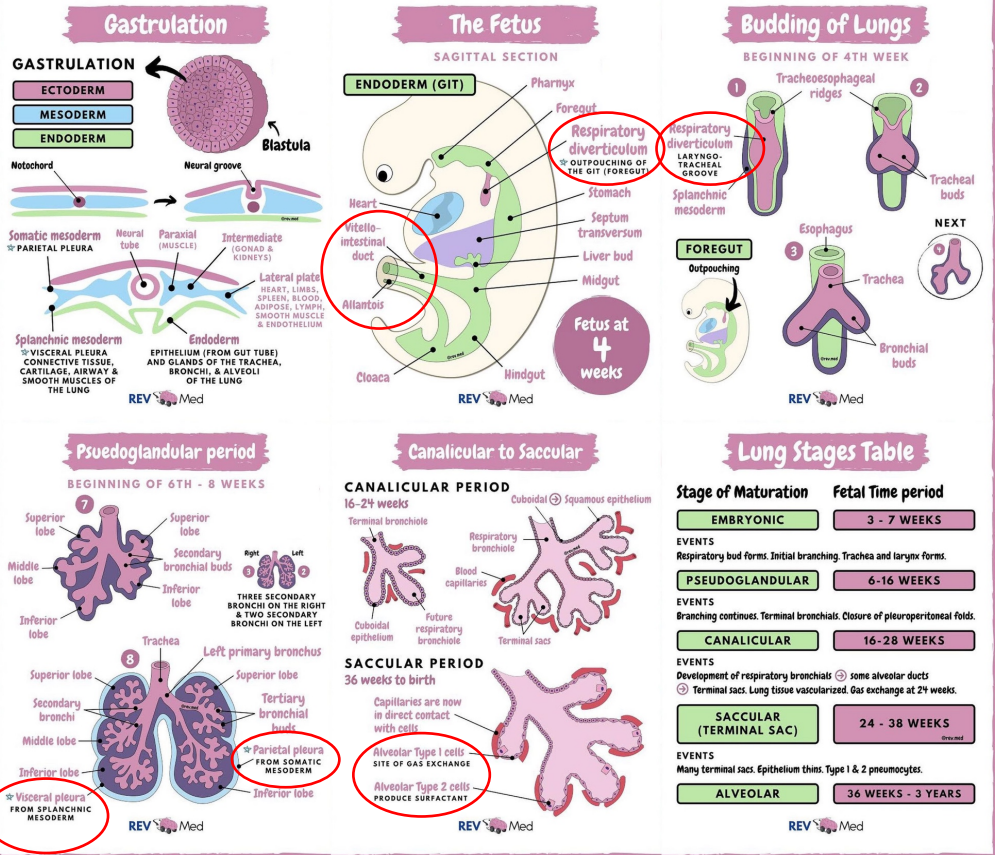
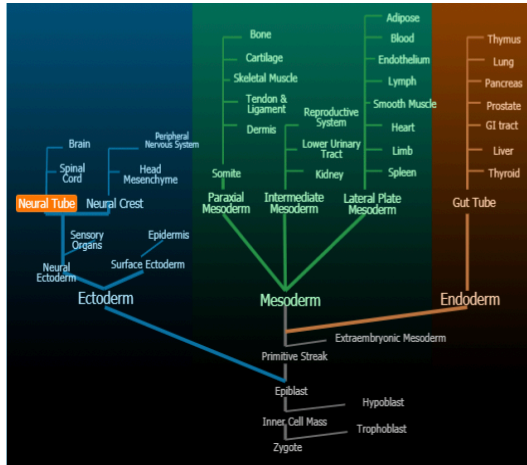


PAEDIATRIC RESPIRATORY

INCOMPLETE fusion of tracheoesophageal folds in 4th week leads to TEF – recurrent pneumonitis



Embryological Defects

DEVELOPMENTAL STAGE	EMBRYONIC	PSEUDOGLANDULAR	CANALICULAR	TERMINAL SAC	ALVEOLAR
Gestation	0-6 weeks	7-16 weeks	17-24 weeks	25-36 weeks	>37 weeks
Structural morphogenesis	Trachea, bronchi	Bronchioles, terminal bronchioles, lung circulation	Respiratory bronchioles, primitive alveoli	Alveolar ducts, thin-walled alveolar sacs, increasing functional type 2 cells ^a	Definitive alveoli and mature type 2 cells ^a
Disease manifestation	Tracheoesophageal fistula, pulmonary sequestration	Bronchogenic cyst, congenital diaphragmatic hernia, congenital cystic adenomatoid malformation	Pulmonary hypoplasia, RDS, BPD, alveolar capillary dysplasia	RDS, BPD	TTN, MAS, neonatal pneumonia, PPHN

BPD=bronchopulmonary dysplasia; MAS=meconium aspiration syndrome; PPHN=persistent pulmonary hypertension of the newborn; RDS=respiratory distress syndrome; TTN=transient tachypnea of the newborn;
^aType 2 pneumocytes are surfactant-producing cells

Risk Factors of Respiratory Distress in the Newborn

RESPIRATORY DISEASE	RISK FACTORS
TTN	Caesarian section, precipitous delivery, late preterm or early term, maternal sedation or medication, fetal distress, gestational diabetes
Neonatal pneumonia	Maternal group B streptococcus carrier, chorioamnionitis, maternal fever, PROM, prematurity, perinatal depression
RDS	Prematurity, gestational diabetes, male infant, multiple gestation
MAS	MSAF, postterm gestation, fetal distress or perinatal depression, African American ethnicity
Pulmonary hypoplasia	Oligohydramnios, renal dysplasia or agenesis, urinary outlet obstruction, premature PROM, diaphragmatic hernia, neuromuscular disorder (loss of fetal respirations/bell-shaped chest)

QUICK QUESTIONS

What is one outcome of the lack of lymphatics in Reinke's space?

- Tumours don't metastasise

Difference between nasal cavity respiratory and olfactory epithelium

- No goblet cells
- No cilia

Do bronchioles have hyaline cartilage?

- No

What is the difference between terminal and respiratory bronchioles?

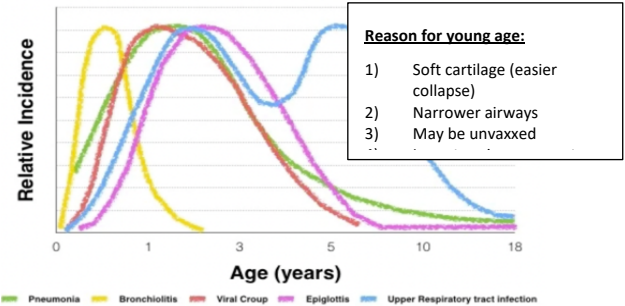
- Respiratory bronchioles have alveoli for gas exchange

RESP H+E


Resp. Hx

- **Age important** (< 3/12 most vulnerable to apnoea)
- **Feeding + drinking Hx:** sig. changes?
- **Activity levels + sleeping:** Quiet or clingy
- **PMHX:**
 - Pattern of wheeze (assoc. w/ bronchitis) OR
 - FHx of atopy (eczema, asthma, hayfever)
- **Red-flags?**
 - fevers,
 - pre-term, NICU,
 - Hx of apnoea, CV or resp. diseases
 - parents report sig. change
 - stridor at rest
 - quiet chest

Age distribution of acute respiratory infections in children




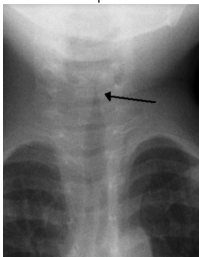
Exam (ABCDE)

Inspect	<div><div><div>1) ?Level of alertness – interactive/playful → agitated → lethargic/tired</div><div>2) Check for any vomit → aspiration pneumonia?</div><div>3) ?Posture – propped up (easier to breathe) or lying down</div><div>4) ?Ability to speak – normal → short sentences → cannot speak or complete sentences</div><div>5) Body / facial dysmorphism</div></div><div><p>Petechiae due to heavy chronic cough</p></div></div>				
Hands	<div><div>Clubbing in Children<ul style="list-style-type: none">• Hereditary clubbing• Cyanotic heart disease• Infective endocarditis• Cystic fibrosis• Tuberculosis• Inflammatory bowel disease• Liver cirrhosis</div><div><table><tr><th>URTI</th><th>LRTI</th></tr><tr><td><ul style="list-style-type: none">• Coryza• Wheeze• Stridor</td><td><ul style="list-style-type: none">• Productive cough• Crackles• ↓ air-entry bilaterally</td></tr></table></div></div>	URTI	LRTI	<ul style="list-style-type: none">• Coryza• Wheeze• Stridor	<ul style="list-style-type: none">• Productive cough• Crackles• ↓ air-entry bilaterally
URTI	LRTI				
<ul style="list-style-type: none">• Coryza• Wheeze• Stridor	<ul style="list-style-type: none">• Productive cough• Crackles• ↓ air-entry bilaterally				
VITALS	<div>Check with child's age to determine if tachycardic, tachypnoeic</div> <div><div>➤ Tachypnoea → late sign (bradypnea) → resp. arrest</div><div>➤ Detect hypoxia early (i.e. before it fall below 90% -- prevent decompensation)<ul style="list-style-type: none">◦ Supp. oxygen given if sats < 92% → NP, HM, NRBM, CPAP</div></div>				
WoB	<div><ul style="list-style-type: none">• Rib recession (mild-mod-severe) – tracheal tug, supraclavicular, sternal (=severe), intercostal, subcostal<ul style="list-style-type: none">◦ Younger children show recession more frequently, due to their softer chest walls• Accessory muscles → head bobbing (SCM = severe), abdominal breathing, nasal flaring</div>				
Abnormal airway noise	<div><ul style="list-style-type: none">• Coryza (runny nose) – common in URTIs, bronchiolitis and well infants!• Wheeze (exp.) – narrowed lower airways during expiration – asthma, bronchiolitis, viral-induced wheeze• Stridor (insp. + exp.) – upper airway obstruction<ul style="list-style-type: none">◦ Acute stridor → croup (+ hoarseness), anaphylaxis, FB inhalation◦ Chronic stridor → laryngomalacia, subglottic stenosis◦ THE SOFTER THE STRIDOR – THE WORSE THE NARROWING• Grunting (exhaling while glottis is partially closed creating PEEP) OR crying in prolonged expiration – closed glottis to keep alveoli open - infants with severe respiratory distress• Hot potato voice = laryngitis</div>				
	<div><ul style="list-style-type: none">• Cushingoid == steroid usage• Nasal flaring/grunting ➔ increased WoB ➔ congenital cyanotic HD or HF• Micrognathia (undersized jaw) ➔ genetic issue (e.g. Marfan, Noonan, Pierre-Robin),• Ears = tympanic membrane (otitis media – URTi), hearing loss (primary ciliary dyskinesia)• Throat = tonsillitis, pharyngitis, quinsy (trismus), EBV (white exudates), poor dentition (caries)</div>				
Auscult	<div><ul style="list-style-type: none">• Audible wheeze (e.g. croup, viral-induced wheeze, bronchiolitis)• WET Crepitations (secretions = infection) ➔ RHONCHI• Bronchial breathing (consolidation due to pneumonia) – coarse sound</div>				

Ix

- VITALS, FIO₂,
- UA (nephrotic, subacute bacterial endocarditis)
- VBG
- CXR
- ECG (3-lead)
- Sputum sample
- PEFR + inhaler technique
- Measure + plot height and weight on growth chart

Respiratory Scenarios

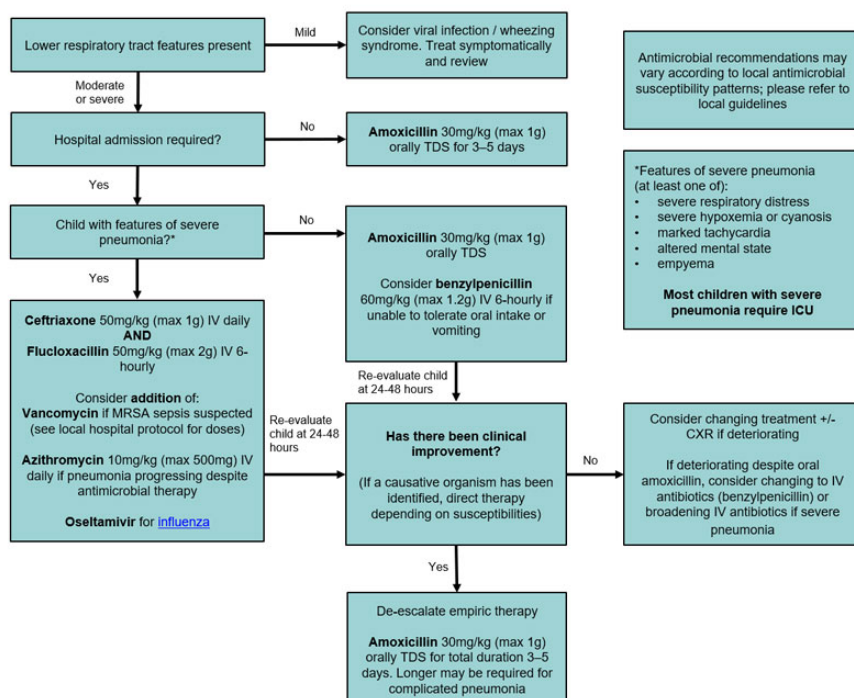
<ul style="list-style-type: none"> 7 y.o. boy w/ 9/52 cough Persistent fevers No sig. pMx A – patent B – mild increased WOB C – CR < 2 sec, strong pulse 	<ul style="list-style-type: none"> 18/12 y.o. girl waking up with sudden SOB Brought in by mother Assoc. w/ barking cough +/- stridor Salbutamol ineffective Intercostal and subcostal recession present 	<ul style="list-style-type: none"> Father brings in 10/12 daughter with cough and irritable 3-day Hx of runny nose and cough Bronchodilator ineffective 	<ul style="list-style-type: none"> 21-day infant presented cyanotic at home recovered in 30s after stimulation by mother 																																														
<p>TRIAGE SHEET</p> <p>Triage Group: Emergency TPH Triage Category: 3 Triage Family Present: Father Triage Date/Time: 25/12/2020 22:31 AEDT Triage Visit Reason: Respiratory - Breathing Problem Espinosa, Carla I</p> <p>Type of Visit: Emergency Presentation Triage Author: Espinosa, Carla (RN) Respiratory Rate: 40 brpm Oxygen Saturation: 90% Room Air or Oxygen at Triage: Room Air Infectious Contact: No Peripheral Pulse Rate: 130 BPM Immunisations up to Date: Yes Temperature, Axilla: 38.9 DegC Pain: Assessed</p>	<p>DCP Generic code: Triage Group: Emergency TPH Triage Category: 2 Triage Family Present: Mother Triage Date/Time: 25/04/2020 02:02 AEDT Triage Visit Reason: Respiratory - Breathing Problem Espinosa, Cc</p> <p>Type of Visit: Emergency Presentation Triage Author: Espinosa, Carla (RN) Respiratory Rate: 54brpm Oxygen Saturation: 97% Room Air or Oxygen at Triage: Room Air Infectious Contact: No Peripheral Pulse Rate: 155 BPM Immunisations up to Date: Yes Temperature, Axilla: 37 DegC Pain: Assessed</p>	<p>Examination:</p> <ul style="list-style-type: none"> 38.7 deg fever Wheeze Crepitations throughout both lung fields 	<p>TRIAGE SHEET</p> <p>DCP Generic code: Triage Group: Emergency TPH Triage Category: 3 Triage Family Present: Mother Triage Date/Time: 21/01/2020 10:18 AEDT Triage Visit Reason: Respiratory - Breathing Problem Espinosa, C</p> <p>Type of Visit: Emergency Presentation Triage Author: Espinosa, Carla (RN) Respiratory Rate: 48brpm Oxygen Saturation: 95% Room Air or Oxygen at Triage: Room Air Infectious Contact: No Peripheral Pulse Rate: 136 Immunisations up to Date: No Temperature, Axilla: 37 DegC Pain: Assessed</p>																																														
<p>Investigations:</p> <ol style="list-style-type: none"> FBC, EUC, LFT CRP blood culture M/C/S +/- sputum Nasopharyngeal swab CXR 	<p>DDx:</p> <ul style="list-style-type: none"> Croup (parainfluenza) - laryngotracheobronchitis Asthma (?wheeze) Anaphylaxis (?urticaria, trigger) Inhaled foreign body (?airway, choking) Bacterial tracheitis (?very sick) Epiglottitis (?HiB vax, ?drooling, sitting forward - tripodding) 	<p>DDx:</p> <ul style="list-style-type: none"> Bronchiolitis (RSV induced airway inflammation) Viral induced wheeze Asthma (no wheeze & never diagnosed in infants) Resp. distress (Steroids used in pre-term) Pertussis (immunised?) Pneumonia (no wheeze) Chronic lung disease 	<p>ISBAR: This is 21 day old baby Jag. He is having apnoea & presented cyanotic at home. While asleep, he became cyanotic and bradycardic to 48. I have ventilated him for about 30 s. He has good chest movements and pulse has recovered to over 100. The bag isn't connected to O2 yet & need resuscitation trolley</p>																																														
<p>What's next?</p> <ol style="list-style-type: none"> Oxygen (nasal prongs, hudson mask) – no sig. PMHx but low Sats ?Nebulised adrenaline (airway obstruction) ?Salbutamol (wheeze) ?Cannulation – fluid bolus, meds ?paracetamol – fever to avoid tachycardia, tachypnoea  <ul style="list-style-type: none"> LLL = pneumonia mycoplasma pneumoniae as 1/3rd of school aged children = macrolide S. pneumoniae = most common CAP → amoxicillin 	<p>Rx for croup cough:</p> <ol style="list-style-type: none"> Call for senior help → discuss Mx esp. to prepare for deterioration → anaesthetics, intubation To treat airway obstruction: Nebulised adrenaline = more vasoconstriction mainly (0.5mg/kg – MAX 5ML) Steroids = reduce airway swelling <ul style="list-style-type: none"> Oral = dexamethasone 0.3mg/kg Inhaled = budesonide <ul style="list-style-type: none"> Unconscious → airway adjunct Low O2 sats → oxygen Unresponsive to Rx → CXR  <ul style="list-style-type: none"> Closure of trachea (steeple sign) 	<p>Rx/Mx:</p> <ul style="list-style-type: none"> No – no need medical intervention at this stage Usu. gets worse for 1-3 days before improving Feeding plan: offer half usual formula amount, twice as often Close contacts: esp. children at home (as RSV highly contagious) Reassure stressed parents <p>Other considerations:</p> <ul style="list-style-type: none"> Hydration? – poor cap refill time, tachycardia, XS wet nappies Oxygenation? – not needed as saturating well 	<p>DDx:</p> <ul style="list-style-type: none"> Bronchiolitis Infection (pertussis, pneumonia) GBS sepsis ICH Meningitis Gastroenteritis <p>Investigation for apnoea</p> <ul style="list-style-type: none"> FBC EUC – arrhythmia, seizures CRP – ?sepsis Nasopharyngeal aspirate (can be assoc. w/ bronchiolitis, whooping cough) Suprapubic urine LP CXR (exc. pneumonia) 																																														
<p>Regular medicines</p> <p>Year 20 PRESCRIBER MUST ENTER administration times</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Medicine (print generic name)</th> <th>Route</th> <th>Dose</th> <th>Frequency and NOW enter times</th> </tr> </thead> <tbody> <tr> <td>25/12</td> <td>Benzylpenicillin</td> <td>IV</td> <td>1000mg</td> <td>Q6H</td> </tr> </tbody> </table> <p>Indication: Pneumonia Dose calculation (eg, mg/kg per dose): 50mg/kg/dose</p> <p>Weight: 3-10kg Method A: Daily requirements (mL/24hours): 100mL/kg Method B: Hourly IV requirements (mL/hours): 4mL/kg</p>	Date	Medicine (print generic name)	Route	Dose	Frequency and NOW enter times	25/12	Benzylpenicillin	IV	1000mg	Q6H	<p>As per manufacturer's guidelines</p> <p>First prescriber to print patient name and check label on</p> <p>DOCTOR: Print DOCTOR Date: 25/4/20 Weight (kg): 12kg Height (cm): 8</p> <p>Paediatric Medication chart number of</p> <p>Facility/service: Ward/unit:</p> <p>Additional charts: <input type="checkbox"/> IV fluid <input type="checkbox"/> BGL/insulin <input type="checkbox"/> Acute pain <input type="checkbox"/> Palliative care <input type="checkbox"/> Chemotherapy</p> <p>Once only medicines</p> <table border="1"> <thead> <tr> <th>Date prescribed</th> <th>Medicine (print generic name)</th> <th>Route</th> <th>Dose</th> <th>Datetime to be given</th> <th>Signature</th> <th>Print your name</th> <th>Dose calc: mg/kg per dose</th> <th>Gl: t</th> </tr> </thead> <tbody> <tr> <td>25/4/20</td> <td>Adrenaline 1:1000</td> <td>NEB</td> <td>5mL</td> <td>STAT</td> <td></td> <td>Doctor</td> <td>0.5mL/kg</td> <td></td> </tr> <tr> <td>25/4/20</td> <td>DEXAMETHASONE</td> <td>PO</td> <td>3.6mg</td> <td>STAT</td> <td></td> <td>Doctor</td> <td>0.3mg/kg</td> <td></td> </tr> </tbody> </table> <ol style="list-style-type: none"> Observe for at least 4 hrs after NEB adrenaline Discharge ONLY if families live far away or have poor transportation options Repeat NEB adrenaline ONLY if stridor at rest or increase WoB (may need to admit to ICU) Repeat Oral steroids PM to reduce swelling and minimise risk of recurrence 	Date prescribed	Medicine (print generic name)	Route	Dose	Datetime to be given	Signature	Print your name	Dose calc: mg/kg per dose	Gl: t	25/4/20	Adrenaline 1:1000	NEB	5mL	STAT		Doctor	0.5mL/kg		25/4/20	DEXAMETHASONE	PO	3.6mg	STAT		Doctor	0.3mg/kg		<p>DOCTOR: Print DOCTOR Date: 21/1/20 Weight (kg): 3.8kg Date weighed: 21/1/20</p> <p>Regular medicines</p> <p>Year 20 PRESCRIBER MUST ENTER administration times</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Medicine (print generic name)</th> <th>Route</th> <th>Dose</th> <th>Frequency and NOW enter times</th> </tr> </thead> <tbody> <tr> <td>21/1/20</td> <td>Azithromycin</td> <td>PO</td> <td>38mg</td> <td>Daily</td> </tr> </tbody> </table> <p>Indication: Pertussis Dose calculation (eg, mg/kg per dose):</p> <p>Nb: Jag is 3.8kg → so correct dose is 38mg, but can be rounded up to 40mg for ease of administration</p> <ul style="list-style-type: none"> Pertussis = check for sick contacts → notifiable disease Pertussis = presents as apnoea in children + cough (lasts 100 days) Macrolide ABx for pertussis (but Vaccine preventable) 	Date	Medicine (print generic name)	Route	Dose	Frequency and NOW enter times	21/1/20	Azithromycin	PO	38mg	Daily
Date	Medicine (print generic name)	Route	Dose	Frequency and NOW enter times																																													
25/12	Benzylpenicillin	IV	1000mg	Q6H																																													
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25/4/20	DEXAMETHASONE	PO	3.6mg	STAT		Doctor	0.3mg/kg																																										
Date	Medicine (print generic name)	Route	Dose	Frequency and NOW enter times																																													
21/1/20	Azithromycin	PO	38mg	Daily																																													

Respiratory Illness: Stridor

	Foreign Body Inhalation	Croup	Epiglottitis	Laryngomalacia
PP		URTi causing larynx oedema due to pathogen (usu. parainfluenza virus) Others - influenza, adenovirus, RSV, diphtheria	Haemophilus Influenza Type B	Partial airway obstruction due to softer supraglottic larynx flopping across airway during inspiration
RF		6 months to 2 years	Unvaxxed Foreign traveller child	Affects infants (esp. 6/12 yo)
Sx	<p>HIGH-RISK FOREIGN BODIES</p> <ol style="list-style-type: none"> 1) BUTTON batteries in oesophagus 2) Large objects (>6cm long or 2.5cm wide) 3) 2 magnets OR 1 magnet + 1 metal object 4) Sharp object 5) Toxic objects (e.g. lead) 	<ul style="list-style-type: none"> Increased WoB "Barking cough" – clustered Hoarse voice Stridor Low grade fever 	<ul style="list-style-type: none"> Sore throat - odynophagia Stridor Dysphonia Drooling + Tripoding position - sitting forward Scared/quiet child Unwell septic appearance 	<ul style="list-style-type: none"> Chronic inspiratory stridor (intermittent) → worse while feeding, upset or URTi
Comp.		Complete airway obstruction – death	Complete airway obstruction – death Epiglottic abscess	None
Ix		None	CXR = lateral neck (thumbprint sign) *helps to exclude FB	None
Mx		<p>Self-limiting within 48 hrs Conservative Mx (home)</p> <ul style="list-style-type: none"> Rest and analgesia Isolate and hand hygiene <p>If unwell, breathing difficulty</p> <ol style="list-style-type: none"> 1) Admit 2) 1mg/kg pred PO or 150mcg/kg dexamethasone 3) FiO2 4) Neb adrenaline 0.5mL/kg (if unresponsive) 5) I+V 	<p>Alert senior paed and anaesthetists Keep child calm – NO exam</p> <ol style="list-style-type: none"> 1) Secure airway – preparations for intubations just in case → ICU most resolve without intubation 2) If airway secure → IV ABx (ceftriaxone) + steroids (dexamethasone) 	<p>Self-resolves as larynx matures</p> <p>DDx:</p> <ul style="list-style-type: none"> Subglottic stenosis
F/U		GP follow-up	National immunisation register	

Respiratory Illness: Community Acquired Pneumonia

PP	Sx	Ix
<ul style="list-style-type: none"> Infected lung tissue causing inflammation and sputum Bacterial – streptococcus (most common) GAS = pyogenes GBS, Hib – newborns Viral – RSV (most common viral cause) parainfluenza, influenza Atypical – mycoplasma (extra-pulm issue = erythema multiforme) 	<ul style="list-style-type: none"> Productive wet cough High grade fever Resp. distress (↑RR, ↑HR, +WoB) Delirium (confusion) Focal coarse crackles Dull percussion notes (tissue collapse) 	<ul style="list-style-type: none"> NP Swab Sputum culture (M/C/S) <p>X-RAY Indications:</p> <p>Signs of severe CAP</p> <ul style="list-style-type: none"> CXR – focal consolidation S. aureus = has typical findings of pneumatoceles and consolidations in multiple lobes



When to admit?

1. **Mod-severe WOB, fever, ++RR, apnoea or ARDS**
2. **FiO2 needed** if saturations are <90%
3. **Fluid hydration needed** → If giving NG or IV fluids as maintenance therapy, limit fluids to 2/3rds to avoid fluid overload, with regular clinical review of fluid status
4. **Abx needed** → Seek local guidelines for ABx (e.g. oral Amoxil vs IV benpen)

Recurrent LRTi

Recurrent admission needing ABx

- **FBC**
- **CXR** – structural abnormality in chest or scarring from infections
- **Serum Ig** – ?antibody deficiency
- **Serum IgG** – check immune status (pneumococcus, haemophilus) → may not be able to convert IgM into IgG (Ig class switch recombination deficiency)
- **Sweat Test** – ?CF
- **HIV test** – ?if mum's status unknown or positive
- **Consider** – trachea-oesophagea fistula (esp. if very young)

Respiratory Illness: Wheeze

Clinical Pearl

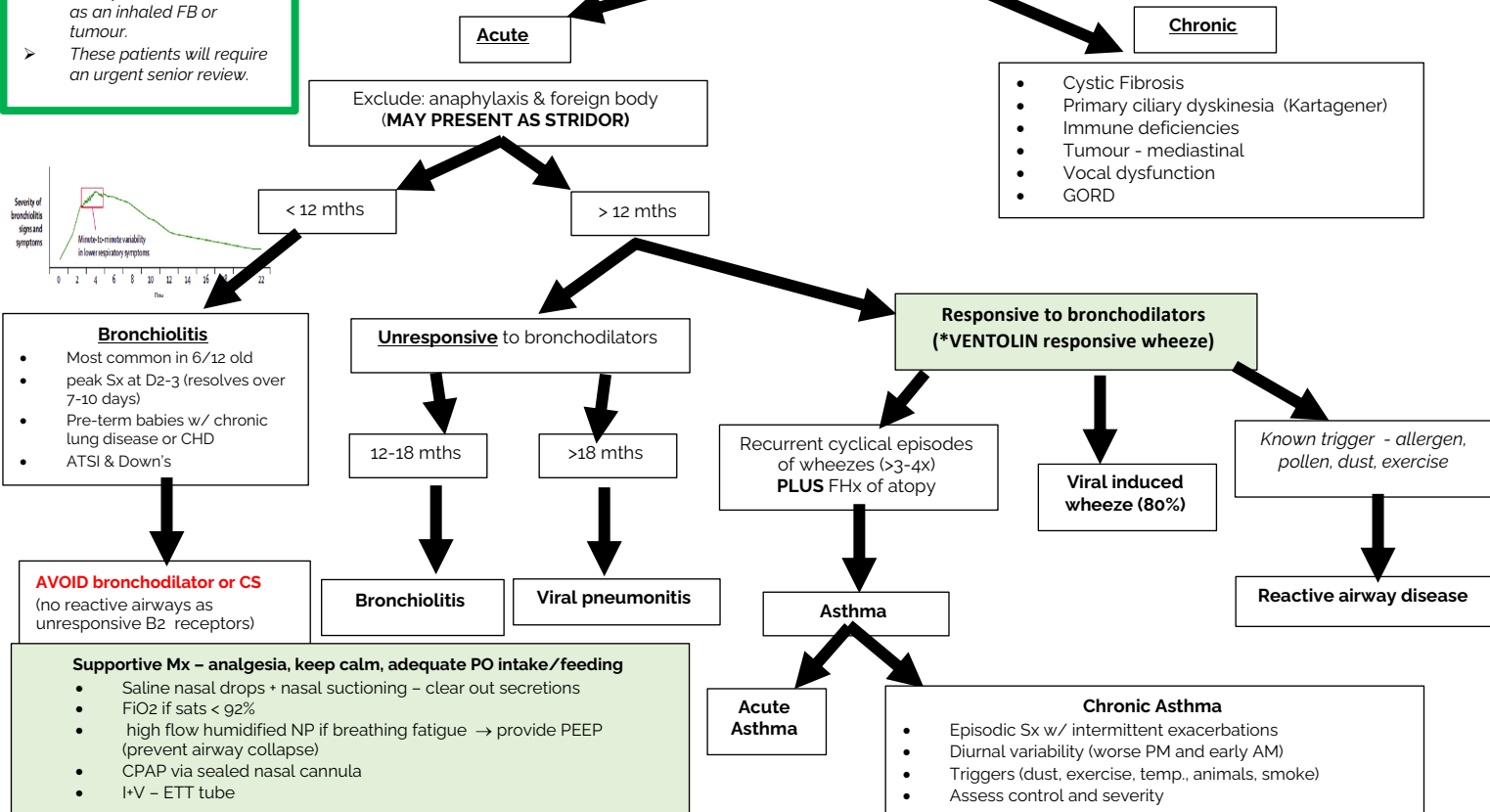
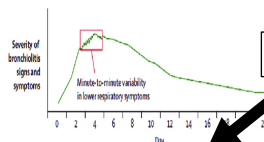
- **Neither** viral-induced wheeze or asthma cause a focal wheeze.
- Beware of a **focal wheeze** → ? a focal airway obstruction such as an inhaled FB or tumour.
- These patients will require an urgent senior review.

Pathophysiology of "wheezy" illness

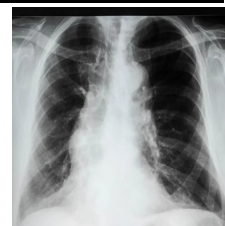
1. Swelling/oedema → air trapping (worsened due to narrow airways of child)
2. Mucus secretion
3. Reactive component (only)

HANDOVER POINTS (ISBARI)

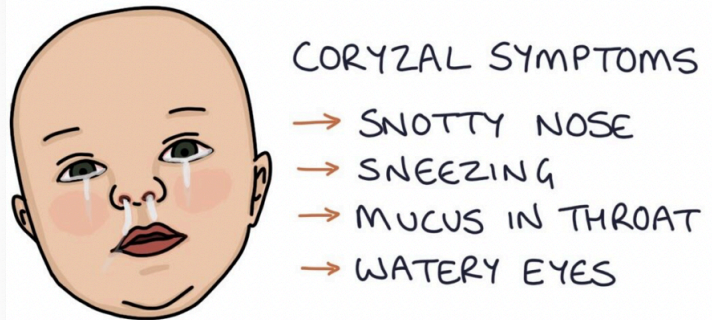
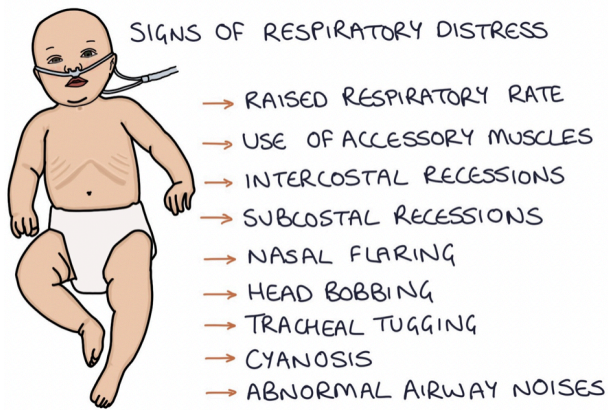
- X-asthma – stable/unstable
- Meds – SABA, SAMA, ICS, Oral CS
- Hx of asthma, atopic features
- Previous hosp. ICU Ax
- Current meds – freq. regime
- O/E
- Plan – weaning, O2 supp. + asthma action plan



Mild	Moderate	Severe	Life-threatening
Wheeze	<ul style="list-style-type: none"> Wheeze (stethoscope) ↑ WoB ↓ sats – > 92% RR < 30 (>5yo) RR < 40 (< 5yo) 	<ul style="list-style-type: none"> Incomplete sentences Audible wheeze + grunting ↑ WoB – worse PEFR < 50% ↓ sats – <92% , RR > 40 Tachycardia (HR) <ul style="list-style-type: none"> > 125 (over 5's) > 140 (under 5's) 	<ul style="list-style-type: none"> PEFR < 33% Sats < 92% Cyanosis hypoTN exhaustion - Tripoding - stationary Silent chest tachycardia
Ventolin D/C home	D/C home	T/F hospital	T/F ICU
<p>If unsure it is asthma – treat as anaphylaxis</p> <p>Admit</p> <p>FiO2 (2L/min nasal prongs)</p> <p>(1) Neb Salbutamol 100mcg (burst)</p> <p>(2) Ipratropium Bromide (250mcg)</p> <p>(3) Prednisolone (RediPred) (2mL/kg oral fluid) (max 60mg) OR IV methylpred if vomiting (1mg/kg qid)</p> <p>A/E = tremor, palp, met. acidosis, severe hypok</p> <p>A/E = Anisocoria</p> <p><6yo</p> <p>>6yo</p> <p>6x puff</p> <p>12x puff</p> <p>4x puff</p> <p>8x puff</p> <p>Every 20min x3</p> <p>Every 20min x3</p>			
<p>ONCE HAEMODYNAMICALLY STABLE:</p> <ol style="list-style-type: none"> 1. TF to wards when clinically well and Ventolin needed every 1-2 hours → Stretch Ventolin to 3 hrly <ul style="list-style-type: none"> MORE freq than every hr → ED → activate life-threatening protocol 1-3 hrly → Ward + O2 ventilation > 3hrly → home 2. Asthma action plan <ul style="list-style-type: none"> Weaning pred dose (1mg/kg daily for further 1-2 days) Stretch Ventolin (from 3 hourly to PRN) Copy plan to GP, school and family 3. Inhaler technique and education (consider spacer + preventer usage) 4. Advise on avoiding triggers – pollen, dust, exercise, 5. Follow up w/ GP in 1 week 			
<p>UNRESPONSIVE to 1st line therapy</p> <p>ESCALATE CARE (consultant, notify anaesthetics and ICU)</p> <p>IV access</p> <p>IV MgSO4 (SMC relaxant)</p> <p>IV theophylline (PDE4i) - aminophylline faster acting</p> <p>CPAP → BiPAP → I+V (aim to splint airway open)</p> <p>*If need to intubate = bad prognosis</p>			
<p>Investigations – ABG</p> <ul style="list-style-type: none"> Respiratory acidosis (CO2 retention due to airway collapse) T2RF – as hypoxia also present <p>Investigations – CXR</p> <ul style="list-style-type: none"> Flattened rib – able to see posterior ribs Elongated heart due to air trapping in enlarged lungs Patchy opacification Peri-bronchial cuffing (swollen bronchioles) <p>Investigations – asthma: INO gold standard test!</p> <p>Clinical diagnosis</p> <ul style="list-style-type: none"> Spirometry (if > 5yo) – bronchodilator reversible Direct bronchial challenge with methacholine Fractional exhaled nitric oxide 			



IMPORTANT SIGNS OF RESPIRATORY DISTRESS



Assess Bronchiolitis severity & Management:

A	Behaviour	Normal Talks normally	Some / intermittent irritability Reduced or poor feeding	Increasing irritability and / or lethargy Cannot feed
B	Tachypnoea Signs of RDS ↓Sats	Normal / slight	Increased <ul style="list-style-type: none"> ➢ Head bobbing ➢ Nasal flaring ➢ RR > 50 ➢ Sats – slight increase 	Marked increase or decrease <ul style="list-style-type: none"> ➢ Stridor at rest ➢ Grunting (self-generated PEEP) ➢ RR > 60 ➢ Sats < 90% RA (decompensated)
C	<ul style="list-style-type: none"> • HR • BP • Pallor • hydration 	Normal	MILD Tachycardia Pallor Dry MM + reduced UO	HypoTN Pale/mottled Reduced skin turgor
D	Activity	Awake	Wake w/ stimulation	Reduced LOC + focal seizures
		MILD	MODERATE	SEVERE
	Do I admit?	<ul style="list-style-type: none"> • D/C • Admit (if RF present) 	<ul style="list-style-type: none"> • Admit → D/C, after period of observation (discuss with senior consultant) 	<ul style="list-style-type: none"> • Admit → organize early transfer to children's hospital/PICU
	Vital signs + AVPU/GCS	<ul style="list-style-type: none"> • 2 readings every 4 hrs • ED triage 	<ul style="list-style-type: none"> • 1-2 Hourly (not continuous) 	<ul style="list-style-type: none"> • Hourly with continuous CVS/RESP monitor (esp. sats)
	Hydration / nutrition	<ul style="list-style-type: none"> • Small frequent feeds 	<ul style="list-style-type: none"> • If not feeding adequately (<50% over 12 hours), administer NG hydration 	<ul style="list-style-type: none"> • If not feeding adequately (<50% over 12 hours), or unable to feed, administer NG hydration
	O2 Therapy (FiO2)	<ul style="list-style-type: none"> • Nil 	<ul style="list-style-type: none"> • Sats < 90%, → oxygen to maintain ≥90% • Discontinue if not requiring for 2hrs 	<ul style="list-style-type: none"> • Administer O2 to maintain sats ≥90%
	Respiratory support	<ul style="list-style-type: none"> • Nil 	<ul style="list-style-type: none"> • 1st line = nasal prong (2L/min) • 2nd line (if fails) = High flow nasal cannula (HFNC) 	<ul style="list-style-type: none"> • HFNC or CPAP
	Disposition / escalation	<ul style="list-style-type: none"> • Med review if RF present or child deteriorates after D/C 	<ul style="list-style-type: none"> • Admit based on logistics/geography, phase of illness (peak?) & RF 	<ul style="list-style-type: none"> • ICU review/admission or HDU if: <ul style="list-style-type: none"> • Deteriorating → persistent desaturations + recurrent apnoea • has risk factors
	Parental education	<ul style="list-style-type: none"> ➢ Educate parents about expected course of illness ➢ safety net → return if worsening symptoms and inability to feed adequately) 		

Case Scenarios – 9/12 old w/ bronchiolitis:

	Scenario	Mx	What to do?
1	RR 70 Sats 88 mod ↑WoB HR 180 CRT 4 WN 0/10	Admit	High FiO2 Hydrate – oral vs NGT
2	RR 40 Sats 96 mild ↑WoB HR 140 CRT 2 WN 8/10	Admit (if day 2) D/C (if day 6)	<ul style="list-style-type: none"> ➢ If day 2 = borderline admission (?FU in PARC → admit if ↑WoB and ↓feeding) ➢ If day 6 = educate parents for safety netting (admit if tracheal tug, intercostal recession, febrile, ↑WoB, sicker child)
3	RR 60 Sats 91 mod ↑WoB HR 170 CRT 42WN 6/10	Admit (if day 3)	FiO2 (aim for > 92%)
4	RR 50 Sats 94 mild ↑WoB HR 180 CRT 4 WN 4/10	Admit (conservative)	TOF (maintenance + resus) → delivered via: <ul style="list-style-type: none"> ➢ Oral (if tolerated via syringe using hydrolyte) ➢ NGT (able to provide BMS formula, calories, fats and proteins) <ul style="list-style-type: none"> ○ Risk of aspiration pneumonia ➢ IV cannula (last resort) → able to provide fluids, take bloods <ul style="list-style-type: none"> ○ Painful, cannot provide formula, infection risk
5	RR 60 Sats 93 mild-mod ↑WoB HR 160 CRT 2 WN 5/10	D/C (if happy) Admit (if miserable)	What causes irritability/miserable? → CO2 retention → Acidosis <ul style="list-style-type: none"> ➢ Oxygenation issue (O2 in) → O2 sats + alveolar SA <ul style="list-style-type: none"> ○ Provide FiO2 ➢ Ventilation issue (CO2 out) → blood gases (VBG sufficient) <ul style="list-style-type: none"> ○ Provide HFNP (2L/kg/min) or PEEP (CPAP) → splint airways open to reduce air trapping

*WN = wet nappies (ask parents what is normal → if < 5/10 → indicates abnormal)

Respiratory Illness #3

	Pertussis "whooping cough"	Chronic lung disease of prematurity (CLDP)	Cystic Fibrosis	Primary ciliary dyskinesia (Kartagener's syndrome)
PP	URTI of bordetella pertussis bacteria (gram-ve)	Aka bronchopulmonary dysplasia - immature lungs causes respiratory failure	Autosomal recessive CFTR1 gene (Chr 7) affecting mucus glands (Cl channels) <ul style="list-style-type: none"> 1 in 25 = carriers 1 in 2500 children Median survival 40yo <ul style="list-style-type: none"> Thick pancreatic & biliary secretions that block ducts Thick airway secretions Bilateral absence of vas deferens 	Autosomal recessive affecting motile cilia – mucus accumulation
RF	<ul style="list-style-type: none"> Sick contacts Unvaxxed 	Pre-term (esp. < 28 wks GA)	Consanguinity parents – higher risk of 2 mutant copies	
Sx	NONE usu. well between coughing fits <ul style="list-style-type: none"> Cough and coryza for one week (catarrhal phase), followed by a more pronounced cough in spells or paroxysms (paroxysmal phase) – vomiting occurs after 100 day cough even after recovery "whooping" sound due to air forcefully sucked back in air after coughing finishes	<u>SIGNS OF RDS</u> <ul style="list-style-type: none"> Low O2 sats Increased WtB FTT – poor wt gain and feeding Crackles and wheze on auscultation Recurrent infections 	<ul style="list-style-type: none"> Meconium ileus signs (V + C) Chronic cough Thick sputum production Steatorrhea Abdo pain +bloating FTT – low percentile Salty kiss Nasal polyps Finger clubbing Crackles and wheeze 	<ul style="list-style-type: none"> Kartagener's triad Paranasal sinusitis Bronchiectasis Situs inversus
Comp.	<ul style="list-style-type: none"> Pneumothorax (if cough too hard) Bronchiectasis Cyanosis Apnoeas 	<ul style="list-style-type: none"> cyanosis, apnoea cor pulmonale (HF) bronchiectasis (recurrent infections) 	<ul style="list-style-type: none"> Meconium ileus (1st sign – pathognomonic) Recurrent LRTi <ul style="list-style-type: none"> S. aureus, HiB Klebsiella E. coli Pseudomonas FTT Pancreatitis 	<ul style="list-style-type: none"> Recurrent LRTi FTT Bronchiectasis Infertility (dysfn cilia in fallopian tubes and flagella in sperm)
Ix	<ul style="list-style-type: none"> nasopharyngeal aspirate/swab for PCR - usually negative after 21 days, or 5-7 days after effective antibiotic therapy has been commenced Bacterial culture to confirm Anti-pertussis toxin IgG 	Diagnostic criteria: <ul style="list-style-type: none"> CXR – for diagnosis Overnight SpO2 and ECG monitoring If needing O2 therapy after 36 wks GA 	<ul style="list-style-type: none"> Newborn bloodspot test (IRT > 100) Sweat test (gold-standard) – pilocarpine skin patch to induce sweat → positive for CF if sweat Cl > 60mM Genetic test (CFTR gene) – amniocentesis or CVS 	<ul style="list-style-type: none"> CXR – situs inversus (50%) Semen analysis – male infertility Bronchoscopy + biopsy – examine ciliated epithelium
Mx	<u>Supportive Mx</u> <ul style="list-style-type: none"> Hand hygiene Avoid contact w/ immunosupp. Self-resolves in 8 wks <u>ABx indication: (refer to guidelines)</u> <ul style="list-style-type: none"> Admitted to hospital Macrolides (e.g. azithromycin 10mg/kg PO od for >5 days) Diagnosed in catarrhal or early paroxysmal phase (reduce severity) 	<u>Ante-natal prevention</u> <ol style="list-style-type: none"> Corticosteroids (betamethasone) for mothers with premature labour < 36 GA → accelerate lung maturation <u>Post-natal (newborn Mx)</u> <ol style="list-style-type: none"> CPAP Caffeine – stimulate resp. effort (refer to guidelines) Avoid over oxygenation 	<ul style="list-style-type: none"> Daily chest PT – clear mucus Daily exercise High calorie diet – due to malabsorption CREON tablets (if pancreatic insufficiency) Prophylactic ABx → Flucloxacillin OR <ul style="list-style-type: none"> Nebulised tobramycin or PO cipro for pseudomonas SABA → for bronchoconstriction Mucolytics → Nebulised hypertonic saline or DNase (e.g. Dornase alpha) – break dow DNA material in resp. secretions 	
F/U	<ul style="list-style-type: none"> <u>SOURCE control</u> – Isolate from school and others outside the home (esp. infants and young children) until received 5 days of therapy, or coughing for > 21 days <u>VACCINATION</u> – if not immunised (complete schedule) – for children and pregnant women <u>DISEASE NOTIFICATION</u>: (suspected or confirmed) of pertussis to the Communicable Diseases Section, <u>ABx prophylaxis for close contacts</u> (check immunisation status of close contacts) → aim to prevent spread to infants < 6/12 old 	<u>Post-natal (toddler/child Mx)</u> <ol style="list-style-type: none"> Formal sleep study – assess O2 sats IM injection of palivizumab (MAB) – to reduce risk and severity of RSV bronchiolitis Consider Audiology assessment if ototoxic aminoglycosides used to treat previous infections → may cause speech and language delay 	<ul style="list-style-type: none"> IUTD – flu, varicella, pneumococcal Psychologist <hr/> <ul style="list-style-type: none"> Bowel obstruction → flushout, lactulose or surgery Lung transplant – end-stage resp. failure Liver transplant – liver failure Fertility treatment – sperm extraction in infertile males Genetic counselling <p><u>Common Q:</u> A popular scenario is: both parents are healthy, one sibling has cystic fibrosis and a second child does not have the disease, what is the likelihood of the second child being a carrier? We know the child doesn't have the condition, so the answer is 2 in 3.</p>	