ECG ABNORMALITIES

SINUS TACHYCARDIA
Recognition and assessment
- Sinus rhythm (P wave precedes every QRS complex) with a heart rate above normal limit for age and gestation

Symptoms and signs
- Fever
- Infection
- Low haemoglobin
- Pain

Differential diagnosis
- Hypovolaemia
- Hyperthyroidism
- Myocarditis
- Drugs (e.g. caffeine and salbutamol)

SINUS BRADYCARDIA
Recognition and assessment
- Sinus rhythm (P wave precedes every QRS complex) with a heart rate below normal limit for age and gestation

Differential diagnosis
- Hypoxia (most likely cause)
- Vagal stimulation (ET tube touching carina)
- Post-intubation
- Hypovolaemia
- Hypothermia
- Metabolic derangement

Immediate management
- Manage airway and breathing
- Adjust ET position, if too low
- If post-intubation, use atropine (see Neonatal Formulary)
- Correct hypovolaemia
- Correct metabolic derangement
- If persistent, obtain 12-lead ECG

PREMATURE ATRIAL BEAT
Recognition and assessment
- Most common form of arrhythmia
- In a regular sinus rhythm at a normal rate, a P wave occurring before next expected P wave is a premature atrial beat
- Most premature atrial beats are benign

Investigations
- 12-lead ECG

PREMATURE VENTRICULAR BEAT
Recognition and assessment
- Premature abnormal QRS complex not preceded by a premature P wave

Investigations
- 12-lead ECG
- Measure QTc interval on ECG during period of sinus rhythm
- Echocardiogram to rule out structural abnormality of heart

**Immediate treatment**
- Seek advice from paediatric cardiologist

**SUPRAVENTRICULAR TACHYCARDIA**

**Recognition and assessment**
- Rapid regular tachyarrhythmia
- Heart rate >230/min
- ECG:
  - P waves commonly absent. When present, almost always have a different morphology
  - narrow QRS complex
  - in fast sinus tachycardia, P waves can be very difficult to see
  - look for delta waves consistent with Wolff-Parkinson White syndrome as this affects the choice of anti-arrhythmic agent used by cardiologists at BCH

**Symptoms and signs**
- Persistent SVT can cause haemodynamic compromise

**Investigations**
- 12-lead ECG to document SVT: if not definite SVT treat for cause of sinus tachycardia (e.g. fluid for hypovolaemia)

**Immediate management**
- Assess airway, breathing and circulation
- Check for signs of cardiac failure
- Vagal manoeuvre such as applying ice pack to face
- Adenosine IV bolus
  - use central venous access or IV access in a bigger vein (antecubital fossa)
  - connect 3-way connector to end of cannula/catheter
  - establish patency of IV access
  - connect syringe with adenosine to one port and normal saline flush to another port
  - run ECG strip
  - give adenosine as a quick bolus and push the bolus of sodium chloride 0.9% at the end quickly
  - document change in cardiac rhythm on ECG

**Adenosine dosage**
- Start with 150 microgram/kg IV bolus
  - if no response, increase by 50 microgram/kg
  - Repeat every 1-2 min
  - maximum dose 300 microgram/kg
  - if no response, discuss with BCH cardiologists regarding DC shock

**Subsequent management**
- Echocardiogram to assess ventricular function and presence of congenital heart disease
- Correct electrolyte and metabolic imbalance, if present
- Discuss with paediatric cardiology centre for further management or earlier if necessary

**VENTRICULAR TACHYCARDIA**

**Recognition and assessment**
- Heart rate >200/min
- Wide QRS complexes

**Immediate management**
- Manage airway and breathing
• Correct hypoxia
• Correct electrolyte disturbance
• Discuss with paediatric cardiology centre
• Consider synchronised cardioversion (in very fast heart rates, defibrillators cannot synchronise with the patient and unsynchronised will be required) if intubated, with analgesia
• Amiodarone 5 mg/kg over 30 min IV (repeat if necessary)
• if no response Lidocaine 5 mg/kg IM or 4 mg/kg (0.4 mL/kg 1% adrenaline-free lidocaine over 1 hr) IV

TACHYARRHYTHMIA
• True heart rate?
• Is baby crying/in pain?
• Check airway and breathing
• Check saturation
• Consider arterial/capillary gas
• Check perfusion
• Check blood pressure
• Manage airway and breathing
• Correct hypoxia
• Correct electrolyte disturbance

12-lead ECG

• Narrow QRS complex
• Absent/abnormal P wave
• vagal manoeuvres
• adenosine
• discuss with paediatric cardiologist
• consider synchronised cardioversion

• Broad QRS complex
• Abnormal P wave
• discuss with paediatric cardiologist
• synchronised cardioversion