NORTH WEST
MATERNAL
MEDICINE NETWORK

Lancashire & South Cumbria
Cheshire & Merseyside
Greater Manchester & Eastern Cheshire

North West Maternal Medicine Network

Cardiac Disease in Pregnancy Pathway

Document Control

This pathway is an adaption of V2 April 2022 Greater Manchester and Eastern Cheshire Strategic Clinical Network Cardiac Disease in Pregnancy Guideline. The Maternal Medicine Network would like to take the opportunity to thank all previous and current contributors for their engagement and dedication in supporting the development of this guideline.

Owners	North West Maternal Medicine Network (NW MMN)	NW.MMN@nhs.net
MMN Authors Designation	Charlotte Bryant (MMN Manager)	Charlotte.bryant11@nhs.net
	Mark Clement-Jones (Consultant Obstetrician and MMN Clinical Lead)	Mark.clement-jones@liverpool.ac.uk
	Catherine Chmiel (MMN Lead Midwife)	Catherine.chmiel@nhs.net
	Emma McGoldrick (Consultant Obstetrician and MMC Clinical Lead) Liverpool Women's Hospital	Emmalouise.mcgoldrick@lwh.nhs.uk
	Vishal Sharma (Consultant Cardiologist and MMC Obstetric Physician) Royal Liverpool and Broadgreen University Hospital NHS Trust	Vishal.sharma@liverpoolft.nhs.uk
	Clare Mumby (Consultant Diabetologist and MMC Obstetric Physician) Manchester University NHS Foundation Trust	Clare.mumby@mft.nhs.uk
	Anna Bewlay (Consultant Anaesthetist and MMC Lead) Lancashire Teaching Hospital (Preston)	Anna.bewlay@lthtr.nhs.uk
Contributing Authors	**Manchester University NHS Foundation Trust:** Anna Roberts (Consultant Obstetrician) Sarah Vause (Consultant Obstetrician) Bernard Clarke (Consultant Obstetrician) **Liverpool Women's Hospital** Zora Castling (Consultant Obstetrician) Naomi McGuinness (Consultant Obstetrician) Helen McNamara (Consultant Anaesthetist) **Liverpool Heart and Chest Hospital** Reza Ashrafi (Consultant Congenital Cardiologist) Damien Cullington (Consultant Congenital Cardiologist) **Blackpool Teaching Hospitals** Liz Haslett (Consultant Obstetrician) Chris Cassidy (Consultant Cardiologist)	

Version control

V0.1	Circulated to the following groups for comments and feedback: • Regional Guidelines Group • North West Congenital Heart Disease Network • North West MMN Coproduction group	
V0.2	Regional Guideline group and MMN Board	

Ratification process	Ratified by: Regional Guideline Group
Date of Ratification:	24th July 2024
Review	Review Date: 24th July 2026 Responsibility of: NW MMN

Once fully ratified and endorsed, this guideline will be available for adoption across the entirety of the North West in order to ensure that women universally receive high quality care.

The MMN are committed to making maternal medicine care inclusive. We use the term 'women' throughout MMN documentation to refer to those who are planning to become pregnant, are pregnant and have given birth. We acknowledge that not all people who are pregnant and give birth identify as women. It is important that evidence-based care for maternity, perinatal and postnatal health is inclusive and tailored to an individual's wishes.

Cardiac Disease in Pregnancy North West Maternal Medicine Network

The Maternal Medicine Network (MMN) is responsible for ensuring that all women in the network's footprint with significant medical problems will receive timely specialist care and advice before, during, and after pregnancy. All constituent providers within the network will be responsible for agreeing and upholding shared protocols on the management and referral of women with medical conditions, including reviewing guidelines and referral pathways. This model of care will ensure that – where agreed appropriate – investigation and management is carried out by an experienced Multidisciplinary Team (MDT).

Most women with complications during pregnancy will continue to be managed by local maternity services. The proportion of a woman's care provided by a Maternal Medicine Centre (MMC) will vary according to individual need. For some women, a single visit to the MMC or communication with the MMC by the local unit will suffice. For the highest risk and most complex women, it may be that all care will be recommended to be provided within the MMC.

There is a designated MMC based in each of the three Local Maternity & Neonatal Systems (LMNS) that serve the Northwest region.

LMNS	MMC
Greater Manchester and Eastern Cheshire (GMEC)	St Mary's Hospital Manchester (SMH)
Cheshire & Merseyside (C&M)	Liverpool Women's Hospital (LWH)
Lancashire & South Cumbria (L&SC)	Royal Preston Hospital (RPH)

The three MMC's encompass all maternity providers within the three LMNS's (Appendix 1). The centres function collaboratively as a network enabling coordination to deliver maternal medicine care to women throughout the NW region. This integrated approach ensures equitable expert care.

For women requiring specialist cardiology input in GMEC and C&M, these patients should be referred to the local MMC's of St Mary's and LWH, respectively. In L&SC Obstetric Cardiology referrals for MDT review/advice should be sent to the Preston MMC electronically for notification purposes. The service will then be led by Blackpool Teaching Hospital as it is the lead service for Cardiology in L&SC.

When referring women, be respectful and aware of all religions, languages, cultures and diversities such as transgender and non-binary to ensure best care for all. Please take into consideration the additional challenges faced by those who are from an ethnic minority, have a severe mental illness or are socially deprived as they are at a higher risk of poor physical health and poor outcomes, compared with the general population. The perinatal period adds further complexity, therefore please ensure you consider mental health needs and refer to your local perinatal mental health service appropriately.

Cardiology Pathway

This document outlines the key contacts, referral processes, and the conditions that require specialist cardiology input or consultant led care. The Obstetric Cardiology contacts in each LMNS can be found in Appendix 2.

All women with cardiac disease should be risk stratified using the Modified World Health Organisation Classification of maternal cardiovascular risk (mWHO) as per Table 1. The adapted version in this appendix (includes conditions not mentioned in the mWHO guidance) provides a framework for appropriate location of care and delivery. It should be noted that for this guideline alone, the nationally agreed classification of maternal medical conditions, A, B, C, has been deferred, as the mWHO classification has been well established within cardiology, and has been used for consistency with that speciality.

Please consider additional co-morbidities alongside cardiac disease as the presence of other health conditions may require specialist support even if ordinarily the cardiac condition is deemed manageable at a local unit.

When considering referral to the MMC in your local LMNS please pay attention to the 'Care in Pregnancy' and 'Location of Delivery' sections in Table 1 as this provides guidance as to when referral to the LMNS MMC is recommended.

Table 1: Risk Stratification of conditions and location of care

	mWHO I	mWHO II	mWHO II-III	mWHO III	mWHO IV
Diagnosis (if otherwise well and uncomplicated)	Small or mild - pulmonary stenosis - patent ductus arteriosus - mitral valve prolapse Successfully repaired simple lesions (atrial or ventricular septal defect, patent ductus arteriosus, anomalous pulmonary venous drainage) Atrial or ventricular ectopic beats isolated	Unoperated atrial septal or ventricular defect Repaired tetralogy of Fallot Most arrhythmias (supraventricular arrhythmias)	Mild left ventricular impairment (EF >45%) Hypertrophic cardiomyopathy Native or tissue valve disease not considered WHO I or IV (mild mitral aortic stenosis) Marfan or other HTAD syndrome without aortic dilatation Aorta <45 mm in bicuspid aortic valve pathology Repaired coarctation Atrioventricular septal defect Turners Syndrome All channelopathies (event rate not applicable)	Moderate left ventricular impairment (EF 30-45%) Previous peripartum cardiomyopathy without any residual impairment of left ventricular function Systemic right ventricle with good or mildly decreased ventricular function Fontan circulation. If otherwise the patient is well and the cardiac condition uncomplicated Unrepaired cyanotic heart disease Other complex heart disease Moderate mitral stenosis Severe asymptomatic aortic stenosis Moderate aortic dilatation Ventricular tachycardia	Pulmonary arterial hypertension (managed in Sheffield PH service) Severe left ventricular dysfunction (EF <30% or NYHA class III-IV) Previous peripartum cardiomyopathy with any residual left ventricular impairment Severe mitral stenosis Severe symptomatic aortic stenosis Systemic right ventricle with moderate or severely decreased ventricular function Severe aortic dilatation Vascular Ehlers-Danlos Severe (re)coarctation Fontan with any complication Mechanical valve

	mWHO I	mWHO II	mWHO II-III	mWHO III	mWHO IV
Risk	No detectable increased risk of maternal mortality and no/mild increased risk in morbidity	Small increased risk of maternal mortality or moderate increase in morbidity	Intermediate increased risk of maternal mortality or moderate to severe increase in morbidity	Significantly increased risk of maternal mortality or severe morbidity	Extremely high risk of maternal mortality or severe morbidity
Maternal cardiac event rate	2.5-5%	5.7-10.5%	10-19%	19-27%	40-100%
Pre-pregnancy Counselling	Optional- local unit	Yes-local unit	Yes- local unit	Yes: expert counselling required	Yes: expert counselling required
Care during pregnancy	At the Local hospital. If there are concerns, or a lack of expertise or timely review in the local hospital, refer to the obstetric cardiology clinic at the local **MMC*** for review or advice.	At the Local hospital. If there are concerns, or a lack of expertise or timely review in the local hospital, refer to the obstetric cardiology clinic at the local **MMC*** for review or advice.	Refer to the Obstetric Cardiology Clinic at the local **MMC*** for MDT consideration about where antenatal care and delivery is most appropriately located irrespective of where they usually attend for their cardiac care. For some women, delivery may be appropriate in their local unit.	Refer to the Obstetric Cardiology Clinic at the local **MMC*** for MDT consideration about where antenatal care and delivery is most appropriately located irrespective of where they usually attend for their cardiac care.	Refer to the Obstetric Cardiology Clinic at their local **MMC*** for regional MDT discussion and decision about transfer of antenatal care and delivery. **Pulmonary Hypertension cases discussed in MMC MDT -managed in Sheffield PH Service**
Minimal follow-up visits during pregnancy	Once or twice	Once per trimester	Bimonthly	Monthly or Bimonthly	Monthly
Location of delivery	Local hospital	Local hospital or Individualised assessment after MDT review	Individualised assessment after MDT review	Expert centre for pregnancy and cardiac disease as decided at MMC MDT review	Expert centre for pregnancy and cardiac disease as decided at MMC MDT or Regional MDT

***In L&SC Obstetric Cardiology referrals for review/advice at the MMC will be led by Blackpool Teaching Hospital**

Effective models of working within the NW MMN should ensure that care is integrated between local, regional, and national models of care to minimise inappropriate referrals into the specialist centres and support local units to provide the right care at the right time, in the right place.

Each MMC is equipped to facilitate and organise telemedicine across the MMN if it is safe for the woman. The option to facilitate consultations via telemedicine is available where it is difficult for the woman to attend a face-to-face appointment. Telemedicine will also be used where expertise is required for specific cases and clinicians from several providers need to work together as an MDT to implement joint care plans. This mitigates the geographical challenges that occur when experts are not based at the same Trust.

Some complex cases (classified at mWHO IV and some complex mWHO III), will require input from the regional MDT and in some instances a supra-regional MDT. These women should be referred to the local MMC who will co-ordinate and facilitate ongoing care/referral to the regional MDT as required. The regional MDT will then decide where the care and delivery is best placed. The local MMC will be supported via the regional MDT to transfer care as required for antenatal and delivery care.

Pathways of Care

Table 2 outlines the pathways of care for women who fulfil the following criteria:

- Women with pre-existing Cardiac disease diagnosed pre-pregnancy
- Cardiovascular problems diagnosed in pregnancy and the puerperium

Women might present with a Cardiovascular problem via primary care, emergency department, acute medicine, community midwifery, gynaecology or obstetric services or self-refer. Maternity services are to be informed at the earliest opportunity after presentation and are to be involved in the woman's ongoing care where required.

Table 2: Provision of care for women with known pre-existing cardiac conditions and those arising in pregnancy and puerperium.

Pre-pregnancy counselling (PPC) Can be provided locally, in combination with, or independently at an MMC depending on categorisation of condition	Women who require PPC: • Anyone under regular cardiology review • Anyone planning to undergo assisted reproduction who has known or significant risk factors for cardiac disease • Anyone with family history or genetic confirmation of inherited cardiac condition
Care of miscarriage or TOP	• MDT to decide best place and method of care • Should be managed in NHS setting with access to cardiac facilities
Antenatal Care	• Women may present to a variety of health care teams (e.g. medical speciality) who can refer to maternity services • There should be an early local assessment of risk as per table 1 above and onward referral to the appropriate MMC • Any new cardiac disease presenting in pregnancy should be referred to the local MMC (see page 9 for urgent referrals)
Intrapartum Care	• All women discussed at MDT with Cardiac Disease will have an MDT care plan (template if required in Appendix 3) • For the most severe cardiac conditions the place of delivery will be decided by the MDT caring for the woman (as outlined in Table 1)
Postnatal Care pre-existing	Where delivery has taken place at the MMC, a woman will be discharged with one of the following discharge plans: • Local MMC with local cardiac provider (mWHO IV and some complex mWHO III) • Primary care/place of birth or Local MMC (clinical opinion) with local cardiac provider (mWHO I-III)
Postnatal Care Cardiac conditions developed postnatally	Any new cardiac disease presenting in the immediate post-partum should be referred to the local MMC

Referral processes

The referral process for each of the MMCs are detailed below. The distinction between routine and urgent referrals are also outlined for each MMC by following the hyperlinks below.

1. Referral to GMEC MMC at St. Mary's Hospital (Appendix 4)
2. Referral to C&M MMC at Liverpool Women's Hospital (Appendix 5)
3. Referral to L&SC MMC at Royal Preston Hospital (Appendix 6)

We welcome referrals from Physicians, Specialist Nurses, Midwives, General Practitioners and Obstetricians within the North West Maternal Medicine Network footprint to the appropriate MMC. See Appendix 1 for details regarding which MMC the local providers feed into.

A request for an obstetric medicine opinion, MDT, or transfer of care should be made through an online referral form. In instances where the referral is from a practitioner other than an Obstetrician, we will ask the referrer to include their email and to identify who the patients lead obstetrician is, or where the patient intends to book.

The referral form will ask referrers to stipulate their degree of urgency (as routine or urgent).

-Routine referrals will be processed within two weeks.

-Urgent referrals will be processed within a week.

Emergency referrals should be obstetric consultant to obstetric consultant via MMC switchboard for immediate guidance. When the clinical plan is agreed the MMC consultant should inform the MDT coordinator of the referral to complete the electronic referral process.

For emergency referrals please see appendices for contact details at each MMC.

Please ensure you include the following information in your referral:

- Cardiac diagnosis
- Current clinical status; cardiac and obstetric issues, other relevant past medical history
- Current medication
- Results of any relevant recent investigations e.g. echo, cardiac MR, Holter.
- Copies of reports where possible/relevant
- Full details of any previous surgery or cardiac procedures if available

Appendix 1: North West Maternity Providers

LMNS	Cheshire & Merseyside	Greater Manchester & Eastern Cheshire	Lancashire & South Cumbria
MMC	Liverpool Women's Hospital NHS FT **works with Liverpool University NHS Foundation Trust to provide join cardiac and obstetric care**	Manchester University NHS FT St Mary's Hospital Oxford Road Campus	Royal Preston Hospital *** In L&SC Obstetric Cardiology referrals for review/advice at the MMC will be led by Blackpool Teaching Hospital**
Provider Trust's	Countess of Chester Hospital NHS FT Mid-Cheshire Hospitals NHS FT (Leighton) Mersey and West Lancashire Teaching Hospitals NHS Trust (St Helens & Knowsley) Mersey and West Lancashire Teaching Hospitals NHS Trust (Southport & Ormskirk) Warrington & Halton Teaching Hospitals NHS FT Wirral University Teaching Hospital NHS FT	Bolton FT East Cheshire NHS Trust (Macclesfield) MFT North Manchester General Hospital MFT Wythenshawe Northern Care Alliance NHS FT Stockport NHS FT Tameside & Glossop NHS FT Wrightington, Wigan and Leigh NHS FT	East Lancashire Hospital NHS Trust University Hospital Morecambe Bay NHS FT (Furness) University Hospital Morecambe Bay NHS FT (Lancaster) Blackpool Teaching Hospitals NHS FT

Appendix 2: Cardiac Obstetric Clinics

MMC/Centre	Obstetrician	Cardiologist	Frequency
St Mary's Hospital Cardio-Obstetric Clinic	Dr A Roberts Dr S Bonner	Prof Clarke Prof Keavney Dr D Cullington	Weekly Tuesday am
Switchboard	**SMH: 0161 2761234**	**MRI: 0161 2741234**	
Liverpool Women's Hospital Cardio-obstetric Clinic	Dr Z Castling Dr N McGuinness	Dr V Sharma Dr D Cullington Dr R Ashrafi	Fortnightly Monday pm
Switchboard	**LWH: 0151 708 9988**	**RLUH: 0151 706 2000** **LHCH: 01516001616**	
Royal Preston Hospital	Dr C Cox Dr L Murphy	Dr W Khan	Monthly
Switchboard	**01772716565**	**01772716565**	
Blackpool Teaching Hospital	Dr L Haslett	Dr C Cassidy	Monthly
Switchboard	**Secretary: 01253 953645** **Switchboard: 01253 300000 (bleep 1223)**	**Secretary: 01253 953368** **Switchboard: 01253 300000 (bleep 1074)**	

Appendix 3: Care Plan Templates (optional use)

Patient Summary at referral Template

Generic%20Patient%20Summary.docx

Patient Summary at Referral

Referrer name:	
Job role	
Referring organisation	

Date	**Patient Details:**
Parity	
Relevant Obstetric History	
Current gestation	
BMI	
First language	**Interpreter required Yes No (please circle)**
EDD	
Next appointment	
Condition & reason for referral	
Diagnosis/Interventions	
Current status of condition	
Relevant Medical/Anaesthetic History	

Medication / Allergies	
Thromboprophylaxis	
Patient individual preferences/comments	

MDT Summary Template

Generic%20MDT%20Summary.docx

MDT Summary

Name	
DOB	
Hospital No	
MDT attendees	
Diagnosis Include: Parity, Condition, Medication	
Investigations	
MDT Discussion	Plan: Actions: Outcome:
Antenatal Plan	
Intrapartum recommendations **(include place of delivery)**	
Postpartum recommendations	
Anaesthetic considerations	
Neonatal considerations	
Outstanding actions/investigations	

Plan in the event of an emergency	
Contact details	Generic MMC e-mail: MMC midwife: MDT co-ordinator:

Birth Plan Template

Generic%20Birth%20Plan.docx

Birth Plan

Patient Name:		
Hospital & NHS Number:		
Address		
Date of Birth		
Allergies:		
Condition/Diagnosis		
EDD		
Obstetric History (Including CS)		
Medical/Surgical History		
Medications		
Planned mode of delivery **(date of elective C/S or IOL if applicable)**		
Staff alert: On call Consultant Obstetrician and Labour ward coordinator to be informed on admission for all Red and Amber patients		Please circle the tick as appropriate ✓ Red Cat A: inform all on call staff immediately on admission, immediate HDU care ✓ Amber Cat B: Inform on call team within 4 hours ✓ Green Cat C: routine care with attention to care plan
Haemodynamic Goals		
Anaesthetic review recommendations		
LSCS	Indication	If labours spontaneously
	Location	Location post op

Induction (continued on next page)	Location-	
	Oxytocin regime	
	Considerations/recommendations: -Fluids -Additional monitoring & frequency -Thromboprophylaxis plan	
Vaginal delivery	Special considerations/recommendations: First stage – Second stage –	
Third stage	Usual management or other recommendations: Drugs to be used with caution:	
Post-delivery Please Circle as appropriate and add comments	ICU	Yes / No
	Stay on labour ward (how long?)	Yes / No
	Stay in hospital (how long?)	
	Medication plan (breastfeeding considerations)	
	Daily examination by Doctor -	Yes / No
	State investigations before discharge	
	Thromboprophylaxis	Yes / No Dose & Duration
	PN follow arranged/planned	Yes / No
Contact Details	Generic MMC e-mail:	
	MMC midwife:	
	MDT co-ordinator:	

Appendix 4: GMEC Referral process to St Mary's Manchester MMC

GMEC MMC at St Mary's Hospital	
MDT co-ordinator (Mon-Fri 8-4)	0161 271 3593 maternal.medicine@mft.nhs.uk
EMERGENCY ADVICE	On call Consultant Obstetrician: Switchboard: 0161 2761234 ask for Obstetric Consultant on call Bleep 6000 or via Vocera. (On call Consultant should inform a member of the obstetric cardiac team during working hours) On call Cardiology registrar/consultant MRI: 0161 2741234
Referral form	MFT Maternal Medicine Referral Form (office.com)

Appendix 5: C&M Referral to Liverpool Women's MMC

C&M MMC at Liverpool Women's Hospital	
MDT co-ordinator (Mon-Fri 8-4)	0151 702 4271 maternal.medicine@lwh.nhs.uk
EMERGENCY ADVICE	For **unwell women where transfer of care** to MMC is being considered or delivery may be indicated this should go through on call obstetric consultant at MMC (switchboard 0151 708 9988 ask for Obstetric Consultant on call) who will facilitate an MDT discussion with Cardiology Consultant, anaesthetic and neonatal teams, to determine appropriate location of ongoing care. For admitted unwell women in spoke hospitals the referral pathway should continue with the usual escalation and review by onsite cardiology - if the woman requires ongoing follow up a referral through the portal should be made for opinion and review as appropriate **All cases should have a referral form completed through the MMC.**
Referral form	https://tinyurl.com/LWHMatMedReferral

Appendix 6: L&SC Referrals to Royal Preston Hospital MMC and Blackpool Teaching Hospital

Referrals to L&SC should be referred to L&SC MMC via the badgernet Maternal Medicine referral form or via email to maternal.medicine@lthtr.nhs.uk. The MDT co-ordinator will liaise with the specialist teams (at Royal Preston Hospital and Blackpool) to ensure the referral is actioned and an appropriate review is undertaken (either via MDT discussion or face to face review).

L&SC MMC at Royal Preston Hospital	
MDT co-ordinator (Mon-Fri 8-4)	01772 524730 maternal.medicine@lthtr.nhs.uk
EMERGENCY ADVICE	On call Consultant Obstetrician at Preston: Switch board 01772716565 Bleep 4371 On call Consultant Obstetrician at Blackpool: Switch board 01253 300000 On call Cardiologist at Preston : Normal working hours switch board 01772716565 On call Cardiologist at Blackpool: Switchboard 01253 300000
Referral form	For patients on BadgerNet use Maternal Medicine referral form in each patients notes For Patients not on BadgerNet email maternal.medicine@lthtr.nhs.uk For preconception patients use Advice and Guidance system