




# *Paediatric Emergencies*

Leicester Wilderness and Emergency Medicine Society  
Sophie Wheeler  
Final Year Medical Student

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- *Paediatric/Neonatal Sepsis*



01

# Assessment



# Approach to the Seriously Unwell Child

## A-E assessment

- Some differences in children
  - The way the airway is assessed (neutral position in infant and “sniffing” position in young children)
  - Hypotension is a very LATE sign of circulatory shock in children as they’re very good at compensating physiologically
  - IO access should be considered early in children who are peripherally shut down and are hard to gain IV access in
  - Raised ICP should be high on your list of causes in a child with reduced consciousness level
  - Make special care to look out for bruising on exposure in children – consider NAI

Airway and Breathing	Circulation	Disability	Exposure
Effort of breathing	Heart rate	Conscious level	Fever
Respiratory rate and rhythm	Pulse volume	Posture	Rash
Stridor / wheeze	Capillary refill	Pupils	Bruising
Auscultation	Skin temperature		
Skin colour			

# History


- Generic structure is the same as an adult hx, with a few exceptions...
- **“BLINDS”**
  - **B**irth and antenatal hx
    - Antenatal scans/blood tests, route of delivery and complications, gestation at birth
  - **L**ooking for risk factors for neonatal sepsis
    - Group B strep, pre-term labour, PROM, chorioamnionitis
  - **I**mmunisations
  - **N**utrition
    - Method of feeding, volume and frequency, weaning, etc
  - **D**evelopmental hx
  - **S**creening for mental health



# Examination

- Perform a good systemic examination, as you would in an adult
- Some tips for examining children:
  - Get down to their level
  - Use icebreakers
  - Observation is key
  - Adapt your approach as needed
  - Change the order of examination if necessary (ie: do the "scariest" or most uncomfortable parts last)






02

*BRUE/ALTE*

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# Brief Resolved Unexplained Event/Apparent Life-Threatening Event

- “An episode that is frightening to the observer, during which a combination of the following symptoms are reported...”
  - Apnoea
  - Colour change
  - Choking or gagging
  - Change in tone”
- By the time they present at A&E, the child is usually looking well, but the parent is very distressed and concerned
- Thorough history taking and examination is important as it *can* reveal a cause (although in 50% of cases, cause remains unknown)



# BRUE/ALTE

## Epidemiology & Pathophysiology

- 1% of emergency presentations of infants <1yo
- 2% of hospitalised children
- 6-5 per 1000 live births
- Mean age 8 weeks
- Boys > girls
- Table shows *potential* causes, from most to least common

Aetiology	Examples of conditions seen
Gastrointestinal	GORD, swallowing problems, intussusception or volvulus
Neurological	Head injuries, seizures or CNS infection
Respiratory	URTI, pertussis ( <u>whooping cough</u> ), RSV, breath holding spells or Obstructive Sleep Apnoea (OSA)
Cardiac	Arrhythmias, prolonged QT interval, Wolff Parkinson White (WPW) Syndrome, <u>congenital cardiac disease</u> or vascular ring
Metabolic or Infective	Inborn errors of metabolism, electrolyte disturbances (hypocalcaemia or hypoglycaemia)
Infective	Meningitis and or sepsis
Child abuse	Suffocation, shaken baby syndrome or Factitious Induced Illness (FII)
Toxins/drugs	Accidental or non - accidental ingestion

# BRUE/ALTE History Taking

- Clear description of the event itself
- Relation to feeding
  - Back arching
  - Associated vomiting
- Previous episodes
- Sleep
  - Reflux tends to be worse when laid flat – have parents tried elevating head of cot?
  - Symptoms may improve when baby held upright
  - Sleep risk factors
  - Systems enquiry
  - PMH, immunisations, family hx, social hx.




+

# BRUE/ALTE

## Investigations/Mx.

- Ix done depending on if child is considered high risk or low risk
  - **Low risk features:**
    - Age >2 months
    - Gestational age >32 weeks
    - Event lasted <1 minute
    - No CPR by healthcare professional needed
    - No concerning features in hx or examination
- For **high risk** patients, referral to the paediatric team for admission is generally recommended
- Specific management depends on if cause found, and if so, which cause

Low risk patients	High risk patients
ECG – helps exclude channelopathies, WPW or cardiomyopathy	CXR (even if no focal chest signs)
Consider perinasal swab for pertussis	Blood gas – may reveal metabolic acidosis consistent with inborn error of metabolism
	Lab bloods – FBC and film, U&Es, CRP, bone profile and glucose

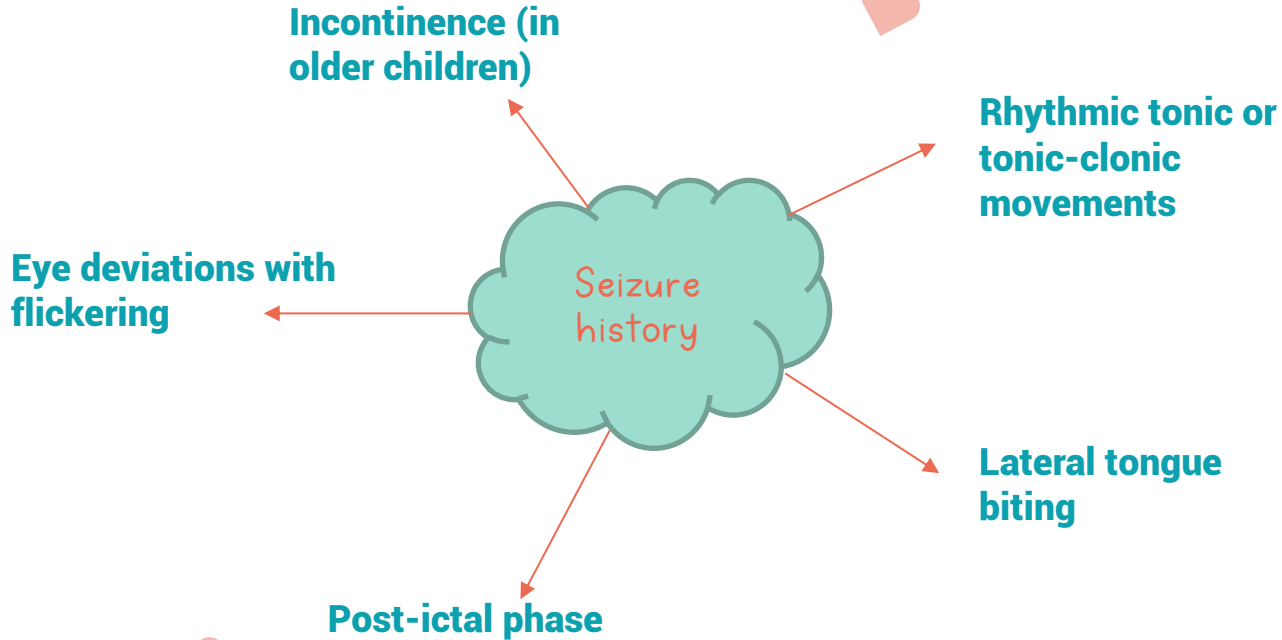


03

*Seizures*



# Seizures in Children



# Febrile Convulsions

- Very common
- Occur in children 6 months – 5 years of age
- Usually a **single, generalised, short-lived** tonic-clonic seizure with a short post-ictal phase
- Child returns to normal neurological state shortly after
- Don't fall for handover chinese whispers!
  - No documented fever immediately before or during seizure? Unlikely to be febrile convulsion
- 33% risk of recurrence
  - Increased risk the younger the child at first febrile convulsion, and if family hx of febrile convulsions
- “Complex” if multiple within 24 hour period – need admitting for investigation

# Seizure Management in Children

## Points to consider:

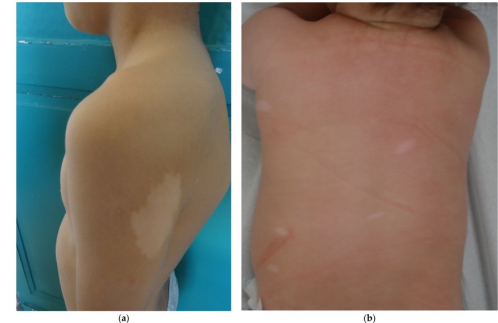
- Temperature
- Blood sugar
- How long has the seizure lasted?
  - A child seizing for >3 mins is unlikely to spontaneously stop
- Past hx of seizures especially during this episode

Paediatric Seizures	
0- 3 min	Oxygen ABCDE Check and correct blood sugar Gain access
5min	1st Line Benzodiazepines Lorazepam 0.1mg/ kg Buccal Midazolam or Rectal Diazepam
10min	Repeat benzodiazepine
State Loudly: "Now we wait ten minutes until the medication has worked, as per algorithm"	
>10min	2nd Line Phenytoin slow infusion (alternatives exist)


@RCEMLearning

# Afebrile Seizures

- Numerous causes of afebrile seizures in children
- A good history is key, especially if it's the first presentation
- **Always** measure blood glucose
- If a child >6 months is neurologically well with no obvious cause in hx or examination, no other Ix. except for basic obs is likely to be helpful
  - **However**, always consider NAI
- **Things to look for in history and examination:**
  - Inconsistent hx +/- unexplained bruising (NAI)
  - Café au lait spots (*neurofibromatosis*)
  - Ash leaf spots (*tuberous sclerosis*)
  - Meningism (*meningitis/intracranial bleed*)
  - Dysmorphic features
  - Hepatomegaly or jaundice (*metabolic disease*)







04

*Fractures*



# How Fractures Differ in Children



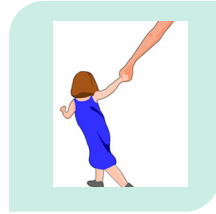
- Any bony injury to a child may impact on future growth
- Children's bones...
  - Are less brittle, more malleable
  - Allow a plastic type of "bowing" injury
- Comminuted fractures are **less** common in children; growth plate and avulsion fractures are **more** common
- Bone healing is faster, and bones heal with fewer complications
  - A greater amount of angulation and displacement is acceptable in children
- Lower incidence of displacement of fractures and open fractures
- Less stiffness after immobilisation (immobilisation needed for shorter periods)



# Common Childhood Fractures/Bony Injuries

## Pulled elbow

Straight pull on the arm of a child <4yo causing subluxation of the radial head under annular ligament

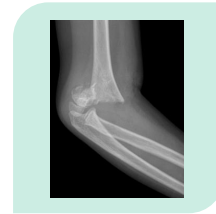
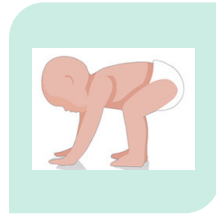


## Growth plate #

Fractures that occur through or near a child's growth plate. Typically torsion at the physal region. Salter-Harris Classification.

## Toddlers #

A fall with the foot planted firmly on the floor leads to rotational force as the child falls. Causes characteristic undisplaced spiral or oblique distal tibial fracture



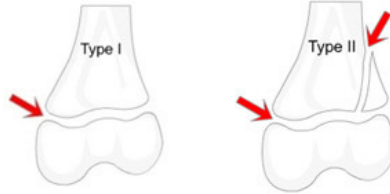
## Supracondylar #

Peak age of incidence 5-7 years. Typical MOI is FOOSH from monkey bars. Risk of neurovascular injury.



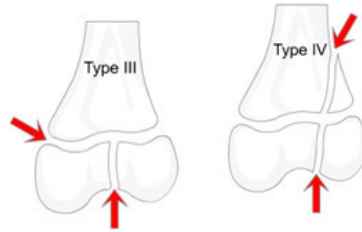
# Salter-Harris Classification

Type I – transverse fracture through the physis. The epiphysis separates completely from the metaphysis.

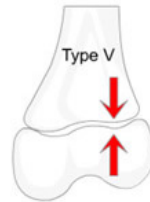


Type II – fracture through the physis with a detached triangular metaphyseal fragment. **Most common.**

Type III – a fracture through the physis and then entering the joint through a fracture of the epiphysis. Intra-articular. **Rare.**



Type IV – fracture through the epiphysis, physis and metaphysis. Intra-articular.



Type V – crush injury of the physis. May initially not show up on X-ray. **Rare.**



# Safeguarding in NAI



## Lightning Learning: Non-Accidental Injury



<https://em3.org.uk>



@EM3FOAMed



[youtube.com/em3orguk](https://www.youtube.com/em3orguk)

# #EM3

East Midlands Emergency Medicine Educational Media

### WHAT?

**Non-accidental injury/Physical abuse/Child maltreatment\***

**Suspect** implausible, inadequate or inconsistent explanations.

**Inspect** physical features of injury, such as...

- Shape and pattern of bruising, bites, lacerations, thermal injury
- Age of fracture/multiple fractures


**Consider:**

- Intracranial injury without accidental major trauma
- Retina haemorrhage
- Genital infections/pregnancy/groin injury

### WHY?

It is estimated 1-in-14 children have been physically abused in the UK (NSPCC).

Safeguarding and promoting the welfare of children is the responsibility of **EVERY** member of staff in the NHS.

- **Recognise** the signs of child abuse
- **Respond** using a  *Traffic Light System* (see 'HOW?' section)
- **Refer** to the appropriate specialty or service
- **Responsibility** to act on all your concerns

### HOW?

**Child Maltreatment: When to Suspect Maltreatment in Under 18's (2009)\* (NICE)**

<http://bit.ly/2MoD4YR>

**Safeguarding Children Policy: Traffic Light System (UHL)**

<http://bit.ly/2JKx0YV>

**National Society for the Prevention of Cruelty to Children (NSPCC)** [www.nspcc.org.uk](http://www.nspcc.org.uk)

#### Children's ED Safeguarding Checklist

	Yes	No
Is there a consistent history?		
Does the injury match the description of incident?		
Is the injury appropriate for the developmental stage of the child?		
Any delay in presentation has a satisfactory explanation?		
No other injuries/unexplained findings on examination?		
Are the parent/child interacting or behaving appropriately?		
If you answered <b>NO</b> to any of above <b>OR</b> are unsure, discuss the patient with the ED/Paed Senior (ST4+)		



05

*Respiratory Distress*

# Respiratory Distress/ Breathing Difficulties in Children

## Causes:

- **Viral Infection**
  - Bronchiolitis
  - Croup
- **Bacterial Infection**
  - Acute tonsillitis
  - Pneumonia
  - Epiglottitis
- + • **Asthma**
- **Allergies/anaphylaxis**
- **Foreign body inhalation**

## Signs of Respiratory Distress/Breathing Difficulties:

- Cough
- Wheeze
- Runny/blocked nose +/- sneezing
- Increased RR
- **Increased work of breathing**
  - Nostril flaring
  - Grunting
  - Tracheal tug
  - Cyanosis
  - Drowsiness
  - Stridor
  - Intercostal/subcostal recessions

# Respiratory Distress/ Breathing Difficulties in Children





# Respiratory Distress/ Breathing Difficulties in Children

Condition	Signs/Symptoms	Management
Bronchiolitis	low-grade fever, rhinorrhoea, cough, feeding difficulty, severe resp. distress, expiratory wheeze, cyanosis/pallor	Oxygen therapy Fluids Consider CPAP if impending resp. failure. Upper airway suctioning if needed.
Croup	Cough, rhinorrhoea, fever, worse at night, stridor, tachypnoea, recessions, hoarseness	Single dose oral dexamethasone (0.15mg/kg body weight). Nebulised adrenaline + oxygen therapy. Admit if moderate/severe.
Asthma exacerbation	Depends on severity – , wheeze, increased WOB, increased RR, reduced air entry or silent chest, difficulty speaking, altered consciousness, difficulty feeding	Oxygen therapy. Bronchodilators (nebulised salbutamol). Ipratropium bromide. Steroids (oral prednisolone or IV hydrocortisone). IV salbutamol +/- Mg sulphate if refractory.

# Respiratory Distress/ Breathing Difficulties in Children

Condition	Signs/Symptoms	Management
Epiglottitis	Dyspnoea Dysphagia Drooling Dysphonia ("hot potato voice") <i>Symptoms usually last &lt;12hours and there is typically <u>no cough</u>.</i> <i>Stridor is a <u>late</u> sign</i>	Secure airway (early escalation to anaesthetist and ENT reg). Oxygen (hold mask <u>near</u> child's face) Keep child calm! Nebulised adrenaline. IV abx. IV steroids. IV fluids (resus and maintenance; NBM until airway improvement).
Anaphylaxis	Wheeze, increased WOB, flushing, urticaria, angioedema, cyanosis, unable to talk, hypotension, clammy, pale.	Early administration of IM adrenaline is vital! Oxygen therapy. If refractory, transfer to ITU for further treatment.
Foreign body inhalation	Stridor, dysphonia, drooling, choking. May be able to visualise object at back of oropharynx.	Magill forceps. Removal via endoscopy with GA (how urgent depends on object).

06

*Paediatric/Neonatal  
Sepsis*

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## *Risk Factors & Clinical Features*

- **Neonates** and **young babies** <3 months old are at increased risk, especially if they were premature, or there is a hx of PROM or maternal group B strep. infection
- **Immunocompromised children**
- Absence of fever (and potentially hypothermia) may be seen in some of the most unwell patients (particularly the very young or immunocompromised)
- History of **lethargy**, **nausea** and **vomiting**, **headache** or **abdominal pain**
- History taking to determine the source of infection is important
- Signs of **shock** on examination but remember children often compensate well!
- Look out for signs of meningococcal disease (eg: **non-blanching rash**).

# Risk Scoring in Febrile Children <5yo

## Traffic light system for identifying risk of serious illness

	Green – low risk	Amber – intermediate risk	Red – high risk
Colour (of skin, lips or tongue)	<ul style="list-style-type: none"> <li>Normal colour</li> </ul>	<ul style="list-style-type: none"> <li>Pallor reported by parent/carer</li> </ul>	<ul style="list-style-type: none"> <li>Pale/mottled/ashen/blue</li> </ul>
Activity	<ul style="list-style-type: none"> <li>Responds normally to social cues</li> <li>Content/smiles</li> <li>Stays awake or awakens quickly</li> <li>Strong normal cry/not crying</li> </ul>	<ul style="list-style-type: none"> <li>Not responding normally to social cues</li> <li>No smile</li> <li>Wakes only with prolonged stimulation</li> <li>Decreased activity</li> </ul>	<ul style="list-style-type: none"> <li>No response to social cues</li> <li>Appears ill to a healthcare professional</li> <li>Does not wake or if roused does not stay awake</li> <li>Weak, high-pitched or continuous cry</li> </ul>
Respiratory		<ul style="list-style-type: none"> <li>Nasal flaring</li> <li>Tachypnoea:                             <ul style="list-style-type: none"> <li>RR &gt;50 breaths/minute, age 6–12 months</li> <li>RR &gt;40 breaths/minute, age &gt;12 months</li> </ul> </li> <li>Oxygen saturation &lt;95% in air</li> <li>Crackles in the chest</li> </ul>	<ul style="list-style-type: none"> <li>Grunting</li> <li>Tachypnoea: RR &gt;60 breaths/minute</li> <li>Moderate or severe chest indrawing</li> </ul>
Circulation and hydration	<ul style="list-style-type: none"> <li>Normal skin and eyes</li> <li>Moist mucous membranes</li> </ul>	<ul style="list-style-type: none"> <li>Tachycardia:                             <ul style="list-style-type: none"> <li>&gt;160 beats/minute, age &lt;12 months</li> <li>&gt;150 beats/minute, age 12–24 months</li> <li>&gt;140 beats/minute, age 2–5 years</li> </ul> </li> <li>CRT ≥3 seconds</li> <li>Dry mucous membranes</li> <li>Poor feeding in infants</li> <li>Reduced urine output</li> </ul>	<ul style="list-style-type: none"> <li>Reduced skin turgor</li> </ul>
Other	<ul style="list-style-type: none"> <li>None of the amber or red symptoms or signs</li> </ul>	<ul style="list-style-type: none"> <li>Age 3–6 months, temperature ≥39°C</li> <li>Fever for ≥5 days</li> <li>Rigors</li> <li>Swelling of a limb or joint</li> <li>Non-weight bearing limb/not using an extremity</li> </ul>	<ul style="list-style-type: none"> <li>Age &lt;3 months, temperature ≥38°C*</li> <li>Non-blanching rash</li> <li>Bulging fontanelle</li> <li>Neck stiffness</li> <li>Status epilepticus</li> <li>Focal neurological signs</li> <li>Focal seizures</li> </ul>
<small>CRT, capillary refill time; RR, respiratory rate                      *Some vaccinations have been found to induce fever in children aged under 3 months</small>			
<b>This traffic light table should be used in conjunction with the recommendations in the NICE guideline on Feverish illness in children.                      See <a href="http://guidance.nice.org.uk/CG160">http://guidance.nice.org.uk/CG160</a></b>			

# Management


- Sepsis 6

## PLUS...

- Correct any hypoglycaemia
- Identify underlying infection source and treat specifically
- May require ventilatory support on ITU

## Paediatric Sepsis 6

Severe sepsis is a **CLINICAL EMERGENCY**. Signs and symptoms of sepsis in children can be subtle and deterioration to shock rapid. Early initiation of simple treatment improves outcomes.



YOU CAN MAKE A DIFFERENCE

Patient Name: \_\_\_\_\_ Date of Birth: \_\_\_\_\_ Unit number: \_\_\_\_\_

**Recognition:**

If a child with suspected or proven infection AND has at least 2 of the following:

- Core temperature < 36°C or > 38.5°C
- Inappropriate tachycardia (Refer to local criteria / APLS Guidance)
- Altered mental state (including: sleepiness / irritability / lethargy / floppiness)
- Reduced peripheral perfusion / prolonged capillary refill!

**Think: could this child have SEPSIS or SEPTIC SHOCK?**

If in doubt, consult a senior clinician.!

Time	Initials
<input type="text"/>	<input type="text"/>

Complete all elements within 1 hour

Respond with Paediatric Sepsis 6:

	Time	Initials
1. Give high flow oxygen:	<input type="text"/>	<input type="text"/>
2. Obtain intravenous/ intraosseous access & take blood tests:	<input type="text"/>	<input type="text"/>
a. Blood cultures		
b. Blood glucose - treat low blood glucose		
c. Blood gas (+ FBC, lactate & CRP as able for baseline)		
3. Give IV or IO antibiotics:	<input type="text"/>	<input type="text"/>
- Broad spectrum cover as per local policy		
4. Consider fluid resuscitation:	<input type="text"/>	<input type="text"/>
- Aim to restore normal circulating volume and physiological parameters		
- Titrate 20 ml/kg Isotonic Fluid over 5 - 10 min and repeat if necessary		
- Caution with fluid overload > Examine for crepitations & hepatomegaly		
5. Involve senior clinicians / specialists early:	<input type="text"/>	<input type="text"/>
6. Consider inotropic support early:	<input type="text"/>	<input type="text"/>
- If normal physiological parameters are not restored after ≥ 40 ml/kg fluids		
- NB adrenaline or dopamine may be given via peripheral IV or IO access!		

Record any reasons for variation from Paediatric Sepsis 6 overleaf



*It's Quiz  
Time!*

# Question 1

Which of the following is **not** a key symptom of a BRUE/ALTE, according to the official definition?

- a) *Apnoea*
- b) *Choking*
- c) *Cyanosis*
- d) *Drowsiness*
- e) *Change in tone*



# Question 1

Which of the following is **not** a key symptom of a BRUE/ALTE, according to the official definition?

- a) Apnoea
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- c) Cyanosis
- d) **Drowsiness**
- e) Change in tone

## Question 2

An 18 month old child is brought into the Emergency Department by paramedics. He has had a seizure at home, witnessed by his parents which spontaneously resolved after 2 minutes, but started seizing again in the ambulance and he is still seizing on entry to the ED. This second seizure has lasted 5 minutes so far. The paramedics have tried to cannulate him en route, but have not been successful. Which of the following is the best initial treatment option for this child?

- a) *Oxygen therapy*
- b) *Rectal Diazepam*
- c) *IV Lorazepam 0.1mg/kg*
- d) *IV Phenytoin bolus*
- e) *Buccal midazolam*

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# Question 3

A 6 year old girl is brought into the Emergency Department by her Mum following an accident at school. The little girl jumped from the vault during a gymnastics session in PE and missed the crash mat, landing on the hard floor. She told the teacher that she “landed on her ankle funny”. The girl is in severe pain. The X-Ray of her ankle is shown to the right. What would this fracture be classified as, according to the Salter-Harris system?

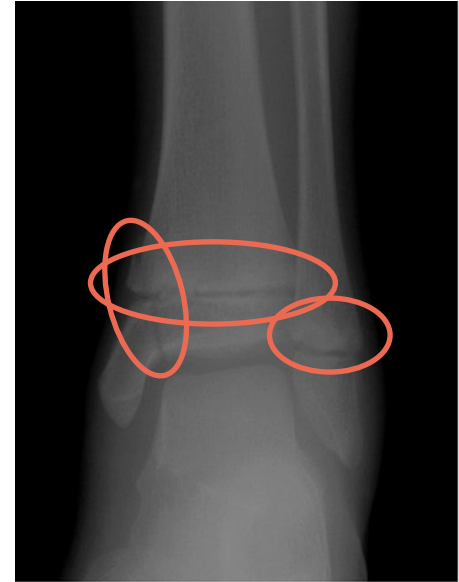
- a) *Type I*
- b) *Type II*
- c) *Type III*
- d) *Type IV*
- e) *Type V*



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- a) *Type I*
- b) *Type II*
- c) *Type III*
- d) ***Type IV***
- e) *Type V*



# Question 4

A 4 year old boy is brought into A&E with increasing difficulty breathing over the past 2 hours. His parents say that he hasn't seemed himself the past 2 days, and has had a cough since last night. The family recently moved here from Nigeria and are unable to remember which vaccinations he has had. On examination, the boy has a respiratory rate of 45, oxygen saturations of 88% on room air, a heart rate of 80, a temperature of 39.7 and you notice she is drooling. Given the most likely diagnosis, what is the next best step in the management of this patient?

- a) *Endotracheal intubation*
- b) *IM adrenaline*
- c) *Oral dexamethasone*
- d) *Thorough ENT examination*
- e) *IV broad spectrum antibiotics*

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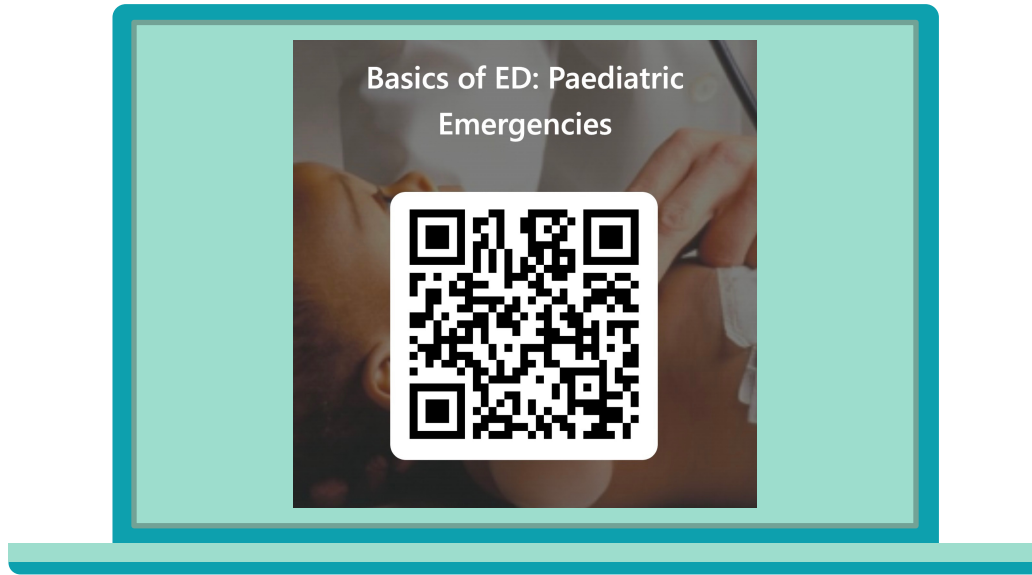
*Thank  
You*





# Feedback

Please scan the QR code and take a few minutes to leave feedback – it's really appreciated!



# References/Resources

- [www.teachmepaediatrics.com](http://www.teachmepaediatrics.com)
- [www.rcemlearning.co.uk/foamed](http://www.rcemlearning.co.uk/foamed)
- [www.teachmesurgery.com](http://www.teachmesurgery.com)
- The UK Sepsis Trust
- The Royal College of Paediatrics and Child Health
- [www.em3.org.uk](http://www.em3.org.uk)

