GIG CYMRU NHS WALES

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Newborn and Infant Physical Examination Cymru

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Examination of the Heart

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Elements of this guideline have been reproduced and adapted from the NIPE Programme Handbook 2021 with permission from the NIPE Programme Team, NHS England.

NHS England (2021) Newborn and infant physical examination screening programme handbook. Available at: Newborn and infant physical examination (NIPE) screening programme handbook – GOV.UK (www.gov.uk) (Accessed: 18th October 2023)

References to parent(s) also relate to carer(s), if appropriate.

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Examination of the Heart

The purpose of screening is early identification of major congenital heart diseases. Congenital heart disease (CHD) is a term used to describe a problem with the heart's structure and function that is present at birth.

Incidence

The overall incidence of CHD ranging from non-significant to major and critical lesions, is about 8 per 1,000 (range 6 to 12 per 1,000 live births). Critical congenital heart disease (CCHD) accounts for 15% to 25% of these and is a leading cause of morbidity and mortality. Congenital heart diseases can be categorised as:

- **CCHD, which includes all potentially life-threatening duct-dependent conditions and those conditions that require procedures within the first 28 days of life**
- **major serious CHD, which includes defects not classified as critical but requiring invasive intervention in the first year of life.**

Some critical and major cardiac diseases may be detected during pregnancy as part of the fetal anomaly screening, during the 20 week ultrasound scan.

Risk factors for CHD

- **family history of CHD (first-degree relative)**
- **fetal trisomy 21 or other trisomy diagnosed (these babies have high risk of cardiac defects and require continued surveillance)**
- **cardiac abnormality suspected from the antenatal scan**
- **maternal exposure to viruses, for example, rubella during early pregnancy**
- **maternal conditions, such as diabetes (type 1), epilepsy, systemic lupus erythematosus (SLE)**
- **teratogenic drugs taken during pregnancy.**

Although practitioners should be aware of these risk factors, they do not alter the NIPEC national heart examination pathway.

Examination of the Heart

Undertaking the newborn examination of the heart

Before the examination, practitioners should establish relevant information regarding:

- **any significant family history in first degree relatives of CHD**
- **anomaly scan report regarding heart or major vessel anomalies**
- **report of any specialised fetal echocardiogram, if performed.**

The following cardiovascular examination findings should always be documented:

- **baby's colour (central cyanosis)**
- **pre- and post-ductal oxygen saturations**
- **heart sounds and the presence or absence of murmur**
- **Femoral pulses**
- **mother's medical and recent obstetric history, including any medication**
- **baby's immediate postnatal health.**

Ask parents if their baby:

- **ever gets breathless or colour change at rest or while feeding**
- **is not feeding well or ever too tired to feed, quiet, lethargic or has poor muscle tone.**

As part of general inspection, note the baby's:

- **colour – central (tongue, when checking the palate) & peripheral**
- **respiratory rate and work of breathing.**

Observation

Observation includes reviewing the baby's:

- **general tone**
- **central (tongue when checking the palate) and peripheral colour**
- **size and shape of chest**
- **respiratory rate**
- **symmetry of chest movement, use of diaphragm and abdominal muscles**
- **signs of respiratory distress (recession or grunting).**

Examination of the Heart

Palpation

Palpation involves examination of the baby's:

- **femoral and brachial pulses, check femoral pulse and compare pulse character and strength to right brachial pulse, if weak or difficult to feel**
- **assessment of perfusion through capillary fill time (should not be > 2 seconds)**
- **position of cardiac apex (to exclude dextrocardia)**
- **palpation of liver to exclude hepatomegaly (> 2cm below right costal margin). May be present in congestive heart failure**
- **feel for precordial thrill (vibrations under palm or fingers) or heave (strongly palpable/forceful cardiac contraction with palm or fingers).**

Auscultation

Auscultation includes identification of a murmur, either systolic or diastolic or loudness. It also includes the assessment of the quality of heart sounds at 5 areas:

1. **Upper left sternal edge (second intercostal space) pulmonary area.**
2. **Upper right sternal edge (second intercostal space) aortic area.**
3. **Lower left sternal edge (fourth intercostal space) tricuspid area.**
4. **Apex – mitral area.**
5. **Midscapulae – esp. coarctation.**

Listen for murmur and regularity of heart sounds (no missed or skipped heart sounds).

If murmur present, describe:

- **whether systolic or diastolic murmur or continuous (audible both in systole and diastole)**
- **grade loudness of murmur – soft, loud, or associated with thrill/heave**
- **which area the murmur was heard the loudest**
- **radiation of the murmur.**

Oxygen saturation measurement

Ensure that peripheries are warm, and well perfused before readings are taken. Measuring both the pre- and post-ductal saturations.

- **apply the saturation probe to the infant's right hand and record the pre-ductal saturations**
- **apply the saturation probe to the infant's right foot, to measure the post-ductal saturation**

- **ensure probe is applied adequately and wait until the monitor has obtained a good signal and has reached the highest level it will go, before recording the saturation reading**
- **if the pre- and post-ductal measurements are 95% or greater and there is less than or equal to 3% difference between them then no further measurement is necessary – abnormality not suspected.**

Signs and symptoms suggestive of critical or major congenital heart disease (CHD) include:

- **tachypnoea at rest (i.e. above 60/min)**
- **episodes of apnoea lasting longer than 20 seconds or associated with colour change**
- **intercostal, subcostal, sternal or supra-sternal recession or nasal flaring**
- **central cyanosis (or pre- or post-ductal saturations <95% or a difference in pre- and post-ductal saturations >3%)**
- **visible pulsations over the precordium, heaves or thrills**
- **absent or weak femoral pulses**
- **presence of cardiac murmurs or extra heart sounds.**

Significant murmurs

These are:

- **usually loud**
- **usually heard over a wide area**
- **usually with a harsh rather than soft quality**
- **possibly associated with other abnormal findings**
- **even soft murmur when associated with cyanosis or breathlessness could indicate a major CHD.**

Benign murmurs

These are typically short, soft, systolic, and localised to the left sternal border. They have no added sounds or other clinical abnormalities associated with them.

The examining practitioner should discuss findings with a senior paediatrician or a paediatrician with expertise in cardiology and refer as appropriate. Urgency will depend on the assessment of the clinical condition of the baby.

Many babies will have cardiac murmurs in the first 48 hours of life in the absence of a cardiac defect (linked to physiological changes at birth). However, cardiac murmurs may be absent in babies with a significant cardiac defect.

Examination of the Heart

Abnormality suspected or significant family history of congenital heart disease identified at newborn examination

If abnormality is suspected, this should be communicated to the parents and referred to the appropriate professional within department or the local referral hospital for midwifery-led units or community midwives **(refer to specific pathways)**. Parents of babies who are referred should be given a full explanation of the reason for and timescale for referral (urgency depends on the clinical condition of the baby).

Abnormality not suspected at newborn and infant (6-week) examination

Babies with screen negative heart results following the NIPEC newborn examination should have the NIPEC infant (6-week) examination at 6 weeks of age.

Parents should contact their midwife, GP or health visitor if they have any concerns about their baby.

Abnormality suspected at infant (6-week) examination

Babies with screen positive heart results following the NIPEC infant examination at 6 weeks of age should follow the locally agreed referral process. Urgency will depend on the clinical condition of the baby and specialist's opinion.

Cardiovascular Examination Pathway

Heart murmur is very common in the first 48 hours of life. (1.4 -1.6% of all newborns) This is mostly due to physiological circulatory changes at birth i.e. closing PDA, transient TR. A small proportion of babies will have significant congenital heart disease that may or may not have a heart murmur. Therefore it is the associated symptoms and signs that dictate the course of management in these babies. Baby needing resuscitation at any time, Call 999 Ambulance, transfer baby with community midwife to the nearest hospital A&E (or tertiary neonatal unit); inform neonatal/ paediatric registrar prior to transfer to attend upon arrival.

Heart murmur or abnormal pulse oximetry in the community

Initial assessment

Full cardiovascular examination.

Assess quality of murmur, femoral pulses and capillary refill time (CRT).

O2 Sats – pre (right hand) + post ductal.

Signs of respiratory distress.

Symptomatic

Murmur ± thrill ± weak pulses ± poor perfusion ± cyanosis.

O2 sats <95% or pre and post ductal sats difference >3%.

Signs of respiratory distress.

↓

Transfer baby urgently with community midwife to the postnatal ward or A&E via 999 ambulance.

Inform neonatal/paediatric registrar prior transfer to review baby urgently upon arrival.

↓

Urgent review by neonatal/paediatric team (registrar or consultant)

ABC management & clinical assessment.

O2 sats – pre & post-ductal, 4-limb BP, blood gas, CXR, ECG.

Urgent echocardiogram.*

Asymptomatic

Any heart murmur and O2 sats ≥95% plus all other assessment normal.

↓

Discuss with neonatal/paediatric registrar regarding transfer to the postnatal ward for assessment.

↓

Cardiovascular examination by neonatal/paediatric team.

↓

Follow pathway according to management of heart murmur in the postnatal ward.

* If there is a strong clinical suspicion of a duct dependent congenital heart disease or severe cyanosis, prepare Prostin whilst waiting for echocardiographic confirmation.

Cardiovascular Examination Pathway

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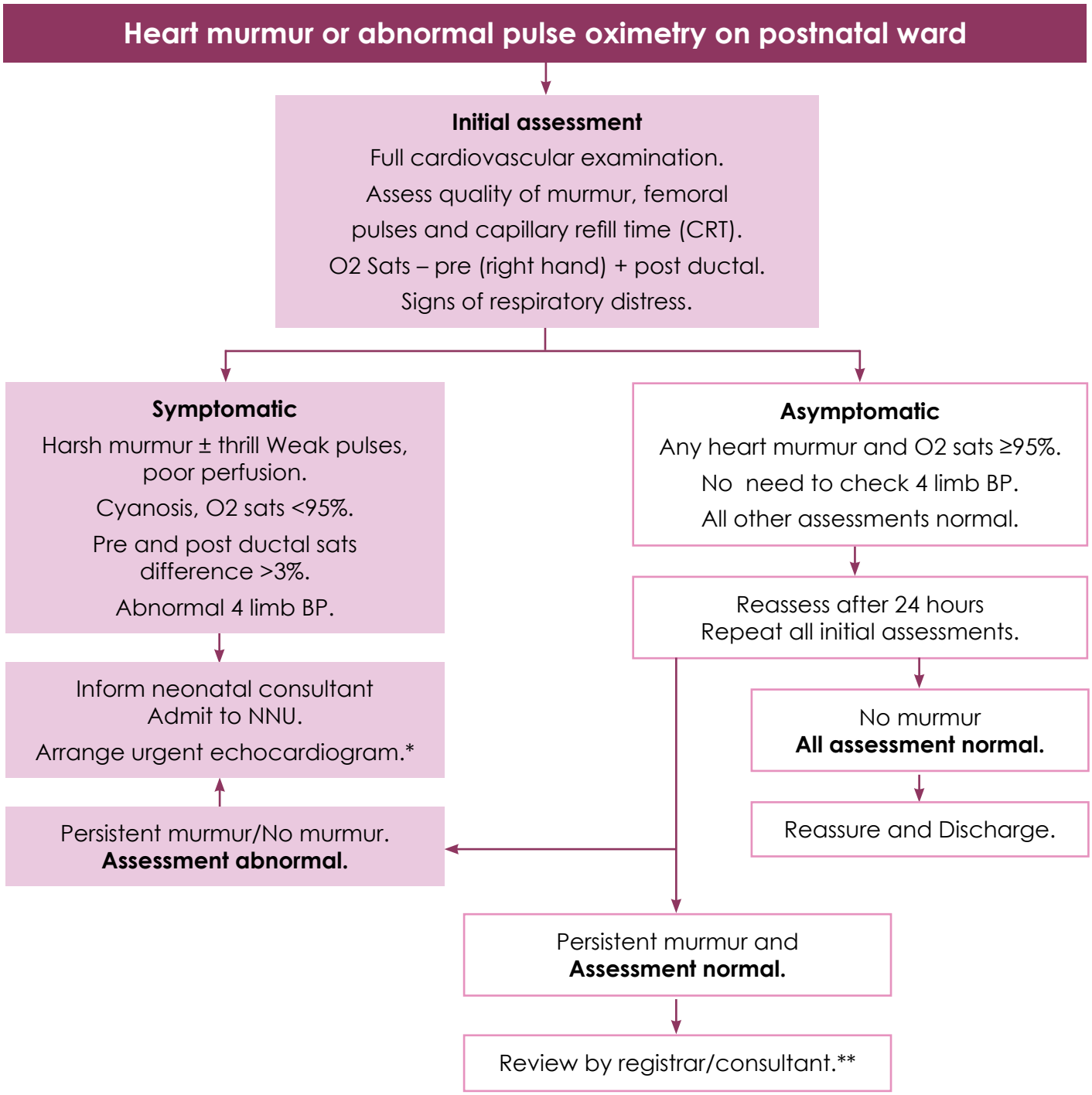
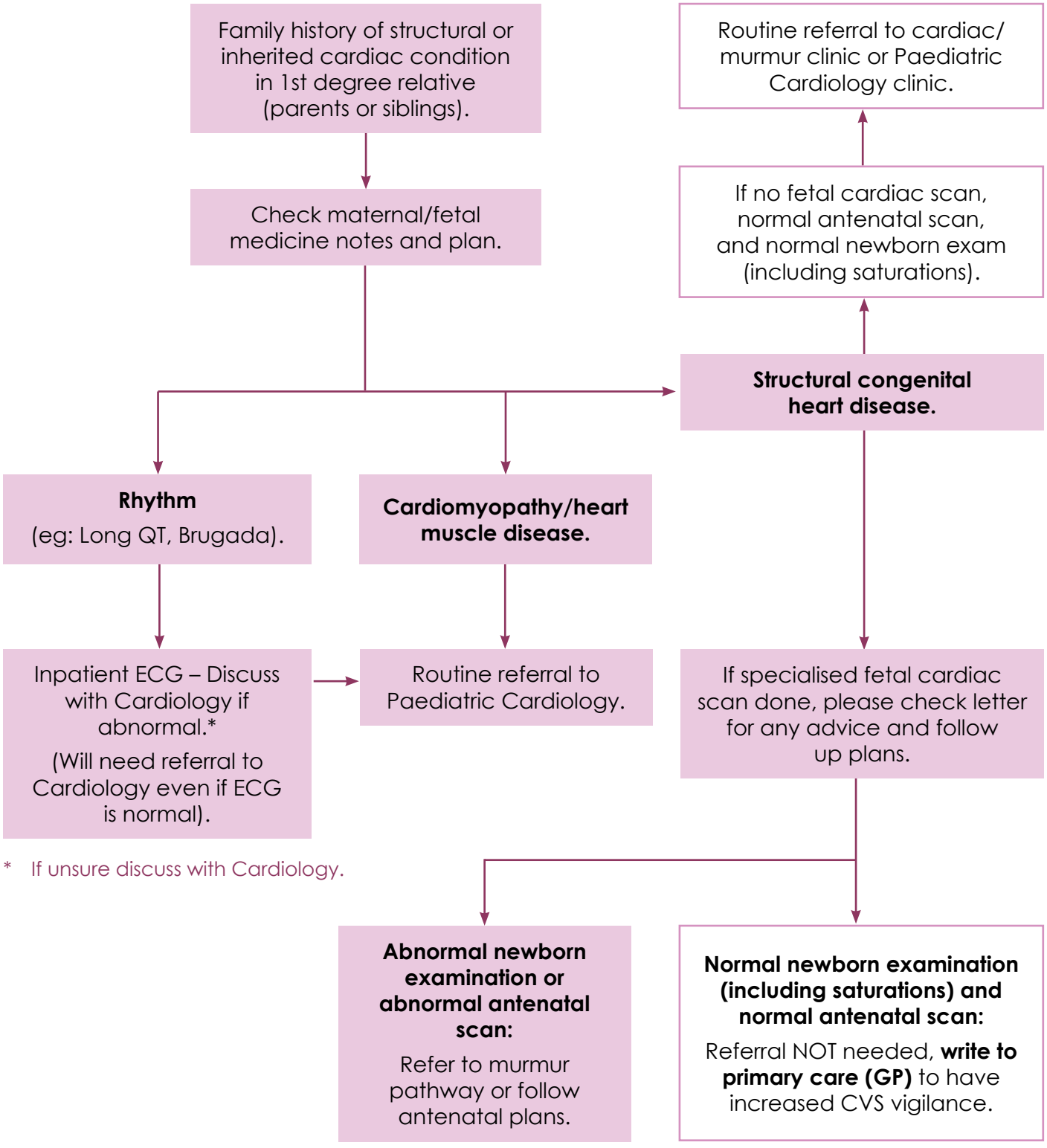


* If there is a strong clinical suspicion of a duct dependent congenital heart disease or severe cyanosis, prepare Prostin whilst waiting for echocardiographic confirmation.

** Arrange echocardiogram before discharge from postnatal ward, if possible (do not guarantee).
Complete referral form or letter for murmur or paediatric cardiology clinic ideally within 6 weeks.
If unable to perform echocardiogram before discharge from postnatal ward – provide information leaflet and document communication of symptoms of heart disease (heart failure / duct dependant lesion).

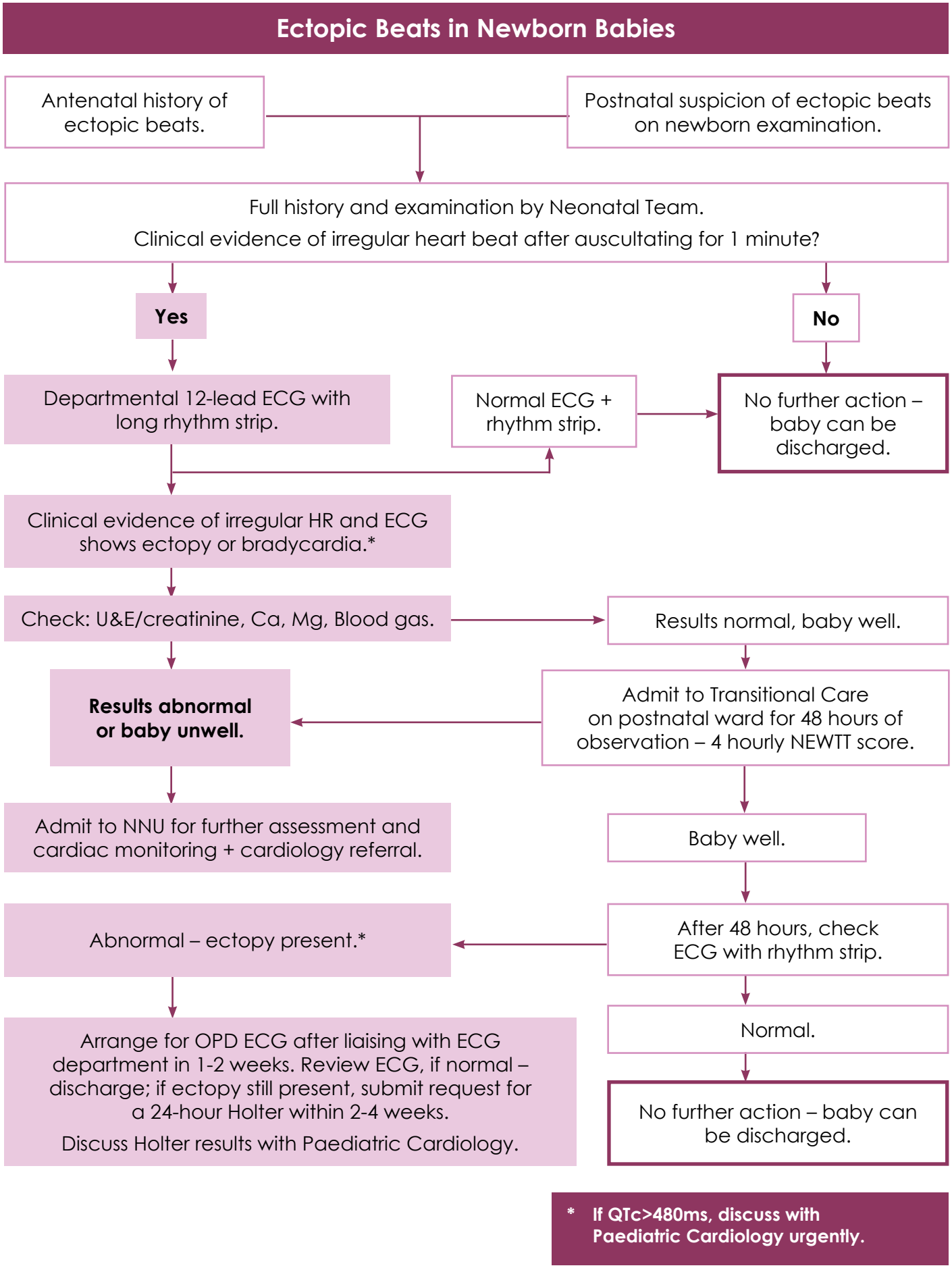
Cardiovascular Examination Pathway

Pathway for babies with family history of Cardiac Disorder



* If unsure discuss with Cardiology.

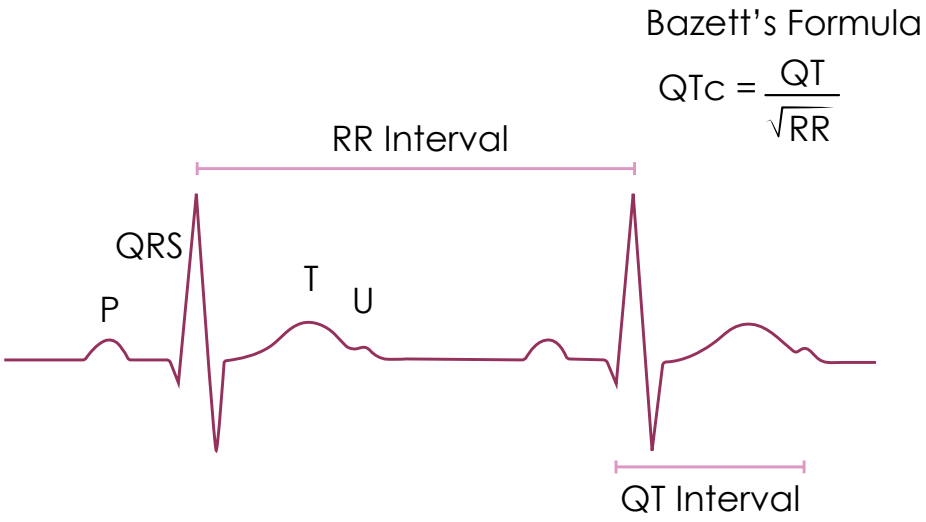
Cardiovascular Examination Pathway



Appendix and references

Appendix: sequential ECG analysis for ectopic beats in neonates

Parameter	Neonatal mean value (Days 1-3) (2nd -98th percentile)
HR (bpm)[1]	120-130 (90 to 160)
QRS axis (degrees)[1]	135 (+60 to +190)
PR interval (sec)[1]	0.10 – 0.11 (0.08 to 0.16 or 2-4 small squares)
QRS duration (sec)[1]	0.05 (0.02 to 0.08 or ½ to 2 small squares)
QTc interval (sec)[2]	0.413 (0.364 – 0.484) Should be ≤0.440[3]



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