Royal Hospital for Women (RHW)
BUSINESS RULE
COVER SHEET

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SUMMARY	To provide a clinical approach to the asymptomatic neonate with a heart murmur and no other clinical features of heart disease

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Heart murmur in asymptomatic newborn infants

This Clinical Business Rule is developed to guide safe clinical practice in Newborn Care Centre (NCC) at The Royal Hospital for Women (RHW). It has been developed in collaboration with the Paediatric Cardiology team at The Heart Centre for Children, Randwick. Individual patient circumstances may mean that practice diverges from this Clinical Business Rule. Using this document outside the RHW or its reproduction in whole or part, is subject to acknowledgement that it is the property of NCC and is valid and applicable for use at the time of publication. NCC is not responsible for consequences that may develop from the use of this document outside NCC.

1. BACKGROUND

Heart murmurs may be detected on routine neonatal examination. This clinical referral pathway is to guide the clinicians providing care to these newborn infants. This policy does **not** apply to the newborn infant with a heart murmur that is symptomatic, has other clinical features of heart disease, or is at increased risk of major congenital heart disease (CHD). The approach described in this policy is centred on a thorough examination of the newborn infant including pre and post-ductal pulse oximetry, review of feeding history and determination of any increased risk of congenital cardiac disease.

An asymptomatic neonatal heart murmur (ANHM) is defined as a heart murmur which is systolic and does not radiate, in a well infant[1]. A well infant is a healthy term infant, being nursed on the postnatal wards who is feeding well, has no increased risk of CHD on history, and has a normal structured cardiorespiratory examination. Normal cardiorespiratory examination findings include: no increased work of breathing or tachypnoea, a praecordium which is not hyperdynamic, normal femoral and equivalent brachial pulse volume, no hepatomegaly, and normal pre- and post-ductal pulse oximetry.

2. RESPONSIBILITIES

Medical and Nursing Staff

3. PROCEDURE

3.1 Equipment

- Pulse oximeter
- Neonatal stethoscope

3.2 Clinical Practice

1. Follow the Flow chart depicting the approach to the asymptomatic neonate with a heart murmur (Appendix 1).
2. Babies do not require routine electrocardiogram (ECG) or chest X-Ray (CXR) for innocent/asymptomatic heart murmurs.
3. Provide the information to parents/carers verbally and in written form (Appendix 2).
4. Audit/ Feedback loop: Referrals for outpatient cardiology assessment will be prospectively monitored and audited to monitor rates of referral, confirm follow-up and determine rates of CHD in referred neonates, in order to confirm compliance with, and impact of this policy, on patient outcomes and clinical workload.

3.3 Educational Notes

- Educational notes can be added here A recent systematic review by Shenvi et al[1] found no evidence to support the use of routine ECG or CXR to identify CHD in asymptomatic cardiac murmurs in term newborn infants. ECGs do not increase the sensitivity or specificity of clinical examination alone[2-4] and the use of CXRs has a low negative predictive value, with no alteration

in management despite a positive report[4,5]. There is also no evidence to support 4-limb blood pressures in these infants. Four-limb blood pressures do not help confirm or exclude coarctation of the aorta and has a false-positive rate of 8%[6].

- In contrast, post-discharge cardiology review +/- echocardiogram in ANHM is valuable in detecting CHD. A systematic review by Yoon et al[7] noted CHD on echocardiogram in 37.3% of newborn infants with ANHM. Ventricular septal defect was the most common congenital malformation among them. More than 50% of these newborns required outpatient cardiology follow-up, and 2.5% had severe CHD requiring immediate interventions, such as cardiac catheterisation and heart surgery.
- CHD and maternal diabetes: Large population based studies found that the prevalence of CHD was significantly high with both pre-gestational diabetes and gestational diabetes in comparison to non-diabetic pregnancies. The incidence was even greater in large for dates infants born to diabetic mothers compared to neonates of normal birthweight[8-11]. However, there is no evidence to indicate that routine ECG or CXR will improve the detection rates of CHD in this group. Cardiologists, neonatologists and paediatricians consider maternal diabetes as a risk factor in triaging these infants for review.

3.4 Abbreviations

NCC	Newborn Care Centre	ECG	Electrocardiogram
CHD	Congenital Heart Disease	CXR	Chest X-Ray
ANHM	Asymptomatic Neonatal Heart Murmur		

3.5 References

1. Shenvi A, Kapur J, Rasiah SV. Management of asymptomatic cardiac murmurs in term neonates. Pediatr Cardiol 2013; 34:1438-46.
2. Gardiner S. Are routine chest x ray and ECG examinations helpful in the evaluation of asymptomatic heart murmurs? Arch Dis Child 2003; 88:638-40.
3. Mackie AS, Jutras LC, Dancea AB, et al. Can cardiologists distinguish innocent from pathologic murmurs in neonates? J Pediatr 2009; 1:50-4.e1.
4. Ralphe JC. Pediatric cardiologists can accurately use physical examination to identify pathologic murmurs in neonates. J Pediatr 2009; 155:145.
5. Oeppen RS, Fairhurst JJ, Argent JD. Diagnostic value of the chest radiograph in asymptomatic neonates with a cardiac murmur. Clin Radiol 2002;57:736-40.
6. Crossland DS, Furness JC, Abu-Harb M, et al. Variability of four limb blood pressure in normal neonates. Arch Dis Child Fetal Neonatal Ed 2004;89:F325-7.
7. Yoon SA, Hong WH, Cho HJ. Congenital heart disease diagnosed with echocardiogram in newborns with asymptomatic cardiac murmurs: a systematic review. BMC Pediatr 2020;20:322.
8. Leirgul E, Brodwall K, Greve G, et al. Maternal diabetes, birth weight, and neonatal risk of congenital heart defects in Norway, 1994–2009. Obstet Gynecol 2016;128:1116-25.
9. Macintosh MC, Fleming KM, Bailey JA, et al. Perinatal mortality and congenital anomalies in babies of women with type 1 or type 2 diabetes in England, Wales, and Northern Ireland: population based study. BMJ 2006;333:177.
10. Correa A, Gilboa SM, Besser LM, et al. Diabetes mellitus and birth defects. Am J Obstet Gynecol 2008;199:237.e1–9.
11. Øyen N, Diaz LJ, Leirgul E, et al. Prepregnancy diabetes and offspring risk of congenital heart disease: a nationwide cohort study. Circulation 2016;133:2243–53.

Heart murmur in asymptomatic newborn infants

4. RELATED BUSINESS RULES AND POLICY DOCUMENTS

- RHW NCC Clinical Business Rule – Pulse Oximetry Screening of Newborns

5. CULTURAL SUPPORT

- When clinical risks are identified for an Aboriginal family, they may require additional supports. This may include Aboriginal health professionals such as Aboriginal liaison officers, health workers or other culturally specific services.
- For a Culturally and Linguistically Diverse CALD family, notify the nominated cross-cultural health worker during Monday to Friday business hours.
- If the family is from a non-English speaking background, call the interpreter service: NSW Ministry of Health Policy Directive PD2017_044-Interpreters Standard Procedures for Working with Health Care Interpreters.

6. IMPLEMENTATION PLAN

This (revised) CBR will be distributed to all medical, nursing and midwifery staff via @health email. The CBR will be discussed at ward meetings, education and patient quality and safety meetings. Education will occur through in-services, open forum and local ward implementation strategies to address changes to practice. The staff are asked to respond to an email or sign an audit sheet in their clinical area to acknowledge they have read and understood the revised CBR. The CBR will be uploaded to the CBR tab on the intranet and staff are informed how to access.

7. RISK RATING

- Low (5 years)

8. NATIONAL STANDARDS

- Standard 1 Governance for Safety and quality in Health Service Organisation
- Standard 6 Clinical Handover
- Standard 9 Recognising and Responding to Clinical Deterioration in Acute Health Care

9. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
23/2/2023	1	A Seigel (Neonatal Fellow); S Bolisetty (Medical Co-Director); J Skinner (Paediatric Cardiologist); G Gnanappa (Paediatric Cardiologist); Julian Ayer (Paediatric Cardiologist); Primary document approved NCC CBR Committee
16/3/2023	1	Approved by RHW Safety and Quality Committee

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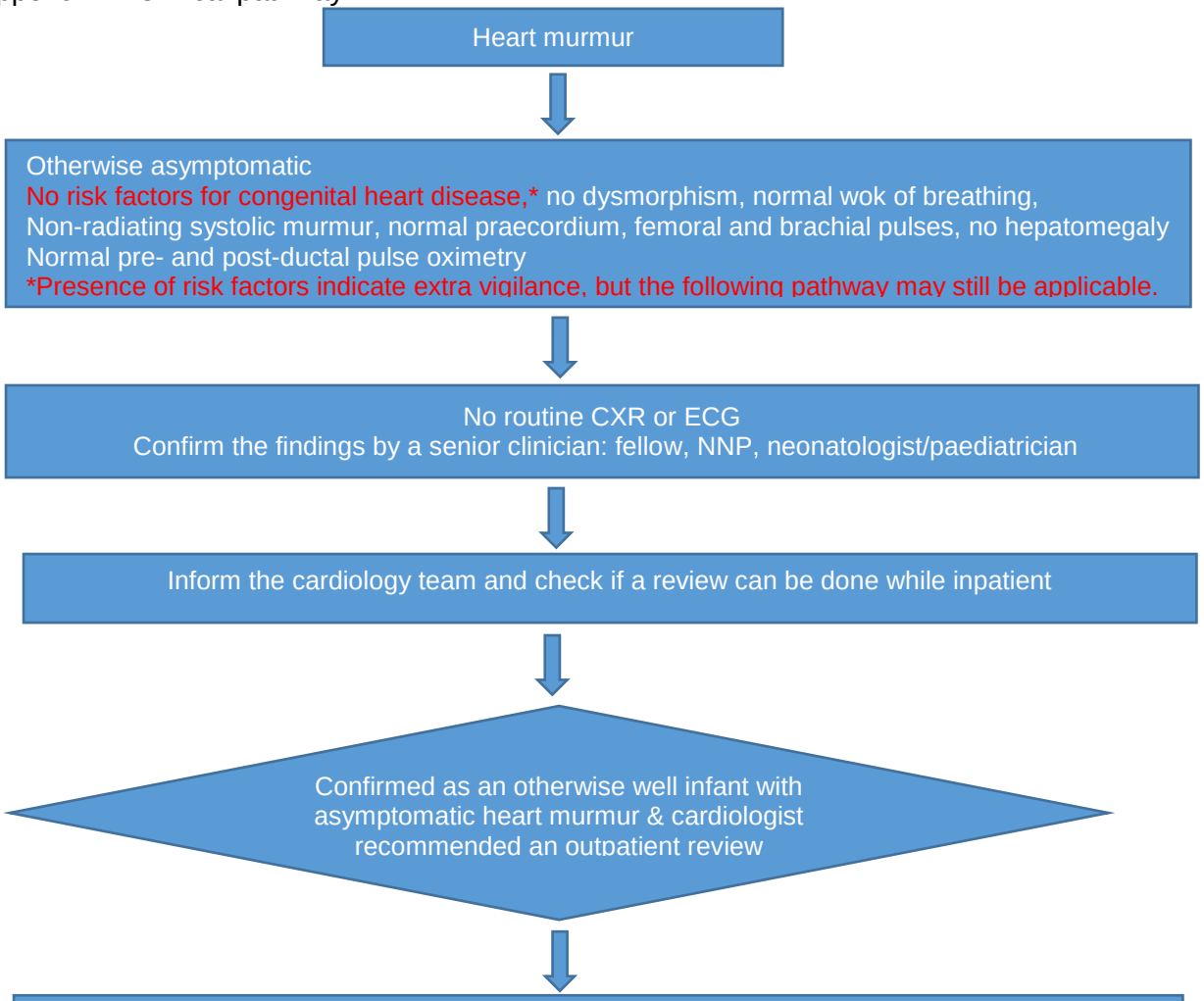
Appendix 1. Clinical pathway



Appendix 2. Parent/Carer information sheet

Heart murmur in an otherwise well newborn baby

What is a heart murmur?

All babies have their heart examined as part of the newborn routine examination. This is done to pick up problems at an early stage. During this examination, your baby has been found to have a heart murmur. Careful examination, including measurements of oxygen levels in the arm and leg, revealed no other abnormalities.

A heart murmur is an extra noise/sound made by blood as it passes through the heart. Heart murmurs are very common in babies. In the vast majority of cases the heart is working normally and these murmurs are called innocent murmurs. But in some cases, heart murmurs may be the first sign that there is a problem with the heart structure. Given that your baby is well and has no other features of heart disease on thorough examination, we expect that any abnormalities in heart structure to be very minor. The commonest example is a small hole in the heart. Most such holes will close over naturally over a few weeks.

What is the plan made by the baby's doctors?

Our paediatric team examined your baby to ensure that there are no other problems. You baby is safe to go home. We have arranged a non-urgent cardiology outpatient review for your baby. This appointment should be booked for 4-6 weeks post-discharge. If you have not received confirmation of a cardiology outpatient appointment within 2 weeks of discharge, please contact the neonatal postnatal ward doctor by calling the Royal Hospital for Women switchboard (tel: 93826111) and request to speak to the postnatal ward newborn resident medical officer (RMO)."

What are the things you should look out for when you take your baby home?

You should seek advice from a doctor/nearest emergency if your baby becomes unwell.
Signs to look out for include:

- Looks pale or blue
- Has difficulty with his or her breathing
- Is finding it difficult to feed or is breathless or sweaty during feeds
- You have other concerns about your baby's health