2009b(10)/MAKEUP: Compare & contrast the neonatal respiratory system with the adult

Neonate = 0-28 days post-delivery

Anatomy

Upper Airways
- Narrow nasal passages → 50% of airways resistance
- Large tongue compared to jaw / mouth
- ‘Obligate’ nose breathers → 2° cephalad position of larynx / large tongue

Larynx
- Epiglottis is large, U-shaped, floppy
- Glottis is cephalad → C3-4 position (cf adult C5-6)
- Funnel shaped airway → narrowest point cricoid (sub-glottis) → cf adult larynx is narrowest point → avoid cuffed tubes

Lower Airway
- Short trachea → 4-5cm
- Slightly straighter angle right main bronchus (30° v 45° adult)
  o ↑ risk inadvertent bronchial intubation
- Less bronchial mm → ↓ response to brochodilators, bronchospasm less common cf adults

Lungs
- High chest wall compliance
- Min thoracic component to ventilation → 2° loss of bucket-handle rib movements
- 1° diaphragmatic breathing
  o ↑ splinting of diaphragm with abdominal distension / gastric insufflation
  o Lack of Type I slow oxidative fibres → susceptible to fatigue
- RR 30-40 bpm →→ adult 10-12 bpm
  o Optimal frequency to overcome high chest wall compliance (TV fixed)
- MV 220ml/kg →→ 2 x adult

Spirometry
- Dead Space 2.2 mls/kg (*as with adult)
- TV 7ml/kg (*as with adult)
- Alveolar ventilation 140ml/kg/min (2 x adult)
- FRC 30ml/kg (*as with adult)
- Closing capacity > FRC → small airways closure leading to gas trapping occurs during normal tidal ventilation
  o → V/Q mismatch (0.4) → ↑ venous admixture

Gas Exchange / O2 Consumption
- ↑ Susceptibility to hypoxia
  o O2 consumption 6-7ml/kg/min v 3-3.5ml/kg/min in adult
  o O2 reserve reduced