GP TEACHING PAEDIATRIC EMERGENCIES

Dan Hagger

Teaching Objectives/Outline

- To recognise, assess and initiate management of the acutely ill paediatric patients

- How children are different
- NICE Fever in under 5s: assessment and initial management guideline
- Acute/common paediatric scenarios

How are children different?



- Weight and size (huge variation)
- Physiological differences (RR, HR, BP)
- Anatomical variations (airway)
- Other aspects (understanding/fear/parents)
- Don't be scared – children are much nicer than adults!

Paediatric Normal Vital Signs

Age	RR	HR	SBP (50th centile)
<1	30-40	110-160	80-90
1-2	25-35	100-150	85-90
2-5	25-30	95-140	90-95
5-12	20-25	80-120	100-105
>12	15-20	60-100	110-120

Source: APLS guidelines

NICE Fever in under 5s: assessment and initial management guideline

	Green – low risk	Amber – intermediate risk	Red – high risk
Colour (of skin, lips or tongue)	• Normal colour	• Pallor reported by parent/carer	• Pale/mottled/ashen/blue
Activity	• Responds normally to social cues • Content/smiles • Stays awake or awakens quickly • Strong normal cry/not crying	• Not responding normally to social cues • No smile • Wakes only with prolonged stimulation • Decreased activity	• No response to social cues • Appears ill to a healthcare professional • Does not wake or if roused does not stay awake • Weak, high-pitched or continuous cry
Respiratory		• Nasal flaring • Tachypnoea: RR > 50 breaths/minute, age 6–12 months RR > 40 breaths/minute, age > 12 months • Oxygen saturation ≤ 95% in air • Crackles in the chest	• Grunting • Tachypnoea: RR > 60 breaths/minute • Moderate or severe chest indrawing
Circulation and hydration	• Normal skin and eyes • Moist mucous membranes	• Tachycardia: > 160 beats/minute, age < 1 year > 150 beats/minute, age 1–2 years > 140 beats/minute, age 2–5 years • CRT ≥ 3 seconds • Dry mucous membranes • Poor feeding in infants • Reduced urine output	• Reduced skin turgor
Other	• None of the amber or red symptoms or signs	• Age 3–6 months, temperature ≥ 39°C • Fever for ≥ 5 days • Rigors • Swelling of a limb or joint • Non-weight bearing limb/not using an extremity	• Age < 3 months, temperature ≥ 38°C • Non-blanching rash • Bulging fontanelle • Neck stiffness • Status epilepticus • Focal neurological signs • Focal seizures

Scenario 1

- You are seeing a 4 year old child in clinic with a cough, sudden onset noisy breathing and increased work of breathing
- What important points do you need to elicit from the history?
- Normally fit and well. No regular medicines. Immunisations up to date
- No apnoea/cyanotic episodes
- No hot/rash/unrepsonsive/seizure
- No history of inhaled foreign body

- You assess this child…

Scenario 1

- A: Maintaining own airway
- B: RR 45, Sats 92% on air. Moderate intercostal and subcostal recession. Some sternal recession. Tracheal tug.
- B: (on auscultation..)
- C: HR 145bpm. CRT <2 secs. Normal heart sounds, no murmurs.
- D/E: GCS 15/15. No rash. Temp 37.9 C.

- What is the most likely diagnosis and your differential?
- Stridor caused by Croup (laryngotracheobronchitis)
- Characterized by sudden onset seal-like barking cough and stridor
- Most commonly children 6 months and 6 years of age
- Parainfluenza virus primarily types 1 and 2, in 75% of cases.
- Other causes include measles, adenovirus and RSV
- How “ill” is this child?

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Scenario 1

- How ill is this child?

Table 1. Westley Croup Scoring System

STRIDOR	
None	0
Audible with stethoscope (at rest)	1
Audible without stethoscope (at rest)	2
RETRACTIONS	
None	0
Mild	1
Moderate	2
Severe	3
AIR ENTRY	
Normal	0
Decreased	1
Severely decreased	2
CYANOSIS	
None	0
With agitation	4
At rest	5
LEVEL OF CONSCIOUSNESS	
Normal	0
Altered	5
CROUP SEVERITY	
Mild croup	≤2
Moderate croup	3–5
Severe croup	6–11
Impending respiratory failure	≥12

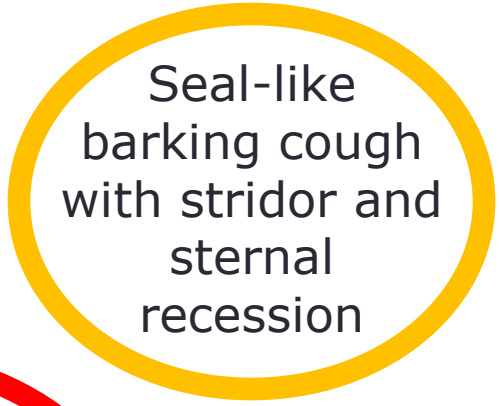
Adapted from: Westley et al, 1978; Johnson, 2009

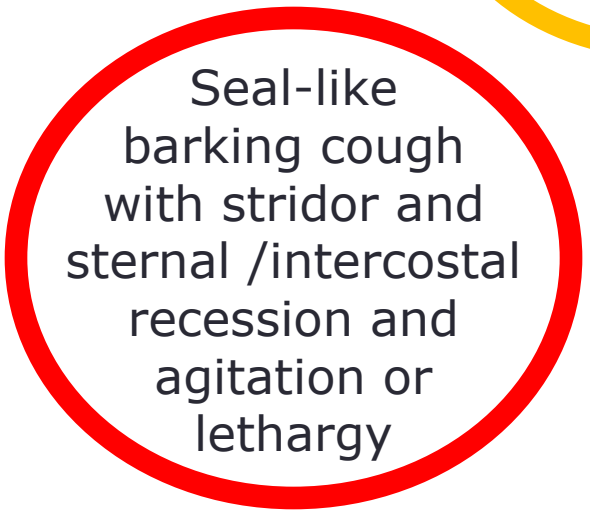
Scenario 1

- How would you manage this child?
- Try to keep them calm – don't examine their throat
- Refer to hospital?
- Dexamethasone 150mcg/kg po
- Budesonide 2mg neb
- Adrenaline 400mcg/kg neb
- Dexamethasome 0.6 mg/kg IM

- All moderate to severe should be transferred to hospital







Scenario 1

- If the child was drooling and in the tripod position what would be your top differential diagnosis and your management of this be?

- Acute epiglottitis – call 999, keep the child calm, don't examine them
- Historically caused by Haemophilus influenzae type B with immunization this is no longer the case
- Bacteria that are now typically involved are Streptococcus pneumoniae, Streptococcus pyogenes, or Staphylococcus aureus

Scenario 2

- Telephone consultation
- 12 week old girl. 4 day history runny nose and 3 days of cough. Episodes of pausing in breathing

- What else would you want to know?
- Breathing about one breath every second
- No temperature or rash. Settled. Wakes easily. Not pale/blue
- 48hrs of vomiting feeds – no blood/bile
- Less wet nappies last 24 hours

- What else would you want to know in PMH?
- Born at 32/40. On SCBU: CPAP for 2 days, oxygen for 4 days

- How would you assess this child over the phone?

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Scenario 2

- In light of your assessment what would you do?

- Children with any 'red' features but who are not considered to have an immediately life-threatening illness should be urgently assessed by a healthcare professional in a face-to-face setting within 2 hours
- Children with 'amber' but no 'red' features should be assessed by a healthcare professional in a face-to-face setting. The urgency of this assessment should be determined by the clinical judgement of the healthcare professional carrying out the remote assessment
- Children with 'green' features and none of the 'amber' or 'red' features can be cared for at home with appropriate advice for parents and carers, including advice on when to seek further attention from the healthcare services

Scenario 2

- A: Maintaining own airway
- B: RR 68 Sats 86% on air. Moderate-severe intercostal and subcostal recession. Coryzal.
- B: (on auscultation..)
- C: HR 180, intermittent bradycardias to 78 bpm. CRT 2-3 secs. Normal heart sounds, no murmurs. Good femorals.
- D/E: Normal tone and movement. Gluc 3.4 mmol/L. No rash. Upset but not irritable. Temp 37.8 C.

- Diagnosis?
- Bronchiolitis
- Measure oxygen saturation in every child presenting with suspected Bronchiolitis, including those presenting to primary care

Scenario 2

- What would be your management plan?
- O2, call 999, inform Paediatric team

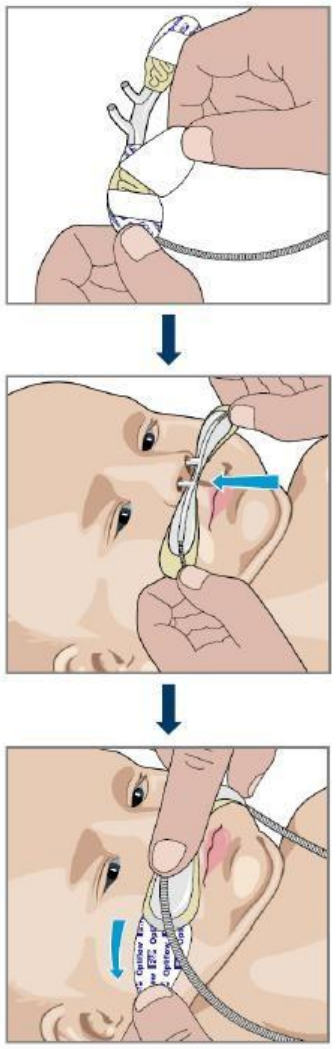
- What medications would you give?
- Do not use any of the following to treat bronchiolitis in children:
- Antibiotics
- Hypertonic saline
- Adrenaline (nebulised)
- Salbutamol
- Montelukast
- Ipratropium bromide
- Systemic or inhaled corticosteroids

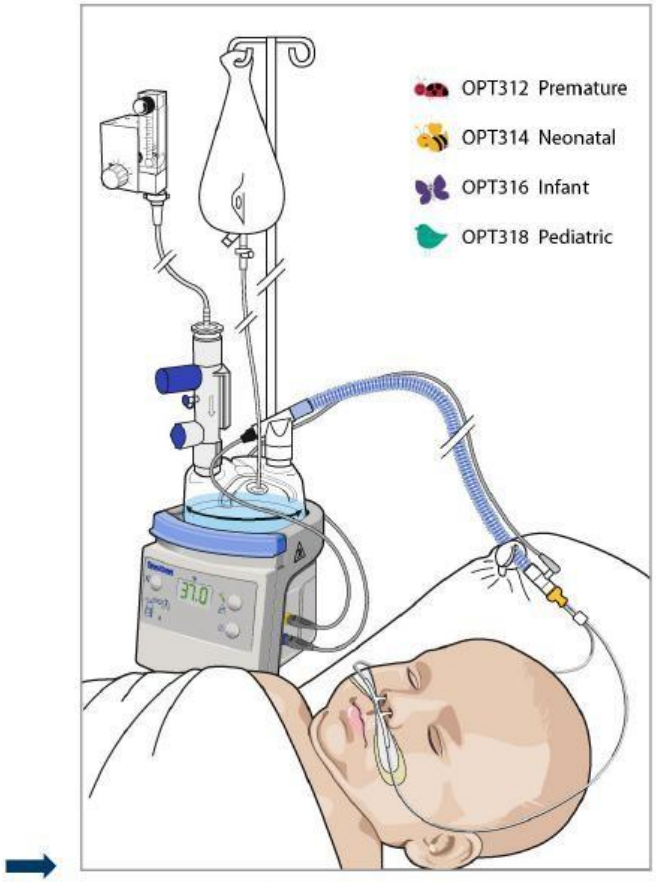
Scenario 2

- What would be your management plan in hospital?

- O2
- High Flow
- CPAP

- NG tube feeds





Scenario 3

- You assess a five year old fit and well other than Eczema with “difficulty breathing”. 20kg.
- On your assessment:
- A: Clear upper airway
- B: RR 55, Using accessory muscles. Sats are 86% in air. Cannot talk in full sentences.
- B: (on auscultation..)
- C: Pulse 160, CRT 2 seconds, cool peripheries.
- D/E: Agitated, uncooperative, GCS 14, PERL. Eczema rash only

- What is the diagnosis?
- Viral Wheeze
- What would be your initial treatment?

Scenario 3

- Give O2
- Aim for sats >94%
- Give B-agonist (Salbutamol) 2.5mg neb (<5 years) 5mg (>5 years) and mix with Ipratropium Bromide (250mcg)
- Above can be given continuously/every 20-30mins and weaned with improving symptoms
- Give Prednisolone 1-2mg/kg PO
- Call Ambulance for acute transfer to ED

- What signs are severe and what are life threatening?

Scenario 3

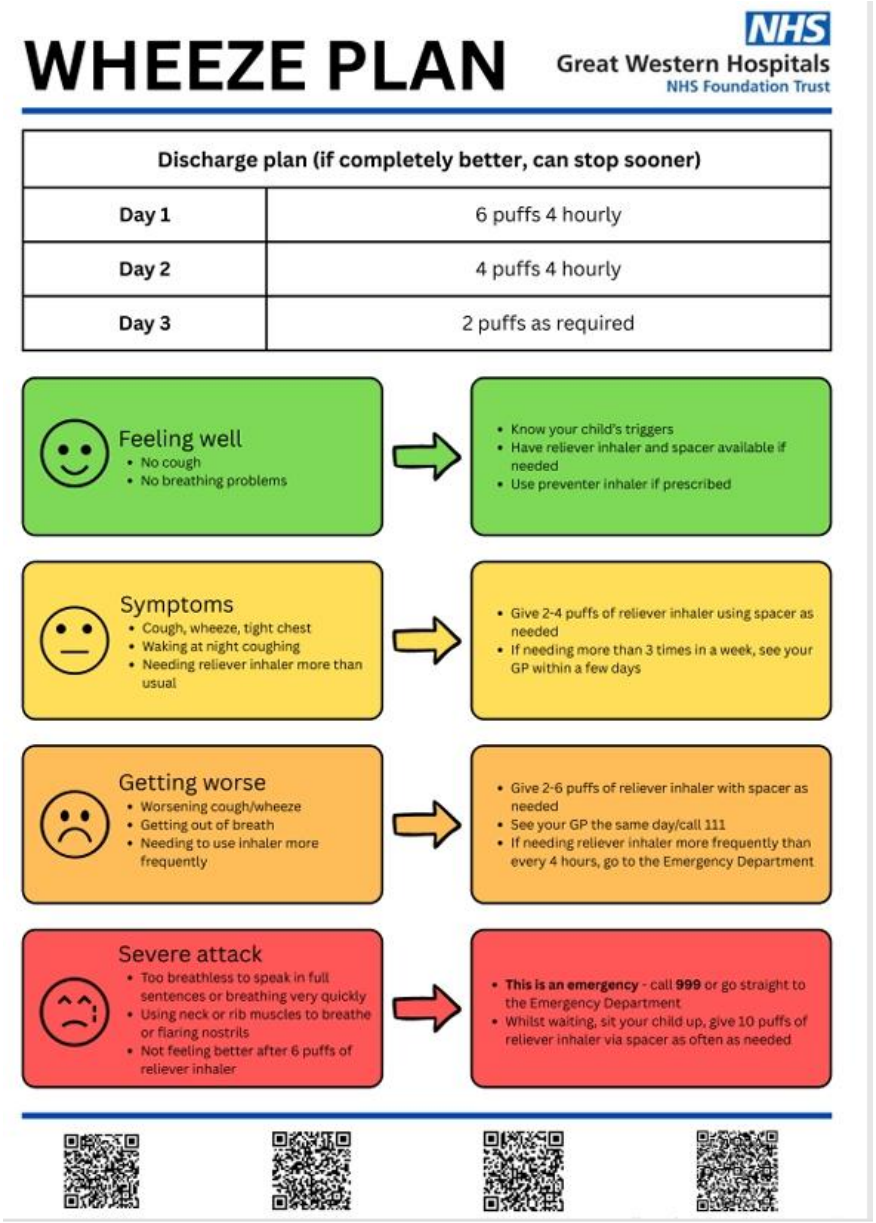
Moderate asthma	Acute severe asthma	Life-threatening asthma
Normal mental state	Agitated, distressed	Confused, drowsy, exhausted
Ability to talk in sentences or vocalise as normal	Can't complete sentences in one breath	Unable to talk
Some accessory muscle use	Moderate to marked accessory muscle use	Maximal accessory muscle use (poor respiratory effort is **pre-terminal**)
PEF ≥ 50% of best or predicted	PEF 33–50% of best or predicted	Marked tachycardia (sudden fall in HR is **pre-terminal**)
O_2 saturations > 92% in air	O_2 saturations < 92% in air	PEF < 33% of best or predicted
Moderate tachycardia	HR > 125 min^{-1} (> 5 years)	O_2 saturations < 92% in air
HR ≤ 125 min^{-1} (> 5 years)	HR > 140 min^{-1} (2–5 years)	Silent chest
HR ≤ 140 min^{-1} (2–5 years)	RR > 30 min^{-1} (> 5 years)	Cyanosis
RR ≤ 30 min^{-1} (> 5 years)	RR > 40 min^{-1} (2–5 years)	Hypotension
RR ≤ 40 min^{-1} (2–5 years)		

Scenario 3

- Treatment in hospital:
- IV Hydrocortisone (4mg/kg) – (If not tolerating PO Prednisolone)
- IV Magnesium Sulphate (40mg/kg over 20mins)
- IV Salbutamol bolus (15mcg/kg over 10mins) followed by infusion (1-5 mcg/kg/min) and monitor ECG and K
- IV Aminophylline bolus (5mg/kg over 20mins) followed by an infusion (1mg/kg/h)

Scenario 3

- All Children should have an Asthma/Wheeze Plan



WHEEZE PLAN

NHS
Great Western Hospitals
NHS Foundation Trust

Discharge plan (if completely better, can stop sooner)	
Day 1	6 puffs 4 hourly
Day 2	4 puffs 4 hourly
Day 3	2 puffs as required

Feeling well
- No cough
- No breathing problems

→
- Know your child's triggers
- Have reliever inhaler and spacer available if needed
- Use preventer inhaler if prescribed

Symptoms
- Cough, wheeze, tight chest
- Waking at night coughing
- Needing reliever inhaler more than usual

→
- Give 2-4 puffs of reliever inhaler using spacer as needed
- If needing more than 3 times in a week, see your GP within a few days

Getting worse
- Worsening cough/wheeze
- Getting out of breath
- Needing to use inhaler more frequently

→
- Give 2-6 puffs of reliever inhaler with spacer as needed
- See your GP the same day/call 111
- If needing reliever inhaler more frequently than every 4 hours, go to the Emergency Department

Severe attack
- Too breathless to speak in full sentences or breathing very quickly
- Using neck or rib muscles to breathe or flaring nostrils
- Not feeling better after 6 puffs of reliever inhaler

→
- **This is an emergency** - call **999** or go straight to the Emergency Department
- Whilst waiting, sit your child up, give 10 puffs of reliever inhaler via spacer as often as needed

Scenario 4

- 6 week old girl. Couple's first child. Normal pregnancy and delivery, no SCBU. Breast feeding well, gaining weight, no previous concerns
- Attended as parents feel baby is "not quite right"
- "Off feeds" for 8-12 hours.
- Seems to be hungry but not as much as usual, goes to breast, but reluctant to feed, pulls away very upset and crying. Sleeping more than usual

- You assess this child…

Scenario 4

- A: Patent
- B: Clear chest. Sats 96% air. Mild SCR.
- C: Pale, capillary refill 3 seconds on sternum, HR 190/min. HS 1+2+0. Good femorals.
- D: GCS 15/15. Normal tone but irritable on handling. High pitched cry. Temp 38.8
- E: Few fine pink spots over trunk. Pinprick spots over lower limbs

- How “ill” is this child?

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Scenario 4

- What is your differential diagnosis?
- What would be your management?
- Call for a 999 emergency transfer to ED

- **Suspected bacterial meningitis without non-blanching rash**
  - Transfer children and young people with suspected bacterial meningitis without non-blanching rash directly to secondary care **without** giving parenteral antibiotics

- **Suspected meningococcal disease (meningitis with non-blanching rash or meningococcal septicaemia**
  - **Give** parenteral antibiotics (IM or IV Benzylpenicillin) at the earliest opportunity do not delay urgent transfer to hospital to give the antibiotics

Table 1 Symptoms and signs of bacterial meningitis and meningococcal septicaemia

Symptom/sign	Bacterial meningitis (meningococcal meningitis and meningitis caused by other bacteria)	Meningococcal disease (meningococcal meningitis and/or meningococcal septicaemia)	Meningococcal septicaemia	Notes
Common non-specific symptoms/signs				
Fever	√	√	√	Not always present, especially in neonates
Vomiting/nausea	√	√	√	
Lethargy	√	√	√	
Irritable/ unsettled	√	√	√	
Ill appearance	√	√	√	
Refusing food/ drink	√	√	√	
Headache	√	√	√	
Muscle ache/ joint pain	√	√	√	
Respiratory symptoms/signs or breathing difficulty	√	√	√	
More specific symptoms/signs				
Non-blanching rash	√	√	√	Be aware that a rash may be less visible in darker skin tones – check soles of feet, palms of hands and conjunctivae
Stiff neck	√	√	NK	
Altered mental state	√	√	√	Includes confusion, delirium and drowsiness, and impaired consciousness
Capillary refill time more than 2 seconds	NK	√	√	
Unusual skin colour	NK	√	√	
Shock	√	√	√	
Hypotension	NK	√	√	
Leg pain	NK	√	√	
Cold hands/feet	NK	√	√	
Back rigidity	√	√	NK	
Bulging fontanelle	√	√	NK	Only relevant in children aged under 2 years
Photophobia	√	√	X	
Kernig's sign	√	√	X	
Brudzinski's sign	√	√	X	
Unconsciousness	√	√	√	
Toxic/moribund state	√	√	√	
Paresis	√	√	X	
Focal neurological deficit including cranial nerve involvement and abnormal pupils	√	√	X	
Seizures	√	√	X	

Scenario 4

Suspected meningococcal disease (meningitis with non-blanching rash or meningococcal septicaemia) prior to urgent transfer to hospital

By intravenous injection, or by intramuscular injection

For Child 1–11 months

300 mg, administer as single dose prior to urgent transfer to hospital so long as does not delay transfer.

For Child 1–9 years

600 mg, administer as single dose prior to urgent transfer to hospital so long as does not delay transfer.

For Child 10–17 years

1.2 g, administer as single dose prior to urgent transfer to hospital so long as does not delay transfer.

Scenario 4

- How would this child be managed in hospital?
- Fluid bolus – does this improve perfusion? Inotropes?
- IV Antibiotics – what?
- Broad spectrum – Ceftriaxone and Amoxicillin

- What investigations do you want to do?
- Access and bloods: culture, FBC, U+E, BM, LFT, CRP, clotting, PCR
- LP – if no contraindications (e.g. raised ICP, shock, abnormal coagulation, infection over LP site, cardio/resp instability)

- How do you assess dehydration?

Scenario 4

- How do you assess dehydration?

No clinically detectable dehydration	Clinical dehydration	Hypovalaemic shock
Alert and responsive	Red flag Altered responsiveness (irritable, lethargic)	Decreased level of consciousness
Appears well	Red flag Appears to be unwell or deteriorating	-
Eyes not sunken	Red flag Sunken eyes	-
Moist mucous membranes	Dry mucous membranes (except for 'mouth breather')	-
Normal blood pressure	Normal blood pressure	Hypotension (decompensated shock)
Normal breathing pattern	Red flag Tachypnoea	Tachypnoea
Normal CRT	Normal CRT	Prolonged CRT
Normal heart rate	Red flag Tachycardia	Tachycardia
Normal peripheral pulses	Normal peripheral pulses	-
Normal skin turgor	Red flag Reduced skin turgor	-
Normal urine output	Decreased urine output	-
Skin colour unchanged	Skin colour unchanged	Pale or mottled skin
Warm extremities	Warm extremities	Cold extremities

Scenario 4

- If the patient had raised WC in CSF which were all lymphocytes along with deranged LFTs+clotting and twitching left leg how would this change your management?

- Is this herpes?
- Any lesions? Maternal history?
- Add in Acyclovir if suspected clinically, in history or by results

Body weight (Kg)	Surface area (m^2)
1	0.10
1.5	0.13
2	0.16
2.5	0.19
3	0.21
3.5	0.24
4	0.26
4.5	0.28
5	0.30
5.5	0.32
6	0.34
6.5	0.36
7	0.38
7.5	0.40
8	0.42
8.5	0.44
9	0.46
9.5	0.47
10	0.49
11	0.53
12	0.56
13	0.59
14	0.62
15	0.65
16	0.68
17	0.71
18	0.74
19	0.77
20	0.79
21	0.82
22	0.85
23	0.87
24	0.90
25	0.92
26	0.95

Scenario 5

- You see a five year old girl whose mother has attended the GP due to concerns of being tired and vomiting bile.
- What else would you want to know?
- No blood. No abdominal pain. Tolerating oral fluids. No pyrexia or rash. Not intentional weight loss but maybe lost some weight. No dietary restriction.
- Previously fit and well. No regular medicines or allergies



Scenario 5

- On assessment:
- A: Patent
- B: RR 38. Sats 98% in air. Sub-costal recession and some tracheal tug
- C: CRT 2-3 seconds. HR 138. Cool peripherally.
- D: Very lethargic. Temp 38.5
- E: No rash

- How “ill” is this child?

	Green – low risk	Amber – intermediate risk	Red – high risk
Colour (of skin, lips or tongue)	• Normal colour	• Pallor reported by parent/carer	• Pale/mottled/ashen/blue
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Scenario 5

- What test could help you with diagnosis?
- Measure blood glucose at presentation in children who have:
  - Increased thirst
  - Polyuria
  - Recent unexplained weight loss
  - Excessive tiredness
    - and any of:
  - Nausea, vomiting, abdominal pain, hyperventilation, dehydration or reduced level of consciousness

- Glucose above 11 mmol/litre and above symptoms gives you a diagnosis of type 1 Diabetes

Scenario 5

Osmotic Diuresis as blood glucose levels exceed renal threshold

Toilet

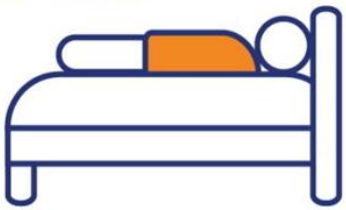


Thirsty

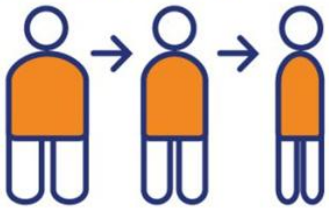


Caused by resulting loss of fluid from osmotic diuresis

Tired



Thinner



As the body can not utilise glucose for energy

Fluid depletion and breakdown of fat and muscle as energy

Scenario 5

- If known Diabetic measure their blood ketones if able
- Immediately send them to a hospital if:
  - Blood ketones are elevated
  - A near-patient method for measuring their blood ketones is not available

- All children with suspected Diabetes based on symptoms and raised blood glucose need to be referred to hospital the same day

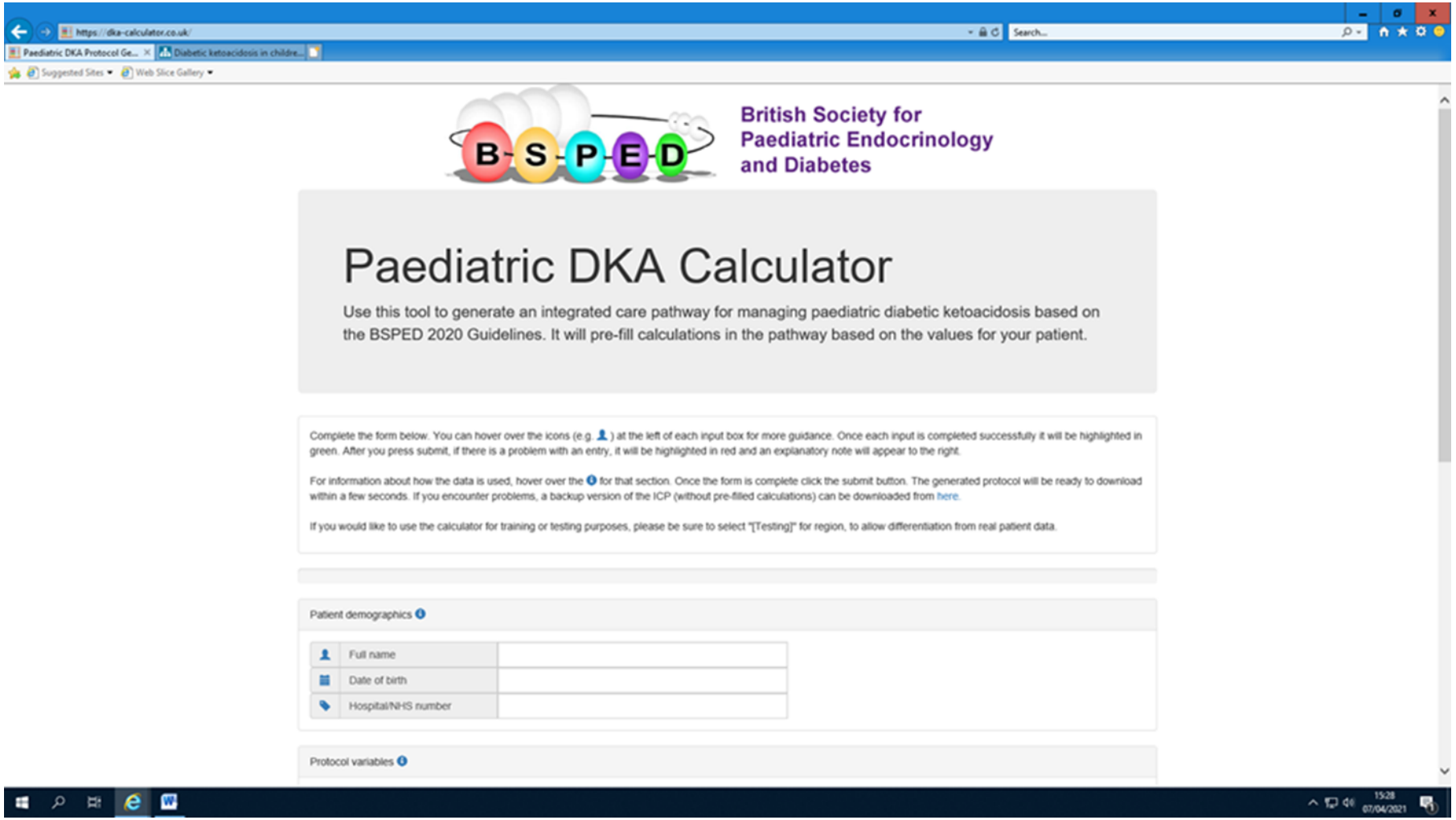
Scenario 5

- If you saw this patient in hospital, what initial tests would you want to do first?

- Results:
- pH 7.26, pCO2 3.5, HCO3 14, Glucose 35, Lac 2.4, Ketones 3.4

- What is the diagnosis?
- **Diabetic Keto Acidosis**
- What do you want to do now?

Scenario 5


https://dka-calculator.co.uk/
Search...
Paediatric DKA Protocol Ge...
Diabetic ketoacidosis in childre...
Suggested Sites
Web Slice Gallery
B S P E D
British Society for Paediatric Endocrinology and Diabetes
Paediatric DKA Calculator
Use this tool to generate an integrated care pathway for managing paediatric diabetic ketoacidosis based on the BSPED 2020 Guidelines. It will pre-fill calculations in the pathway based on the values for your patient.
Complete the form below. You can hover over the icons (e.g.) at the left of each input box for more guidance. Once each input is completed successfully it will be highlighted in green. After you press submit, if there is a problem with an entry, it will be highlighted in red and an explanatory note will appear to the right.
For information about how the data is used, hover over the for that section. Once the form is complete click the submit button. The generated protocol will be ready to download within a few seconds. If you encounter problems, a backup version of the ICP (without pre-filled calculations) can be downloaded from here.
If you would like to use the calculator for training or testing purposes, please be sure to select "[Testing]" for region, to allow differentiation from real patient data.
Patient demographics
Full name
Date of birth
Hospital/NHS number
Protocol variables
15:28
07/04/2021

Page 3

FLOW CHART 1 – ASSESSMENT & DIAGNOSIS

Patient Name:
Date of Birth:
Hospital / NHS Number:

START HERE

Clinical History:
- Polyuria/polydipsia
- Weight loss
- Abdominal pain
- Weakness
- Vomiting
- Confusion

Clinical Signs:
- Dehydration
- Kussmaul breathing (deep, sighing)
- Ketotic smell
- Lethargy, drowsiness

Biochemistry:
- Hyperglycaemia (>11mmol/L)
- Acidaemia (pH<7.3)
- Ketosis (blood ketones >3mmol/L or urine ketones ++)

Suspect DKA

Ask for senior support

Check: Blood Glucose, Blood Ketones, Blood Gas

Record initial values:
- Glucose ____ mmol/L
- pH ____
- Ketones ____ mmol/L
- Bicarb. ____ mmol/L

Raised blood glucose, pH >7.3 AND bicarbonate >15mmol/L → Consider new diabetes not in DKA. Use local guidelines

Very high blood glucose (>35mmol/L), No significant ketosis (<3 mmol/L) OR acidosis (pH>7.3, bicarb. >15 mmol/L) → Go to flow chart 12 HYPEROSMOLAR HYPERGLYCAEMIC STATE Page 13

pH <7.3 or bicarbonate <15mmol/L AND Blood ketones >3mmol/L → Diagnose DKA

Blood glucose levels are generally high (above 11 mmol/L) but children and young people with known diabetes may develop DKA with normal blood glucose levels.

Perform rapid emergency assessment

Record your initial assessment here and use this to guide your management on the following page

Airway — Maintaining own airway? Yes ☐ No ☐

Breathing — RR ____ /min; SpO_2 ____ %; Acidotic pattern? Yes ☐ No ☐

Circulation — HR ____ /min; CRT ____ secs; BP ____ / ____; Clinically shocked? Yes ☐ No ☐ → See also page 4

Disability — GCS ____ /15; M: ____ /6 V: ____ /5 E: ____ /4 → See also appendix 1 page 14

Further details:

Children who are alert, not clinically dehydrated, not nauseated or vomiting, do not always require IV fluids, even if their ketone levels are high. They usually tolerate oral rehydration and subcutaneous insulin but do require monitoring regularly to ensure that they are improving and their ketone levels are falling. This decision should be made in consultation with the responsible paediatrician.

Go to flow chart 2 RESUSCITATION Page 4

Chart completed by:
GMC number:
Signature:
Time / Date:

Page 4

FLOW CHART 2 – RESUSCITATION

Patient Name:
Date of Birth:
Hospital / NHS Number:

From flow chart 1 ASSESSMENT & DIAGNOSIS

A: Establish airway: Seek urgent anaesthetic review if unable to protect airway. If child comatose: Insert NG tube on free drainage.

B: Give O_2 100% via face mask with reservoir bag (only omit if child very well).

C: Establish IV access (consider 2nd cannula for later blood samples), take bloods (see box). Commence cardiac monitoring (peaked T waves may indicate hyperkalaemia).

For estimated weight:
- Refer to appendix 2, page 14
- Ensure an accurate weight is obtained before starting maintenance fluids

Weight: ____ kg
Actual / Estimated / Recent ☐ ☐ ☐

Recommended bloods:
- Blood ketones
- Blood gas
- $HbA1_c$
- FBC, U+Es, CRP
- Lab glucose

For patients newly diagnosed:
- TFTs
- TTG
- Additional bloods as per your local policy

Is the patient shocked?
- Tachycardia
- Prolonged central capillary refill
- Poor peripheral pulses
- Hypotension (late sign)

Shocked patients should be discussed with the most senior paediatrician or intensivist at the earliest opportunity.

Yes / No

Shocked patients: 20 ml/kg bolus of 0.9% saline or plasmalyte over 15 minutes
Volume: ____ ml
Started: hh:mm dd/mm/yyyy

Reassess: if still shocked further boluses of 10ml/kg (up to total of 40ml/kg) may be given
Volume: ____ ml
Started: hh:mm dd/mm/yyyy
Volume: ____ ml
Started: hh:mm dd/mm/yyyy

If still shocked consider inotropes and critical care escalation

All children with mild, moderate or severe DKA should receive a 10ml/kg bolus of 0.9% saline over 1 hour
Volume: ____ ml
Started: hh:mm dd/mm/yyyy

Whilst excessive fluid should be avoided because of the risk of cerebral oedema, it is important to ensure that the circulation is adequate and fluid should be given to support this. Cerebral perfusion is dependent on both perfusion pressure and intracranial pressure, and hypotension will exacerbate the risk of brain injury.

A bolus given on this arm is later subtracted from the calculated fluid deficit, whereas boluses for shocked patients are not. See page 6 for details.

Do NOT give IV sodium bicarbonate to patients with DKA. See appendix 4, page 15, for more information.

D: Consider if cerebral oedema may be present
Early manifestations: headache, agitation/irritability, unexpected fall in heart rate, rise in blood pressure
Additional manifestations: deterioration in conscious level, abnormal breathing pattern, oculomotor palsies, abnormal posturing, pupil inequalities or dilatation

Features of cerebral oedema? No → Go to flow chart 3 SECONDARY REVIEW Page 5; Yes → Go to flow chart 8 CEREBRAL OEDEMA Page 11

Chart completed by:
GMC number:
Signature:
Time / Date:

Page 6

FLOW CHART 4 - FLUIDS

Patient Name:
Date of Birth:
Hospital / NHS Number:

From flow chart 3 SECONDARY REVIEW

To avoid excessive amounts of fluid in overweight and obese children it is recommended that consideration be given to using a **maximum weight of 80kg or 98th centile weight for age** (whichever is lower) when calculating both deficit and maintenance requirements. Please refer to the full BSPED guidelines for further information.

Decide DKA severity

- pH <7.1 and/or bicarb. <5 SEVERE DKA → Assume 10% dehydration
- pH 7.1-7.19 and/or bicarb. <10 MODERATE DKA → Assume 7% dehydration
- pH 7.2-7.29 and/or bicarb. <15 MILD DKA → Assume 5% dehydration

Fluid calculations

Fluid deficit = Patient weight kg × % Dehydration × 10 = mL

e.g. 22kg × 7% × 10 = 1540mL

Subtract ONLY the 10mL/kg bolus given over 1 hour to non-shocked patients. DO NOT subtract rapid resuscitation boluses given to shocked patients.

Fluid deficit (less bolus volume) = Fluid deficit mL - 10ml/kg bolus volume mL = mL

e.g. 1540mL – 220mL = 1320mL

Deficit replacement rate = Fluid deficit (less bolus volume) mL ÷ 48 hours = mL/hour

e.g. 1320mL ÷ 48hours = 27.5mL/hour

Use Holliday-Segar formula: i.e. 100mL/kg for first 10kg; 50mL/kg for next 10kg; 20mL/kg thereafter.

Note: deficit is replaced over 48 hours, maintenance rate is calculated over 24 hours.

Maintenance rate = Daily fluid requirement mL ÷ 24 hours = mL/hour

e.g.(for 22kg) (1000mL+500mL+40mL) ÷ 24hours = 64.2mL/hour

STARTING FLUID RATE (after bolus complete) = Maintenance rate mL/hour + Deficit replacement rate mL/hour = mL/hour

e.g. 64.2mL/hour + 27.5mL/hour = 91.7mL/hour

Plasmalyte 148 can be used as an alternative to 0.9% Sodium Chloride but must have added potassium.

If potassium is above normal range add potassium to fluids only after the patient has passed urine **or** after the Potassium has fallen to within the normal range.

Once initial bolus is complete: Start 0.9% Sodium Chloride + 20mmol Potassium Chloride in 500mL at STARTING FLUID RATE as above.

Fluid start time / date: hh:mm dd/mm/yyyy

Go to flow chart 5 INSULIN Page 7

Chart completed by:
GMC number:
Signature:
Time / Date:

Page 7

FLOW CHART 5 - INSULIN

Patient Name:
Date of Birth:
Hospital / NHS Number:

From flow chart 4 FLUIDS

Insulin rates of 0.05 and 0.1 units/kg/hr are typically suggested. A rate of 0.05 Units/kg/hr should be used in most cases unless your local policy dictates otherwise, or in specific cases (such as in adolescents or severe DKA) as directed by a senior paediatrician or intensivist.

Wait for 1-2 hours after starting IV fluid treatment before starting insulin

Starting insulin early may increase the risk of cerebral oedema

Insulin hourly rate = 0.05-0.1 units/kg /hour × Patient weight kg = units /hour

e.g. 22kg × 0.05units/kg/hour = 1.1units/hour

Use pre-filled syringes containing 50 Units of soluble insulin in 50 ml 0.9% sodium chloride where available. If pre-filled syringes are not available, add 50 units of soluble insulin (e.g. Actrapid) to 49.5ml 0.9% sodium chloride.

Start at INSULIN HOURLY RATE as calculated above:

Insulin start time / date: hh:mm dd/mm/yyyy

Pre-existing diabetes?

Yes

Patients on insulin pumps (CSII) should have their pump stopped once IV insulin is started.

Pump stopped? Yes / N/A

Patients already on long-acting insulin consider continuing at the usual dose and time throughout the DKA treatment, in addition to the IV insulin infusion, in order to shorten length of stay after recovery from DKA.

Long-acting insulin continued? Yes / No / N/A

No

If supported by your local guidelines, consider starting an appropriate dose of long acting background insulin alongside the intravenous infusion.

Long-acting insulin started? Yes / No

Go to flow chart 6 MONTORING & REVIEWS Page 8

Chart completed by:
GMC number:
Signature:
Time / Date:

Scenario 6

- A ten year old boy acutely presents with itchy lips, a rash and difficulty in breathing. He is noted to be wheezing and tachycardic

- What do you think is the problem? What could have caused it?
- Food (nuts, shellfish), drugs (penicillin)
- Is this anaphylaxis?



- What is the definition of anaphylaxis?
- Anaphylaxis is a severe, life-threatening, generalised or systemic hypersensitivity reaction

Scenario 6

3.1 Anaphylaxis is likely when all of the following 3 criteria are met:

- Sudden onset and rapid progression of symptoms
- Life-threatening Airway and/or Breathing and/or Circulation problems
- Skin and/or mucosal changes (flushing, urticaria, angioedema)

The following supports the diagnosis:

- Exposure to a known allergen for the patient

Remember:

- Skin or mucosal changes alone are not a sign of an anaphylactic reaction
- Skin and mucosal changes can be subtle or absent in up to 20% of reactions (some patients can have only a decrease in blood pressure, i.e., a Circulation problem)
- There can also be gastrointestinal symptoms (e.g. vomiting, abdominal pain, incontinence)

Scenario 6

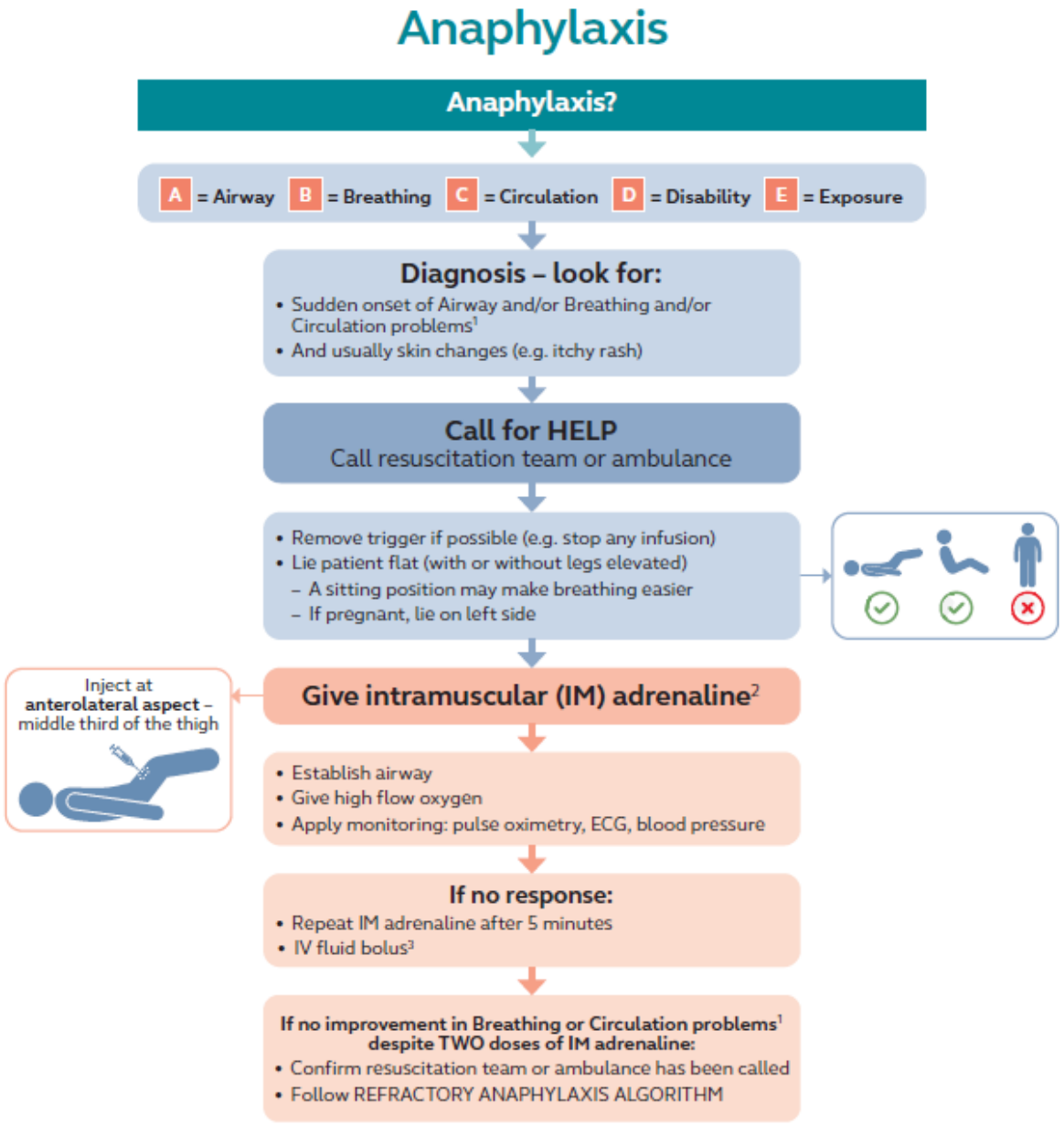
- What are the signs of a severe allergic reaction i.e. anaphylaxis?

- Airway:
- Swollen tongue, difficulty swallowing, throat tightness, change in voice (hoarse/croaky)

- Breathing:
- Difficulty breathing, chest tightness, noisy breathing, persistent cough, wheeze

- Circulation:
- Feeling dizzy or faint, collapse, loss of consciousness, pale and floppy (in babies/small children)

Scenario 6


Anaphylaxis
Anaphylaxis?
A = Airway
B = Breathing
C = Circulation
D = Disability
E = Exposure
Diagnosis – look for:
• Sudden onset of Airway and/or Breathing and/or Circulation problems[1]
• And usually skin changes (e.g. itchy rash)
Call for HELP
Call resuscitation team or ambulance
• Remove trigger if possible (e.g. stop any infusion)
• Lie patient flat (with or without legs elevated)
– A sitting position may make breathing easier
– If pregnant, lie on left side
Inject at anterolateral aspect – middle third of the thigh
Give intramuscular (IM) adrenaline[2]
• Establish airway
• Give high flow oxygen
• Apply monitoring: pulse oximetry, ECG, blood pressure
If no response:
• Repeat IM adrenaline after 5 minutes
• IV fluid bolus[3]
If no improvement in Breathing or Circulation problems[1] despite TWO doses of IM adrenaline:
• Confirm resuscitation team or ambulance has been called
• Follow REFRACTORY ANAPHYLAXIS ALGORITHM

Scenario 6

Refractory anaphylaxis

No improvement in respiratory or cardiovascular symptoms despite 2 appropriate doses of intramuscular adrenaline

Establish dedicated peripheral IV or IO access

Seek expert[1] help early
Critical care support is essential

Give rapid IV fluid bolus
e.g. 0.9% sodium chloride

&

Start adrenaline infusion
Adrenaline is essential for treating all aspects of anaphylaxis

Give IM* adrenaline every 5 minutes until adrenaline infusion has been started
*IV boluses of adrenaline are not recommended, but may be appropriate in some specialist settings (e.g. peri-operative) while an infusion is set up

Give high flow oxygen
Titrate to SpO_2 94–98%

Monitor HR, BP, pulse oximetry and ECG for cardiac arrhythmia
Take blood sample for mast cell tryptase

Follow local protocol
OR
Peripheral low-dose IV adrenaline infusion:
- 1 mg (1 mL of 1 mg/mL [1:1000]) adrenaline in 100 mL of 0.9% sodium chloride
- Prime and connect with an infusion pump via a dedicated line

DO NOT 'piggy back' on to another infusion line

DO NOT infuse on the same side as a BP cuff as this will interfere with the infusion and risk extravasation

- In both adults and children, start at 0.5–1.0 mL/kg/hour, and **titrate according to clinical response**
- Continuous monitoring and observation is mandatory
- ↑↑ BP is likely to indicate adrenaline overdose

Continue adrenaline infusion and treat ABC symptoms
Titrate according to clinical response

[1]Intravenous adrenaline for anaphylaxis to be given only by experienced specialists in an appropriate setting.

A = Airway

Partial upper airway obstruction/stridor:
Nebulised adrenaline (5mL of 1mg/mL)

Total upper airway obstruction:
Expert help needed, follow difficult airway algorithm

B = Breathing

Oxygenation is more important than intubation

If apnoeic:
- Bag mask ventilation
- Consider tracheal intubation

Severe/persistent bronchospasm:
- Nebulised salbutamol and ipratropium with oxygen
- Consider IV bolus and/or infusion of salbutamol or aminophylline
- Inhalational anaesthesia

C = Circulation

Give further fluid boluses and titrate to response:
Child 10 mL/kg per bolus
Adult 500–1000 mL per bolus
- Use glucose-free crystalloid (e.g. Hartmann's Solution, Plasma-Lyte®)

Large volumes may be required (e.g. 3–5 L in adults)

Place arterial cannula for continuous BP monitoring

Establish central venous access

IF REFRACTORY TO ADRENALINE INFUSION
Consider adding a second vasopressor **in addition** to adrenaline infusion:
- Noradrenaline, vasopressin or metaraminol
- In patients on beta-blockers, consider glucagon

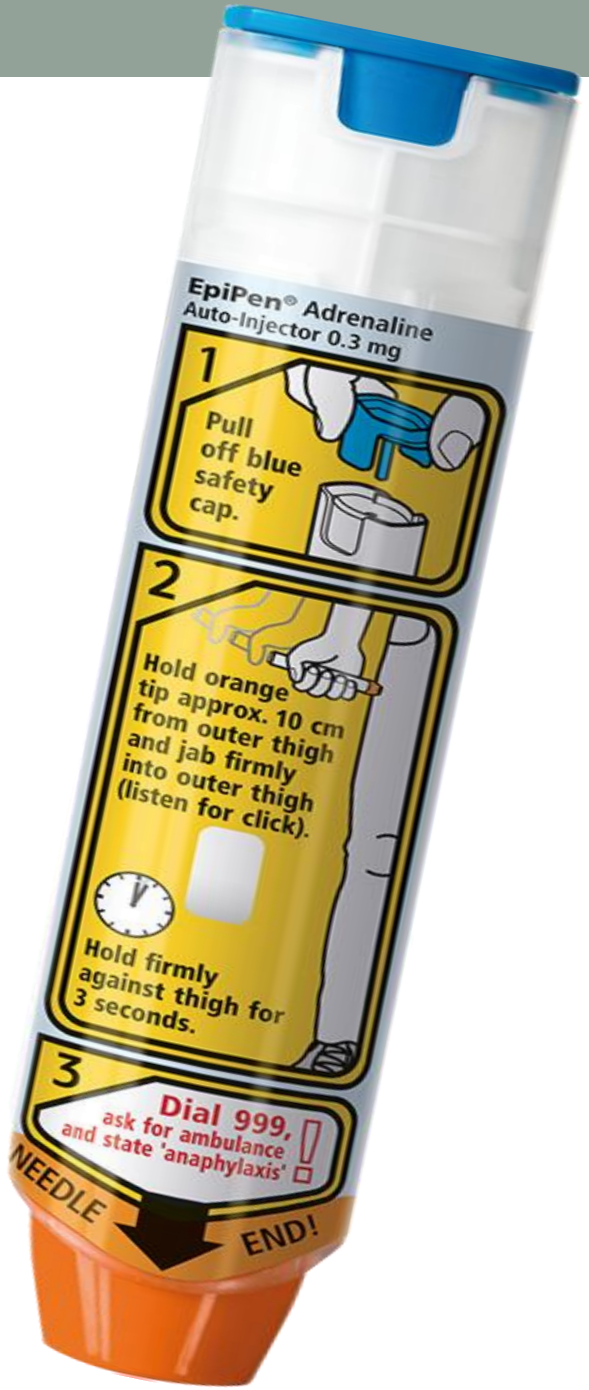
Consider extracorporeal life support

Cardiac arrest – follow ALS ALGORITHM
- Start chest compressions early
- Use IV or IO adrenaline bolus (cardiac arrest protocol)
- Aggressive fluid resuscitation
- Consider prolonged resuscitation/extracorporeal CPR

Scenario 6







https://www.allergyuk.org/information-and-advice/conditions-and-symptoms/33-anaphylaxis-and-severe-allergic-reaction

Scenario 6

BSACI Improving Allergy Care

ALLERGY ACTION PLAN

RCPCH Royal College of Paediatrics and Child Health · anaphylaxis UK · AllergyUK

Name:

DOB:

Mild/moderate reaction:

- Swollen lips, face or eyes
- Itchy/tingling mouth
- Mild throat tightness
- Hives or itchy skin rash
- Abdominal pain or vomiting
- Sudden change in behaviour

Action to take:

- Stay with person, call for help if needed
- Locate adrenaline autoinjector(s)
- **Give antihistamine:** .....

(If vomited, can repeat dose)

- Phone parent/emergency contact
- Do not take a shower to help with itchy skin, this can worsen the reaction

Watch for signs of ANAPHYLAXIS

(a potentially life-threatening allergic reaction)

Anaphylaxis may occur without skin symptoms: ALWAYS consider anaphylaxis in someone with known food allergy who has **SUDDEN DIFFICULTY IN BREATHING**

A AIRWAY	B BREATHING	C CONSCIOUSNESS
• Persistent cough	• Difficult or noisy breathing	• Persistent dizziness
• Hoarse voice	• Wheeze or persistent cough	• Pale or floppy
• Difficulty swallowing		• Suddenly sleepy
• Swollen tongue		• Collapse/unconscious

IF ANY ONE (OR MORE) OF THESE SIGNS ABOVE ARE PRESENT:

1. **Lie flat with legs raised** (if breathing is difficult, allow person to sit)



2. **Use Adrenaline autoinjector without delay** (eg. EpiPen®) (Dose: mg)
3. **Dial 999** for ambulance and say ANAPHYLAXIS ("ANA-FIL-AX-IS")

***** IF IN DOUBT, GIVE ADRENALINE *****

AFTER GIVING ADRENALINE:

1. Stay with child/young person until ambulance arrives, **do NOT stand them up.** Keep them lying down, even if things seem to be getting better.
2. Phone parent/emergency contact. If you are on your own, call a friend or relative and ask them to come over.
3. If no improvement **after 5 minutes, give a further adrenaline dose** using a second autoinjector device, if available.

Commence CPR if there are no signs of life

You can dial 999 from any phone, even if there is no credit left on a mobile.
Medical observation in hospital is recommended after anaphylaxis.

Emergency contact details:

1) Name: .....

.....

2) Name: .....

.....

Parental consent: I hereby authorise school staff to administer the medicines listed on this plan, in accordance with Department of Health Guidance on the use of AAIs in schools.

Signed: .....

Print name: .....

Date: .....

Consent is required for children under 16 years (and for young people over 16 unable to give consent themselves) except in an unforeseen emergency

For more information about managing anaphylaxis in schools and "spare" adrenaline autoinjectors, visit: sparepensinschools.uk

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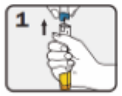
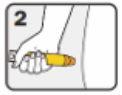
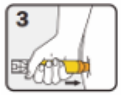
How to give EpiPen®



PULL OFF BLUE SAFETY CAP and grasp EpiPen. Remember: "blue to sky, orange to the thigh"



Hold leg still and PLACE ORANGE END against mid-outer thigh "with or without clothing"



PUSH DOWN HARD until a click is heard or felt and hold in place for **3 seconds**. Remove EpiPen.

Additional instructions:

If wheezy due to an allergic reaction, GIVE ADRENALINE FIRST and then asthma reliever (e.g. blue puffer) via spacer, if prescribed

This is a medical document to be completed by a healthcare professional. It must not be altered without their permission. This document provides medical authorisation for schools to administer a 'spare' back-up adrenaline autoinjector if needed, as permitted by the Human Medicines (Amendment) Regulations 2017. During travel, adrenaline auto-injector devices must be carried in hand-luggage or on the person, and **NOT** in the luggage hold. **This action plan and medical authorisation to carry emergency autoinjectors has been prepared by:**

Sign & print name: .....

Hospital/Clinic: .....

.....

Date: .....

Scenario 7

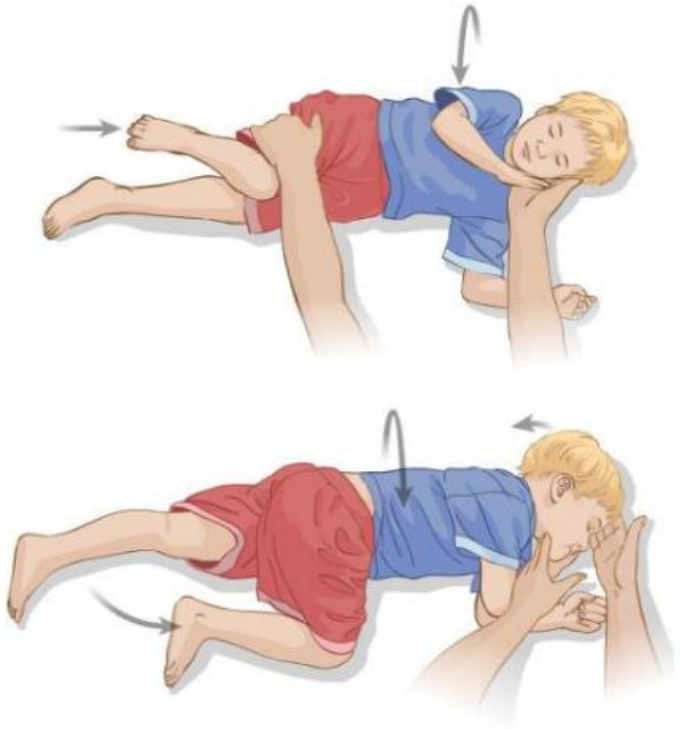
- A five year old girl is rushed into the GP practice
- Mum states that she has just started fitting

- What important information you would like to know?
- Cough and soar throat 48 hours. Hot all day
- No trauma
- No history of epilepsy/PMH
- No known poison ingestion

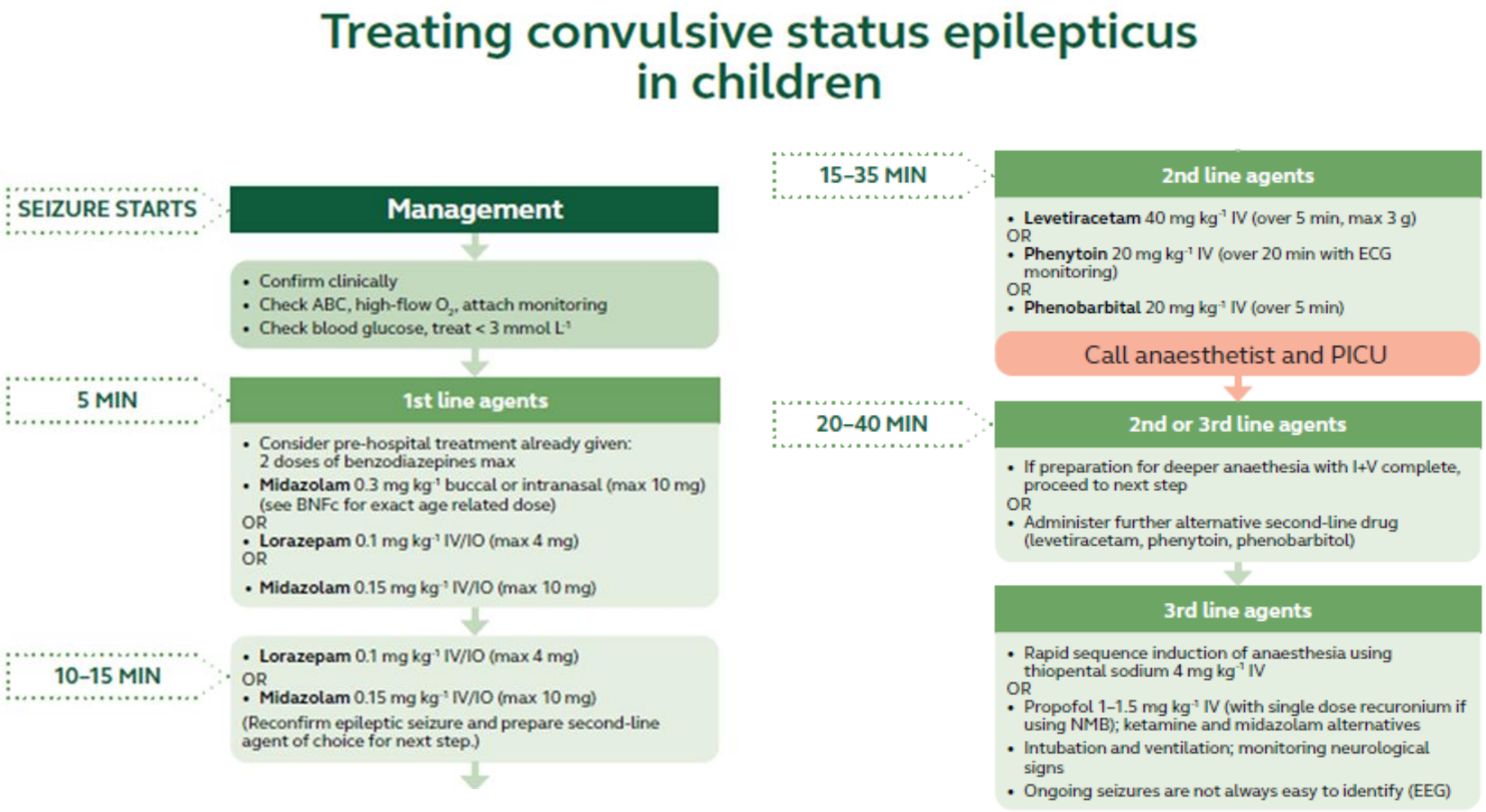
Scenario 7

- What is your management?
- Protect them from injury (remove harmful objects from nearby)
- Cushion or gently hold child's head to protect them from head injury
- Turn the child onto their side, into the recovery position, as soon as you are able
- Call 999

- What medications can you give if the seizure is ongoing?



Scenario 7


Treating convulsive status epilepticus in children
SEIZURE STARTS
Management
• Confirm clinically
• Check ABC, high-flow O_2, attach monitoring
• Check blood glucose, treat < 3 mmol L^{-1}
5 MIN
1st line agents
• Consider pre-hospital treatment already given: 2 doses of benzodiazepines max
• Midazolam 0.3 mg kg^{-1} buccal or intranasal (max 10 mg) (see BNFc for exact age related dose)
OR
• Lorazepam 0.1 mg kg^{-1} IV/IO (max 4 mg)
OR
• Midazolam 0.15 mg kg^{-1} IV/IO (max 10 mg)
10–15 MIN
• Lorazepam 0.1 mg kg^{-1} IV/IO (max 4 mg)
OR
• Midazolam 0.15 mg kg^{-1} IV/IO (max 10 mg)
(Reconfirm epileptic seizure and prepare second-line agent of choice for next step.)
15–35 MIN
2nd line agents
• Levetiracetam 40 mg kg^{-1} IV (over 5 min, max 3 g)
OR
• Phenytoin 20 mg kg^{-1} IV (over 20 min with ECG monitoring)
OR
• Phenobarbital 20 mg kg^{-1} IV (over 5 min)
Call anaesthetist and PICU
20–40 MIN
2nd or 3rd line agents
• If preparation for deeper anaethesia with I+V complete, proceed to next step
OR
• Administer further alternative second-line drug (levetiracetam, phenytoin, phenobarbitol)
3rd line agents
• Rapid sequence induction of anaesthesia using thiopental sodium 4 mg kg^{-1} IV
OR
• Propofol 1–1.5 mg kg^{-1} IV (with single dose recuronium if using NMB); ketamine and midazolam alternatives
• Intubation and ventilation; monitoring neurological signs
• Ongoing seizures are not always easy to identify (EEG)

Thanks

- Any questions?

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