



Cardiac Arrhythmias

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NETS WA

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [disclaimer](#). Also refer to:

- [Cardiac: Arrhythmias, Cardiac Arrest and Arrhythmias in NICU: Treatment Algorithms](#)
- [Cardiac: Cardioversion and Defibrillation](#)
- [Recognising and Responding to Clinical Deterioration](#), [Resuscitation: Neonatal](#)

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Aim

To summarise the features and treatment of cardiac arrhythmia in neonates.

Risk

Delays in recognition and/or management of neonates with cardiac arrhythmia can place neonates at increased risk of deterioration and adverse events. A standardized approach to assessment and management aims to minimize these risks.

Types of neonatal arrhythmias

Arrhythmias are classified as tachyarrhythmias and bradyarrhythmias.

Tachyarrhythmias are sub-classified as narrow complex and broad complex tachyarrhythmias. Significant neonatal arrhythmias needing urgent treatment have the incidence of 1 in 4000 live births, the most common being narrow-complex supraventricular tachyarrhythmias (SVT) (e.g. AV re-entry tachycardia)¹. The other common cardiac causes of tachycardia in neonates include sinus tachycardia and benign tachyarrhythmias (premature atrial and premature ventricular contractions).

General Management

- On NETS call, first always check for the hemodynamic stability of the neonate and prioritize the routine resuscitation steps (ensure **Airway, Breathing and Circulation** is maintained). If shocked or in cardiac failure, may require intubation and ventilation.
- Patch the on-call cardiologist at PCH for advice about management.
- Run a rhythm strip to ascertain the type of arrhythmia. This strip should be relayed immediately to the on-call cardiologist and NETS-WA consultant.
- Perform an urgent blood gas analysis. Review glucose, electrolytes (sodium, potassium, ionized calcium, magnesium) and correct if required. Review lactate to assess signs of systemic compromise.
- Secure an IV access, preferably in a big vein in the upper limb if required to administer antiarrhythmic drugs (e.g., [Adenosine](#)) as per Cardiology.
- Vagal manoeuvres (e.g., cold pack on face) could be considered for SVT (see SVT management)
- Keep baby NBM and start IV fluids. Consider screen and treat with antibiotics.
- Avoid the use of any adrenergic (eg catecholamines or inotropes) or vagolytic (eg Pancuronium) drugs
- Check history of fetal tachycardia, medications (maternal and neonatal), thyroid dysfunction and family history of arrhythmias

1. Sinus Tachycardia and Treatment

Sinus Tachycardia is the most common tachycardia with heart rates 180-220 beats per minute. It can be difficult to differentiate from a supraventricular tachycardia (SVT), refer to Table 1 below. Treat the underlying cause.

Table 1: Features of Sinus tachycardia and Supraventricular Tachycardia

	Sinus tachycardia	Supraventricular tachycardia
Heart rate	Usually <220	>220
Onset	Gradual	Abrupt
Physical examination	Signs of underlying cause(i.e. fever, drugs ie caffeine, hypovolemia)	Signs of heart failure if long standing(oedema, crepitation, hepatomegaly)
ECG	Presence of upright P wave in lead I/aVF	P wave absent/abnormal, inverted in leads II, III or aVF.
Cardiac monitoring	Variability in heart rate with stimulation or treatment	Minimal variability in heart rate Increasing lactate

2. Narrow-complex Tachyarrhythmias (Supraventricular Tachycardia)

SVT is the commonest tachyarrhythmia in neonates requiring urgent management.

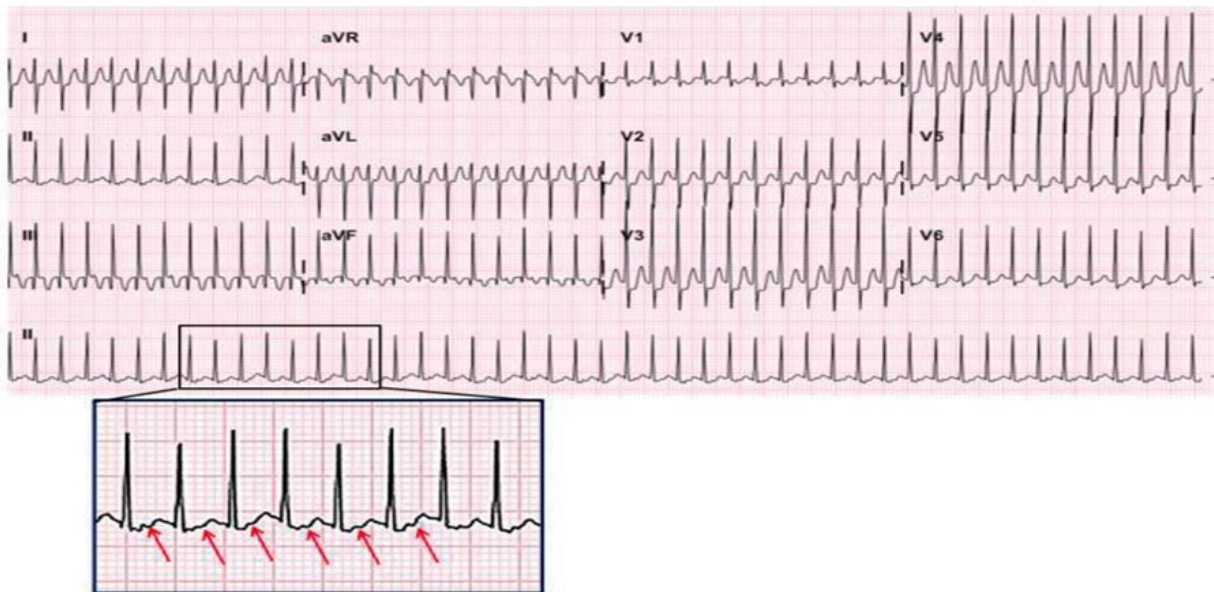
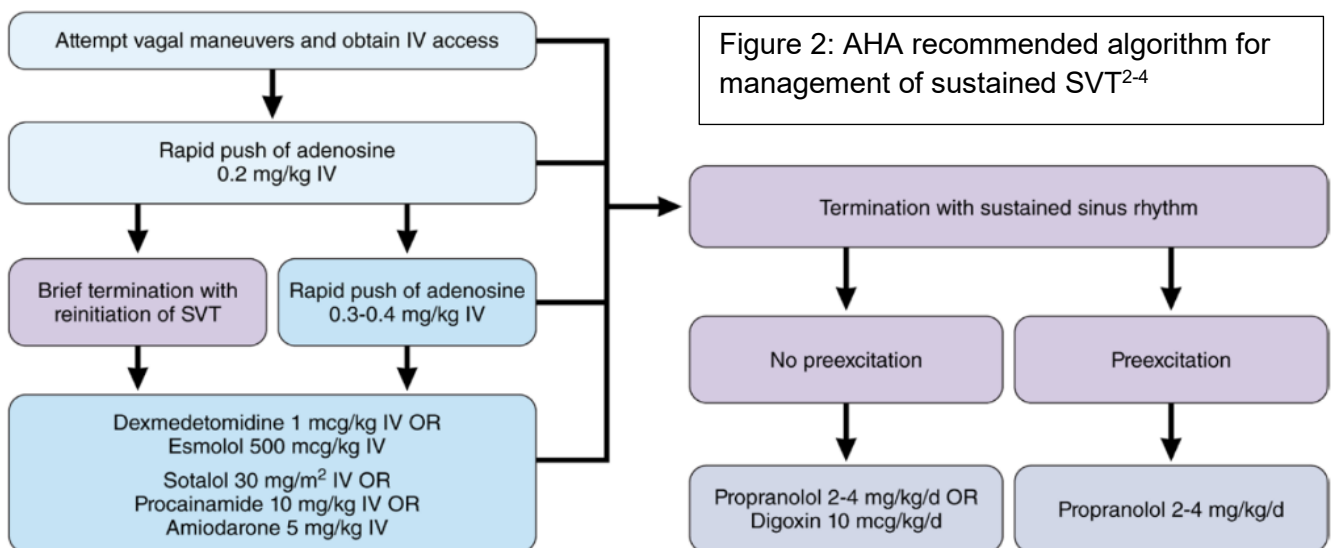


Figure 1. SVT. Narrow QRS tachycardia with a ventricular rate of 245 beats/min is shown. Retrograde P waves (arrows) are shown in the ST segment in lead II.

Management on transport

- Run a rhythm strip to ascertain the type of arrhythmia. The strip should be relayed immediately to the on-call cardiologist and NETS-WA consultant via photo and email to nets@health.wa.gov.au. If possible, the rhythm strip should be continued to run when the treatment is being administered.
- Vagal maneuvers (e.g. cold pack over face):

- Apply cold pack to face, be careful of eyes and do not hold on the face longer than 30 seconds as cold pack can 'burn' an infant's skin.
- Do not put pressure on eyeballs as this can result in retinal detachment.
- Do not use carotid sinus massage as this may compromise cerebral circulation.
- If the arrhythmia does not revert on vagal maneuvers or if reappears then consider pharmacological management with drugs such as [Adenosine](#) under guidance of the on-call Cardiologist. [Adenosine](#) fast IV push followed by a flush using a three way. Use an IV line closer to the heart (brachial if possible). If unresponsive, increase the dose as detailed in the treatment flowchart below.
- Check with the on-call Cardiologist about the additional medications to be carried on transport. Other antiarrhythmic drugs like [Amiodarone](#)/[Dexmedetomidine](#)/Esmolol are rarely required when all above has failed, and the infant is in cardiac failure. These drugs should only be under the strict guidance of the on-call Cardiologist.
- If need for cardioversion, it should only be done under the guidance of the on-call Cardiologist.
- Consider diuretics ([Frusemide](#)) if neonate in cardiac failure.
- The below flowchart depicts the latest AHA 2024 guidelines for pharmacological management of SVT in neonatal period 2.



Atrial Flutter (AF)

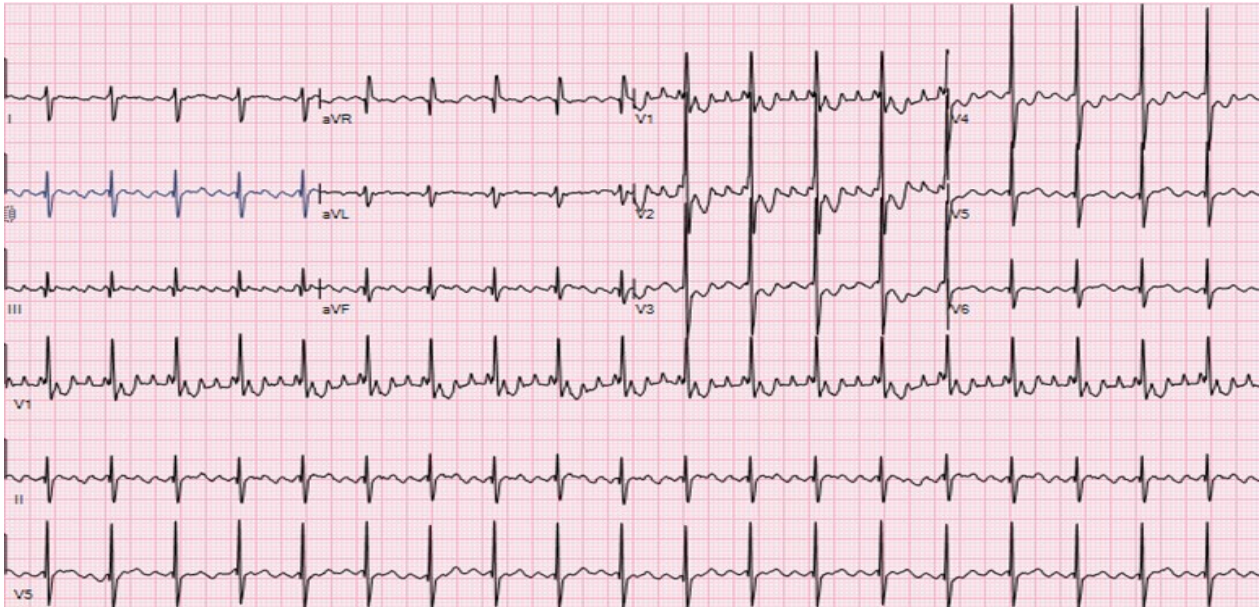
Atrial flutter is due to a macro-reentry circuit within the atrial wall. It is characterized by saw-tooth flutter waves and variable, but most commonly 2:1 AV conduction.

Management on transport

- Run a rhythm strip to ascertain the type of arrhythmia.
- [Adenosine](#) will not terminate AF but is sometimes given to unmask flutter waves by causing AV block. Please discuss with on-call cardiologist if this is needed.

- Treatment is with synchronized DC [cardioversion](#) (usually 1-2 J/kg) with adequate analgesia/sedation.

Other antiarrhythmic drugs such as [Digoxin](#), [Propranolol](#) and [Amiodarone](#) can be used but only after discussion with the on-call cardiologist.



3. Broad-complex tachyarrhythmia (eg: Ventricular tachycardia, Ventricular fibrillation)

- Broad complex tachyarrhythmias are very rare in neonatal population. mostly secondary to structural cardiac lesions such as tumours⁵. The incidence of cardiac tumours in fetal life is roughly 0.14%⁵.
- Tachyarrhythmias are often difficult to manage and need urgent transfer to a tertiary neonatal unit.



Figure 3: ECG appearance of Ventricular Tachycardia

Management on transport

- Ensure appropriate Airway, Breathing and Circulation is maintained. Strongly consider Intubation and ventilation for hemodynamic stability prior to transfer.
- Urgent treatment depends on 2 simple clinical features: are pulses present; if yes is shock present.
- If pulses present and no shock consider [Amiodarone](#) loading dose –as first line or if VT is resistant to shock.
- Immediate synchronous [Cardioversion](#) if pulseless/shock- commence at 4J/kg (ensure adequate analgesia/sedation)
- Medications such as Beta blockers ([Propranolol](#), [Sotalol](#)) and [Amiodarone](#) might be useful.
- [Lignocaine](#) loading dose may have role in prophylaxis of recurrent VT/VF.
- [Magnesium](#) may be useful in ventricular tachyarrhythmias, particularly Torsades de Pointes, but infuse slowly as has potential pro-arrhythmic action. Check with the on-call Cardiologist about the additional medications to be carried on transport. All the anti-arrhythmic drugs to be strictly used only under the guidance of the on-call Cardiologist.

4. Bradyarrhythmia

- In premature infants, most common cause is sinus bradycardia secondary to apnoea of prematurity.
- In term infants, most common cause is sinus bradycardia in a relaxed baby. Usually, HR responds to stimulation in these cases.
- Check for history of maternal medications and disease such as SLE.

Management

If clinically asymptomatic (no cardiac failure, good perfusion, normal lactate, heart rate response with stimulation):

- Preterm infants: loading dose of [Caffeine](#). In preterm infants, if likely secondary to apnoeas and not responding to stimulation and caffeine, will require assisted ventilation (CPAP or intubation + ventilation).
- Asymptomatic term infants: close observation, advice from Cardiology for follow up.
- If clinically symptomatic (cardiac failure, poor perfusion, worsening lactate, no response with stimulation):
 - Ensure **Airway, Breathing and Circulation** is maintained. Consider Intubation and Ventilation for transfer for cardio-pulmonary stability.
 - Ensure electrolytes are checked and corrected if deranged.
 - Need urgent transfer to tertiary NICU for further management (Echo, Pacemaker therapy)
 - May require [Isoprenaline](#) – only under guidance of cardiologist.

Related CAHS internal policies, procedures and guidelines

[Cardiac Arrhythmias \(health.wa.gov.au\)](http://health.wa.gov.au)

Cardiac: Cardiac Arrest and Arrhythmias in NICU: Treatment Algorithms (health.wa.gov.au)









[Cardiac: Cardioversion and Defibrillation \(health.wa.gov.au\)](http://health.wa.gov.au)

[King Edward Memorial Hospital - Neonatal Medication Protocols \(health.wa.gov.au\)](http://health.wa.gov.au)

Related CAHS internal policies, procedures and guidelines

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2. Batra AS, Silka MJ, Borquez A, Cuneo B, Dechert B, Jaeggi E, et al. Pharmacological Management of Cardiac Arrhythmias in the Fetal and Neonatal Periods: A Scientific Statement From the American Heart Association: Endorsed by the Pediatric & Congenital Electrophysiology Society (PACES). *Circulation*. 2024;149:e937-e52.
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This document can be made available in alternative formats on request.

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