



Ventilatory Management in Respiratory Distress Syndrome and Surfactant Therapy update

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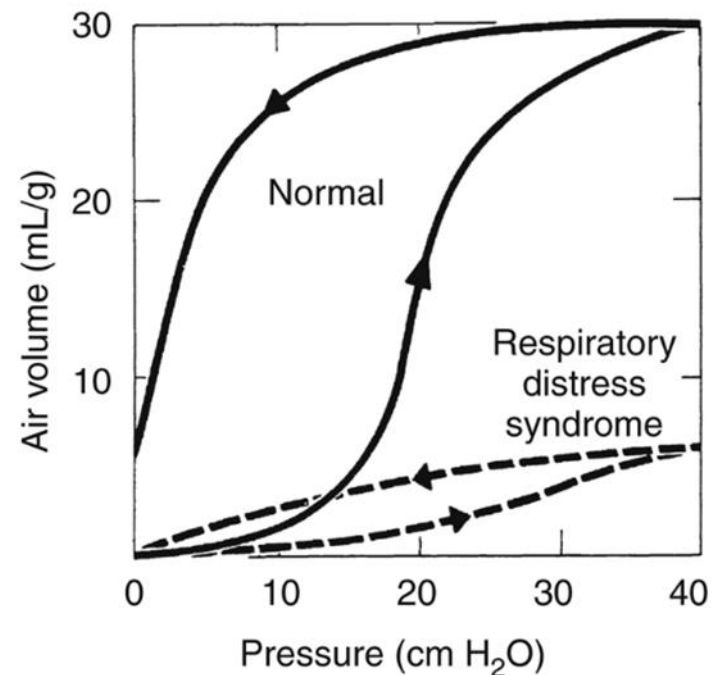
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Respiratory Distress Syndrome

- Previously known as “Hyaline Membrane Disease”.
- Results from insufficiency of the pulmonary surfactant system → low compliance and alveolar collapse





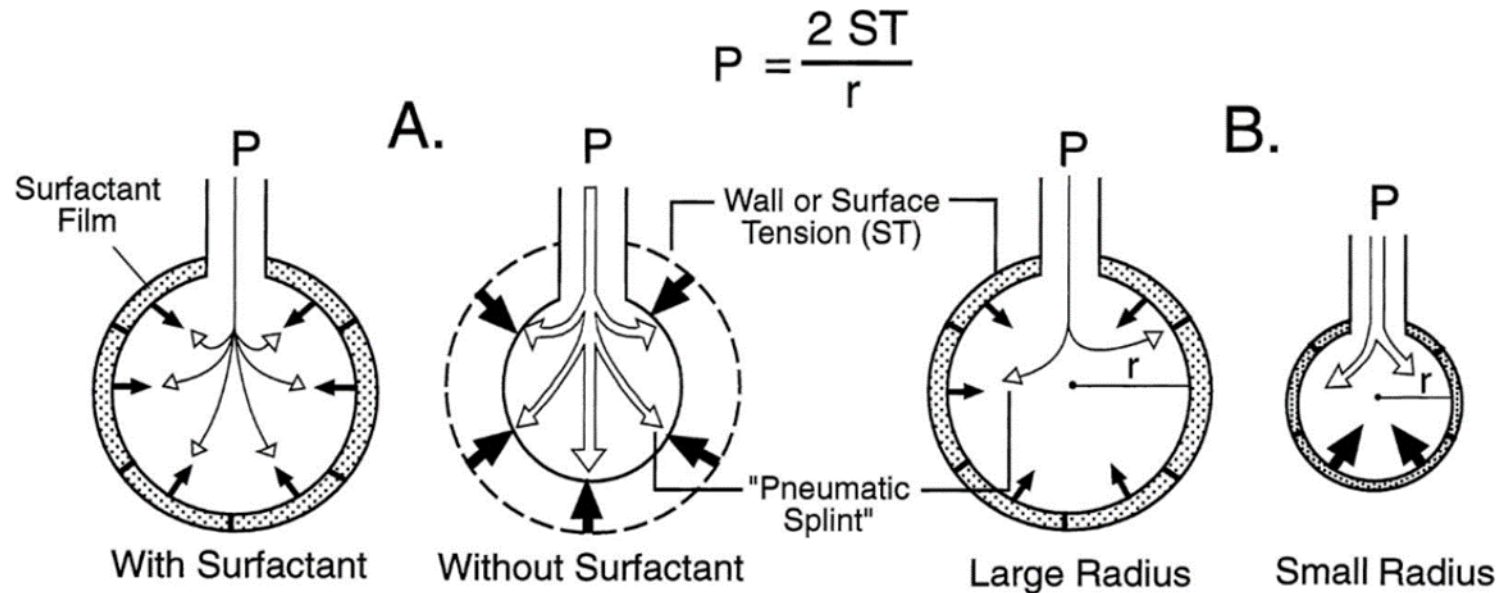
- Primarily a disorder of surfactant deficiency resulting in pulmonary insufficiency from soon after birth.
- Radiographic appearances of “ground glass with air bronchograms” are rarely seen today due to early surfactant therapy and early continuous positive airway pressure (CPAP).
- The aim of management of RDS is to provide interventions to maximise survival whilst minimising potential adverse effects including BPD.
- Is it Just for Preterm babies?

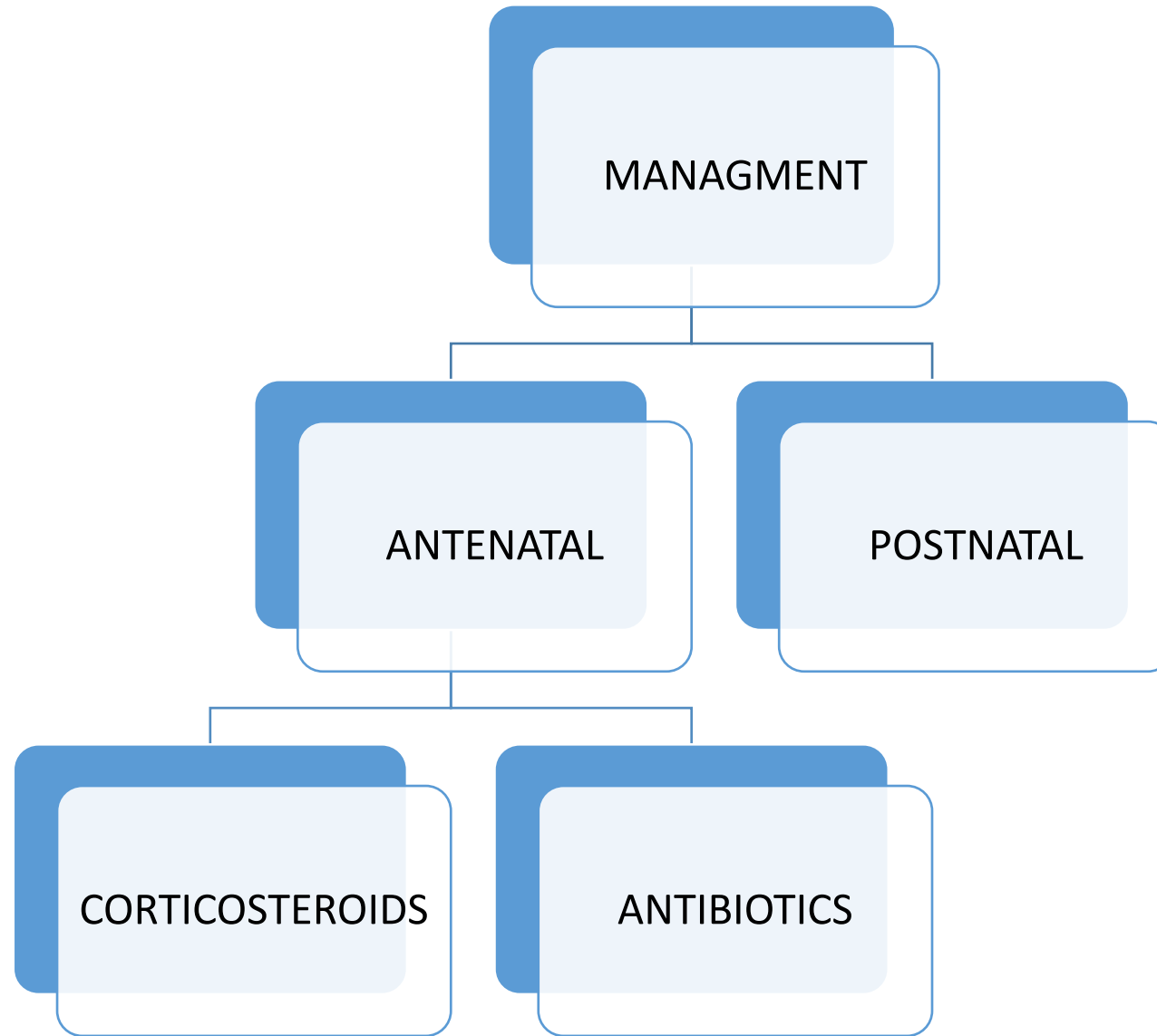


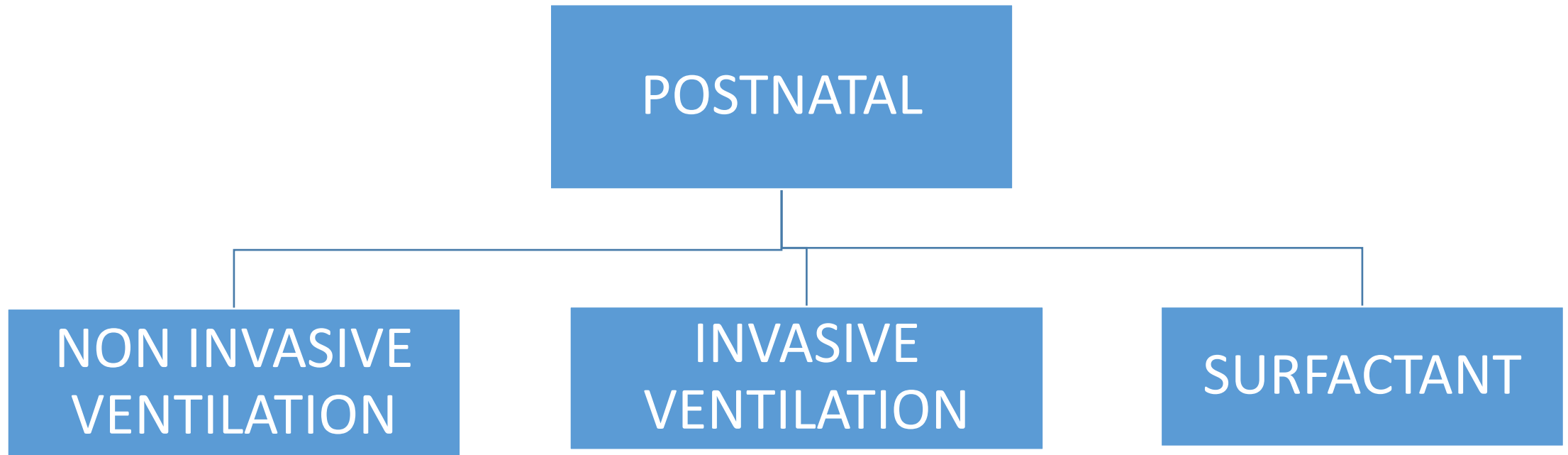
What is surfactant?

- “Surface Active” protein: predominantly phosphatidylcholi, Decreases surface tension of the alveolus.
- If not treated?

LaPlace Formula





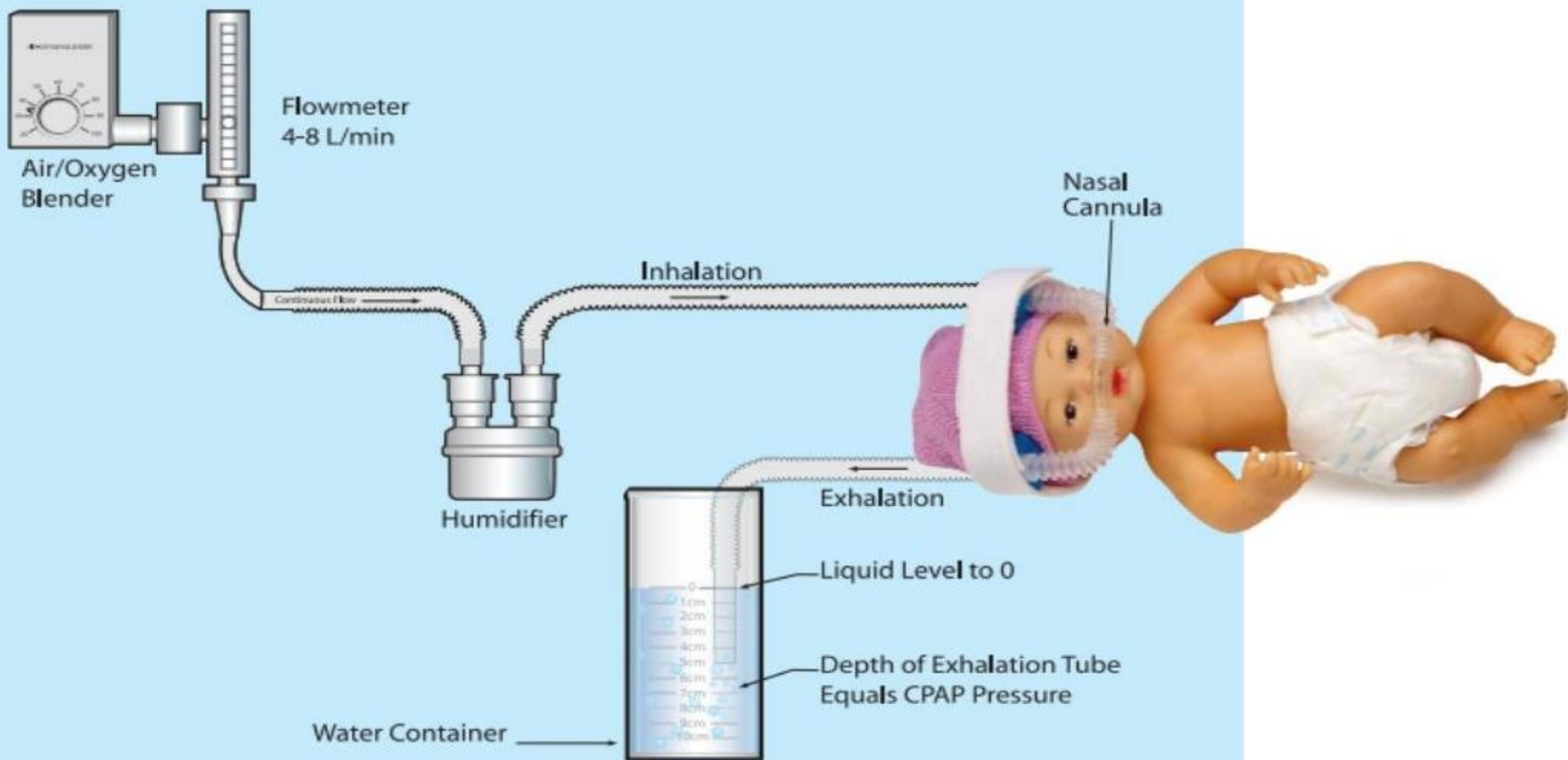




- Prenatal corticosteroid therapy is recommended in all pregnancies with threatened preterm birth before 34 weeks' gestation.
- **Delivery Room Stabilisation-** Delayed “physiological” clamping after lung aeration results in much smoother transition.
- Spontaneously breathing babies should be started on CPAP rather than intubated.
- Provision of CPAP alone is ideal, and routine use of positive pressure breaths should be discouraged.(COIN TRIAL)



Simple Bubble CPAP Setup and Components





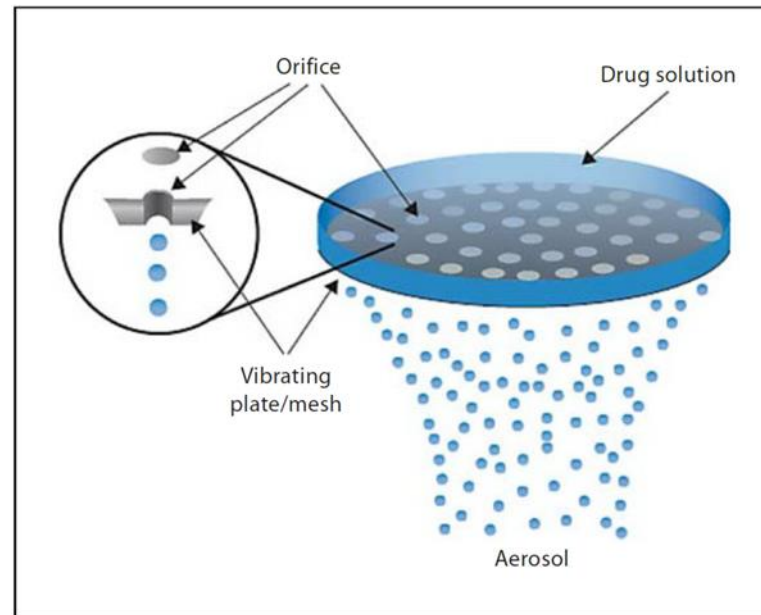
Exogenous Surfactant: Modes of Delivery

- Mode of delivery in placebo trials: intubation for RDS and instillation of fluid suspension via ETT
- Early surfactant (<2hours) shows improved outcomes.
- INSURE: Intubate-SURfactant-Extubate
- LISA: Less Invasive Surfactant Administration/MIST: Minimally Invasive Surfactant Therapy
- LMA: Laryngeal Masked Airway administration

Exogenous Surfactant: Nebulization

- using vibrating perforated membrane nebulizers (>14% lung deposition) which have shown improved oxygenation in a RDS feasibility pilot study.

Vibrating Perforated Membrane





INSURE

Death and/or BPD
RR 0.88
(95% CI 0.76–1.02)
- accompanied with
positive pressure
ventilation and prolonged
mechanical ventilation



Surfactant to spontaneous breathing infants

Death and/or BPD
RR 0.75
(95% CI 0.59–0.94)
- no sedation

LISA

Feeding
catheter 4–5 Fr
+
Magill forceps

MIST

Angiocath 16 G

Laryngeal mask administration

Death and/or BPD?
- only applicable in
larger infants (>1,000 g)

Nebulization

Death and/or BPD?
- no clinical data



Ventilatory Management

- Historically.....
- Problems.....
- Do we need it?



CPAP

- Nasal CPAP is a noninvasive method for applying a constant distending pressure to the lungs via the nostrils.
- CPAP preserves spontaneous breathing, does not require endotracheal intubation, and thus may result in less lung injury than mechanical ventilation.
- CPAP vs Mechanical Ventilation (+/-surfactant) in RDS(COIN TRIAL)
 - CPAP: Reduced incidence of death or BPD
 - CPAP: Decreased need for mechanical ventilation and the use of surfactant



- Prophylactic CPAP vs supportive care (<32wk GA)
 - CPAP: Reduced treatment failure (defined as: recurrent apnea, hypercarbia, or hypoxemia requiring rescue CPAP or mechanical ventilation)
 - No significant reductions in death, BPD, or other secondary outcomes
- CPAP after extubation in preterm infants
 - Compared to oxygen hood, CPAP reduced incidence of apnea, respiratory acidosis, and hypoxemia
 - Did not effect rate of endotracheal reintubation when comparing initial vs rescue CPAP



High Flow Nasal Cannula

- High flow nasal cannulae (HFNC) are small, thin, tapered binasal tubes that deliver oxygen or blended oxygen/air at gas flows of more than 1 L/min in preterm infants
- Functions by O₂ delivery and CO₂ “wash-out” in pharynx, but HFNC systems are capable of creating distending pressure.
- Is it any different?



IPPV

- Noninvasive ventilation during which patients are exposed intermittently to higher levels of airway pressure, along with NCPAP through the same nasal device
- NIPPV vs CPAP for initial management of RDS
 - NIPPV decreased rates of respiratory failure and need for intubation
 - No observed change in risk for death or BPD
 - No evidence of harm reported
- Synchronized NIPPV
- High-Frequency NIPPV eliminates of the need for synchrony by delivering high-frequency small tidal volume respirations

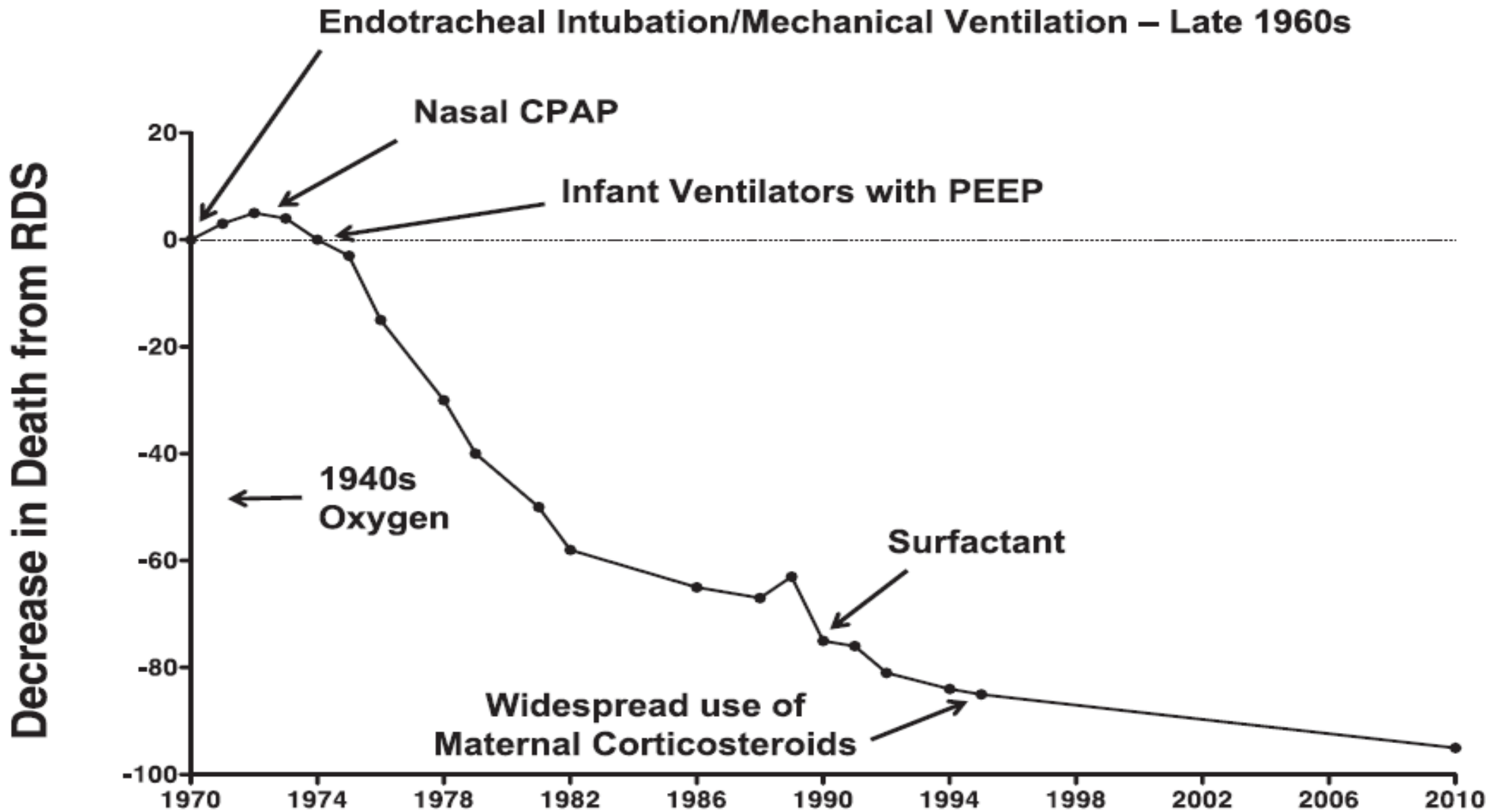


Ventilation

- High tidal volume \longrightarrow lung injury \longrightarrow BPD.
- Low tidal volume , open lung ventilation with high PEEP is also popular.
- Open lung concept – lung ventilation with high PEEP to open the atelectic lung results in over inflation of already open alveoli leading to volutrauma.
- Hence ventilating the lung with PEEP of 6-8cmH₂O, tidal volume of 4ml/kg i.e low tidal volume ventilation is less likely to cause ventilator associated lung injury.



- Despite best efforts some preterms need intubation and mechanical ventilation.
- Aim of treating such neonates is to provide adequate respiratory support with minimum lung injury and efforts for early extubation.
- In today's scenario ideal ventilation is gentilation.....





Thank You