

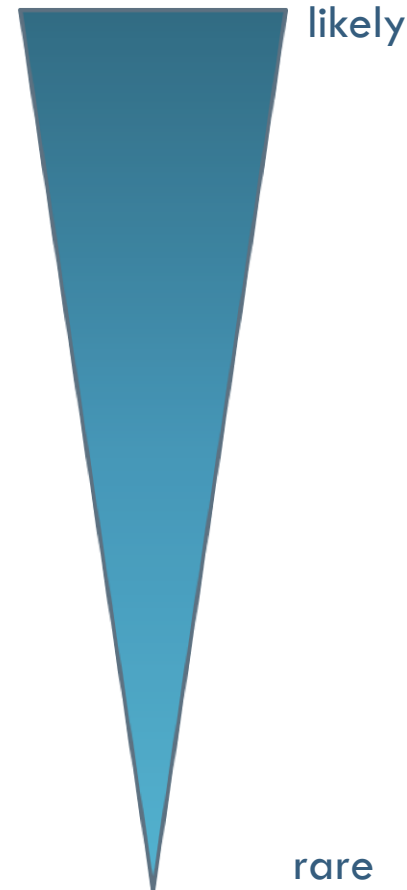
THE BREATHLESS CHILD

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Causes of breathing difficulties?

- Asthma/VIW
- Croup
- Bronchiolitis
- Pneumonia
- Pertussis
- Inhaled foreign body
- Anaphylaxis
- Pneumothorax
- Not respiratory
 - ▣ sepsis
 - ▣ diabetic ketoacidosis
 - ▣ heart failure



What we will cover

- Quite a broad topic!
- Focus on respiratory illnesses
 - ▣ Bronchiolitis
 - ▣ Croup
 - ▣ Viral-induced wheeze
 - ▣ Asthma
 - ▣ Pneumonia
- How to assess
- When to refer to ED, what else to do
- Typical hospital course
- Cases to prompt an interactive session

Assessment

□ History

- ▣ Usual plus (i) previous episodes? (ii) feeding? (iii) general activity

□ Examination

- ▣ Global assessment – **well or ill?**
- ▣ ABC
- ▣ Conscious level
- ▣ **Respiratory rate** – COUNT don't guess
- ▣ **Heart rate**
- ▣ **Work of breathing** – recession plus use of accessory muscles
- ▣ **Oxygen saturation** – use paediatric probe for < 2yrs
- ▣ Breathing noises – stridor or audible wheeze
- ▣ Auscultate – wheeze and/or crackles

Breathing noises

□ Stridor

- ▣ Harsh noise coming from trachea
- ▣ Usually predominantly inspiratory
- ▣ Usually heard without a stethoscope

□ Wheeze

- ▣ Turbulent airflow in small to medium sized airways
- ▣ Usually high-pitched and polyphonic
- ▣ Always loudest on expiration
- ▣ May be heard without a stethoscope

□ Crackles (crepitations)

- ▣ Coarse or fine snapping noises heard on inspiration or expiration
- ▣ Only heard with a stethoscope

Heart rate and respiratory rate

□ Heart rate

- ▣ Will change with distress and anxiety
- ▣ Higher in febrile children
- ▣ Varies with age

□ Respiratory rate

- ▣ May be the only abnormal sign
- ▣ Varies with age

Heart rate and respiratory rate

Adapted from APLS

Age	Respiratory Rate	Heart Rate	Systolic BP
<4wk	40-60	120-160	>60
<1yr	30-40	110-160	70-90
1-2yrs	25-35	100-150	75-95
2-5 yrs	25-30	95-140	85-100
5-11 yrs	20-25	80-120	90-110
12-16 yrs	15-20	60-100	100-120

How to assess severity

- It is useful to clarify (in your own head at least) whether this is mild, moderate, severe
- Varying algorithms for this....

Assessment – Asthma (OUH/Bucks)

	Green - Moderate	Amber - Severe	Red - Life Threatening
Talking	In sentences	Not able to complete a sentence in one breath. Taking two breaths to talk or feed.	Not able to talk / Not responding Confusion / Agitation
Auscultation	Good air entry, mild-moderate wheeze	Decreased air entry with marked wheeze	Silent chest
Respiratory Rate	Normal range: ≤ 40 breaths/min (2-5 yrs) ≤ 30 breaths/min (>5 yrs)	Above normal range: > 40 breaths/min (2-5 yrs) > 30 breaths/min (>5yr)	Cyanosis Poor respiratory effort Exhaustion
Heart Rate	≤ 140bpm (2-5 yrs) ≤ 125 bpm (>5 yrs)	> 140 bpm (2-5 yrs) > 125 bpm (>5 yrs)	Tachycardia or bradycardic Hypotension
SpO ₂ in air	≥ 92%	< 92%	< 92% plus anything else in this column
PEFR (if possible)	> 50% of predicted	33-50% of predicted	< 33% of predicted
Feeding	Still feeding	Struggling	Unable to feed

Assessment – Asthma (BTS)

Management of acute asthma in children in general practice

Age 2-5 years

ASSESS ASTHMA SEVERITY

Moderate asthma

- SpO₂ ≥92%
- Able to talk
- Heart rate ≤140/min
- Respiratory rate ≤40/min

Severe asthma

- SpO₂ <92%
- Too breathless to talk
- Heart rate >140/min
- Respiratory rate >40/min
- Use of accessory neck muscles

Life-threatening asthma

- SpO₂ <92% plus any of:
 - Silent chest
 - Poor respiratory effort
 - Agitation
 - Altered consciousness
 - Cyanosis

Age >5 years

ASSESS ASTHMA SEVERITY

Moderate asthma

- SpO₂ ≥92%
- PEF ≥50% best or predicted
- Able to talk
- Heart rate ≤125/min
- Respiratory rate ≤30/min

Severe asthma

- SpO₂ <92%
- PEF 33-50% best or predicted
- Too breathless to talk
- Heart rate >125/min
- Respiratory rate >30/min
- Use of accessory neck muscles

Life-threatening asthma

- SpO₂ <92% plus any of:
 - PEF <33% best or predicted
 - Silent chest
 - Poor respiratory effort
 - Agitation
 - Altered consciousness
 - Cyanosis

<https://www.brit-thoracic.org.uk/guidelines-and-quality-standards/asthma-guideline/>

Assessment – Bronchiolitis (Oxford CCG)

	Low risk	Intermediate risk	High risk
Activity	- Alert - Normal	- Irritable - Not responding to social cues - Decreased activity - No smile	- Unable to rouse - Wakes only with prolonged stimulation - No response to social cues - Weak, high pitched or continuous cry - Appears ill to a health care professional
Skin	- Capillary refill <2 secs - Normal colour skin, lips and tongue - Moist mucous membranes	- Capillary refill 2-3 secs - Pale / mottled - Pallor reported by parent / carer - Cool peripheries	- Capillary refill >3 secs - Pale / mottled / ashen / blue - Cyanotic lips and tongue
Respiratory Rate	<12m: <50 breaths/min >12m: <40 breaths/min - No respiratory distress	<12m: 50-60 breaths/min >12m: 40-60 breaths/min - Tachypnoea	- All ages: >60 breaths/min - Significant respiratory distress
SpO ₂ in air	95% or above	92-94%	92% or less
Chest recession	None	Moderate	Severe
Nasal flaring	Absent	May be present	Present
Grunting	Absent	Absent	Present
Apnoeas	Absent	Absent	Yes – 10-15 secs or shorter if with sudden decrease in sats, bradycardia or central cyanosis
Feeding/ Hydration	- Tolerating 75% of fluid - Occasional cough induced vomit	50-75% fluid intake over 3-4 feeds - Cough induced vomiting - Reduced urine output	<50% fluid intake over 2-3 feeds - Cough induced vomiting frequently - Significantly reduced urine output

Generic Assessment – a simple version

	Mild - Moderate manage in community	Severe ?send to hospital	Life Threatening call an ambulance
Talking Activity	Normal	Impeded	Not talking, confused, agitated
Resp effort	Normal	Increased	Either severe or decreased
Resp Rate	Normal or slightly elevated	Elevated	Either very high or low
Heart Rate	Normal or slightly elevated	Elevated	Either very high or low
SpO ₂ in air	95% or above	92-94%	Less than 92%
Skin and perfusion	Normal	May be cool peripheries	Cool, cyanosed, poor perfusion
Feeding	At least 75% of normal	50-75% of normal	<50% or not feeding
PEFR (asthma)	>50% predicted	33-50%	<33%

What treatment options are there for respiratory illnesses in children?

□ In no particular order.....:

1. Get help, call an ambulance
2. Oxygen
3. Inhaled beta-agonists (inhaled or nebulised)
4. Antibiotics
5. Oral steroids
6. Nebulised adrenaline
7. Give advice – feeding, illness duration, safety net, follow-up

Summary: it's not brain surgery!

Wheeze



- Viral-induced wheeze and asthma are part of a continuum

Asthma	Viral-induced wheeze
School-aged (5+ years)	Pre-school (1-4 years)
Multi-trigger	Viral trigger (URTI)
Interval symptoms	No interval symptoms
Often atopic	May or not be atopic

- Treatment is very similar: main difference is use of steroids (i.e. only use in asthma) and preventer medications (often unhelpful in VIW)
- Why not just call it all asthma?
 - ▣ Majority of children with VIW 'grow out of it'
 - ▣ Calling it asthma has implications for career/insurance in later life

Wheeze: mild-moderate



□ Mild to moderate wheeze can be treated at home

- Can safely use up to 10 puffs salbutamol every 4 hours
 - Reduce frequency according to symptoms
 - Need to check on the child at least once during the night
 - Need to seek further help if wheeze worsens
 - Need review if not better in 3 days
- Consider need for steroids if asthma (not VIW)



Wheeze



□ What not to do:

- Start antibiotics (even if focal crackles)
- Suggest CXR (even if focal crackles)
- Give steroids in VIW (even if atopic or given previously)

□ When to refer:

- Severe or life-threatening episode (see before)
- Not responding to salbutamol, or if needing salbutamol more than 4-hourly

Wheeze: life-threatening episode

- Give **oxygen**
- Call an **ambulance**
- Give **salbutamol nebuliser** (2.5 – 5mg) driven by O_2
- Continuous nebulisers if necessary (top-up every 10 minutes)
- If you have it, add **nebulised ipratropium** (250mcg) for 2 nebs
- If the child can swallow and is >4 years old, give a dose of **prednisolone** (20-40mg)



Life-threatening wheeze:

inpatient course

- **Oxygen** to keep sats $>92\%$
- **'Burst therapy' nebulisers** over 30 minutes
 - ▣ salbutamol
 - ▣ salbutamol+ibuprofen
 - ▣ salbutamol+ibuprofen
- **IV bronchodilators (not for <2 years)**
 - ▣ IV salbutamol
 - ▣ IV magnesium
 - ▣ IV aminophylline
- **High-flow humidified oxygen** (e.g. airvo)
- Very rare to intubate (do badly on ventilator)
- Usually quick turnaround: typically LOS <2 days

Bronchiolitis



□ Who?

- Infants <1 years
- Vulnerable for significant disease: preterms, younger babies (<2 months)

□ When?

- Now!
- Autumn/early winter = RSV
- Late winter = Flu A/Flu B
- Other viruses throughout the time...

Bronchiolitis



□ Presenting features:

- Wet cough
- Increased work of breathing
- Decreased feeding
- Apnoeas (in younger babies)
- Fever (it is a virus, after all)*

□ Refer if:

- moderate-severe recession at rest
- sats < 92%
- taking < 50% of feeds
- history of apnoea
- low threshold for infants < 6 weeks old and ex-preterm infants.

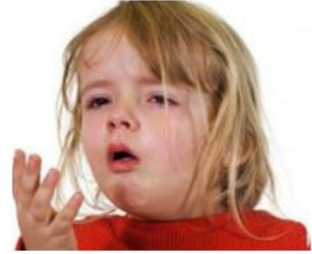
* always refer fevers > 38 degrees if < 3 months

Bronchiolitis: inpatient course



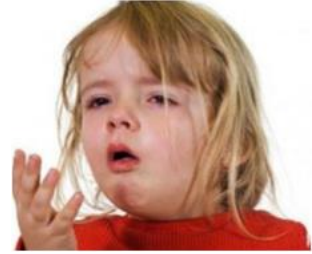
- Supportive treatment: fluids and breathing
- Fluids:
 - ▣ Little and often oral feeds
 - ▣ NG feeds (75ml/kg/day)
 - ▣ IV fluids
- Breathing
 - ▣ Oxygen
 - ▣ High-flow humidified oxygen (AIRVO)
 - ▣ Intubation: either for work of breathing or persistent recurrent apnoeas
- Usual LOS 3-4 days if admitted (many d/c from ED)

Croup



- Who?
 - ▣ Toddlers
- When?
 - ▣ Middle of night peak
- Presentating features
 - ▣ Coryza, then high fever
 - ▣ Barking cough
 - ▣ +/- stridor

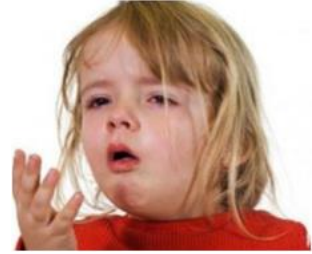
Croup



- If intermittent stridor:
 - ▣ Dexamethasone 0.15mg/kg*
 - ▣ Arrange planned GP review
- When to refer:
 - ▣ Stridor at rest
 - ▣ Recession at rest
- When to call an ambulance
 - ▣ If severe recession, severe stridor or desaturated
 - ▣ Give oxygen
 - ▣ Can give nebulised adrenaline 5ml of 1:1000
 - ▣ Desaturation is a LATE sign; may need anaesthetist/ENT intubation

* Or prednisolone 1mg/kg two doses 12 hours apart if no dexamethasone available

Croup: in hospital course



- Don't p*ss them off: give dexamethasone to mother to administer, and stand outside the cubicle
 - ▣ Don't examine throat/ears
- Majority discharged after dexamethasone PO and period of observation
- If intubated, is event that needs to be very carefully managed e.g. anaesthetist, ENT surgeon in West Wing theatres...
 - ▣ Don't cannulate on your own; OK to put ametop cream on
- Average LOS < 12 hours

Pneumonia



- Presenting features:
 - ▣ Lethargy and fever
 - ▣ Cough, breathlessness, chest pain
 - ▣ Invariably tachypnoeac
 - ▣ Crackles or bronchial breathing (without wheeze!)
- Treatment:
 - ▣ Amoxicillin PO
- Refer if:
 - ▣ Significant respiratory distress or ?sepsis
 - ▣ Gets less well or remains febrile after 72 hours despite amoxicillin

Pneumonia: in hospital course



- Community-acquired pneumonia usually treated with PO amoxicillin and discharged from ED
- If oxygen requirement
 - ▣ admitted but still treated with **PO** amoxicillin
 - ▣ No blood test needed!
- If vomiting++
 - ▣ IV amoxicillin until able to tolerate PO
- If unwell, high FiO_2
 - ▣ high-flow humidified oxygen
 - ▣ occasionally intubated for severe disease

All happy with the theory?



Any questions?

Case 1: Alfie (7 years old)



- 7-year-old with shortness of breath came on gradually over the day. Had runny nose past two days.
- When mum picked up from school was working hard with breathing so booked an urgent out-of-hours appointment
- PMHx:
 - ▣ Wheezes with viruses, exercise and in high pollen season. Has brown inhaler which he uses daily. Never admitted to hospital.

Case 1: Alfie (7 years old)

□ Assessment:

- ▣ Chatty in short sentences
- ▣ Bilateral wheeze, prolonged expiratory phase
- ▣ Intercostal and subcostal recession
- ▣ Heartrate 130/min, resp rate 32/min
- ▣ Sats 94% in air



Case 1: Alfie (7 years old)

- Diagnosis?
 - ▣ Asthma exacerbation
- Treatment?
 - ▣ Salbutamol 10 puffs then re-review
- Some improvement but still working hard
 - ▣ Add prednisolone PO, further salbutamol 10 puffs and send to hospital



Case 1: Alfie (7 years old)

- Likely hospital approach:
 - ▣ Further salbutamol 10 puffs via inhaler as long as sats OK
 - ▣ If responds well, watch in ED then likely discharge
 - ▣ If poor response, admit and continue salbutamol inhalers until able to stretch to 4-hourly
 - ▣ Most likely LOS <24 hours



Case 2: Libby (5 years old)



- 5-year-old with shortness of breath came on gradually over previous day. Has had cough/cold past few days.
- School gave inhalers when running around at lunch. Mum gave further inhalers before bed, and on waking.
- Booked into morning clinic
- PMHx:
 - ▣ Previous wheeze when toddler and admitted twice to hospital overnight

Case 2: Libby (5 years old)

□ Assessment:

- Looks unwell
- Bilateral wheeze, prolonged expiratory phase
- Marked intercostal and subcostal recession
- Heartrate 140/min, resp rate 42/min
- Sats 89-90% in air



Case 2: Libby (5 years old)

- Diagnosis?
 - ▣ Asthma exacerbation
- Treatment?
 - ▣ Salbutamol nebuliser 2.5mg with O₂
 - ▣ Prednisolone PO
- Some improvement but still working hard; sats 91% in air
 - ▣ Further salbutamol nebulisers (plus ipratropium if available)
 - ▣ Send to hospital in ambulance with O₂



Case 2: Libby (5 years old)

- Likely hospital approach:
 - ▣ Back-to-back nebs
 - ▣ Prednisolone if not already given
 - ▣ Monitor for response: often 'turn around' quickly and LOS < 24 hours
 - ▣ If not improving over next few hours may need high-flow humidified oxygen +/- IV bronchodilators



Case 3: Riley (2 years old)



- Cough and coryza past 2 days
- Had GP appointment booked for this since morning: by afternoon appointment parents feel he has got worse: loud barking cough
- PMHx:
 - ▣ Has salbutamol inhaler for recurrent viral wheeze
 - ▣ Admitted twice to hospital overnight for this

Case 3: Riley (2 years old)



- Assessment:
 - ▣ Barking cough, coryzal
 - ▣ Chest clear
 - ▣ Stridor when running around waiting room but settles when calm sat on mum's lap.
 - ▣ When you examine gets upset again and stridor returns
 - ▣ Tracheal tug when upset
 - ▣ Heartrate 170/min (crying), resp rate 30/min
 - ▣ Sats 99%, temp 39.1

Case 3: Riley (2 years old)

- Diagnosis?
 - ▣ Croup
- Treatment?
 - ▣ Oral steroids (dexamethasone)
 - ▣ Antipyretics
 - ▣ Reassess in 30-60 minutes: if no worse, reasonable to discharge but with safety netting and planned review



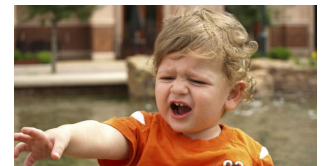
Case 3: Riley (2 years old)

- Likely hospital approach
 - ▣ Oral dexamethasone
 - ▣ Antipyretics
 - ▣ Review with repeat obs when temp settled
 - ▣ Discharge
- Typical LOS <4 hours



Case 4: Jacob (20 months old)

- 20-month-old with viral URTI diagnosed by GP day before (fever, runny nose, cough)
- Comes to afternoon GP surgery because mum feels 'he's getting worse'. Given 2 puffs of salbutamol every 2 hours today.
- PMHx:
 - Had bronchiolitis aged 2 months and admitted to hospital for this for 3 days
 - Since then had wheezing with URTIs and been admitted to hospital overnight three times
 - GP colleague started brown inhaler last month



Case 4: Jacob (20 months old)

□ Assessment:

- ▣ Bilateral wheeze, prolonged expiratory phase
- ▣ Subcostal recession (too chubby to see intercostal)
- ▣ Heartrate 140/min, resp rate 32/min
- ▣ Sats 96% in air, temp 38.0



Case 4: Jacob (20 months old)

- Diagnosis?
 - ▣ Viral-induced wheeze
- Treatment?
 - ▣ Salbutamol 10 puffs via spacer
 - ▣ “But he hates the spacer”
 - That means he’ll cry well and take nice deep breaths...
 - ▣ Paracetamol PO
- Review after inhaler/paracetamol
 - ▣ If improved/stable, allow home with clear safety netting/education



Case 4: Jacob (20 months old)

- Likely hospital approach:
 - ▣ Trial salbutamol 10 puffs via inhaler
 - ▣ Home if stable over next couple of hours; if not, admit to short-stay unit until safely 4-hourly
- Suggest that if no clear benefit from brown inhaler after 2 months, stop it
 - ▣ If apparent benefit, then still stop it to check symptoms recur off it
- Don't give steroids
- Typical LOS <12 hours



Case 5: Malakai (8 years old)

- Unwell with cough, runny nose, intermittent fever past 2 weeks
 - ▣ Multiple GP presentations, diagnosed viral URTI
- Today mum comes again because not eating as much, still off school, wanting to lie on sofa all day, vomiting calpol
- PMHx
 - ▣ Previously fit and well



Case 5: Malakai (8 years old)

□ Assessment:

- ▣ Lethargic, miserable
- ▣ Reduced breath sounds with crackles on right
- ▣ No wheeze
- ▣ Intercostal recession
- ▣ Heartrate 160/min, resp rate 45/min
- ▣ Sats 90% in air, temp 39.1 degrees, cap refill 4 sec



Case 5: Malakai (8 years old)

- Diagnosis?
 - ▣ Pneumonia
- Treatment?
 - ▣ Oxygen
 - ▣ Call ambulance
 - ▣ Consider pre-alert
 - ▣ Paracetamol (helps to assess once in ED)
 - ▣ IM benzylpenicillin? What about if petechiae?



Case 5: Malakai (8 years old)

- Likely hospital approach:
 - ▣ Think SEPSIS → sepsis 6
 - ▣ Sepsis 6: oxygen, IV access, blood cultures and gas with BM, fluid resuscitation, oxygen, IV antibiotics, consider early inotropes, senior review
- LOS dependent upon response to ABx (minimum 2 days until blood cultures available)



Case 6: Shaniya (3 months old)

- Unwell with cough, snuffly nose for 2 days
- Taking 2oz milk 3-4 hourly (usually takes 3oz).
- PMH:
 - ▣ Born at 31 weeks: required vapotherm (humidified O₂) but never intubated
 - ▣ Discharged home at 36 weeks corrected gestation



Case 6: Shaniya (3 months old)

□ Assessment:

- Sleeping in mum's arms: looks tired
- Bilateral wheeze and crackles, wet cough
- Grunting intermittently
- Subcostal recession and intercostal recession
- Heartrate 170/min, resp rate 24/min
- Sats 92%, temp 36.5



Case 6: Shaniya (3 months old)

- Diagnosis?
 - ▣ Bronchiolitis
- Treatment?
 - ▣ Worryingly low resp rate: at risk of apnoeas or exhaustion
 - ▣ Oxygen, call ambulance, send to hospital
 - ▣ May well get worse before gets better (day 2 illness)



Case 6: Shaniya (3 months old)

- Likely hospital approach:
 - ▣ NG feeds/IV fluids if deteriorating
 - ▣ High-flow humidified oxygen
 - ▣ If persistent apnoeas may need intubation
 - Trial of caffeine occasionally helps stimulate breathing
 - ▣ Length of stay likely several days



Case 7: Harper (3 years old)

- Runny nose and cough yesterday
- Today woke with barking cough early this morning
- Morning GP appointment
- Previously fit and well



Case 7: Harper (3 years old)

□ Assessment:

- ▣ Barking cough, coryzal
- ▣ Chest clear
- ▣ Stridor at rest
- ▣ Tracheal tug and subcostal recession
- ▣ Heartrate 170/min (crying), resp rate 30/min
- ▣ Sats 100%, temp 39.1



Case 7: Harper (3 years old)

- Diagnosis?
 - ▣ Croup
- Treatment?
 - ▣ Oral steroids (dexamethasone)
 - ▣ Antipyretics
 - ▣ Refer to hospital given stridor and tracheal tug at rest



Case 7: Harper (3 years old)

- Likely hospital approach
 - ▣ Oral dexamethasone
 - ▣ Antipyretics
 - ▣ Review with repeat obs when temp settled
 - ▣ Discharge once stridor at rest improved
- Likely LOS <6 hours



Case 8: Callum (3 years old)

- 3-year-old with shortness of breath came on gradually over the day. Had runny nose past two days: given salbutamol inhaler at home
- Sent home from nursery early because of cough and fever so booked an urgent afternoon appointment
- PMHx:
 - ▣ Wheezes with viruses, has salbutamol inhaler which is only used when has URTI



Case 8: Callum (3 years old)

□ Assessment:

- ▣ Looks tired
- ▣ Bilateral wheeze, prolonged expiratory phase
- ▣ Intercostal and subcostal recession
- ▣ Heartrate 170/min, resp rate 52/min
- ▣ Sats 88% in air



Case 8: Callum (3 years old)

- Diagnosis?
 - ▣ Viral induced wheeze
- Treatment?
 - ▣ Oxygen
 - ▣ Salbutamol nebulisers
 - ▣ Call for ambulance, admit to hospital



Case 8: Callum (3 years old)

- Likely hospital approach:
 - ▣ Oxygen
 - ▣ Nebulisers (salbutamol and ipratropium)
 - ▣ NOT for steroids
 - ▣ If does not improve, consider high-flow oxygen therapy
 - ▣ If really not improving consider IV therapy



Case 9: Ella (5 months old)

- Unwell with cough, snuffly nose for 6 days
- Seen GP twice in this time
- Taking 4oz milk 3-4 hourly (usually takes 6oz).
Taking solids OK
- Mum concerned as no better and feels hot
- PMH:
 - ▣ Previously well, born at term



Case 9: Ella (5 months old)

□ Assessment:

- Smiling, kicking legs
- Bilateral wheeze and crackles
- Wheeze heard without stethoscope
- Subcostal recession (too chubby to see intercostal)
- Heartrate 140/min, resp rate 40/min
- Sats 97% in air, temp 37.8 degrees



Case 9: Ella (5 months old)

- Diagnosis?
 - ▣ Bronchiolitis
- Treatment?
 - ▣ Supportive
 - ▣ Consider 'little and often' feeds
 - ▣ Reassure day 6 likely at worst of disease
 - ▣ Will take at least another week to get better
 - ▣ Safety netting re: work of breathing, feeding
 - ▣ Salbutamol usually not effective (why?)



Case 9: Ella (5 months old)

- Likely hospital approach:
 - ▣ As above (reassure, safety net)
 - ▣ Observe feed
 - ▣ Discharge from ED
- Typical LOS <4 hours



Thanks for listening



Any questions?