Trust Guideline for the Management of New-born Babies with abnormal heart rhythm

A clinical guideline recommended

For use in:	Blakeney Ward, Delivery Suite, Neonatal Unit
By:	Neonatal Medical Staff (SHOs, Registrars, Consultants) Advanced Neonatal Nurse Practitioners (ANNPs), Midwifery Neonatal Examiners (MNEs)
For:	All Neonates
Division responsible for document:	Division 3 – Women and Children's
Key words:	Heart, Premature atrial, Premature Ventricular, Arrhythmia,
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Assessed and approved by:	Clinical Guidelines Assessment Panel (CGAP)
Date of approval:	06 February 2018
Ratified by or reported as approved to (if applicable):	Clinical Standards Group and Clinical Safety and Effectiveness Sub-Board
To be reviewed before:	06 February 2021
To be reviewed by:	Dr R Roy
Reference and/or Trustdocs ID No:	CA6034 – ID No: 10861
Version No:	2
Description of changes:	Audit Standards updated
Compliance links: *(is there any NICE related to Guidance)*	None
If Yes – does the strategy/policy deviate from the recommendations of NICE? If so, why?	N/A

This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.

Quick Reference Guidelines

Please see page 3.

Objective of Guideline

a. To provide a standard framework for investigating neonates with abnormal heart rhythm.

b. To try and reduce anxiety in parents.

Rationale of Recommendations

Arrhythmias are found in 1-5% of newborns during the first 10 days of life. The vast majority of these are benign premature atrial ectopics that are likely to disappear within the first few weeks to months of life without any untoward consequences. It is necessary to try and identify the neonates with potentially serious arrhythmias and to investigate these neonates more intensively. The majority of ectopic beats and arrhythmias are premature atrial contractions which disappear within the first month of life. The evidence presented in this guideline is based upon recommended practice and literature searches.

Broad Recommendations

- Any infant where an arrhythmia or ectopic beat is found postnatally should have a full history, thorough examination and ECG performed.
- If the diagnosis is anything but premature atrial contraction, babies should be discussed with consultant neonatologist on-call and further investigations performed.
- Parents should be kept fully informed at all times and an explanation as to why these investigations are being performed given.

Introduction

Irregularities in heart rhythm are found in roughly 1-5% of normal newborn infants within the first 10 days of life. [1] They are largely self-limiting and benign and often disappear within the first few weeks to months of life and require no follow-up. Often such arrhythmias are identified at the first routine neonatal check. This guideline aims to provide guidance to clinicians as to how to differentiate between benign and pathological arrhythmias and steps in further management.

It is imperative to differentiate between normal sinus arrhythmia (which can include pauses in the healthy neonate of up to 1.5 seconds), [2] benign arrhythmias (including premature atrial contractions, premature ventricular contractions, nodal or junctional rhythm and wandering atrial rhythm), [3] and pathological arrhythmias. Pathological arrhythmias can be divided into:

- Tachyarrhythmias - where the heart rate is usually in the range 240-300 beats per minute. These are most commonly narrow complex supraventricular tachycardia but also ventricular tachycardia, long QT syndrome, ventricular fibrillation and sinoatrial node dysfunction [4].
- Bradyarrhythmias - where heart rate is usually less than 100 beats per minute and include congenital heart block and disorders of AV node conduction.

It is important to remember that the majority of arrhythmias consist of benign premature atrial contractions, which often disappear within the first month of life

Clinical Presentation

Often neonates with arrhythmias will be asymptomatic and will present as an incidental finding on routine examination. Other infants will present with signs and symptoms of heart failure, including poor feeding, colour changes, sweating or clamminess, or with an antenatal diagnosis of fetal hydrops.

Investigation

Investigations should be tailored to the clinical presentation of the neonate. However, the following should be considered mandatory:

- Routine investigations including heart rate, pre and post ductal saturations and blood pressure [5].
- 12 lead ECG including 3 lead rhythm strip. Ensure that the rate, rhythm and QTc are calculated.

Those babies who have a diagnosis that is NOT premature atrial contraction:

- Checking urea and electrolytes, serum calcium, magnesium and blood sugar is mandatory [3]

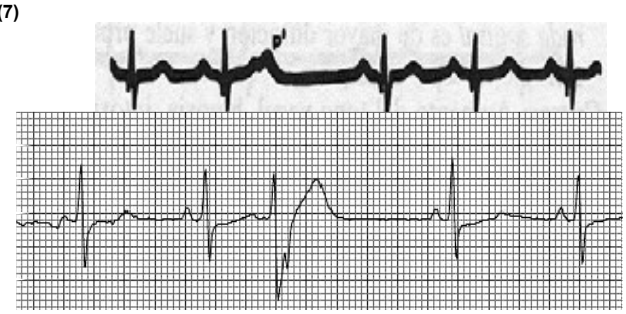
Additionally, depending upon the results of the above investigations the following should be considered:

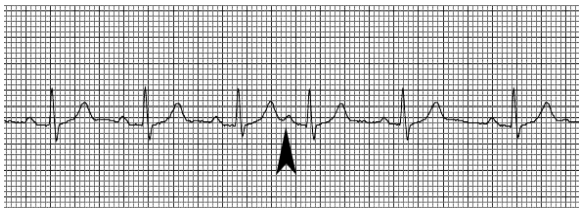
- In a tachyarrhythmia, administration of adenosine may unmask the underlying rhythm and help differentiate between SVT (including pure atrial tachycardias, atrioventricular re-entry tachycardias) and sinus tachycardia. If the pathology involves the AV node then the adenosine may help in the treatment of the tachyarrhythmia. Very important to RUN the rhythm strip during and for up to 30 seconds after injection of adenosine; this is usually forgotten or ignored.
- 24 hour ECG holter monitoring. This should be considered when there are frequent premature ventricular contractions or there is an abnormal baseline heart rate with premature atrial contractions, which may signify non-conducted premature atrial contraction or blocked atrial bigeminy causing sinus bradycardia. **Patients should be kept as inpatients until this has been reported.**
- Echocardiography. This should be considered if there is a suspicion on clinical examination of structural congenital heart disease (murmur, absence of femorals, concern with differences in oxygen saturations). It should also be considered if there are frequent ventricular premature beats (>60/hour), frequent ventricular couplets (>50/hr) or runs of ventricular tachycardia on the 24 hour ECG Holter monitor. (5) If an echocardiogram reveals an underlying structural concern then these patients will require longer term follow-up and careful monitoring for signs and symptoms of cardiac failure. A normal echocardiogram in the presence of a benign arrhythmia can usually be reassuring.

Any infant who is symptomatic for congenital or cyanotic cardiac disease or congestive cardiac failure should be immediately admitted to the neonatal unit and managed according to their clinical condition.

Some common arrhythmias:

Premature Atrial Contraction (PAC) [5] [7]





- Beats initiate in an irritable focus in the atria before the next SA node impulse is due to discharge.

- Rate and rhythm with the PAC is usually within normal range and regular.

- P-waves of the PAC is positive in lead II, may or may not followed by a QRS complex, often differ in shape from the sinus P-wave – may be flattened, notched, pointed, biphasic or lost in the T waves.

- Benign and require no treatment if they are infrequent with normal cardiac examination indicating a structurally normal heart.

- If frequent (i.e. >15/minute) may initiate episodes of paroxysmal SVT.

- Frequent blocked PACs may result in bradycardia.

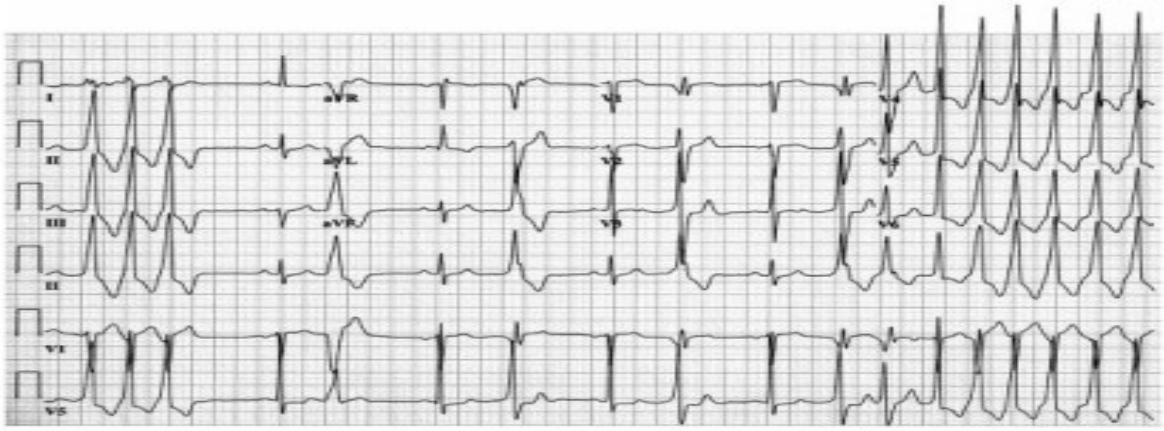
- Differentiate from premature ventricular contraction by normal shaped QRS complex in PAC. BEWARE an aberrant conduction PAC producing a wide QRS complex will have a preceding P-wave which will be different in shape to sinus P-wave and may be buried in preceding T-wave (see example on right).

- PAC can occur in patterns:

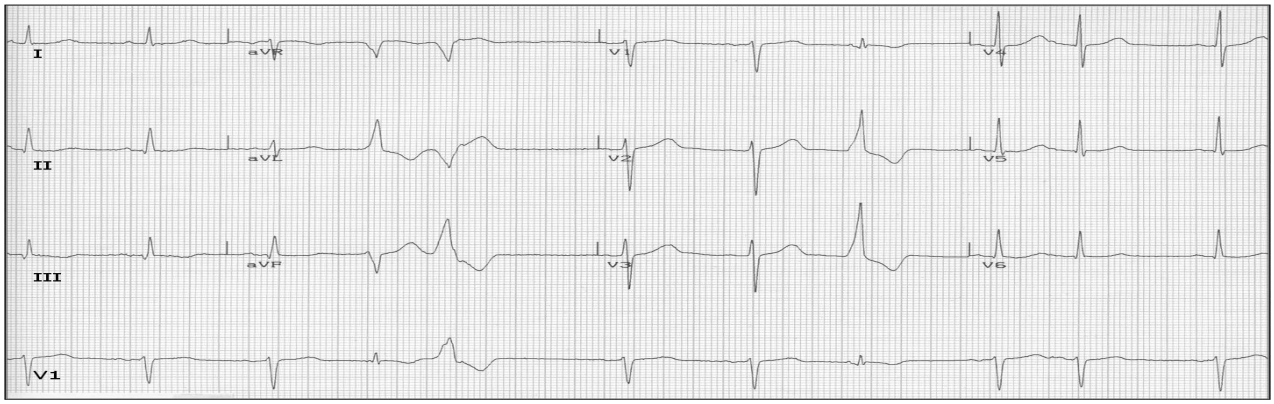
1. Pairs: 2 sequential PACs.
2. Runs: 3 or more sequential PACs also called paroxysmal atrial tachycardia (PAT).
3. Atrial bigeminy: Every other beat is a PAC.
4. Atrial trigeminy: Every third beat is a PAC.

Premature Ventricular Contraction (PVC)/ Ventricular Ectopics [8]

Monomorphic Ventricular Ectopic



Polymorphic Ventricular Ectopic



- A wide QRS complex appears earlier than anticipated without a preceding P wave and with a T-wave axis different from the underlying sinus rhythm in that lead.

- Frequent PVCs in a child is defined when they occur > 1/min (60/hour on 24 hour tape).

- Isolated, infrequent PVCs are a relatively common finding in the neonatal period and are associated with a good prognosis in a neonate with a normal heart.

- A PVC arising from an irritable focus within either ventricle.

- Rate and rhythm with the PVC is usually within normal range and regular

PVCs can occur in patterns

1. Pairs (couplets): 2 sequential PVCs

2. Runs: 3 or more sequential PVCs, known as Ventricular tachycardia

3. Ventricular bigeminy: Every other beat is a PVC

4. Ventricular trigeminy: Every third beat is a PVC

- Monomorphic PVC: PVCs that look the same in the same lead and originate from the same focus.

- Polymorphic PVC: PVCs that appear different from one another in the same lead and often originate from different focus.

- Infrequent monomorphic PVC (<60/hour on 24 hour tape) with normal rate, rhythm, axis, corrected QT interval for age and no ST or T-wave abnormality.

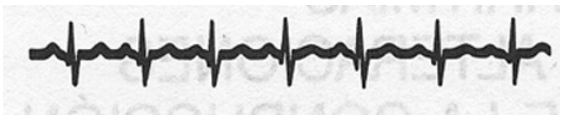
- Normal cardiac examination requires no immediate action, and is likely to resolve within 2-3 months on repeat ECGs.

- Frequent PVCs are usually benign, except in the context of an prolonged QTc, when they may predispose to malignant ventricular arrhythmias.

- Frequent monomorphic or polymorphic PVC can be significant. They can be associated with underlying heart disease, perinatal asphyxia, myocarditis, electrolyte imbalance, cardiomyopathy, increase in catecholamine, caffeine etc. Check electrolytes and perform an echocardiogram and discuss with GOSH cardiology team for arranging follow up.

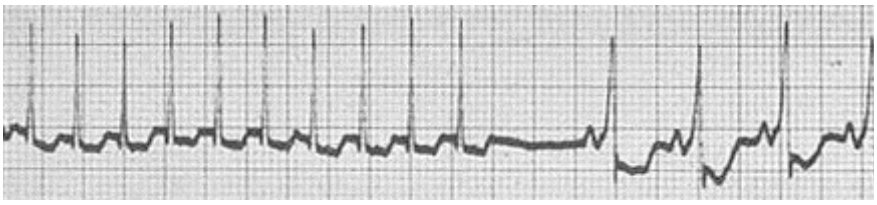
Ask for any positive family history of syncope, cardiomyopathy, sudden unexpected death in young age and history of maternal drug misuse or medication

Sinus tachycardia [5]



- Investigate and treat underlying cause e.g. fever, anaemia, caffeine.
- Normal P wave axis.
- P waves precede QRS.

Supraventricular Tachycardia (Narrow Complex) [5]

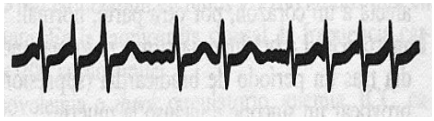


- Relatively common in neonates. Multiple forms.
- Most due to aberrant accessory pathways.
- P wave usually follows QRS on upstroke of T wave in commonest neonatal form of SVT.
- Initial treatments if stable and with normal electrolytes, include vagal manoeuvres and adenosine to restore sinus rhythm. If unstable will need cardioversion.
- If chemical or electrical cardioversion breaks the tachycardia to sinus rhythm but the rhythm then returns to tachycardia, will need a therapeutic agent such as amiodarone. Discuss with reference centre. Another reason why the ECG rhythm strip is crucial.

Multifocal Atrial tachycardia and Atrial Fibrillation [5]

- Extremely rare in the neonate

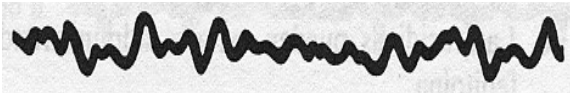
- Classical irregularly irregular pattern
- No two RR intervals are the same
- No clear P waves
- If unstable will need dc cardioversion
- If stable consider digoxin



Atrial Flutter [4] [5]

- Common in fetus and newborn, it becomes rare again until adult life: can be well-tolerated in neonates
- Re-entry tachycardia within atria usually between tricuspid valve and IVC
- Important cause of fetal hydrops
- Saw tooth flutter waves are classic
- Adenosine may reveal saw tooth waves by blocking the AV node
- May require DC cardioversion if unstable
- If stable following conversion to sinus rhythm newborn may need an anti-arrhythmic. Consider Propranolol or Amiodarone

Ventricular Fibrillation [4] [5]

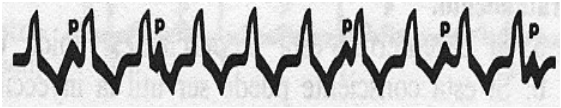


- Rare in neonates
- Chaotic rhythm
- Consider underlying electrolyte imbalance, hypoxia, asphyxia, long QT syndrome or Brugada syndrome

- Requires emergent cardioversion

Ventricular Tachycardia [4] [5]

- Rare in neonates



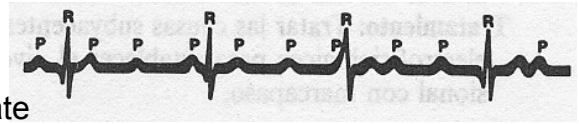
- Wide QRS complex, occasionally with P wave being dissociated from QRS complex

- If unstable, then electrical cardioversion

- If stable, then lidocaine

Complete Congenital Heart Block [5]

- Atrioventricular dissociation



- Atrial rate greater than ventricular rate

- Think of infants of mothers with SLE

- If unstable then resuscitation, isoprenaline, transfer to cardiac centre

- If stable then treat underlying causes

- Permanent pacemaker indications are discussed with reference centre.

Clinical Audit Standards derived from guideline

- All infants documented as having an irregular heartbeat on postnatal examination should have an 12 lead ECG

- All ECGs should have an interpretative comment documented in the notes

- All babies documented as having an irregular heart beat on postnatal examination should have pre and post-ductal saturations measured and documented

These audits will be presented at Departmental Clinical Governance Meetings

Summary of development and consultation process undertaken before registration and dissemination

The authors on behalf of the Neonatal Department, which has agreed the final content, drafted the guideline. It has been discussed at the Departmental Guidelines Meeting

and circulated to the Neonatal Consultants, Paediatric Cardiologist, Specialist Registrars, Neonatal SHOs, ANNPs; suggestions for improvement have been incorporated.

Distribution list / dissemination method

Hospital intranet, Neonatal Unit, Delivery Suite and Blakeney ward.

References/Source Documents

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