

PAEDIATRIC EDUCATION NEWSLETTER



Welcome to the Paediatric Education Newsletter, a monthly education bulletin highlighting learning points from departmental teaching, interesting clinical cases and questions. We hope you find the PEN useful, we'd love to hear from you particularly if there is anything you would like to contribute! The PEN Team

THE PAEDIATRIC ECG

BY AIDAN MATTHEWS

Interpreting ECGs in children can be daunting as they are markedly different from adult traces in both their normal and abnormal morphology! Having a basic understanding of how to approach the paediatric ECG can be invaluable and potentially life saving. Here are a few tips:

Look at your patient and ask yourself why this ECG has been taken. How old is the patient? Is it an episode of loss of consciousness? Chest pain? Overdose? Taking the patient's clinical history and examination into account is essential when interpreting the trace and should prompt you to look for certain features in the ECG (e.g. QT prolongation with citalopram or TCA overdose, ST segment changes in pericarditis)

Have a systematic approach to the ECG. Find somewhere you will not be disturbed and concentrate for a few minutes. You will need to look at reference tables, so it's useful to know where to find them.

RATE

Is there a baseline tachycardia or bradycardia?

RHYTHM

Does a P wave precede every QRS complex, and a QRS complex follow every P wave? Remember that sinus arrhythmia is a very common normal finding in children.

AXIS

Normal axis varies with age as the heart rapidly changes during childhood. The QRS axis can be checked by looking at the direction of the QRS in leads I and aVF (see graphic, right). The p-wave axis should also be measured. P waves should be negative in aVR and positive in all other leads.

P-WAVES

Large or biphasic p-waves can show atrial hypertrophy.

PR INTERVAL

Normal PR interval varies with age and heart rate. Look at the morphology of the PR segment - is there any slurring (i.e. Signs of Wolff-Parkinson-White syndrome)?

Q-WAVES

Normally less than 5mm deep and narrow. Abnormal if present in the right precordial leads (V1 and V2).

QRS COMPLEXES

Should be <120ms (<3 small squares on a standard ECG) i.e. 'narrow' not 'broad'

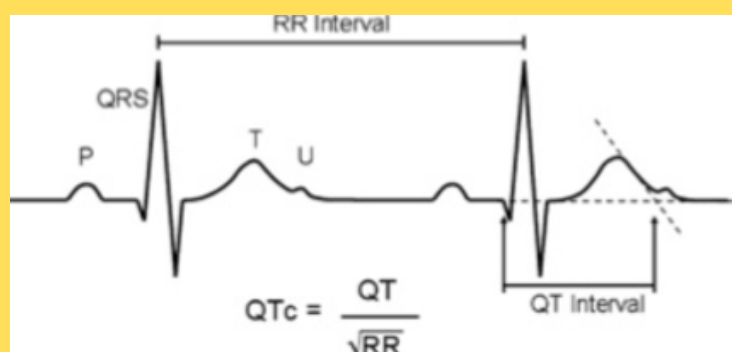
Lead 1	Lead aVF	Quadrant	Axis
POSITIVE	POSITIVE		Normal Axis (0 to +90°)
POSITIVE	NEGATIVE		**Possible LAD (0 to -90°)
NEGATIVE	POSITIVE		RAD (+90° to 180°)
NEGATIVE	NEGATIVE		Extreme Axis (-90° to 180°)

QRS AMPLITUDE

A dominant R wave in older children can indicate right ventricular hypertrophy. Overlapping R and S waves in V5/6 can indicate left ventricular hypertrophy. If you are concerned, then R/S ratios can be calculated using reference values.

CORRECTED QT INTERVAL

Calculate manually and use the "tangent" method to work out the exact value (see graphic below)



T-WAVES

Upright for first few days of life, then often inverted until adolescence. Should be positive in V5 and V6.

ST SEGMENT

Measure any elevation/depression (<2mm in precordial leads, <1mm in limb leads). Remember that some ST changes can be normal:

- Upward sloping ST depression may represent J-point depression, a normal variant in children
- Widespread concave ST elevation with concordant T waves may represent benign early repolarisation.

FURTHER READING

[Harris M, Oakley C, Abumehdi MR](#)

[Making sense of the paediatric ECG](#)

[Archives of Disease in Childhood - Education and Practice 2022;107:24-25.](#)



[Paediatric ECG: Stepwise approach • LITFL • ECG Library Diagnosis](#)

[Electrocardiograph \(ECG\) \(starship.org.nz\)](#)

[Benign Early Repolarisation • LITFL • ECG Library Diagnosis](#)

ACUTE STRIDOR AND CROUP

BY HENRY DU FRESNE

Croup is a common paediatric presentation representing 1.3% of paediatric emergency department presentations. The majority of cases presenting to hospital are mild and do not require admission however a minority of patients require admission and an even smaller number require emergency intubation for upper airway obstruction. Following one such case in the department recently here is a quick reminder of some of the important things to have in mind when assessing children with acute stridor and croup.

DIFFERENTIAL DIAGNOSES

Croup is by far the commonest cause of acute stridor in children however there are several other important causes to consider. Four of the most important are epiglottitis, bacterial tracheitis, anaphylaxis and inhaled foreign body. Time and mode of onset, the presence of fever, history of previous episodes, allergy and vaccination status are all key questions to ask.

AN ABCD APPROACH

Stridor is a serious clinical sign reflecting upper airway obstruction and hence a structured ABCD approach essential. It is important to get senior help early.

A – AIRWAY

- If concerns of imminent airway obstruction call 2222
- If the child is maintaining their own airway avoid causing distress
- Open and maintain the airway if needed
- Loudness of the stridor is not a good guide to severity as stridor may decrease as a child tires

B – BREATHING

- Assess rate, effort and efficacy of breathing (including air entry)
- Apply pulse oximeter if not applied
 - Saturations of >95% in air is acceptable
 - Saturations of <90% in air needs urgent treatment
- Sats are a poor guide to severity when giving oxygen
- Consider nebulised adrenaline 400mcg/kg (max per dose 5mg). The effect is temporary and there may be rebound deterioration. The dose can be repeated.

C – CIRCULATION

- Heart rate generally increases with increasing obstruction and work of breathing
- Bradycardia is a late (pre-terminal) sign

D – MENTAL STATUS

- Hypoxia can cause agitation/ irritability and restlessness as well as reduced consciousness and drowsiness

FURTHER READING

[Majumdar S, Bateman NJ, Bull PD](#)

[Paediatric stridor](#)

[Archives of Disease in Childhood - Education and Practice 2006;91:ep101-ep105](#)



[Croup - Don't Forget the Bubbles \(dontforgetthebubbles.com\)](#)

[Croup - RCEMLearning](#)

[The Curious Incident of the Barking Cough in the Night Time: Croup in the ED - RCEMLearning](#)

[Croup | Health topics A to Z | CKS | NICE](#)

SIMULATION LEARNING

One learning point from recent departmental simulation sessions has been for the use of EMBRACE drug cards in those patients needing transfer. The paediatric and neonatal charts can be found on the EMBRACE website via the links below.

<https://www.sheffieldchildrens.nhs.uk/embrace/>

[Paediatric Drug Chart](#)

[Neonatal Drug Chart](#)

