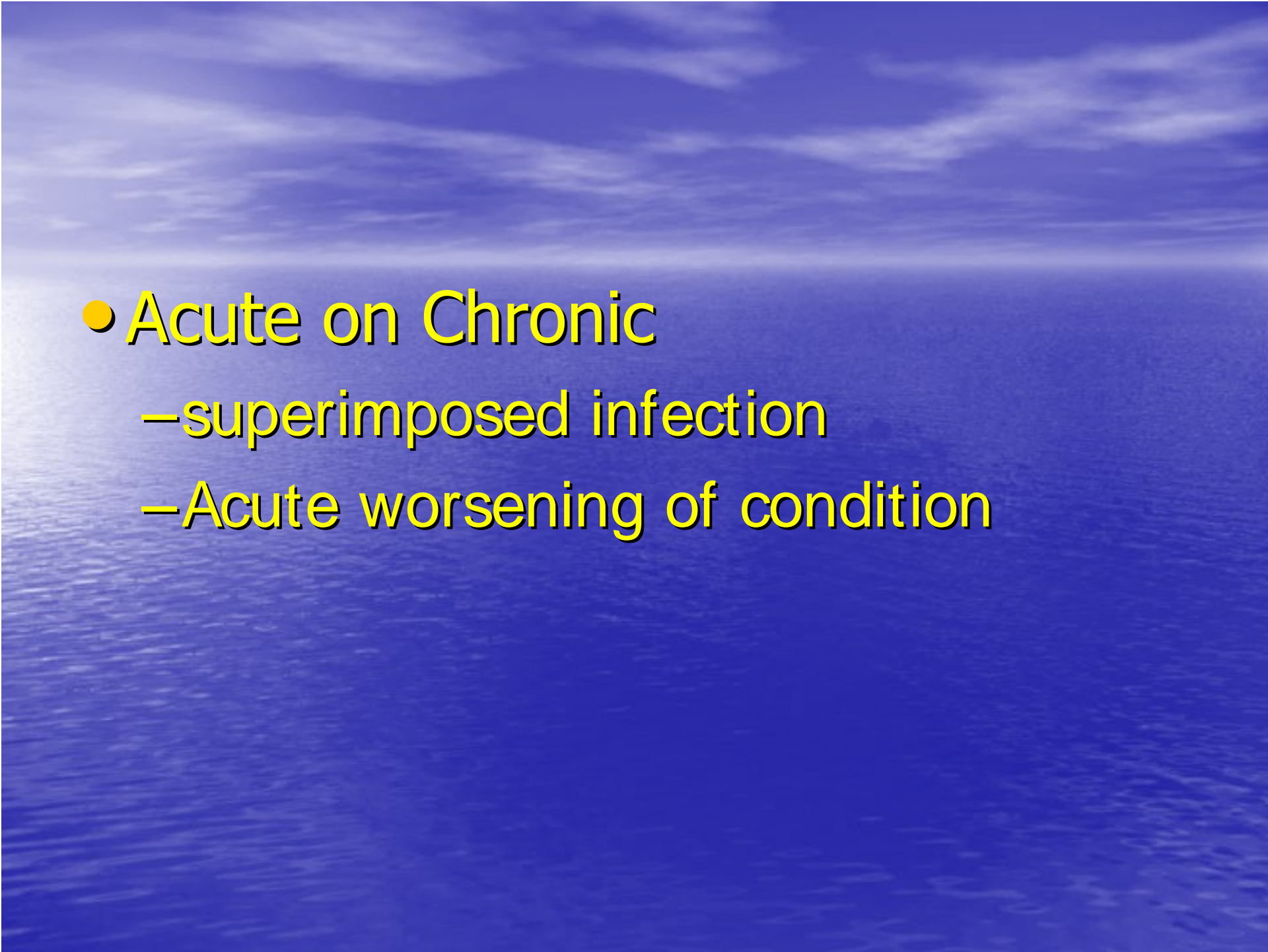


Indications for NIV

- Acute Respiratory Failure
 - Primary respiratory failure
 - Infection
 - Asthma
 - Cardiovascular pathology
 - Pulmonary oedema
 - LCOS



- Chronic Respiratory Failure
 - Primary respiratory pathology
 - Malacia
 - Chronic Lung Disease
 - COPD
 - Neuromuscular disorders
 - Duchene Muscular Dystrophy
 - Myasthenia Gravis

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- Acute on Chronic
 - superimposed infection
 - Acute worsening of condition

What does the Literature say?

- Neonates
 - Davis, Davies & Faber (2001)
 - De Paoli et al (2002)
 - Davis & Henderson-Smart (2000)
- Infants & Children
 - Thia et al (2007)
 - Shah, Ohlsoon & Shah (2003)
 - Keenan et al (2004)
 - Bernet et al (2005)
- Adults
 - British Thoracic Society (2002)
 - Sharma (2006)



Contra-indications

- Airway
 - Upper airway obstruction
 - Aspiration Risk
- Cardiovascular Arrest
- Cardiovascular
 - Haemodynamic instability
 - Unstable arrhythmias
- Neurological
- Anatomical deformity

Equipment required

- Flow driver/ NIV machine
- Face/Nasal Masks
 - Choice & Fit
- Humidification System?
- Supplemental oxygen
- Monitoring



Settings

- Continuous positive airway pressure (CPAP)
- Pressure Limited
 - Pressure Control
 - Pressure Support
 - Bi-level positive airway pressure (BiPAP)
- Trigger sensitivity

Other Considerations

- Explanations to child (& family) to improve concordance/ compliance
- Patient comfort
- Abdominal distension
- Pressure area care!
- Physiotherapy
- Monitoring

Termination of NIV

- Progression to invasive ventilation
- Clinical improvement
- Individualised weaning plan

Future

- NIV ventilators/ flow drivers that can be used on transportation/ retrieval
- Nurse led service
- Helmet-delivered NIV (Piastra et al 2004)
- Facility the use of NIV at home for children.



Any Questions?



