

Clinical Guidance

Paediatric Critical Care: Cardiac Arrhythmias

Summary

This guidance offers advice for staff treating children with a cardiac arrhythmia. It discusses assessment and diagnosis, offers guidance for investigation and treatment options when managing a child with an arrhythmia.

Document Detail	
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Relevant external law, regulation, standards	
<p>This clinical guideline was produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.</p> <p>This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guideline does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Change History		
Date	Change details, since approval	Approved by
07/18	Minor format changes only	Evelina London Clinical Guidelines Committee

Glossary: **mcg:** micrograms, **PVC:** premature ventricular contraction
CHD: cardiac heart disease

- Life-threatening arrhythmias are uncommon in childhood. Exclude primary pathologies (e.g. septic shock/ hypoxia)
- Poorly tolerated by: neonates, children with congenital heart disease (CHD) or heart failure
- Consider associated cardiac conditions (myocarditis, cardiomyopathy),
- History: ? previous episodes (pallor, sweating, breathlessness) or drug ingestion
- **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

Fax numbers for ECGs:
 • Cardiology prefer email
 -Liaise with them
 • STRS fax: 020 7188 4499
 E: 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,II,III,AVF)
P-QRS relationship: 1:1 association, PR interval <0.2sec
QRS complex: rate, axis, broad or narrow
QT duration corrected: $QT_c = QT / \sqrt{RR} < 0.46s$

SUPRAVENTRICULAR TACHYCARDIA (SVT)

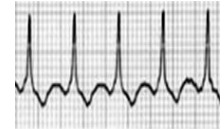
Associations: Wolf-Parkinson-White syndrome

ECG: usually narrow QRS (may be wide if aberration) and very fast (>220 bpm but not always).

NB infants may have *sinus tachycardia* > 200 bpm when shocked (should *transiently* respond to fluid)

Management: ABC and general measures above (including ventilation if shocked)

- CVS stable ECG must be recording: Vagal manoeuvres (ice to face, unilateral carotid massage, valsalva) (ideally 12 lead) **Adenosine** by rapid injection-see below for administration
- CVS unstable **Adenosine** whilst setting up for cardioversion (if awake needs anaesthetic and intubation) Synchronised cardioversion at **1J/kg**. Repeat at **2J/kg** if no response.



SVT

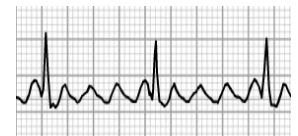
ATRIAL FLUTTER

Associations: Dilated right atrium, atrial surgery, digoxin overdose

ECG: Regular atrial activity, sawtooth flutter waves, narrow QRS

Management: ABC and general measures above. ECG monitoring of all treatment

- CVS stable Adenosine will disclose flutter waves. Discuss with cardiology. 12 lead ECG and ECHO
- CVS unstable Synchronised cardioversion at 1J/kg. Repeat at 2J/kg if no response.



Atrial flutter

ADENOSINE: rapid injection into good vascular access then 10 ml sodium chloride flush using 3 way tap: onset instantaneous

- **Indication:** Terminates SVT. Aids identification of other arrhythmias (sinus tachy, atrial flutter, atrial fibrillation, VT)
- **Dosage :** Start at **100 mcg/kg**, ↑ by 100mcg/kg if no response to **max 500 mcg/kg** (neonates resistant to lower doses)
- ECG must be continuously recording (preferably 12 lead but defib is ok if unstable), **mark when adenosine doses given**
- **Side effects:** ↓BP, bronchospasm, sinus arrest, chest pain, tachycardia acceleration, treatment failure

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 50mg/kg** over 20 minutes (max dose 2g). Can repeat dose if no effect. Discuss with cardiology re anti-arrhythmic medication: **Amiodarone** (see below) or **lignocaine**
- CVS unstable (with pulse) Synchronised cardioversion **1J/kg**, then **2J/kg**. Add amiodarone if no response
- Pulseless VT Follow VF protocol

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 bolus **5 mg/kg iv STAT** before next attempted cardioversion

Stable VT/ SVT **infuse 25 micrograms/kg/min** for 4 hours then **10 mcg/kg/min** (usually in PICU-liaise with cardiology)

Acute side effects (potentiated by low calcium): bradycardia, depressed cardiac function, hypotension, liver derangement
 Consider IV calcium to prevent and treat side effects

BRADYCARDIA most commonly sinus bradycardia due to hypoxia or peri-arrest, rarely a primary rhythm disturbance

HEART BLOCK

Associations: congenitally corrected TGA, post cardiac surgery, congenital (maternal antibodies), anti-arrhythmic toxicity

ECG: Bradycardia. **2° 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