Clinical Guidance

Paediatric Critical Care: Cardiac Arrythmias

Clinical guideline on the diagnosis and management of paediatric cardiac arrythmias, for use on PICU and for hospitals referring to STRS.

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Relevant external law, regulation, standards	

Change History		
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07/2018	Minor format changes only	ELCGC
04/2021	Formatting, clarification of adenosine, amendments to wording, magnesium dose change	ELCGC
10/2022	Dosage for adenosine adjusted	ELCGC
04/2026	Intubation not mandatory for cardioversion (anaesthetist to assess), added VT pulseless and note on APLS algorithm for this as well as persistent bradycardia in unconscious child, updated reference, minor format changes. Adenosine dose adjusted for neonates.	PCGC May 2026

Paediatric Critical Care
Cardiac arrythmias

- Primary life-threatening arrhythmias are uncommon in childhood. Exclude and treat other pathologies (especially septic shock/ hypoxia) initially.
- Consider congenital (structural defect), infectious (sepsis or myocarditis), biochemical (drug, electrolyte disorder, endocrine), inherited (conduction pathway, cardiomyopathies) causes.
- History: Previous episodes (including subclinical), heart surgery, family history as above.
- **Standard resuscitation** is as important as treatment of the abnormal rhythm.
- See separate guideline if immediately post-cardiac surgery (JET or Pacing guideline)

Contact Paed Cardiology:
- Switch: 020 7188 7188

ECG Transfers:
- Cardiology: liaise with SpR
- STRS: STRS.mail@nhs.net

General management principles:
- Shocked patients may need ventilation- discuss with STRS
- 12 lead ECG and CXR
- Continuous rhythm strip while giving adenosine or DC shock.
- Treat fever & electrolytes (aim for iCa >1.0, K >4.0, Mg >1.0)

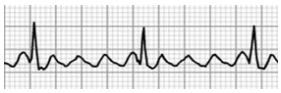
ECG interpretation:
P wave: rate, rhythm, axis (NSR: P upright in I, aVF)
P-QRS relationship: 1:1 association, PR interval < 0.20s
QRS complex: rate, axis, broad or narrow
QT duration corrected: QTc=QT/√RR < 0.46s

SUPRAVENTRICULR TACHYCARDIA (SVT)
Associations: Wolff-Parkinson-White syndrome
ECG: narrow QRS (though may be broad), very fast (usually >220 bpm)
In contrast to sinus tachycardia does not respond to changes in temperature or fluid boluses
Management: ABC and general measures above (including ventilation if shocked)

SVT

- **CVS stable = 12 lead ECG recording:** *1st vagal maneuvers* (ice to face, Valsalva, carotid massage - likely less effective), *2nd adenosine by rapid injection* (see below for administration)
- **CVS unstable = adenosine whilst setting up for synchronized cardioversion** (if awake, needs anaesthetist for appropriate sedation & analgesia ± intubation). Rhythm strip recording during synchronized cardioversion at 1J/kg, repeat at 2J/kg if no response.

ATRIAL FLUTTER
Associations: dilated right atrium, atrial surgery.
ECG: regular atrial activity, sawtooth flutter waves, narrow QRS, can be variable conduction to ventricle
Management: ABC and general measures above. ECG monitoring of all treatment


Atrial Flutter

- **CVS stable = adenosine will disclose flutter waves.** Discuss with cardiology.12 lead ECG and Echo
- **CVS unstable = synchronized cardioversion at 1J/kg,** repeat at 2J/kg if no response.

ADENOSINE: rapid injection into large vein then immediate 10mL 0.9% sodium chloride flush using 3-way tap: onset instantaneous.
- **Indication:** terminates some SVT. Aids identification of other arrhythmias (sinus tachycardia, atrial flutter, atrial fibrillation, VT).
- **Contraindicated** in pre-excited AF (broad, irregular tachycardia) and caution in sinus node dysfunction and severe asthma
- **Dosage: <12yrs:** start at 100 microgram/kg (150 microgram/kg if <1 month), ↑ by 100microgram/kg if no response to max 500 microgram/kg (max 300microgram/kg if <1 month) **>12yrs**: start at 3mg, increased to 6mg then 12mg if no response.
- **ECG** must be continuously recording (12 lead – if not possible then defib rhythm strip), mark when adenosine doses given
- **Side effects:** hypotension, bronchospasm, sinus arrest, chest pain, tachycardia acceleration, treatment failure (see below)
- **Treatment failure**: If AV pause achieved but rhythm disturbance ongoing then further increased doses are unlikely to cardiovert, consult a cardiologist (EP) for further advice.

VENTRICULAR TACHYCARDIA: >4 broad complexes (PVCs) in succession will require treatment.
Associations: prolonged QT, CHD, anti-arrhythmic meds, tricyclic overdose (treat with sodium bicarbonate)
ECG: wide, bizarre QRS complexes with AV dissociation
Management: ABC, general measures as above (including ventilation if shocked) and actively treat electrolyte abnormalities
- **CVS stable (with pulse)** **Magnesium sulphate 50-100mg/kg** over 20 minutes (max dose 2g).
  Discuss with cardiology re: anti-arrhythmic medication: **amiodarone** (see below) **or lignocaine**.
  Cardiology may consider use of adenosine if diagnosis unclear.
- **CVS unstable (with pulse)** Synchronized cardioversion 1J/kg, then synchronized 2J/kg. Add amiodarone if no response.
- **CVS unstable (pulseless) CPR with immediate defibrillation – follow APLS algorithm**

AMIODARONE: bolus or infusion depending on clinical state. NB: may precipitate cardiac arrest in shocked child
Indication: Effective in most supra- and ventricular tachyarrhythmias.
Dosage: Unstable VT *in extremis*: bolus 5 mg/kg IV before next attempted cardioversion, **may cause profound hypotension**, consider slower administration
Stable VT/SVT: infuse 25 micrograms/kg/minute for 4 hours then 10 microgram/kg/minute (usually in PICU - liaise with cardiology)
Acute side effects (potentiated by low calcium): bradycardia, depressed cardiac function, hypotension, liver derangement.

BRADYCARDIA: most commonly sinus bradycardia due to hypoxia or peri-arrest, rarely a primary rhythm disturbance.
NB: if unconscious and HR < 60bpm despite oxygenation, start chest compression and follow APLS algorithm
HEART BLOCK:
Associations: congenitally corrected TGA, post cardiac surgery, congenital (maternal antibodies), anti-arrhythmic toxicity
ECG: bradycardia
- **2nd degree atrioventricular block**:
  - Type I: progressive increase in PR interval followed by non-conducted beat
  - Type II: normal PR interval, intermittent non conduction of P wave
- **Complete atrioventricular block**: P waves unrelated to QRS

Management: ensure resuscitated (correct hypoxia, hypothermia, hypoglycaemia)
Discuss isoprenaline infusion or cardiac pacing with STRS and cardiologist.

References: Resuscitation Council Paediatric Life Support Guidelines 2025. GSTT paediatric formulary (see STRS Website)