Cardiac Disease in Pregnancy

Regional clinical guidance and referral protocol for the management of congenital and acquired cardiac disease from preconception to the postnatal period

Other version of this guideline: A quick reference guide is available which outlines the key stages

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<tr>
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<tr>
<td><strong>Title</strong></td>
<td>Cardiac Disease in Pregnancy: Regional clinical guidance and referral protocol for the management of congenital and acquired cardiac disease from preconception to the postnatal period.</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>This document provides best practice guidance to improve services for women with congenital and acquired cardiac disease when planning a pregnancy, during pregnancy and the postnatal period. Healthcare professionals are asked to take this guidance into account when exercising their clinical judgement. The guidance does not, however, override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.</td>
</tr>
<tr>
<td><strong>Author</strong></td>
<td>This document has been written under the auspices of the North West of England Adult Congenital Heart Disease Strategic Board, but includes both congenital and acquired cardiac disease for practical purposes. It represents the views of a guideline development group of healthcare professionals after consideration of the evidence available.</td>
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<tr>
<td><strong>Target Audience</strong></td>
<td>Obstetricians, Midwives, Anaesthetists, Paediatric and Adult Cardiologists, Paediatric and Adult Cardiac Nurses, Haematologists, Neonatal Teams, Emergency Care Leads, GPs, Sexual and Reproductive Healthcare Consultants and other staff who care for women with cardiac disease. Patient groups who provide support for women with cardiac disease. Primary Care Trusts and Specialist Commissioners. Chief Executives, Clinical Directors, Medical Directors and Heads of Nursing and Midwifery involved in maternity care within District General Hospitals and Tertiary Centres.</td>
</tr>
<tr>
<td><strong>Circulation</strong></td>
<td>This clinical guidance and referral protocol should be made easily accessible and available for healthcare professionals on the Cardiac Network websites, hospital websites and in all clinical areas where women with heart disease are most likely to present for contraception/pre-pregnancy/pregnancy advice or management (for example, antenatal clinics, delivery suites, postnatal wards, accident and emergency departments, GP surgeries, sexual and reproductive healthcare clinics, transition services and cardiology clinics and wards).</td>
</tr>
<tr>
<td><strong>Cross Reference</strong></td>
<td>National Institute for Clinical Excellence (NICE) Prophylaxis against infective endocarditis March 2008; Recommendations from the 51st RCOG Group November 2006; Saving Mothers’ Lives 2007; Saving Mothers’ Lives 2011.</td>
</tr>
<tr>
<td><strong>Superseded Documents</strong></td>
<td>‘Cardiac disease – preconceptual, antenatal, intrapartum and postnatal management’ (Manchester Obstetric Group).</td>
</tr>
<tr>
<td><strong>Action Required</strong></td>
<td>Local organisations can use the guide in the planning, development and delivery of local services for the care of women with cardiac disease in pregnancy.</td>
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EXECUTIVE SUMMARY
Women with cardiac disease in pregnancy are at high risk of complications and cardiac disease is the leading cause of indirect maternal death. This clinical guideline has been developed to promote seamless, multidisciplinary care for women with cardiac disease who need contraceptive advice, are planning to become pregnant, or who are already pregnant who live in the North West of England, North Wales or Isle of Man. This document has been written under the auspices of the North West of England Adult Congenital Heart Disease Strategic Board, but includes both congenital and acquired cardiac disease for practical purposes.

JOINT OBSTETRIC AND CARDIOLOGY CLINICS are held at:
Central Manchester University Hospitals NHS Foundation Trust – Professor Clarke and Dr S Vause Tel: 0161 276 6426
Liverpool Women's NHS Foundation Trust – Dr I Peart and Dr L Bricker Tel: 0151 702 4211/0151 708 9988
Blackpool Fylde and Wyre Hospitals NHS Foundation Trust – Dr D Roberts and Dr E Haslett Tel: 01253 303 448/01253 657 760

PRECONCEPTION
A proactive approach to preconception counselling and education should be started in adolescence and this should include advice on safe and effective contraception and the importance of avoiding an unplanned pregnancy. All women of reproductive age with cardiac disease should have access to specialised multidisciplinary preconception counselling in a joint obstetric and cardiac clinic, to empower them to make choices about pregnancy. They should be given advice about contraception and how to access services rapidly when they become pregnant. Pregnancy should ideally be planned and managed by a multidisciplinary team including obstetricians, midwives, cardiologists, nurses and anaesthetists.

TERMINATION OF PREGNANCY
Rapid access to termination of pregnancy services should be facilitated, if, for whatever reason, a woman chooses this. The termination of pregnancy service should be able to provide the appropriate level of medical care for the severity of the woman’s cardiac disease.

ANTENATAL CARE
All pregnant women with heart disease should be assessed clinically as soon as possible by the multidisciplinary team. Following multidisciplinary assessment and risk stratification, appropriate care can be arranged at a district general hospital (DGH) or tertiary unit according to the complexity of the cardiac disease (see Table below).
- Low risk–care and delivery in DGH, with escalation if clinical deterioration
- Moderate risk–refer to joint obstetric cardiac clinic for assessment, but care may be shared with DGH
- High risk–refer to joint obstetric cardiac clinic for care and delivery in tertiary centre

<table>
<thead>
<tr>
<th>Low risk</th>
<th>Moderate risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repaired cardiac lesions with no residual cardiac dysfunction</td>
<td>Haemodynamically significant mitral stenosis</td>
<td>Eisenmenger syndrome</td>
</tr>
<tr>
<td>Bioprosthetic valve replacement with normal function</td>
<td>Moderate aortic stenosis</td>
<td>Significant pulmonary hypertension</td>
</tr>
<tr>
<td>Isolated mitral valve prolapse with no significant regurgitation</td>
<td>Cyanotic congenital heart disease – un repaired or palliated</td>
<td>Severe aortic stenosis/aortic coarctation</td>
</tr>
<tr>
<td>Non critical mitral stenosis with minimal limitation of maternal physical activity</td>
<td>Aortic coarctation</td>
<td>NYHA class 3 or 4 functional status/presence of severe systemic ventricular dysfunction</td>
</tr>
<tr>
<td>Bicuspid aortic valve without</td>
<td>Mechanical heart valves</td>
<td>Marfan syndrome with dilated aortic root (≥4cm)</td>
</tr>
<tr>
<td></td>
<td>Ischaemic heart disease</td>
<td></td>
</tr>
</tbody>
</table>
significant stenosis or regurgitation
Mild to moderate pulmonary stenosis
Small left to right shunts
(with or without family history of aortic dissection)
Cardiomyopathy with ejection fraction >40%
Critical mitral stenosis <1cm²
Cardiomyopathy with ejection fraction ≤40%

All pregnant women with cardiac disease requiring treatment or care by other specialists should have an integrated care plan developed and agreed between all specialties involved.

An escalation and transfer protocol must be available in all units should a woman with cardiac disease deteriorate during pregnancy or postpartum.

INTRAPARTUM CARE
- **Senior input** and multidisciplinary care are imperative.
- **Aim for a vaginal delivery** unless obstetric or cardiac indications for LSCS (See Table 9, p.39 for indications for caesarean section).
- Women with cardiac disease should see the obstetric anaesthetist antenatally to discuss analgesia. When a woman with cardiac disease is admitted to the delivery suite the anaesthetic staff should be involved early.
- **Fluid balance** needs to be assessed accurately using an hourly input/output chart and an hourly urometer in moderate and high risk cases.
- Observations should be charted on a **HDU chart** in moderate and high risk cases.
- For some cardiac conditions **hypotension** is poorly tolerated. Prompt and accurate replacement of lost volume is necessary. An arterial line may be indicated. This should be specified in the care plan.
- For other cardiac conditions, **hypertensive surges** may be poorly tolerated. Syntocinon is preferred to syntometrine. For women with severe heart disease this may need to be given as an infusion (Syntocinon 5u in 20 mls over 20 mins). This should be specified in the care plan.
- For some women a **short active second stage**, or no active second stage may be necessary and vaginal delivery should be assisted with forceps. If needed this should be specified in the care plan.
- **Tocolytics**, such as nifedipine, may severely compromise cardiac function. The use of tocolytics should be discussed with the consultant. Atosiban is the tocolytic of choice for women with severe cardiac disease as it has the least cardiovascular side effects.
- Current NICE guidelines state that **antibiotic prophylaxis** against infective endocarditis should not be offered for gynaecological and obstetric procedures or childbirth. However, after discussion of the risks and benefits, some women may choose to have antibiotic prophylaxis because of the serious nature of endocarditis and the low risk of anaphylaxis.
- For **postpartum haemorrhage**, due to uterine hypotonia, mechanical methods such as bimanual compression and a B Lynch suture can be used. Misoprostol (1000 micrograms pr) should be used in preference to hemabate as it has less vasoactive effects.

POSTNATAL CARE
This is often a time of decompensation, hence close continued observation is appropriate. Staff should not become complacent. Fluid balance should be monitored closely and there should be regular medical review. An extended postnatal stay may be indicated.
Women with cardiac disease should be supported with breastfeeding, given appropriate contraception advice and offered lifestyle advice (diet, smoking, exercise). Medication should be reviewed and appropriate cardiology follow-up arranged prior to discharge from maternity care. A comprehensive discharge summary should be prepared by the woman’s obstetrician.
OVERVIEW OF THE GUIDANCE

Wherever possible the guidance is in the format of algorithms and supported tables with minimum text. The component parts of the pathway for women with congenital or acquired cardiac disease in pregnancy are discussed in four management stages as follows and the overall pathway is outlined in Algorithm 1.

Table 1

<table>
<thead>
<tr>
<th>OVERVIEW OF THE GUIDANCE</th>
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<tbody>
<tr>
<td>Preconception Care</td>
</tr>
<tr>
<td>Initial assessment; risk stratification; proactive contraception advice and pre-pregnancy counselling (outlined in Algorithm 2, p.13).</td>
</tr>
<tr>
<td>Early Pregnancy and Antenatal Management</td>
</tr>
<tr>
<td>Post conception evaluation and risk stratification; development of pregnancy management plan (including screening for congenital malformations in the fetus where appropriate); and escalation during pregnancy (outlined in Algorithm 3, p.29).</td>
</tr>
<tr>
<td>Intrapartum and Early Postpartum Care (First 24 hours) and Neonatal Care</td>
</tr>
<tr>
<td>Indications for timing and mode of delivery; maternal and fetal monitoring; neonatal assessment and care; and facilities/service provision (outlined in Algorithm 4, p.35).</td>
</tr>
<tr>
<td>Subsequent Postpartum and Postnatal Care (After 24 hours)</td>
</tr>
<tr>
<td>Breastfeeding guidelines on cardiac drugs; information and follow-up after birth (outlined in Algorithm 5, p.41).</td>
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</tbody>
</table>

How the guidance was developed

In writing up this guidance we have drawn upon expertise from a Guideline Development Group (see Appendix A, p.44), ensuring that stakeholder comments have been adequately considered and responded to from the following perspectives: primary care, secondary care, tertiary care and specialist ACHD care, patients and patient groups. Dr Anne Webb, Consultant in Sexual and Reproduction Healthcare (Central Abacus, Liverpool) was consulted with on the development of appropriate sections.

Previous existing cardiology guidance developed by the Manchester Obstetric Group¹, the proceedings of the Royal College of Obstetricians and Gynaecologists (RCOG) 51st Study Group on Heart Disease and Pregnancy², and the consensus statement, published by RCOG press (2006)³ have been considered in the development of this document.
OVERVIEW

OBSTETRIC PATHWAY FOR WOMEN WITH CONGENITAL OR ACQUIRED CARDIAC DISEASE

Women with cardiac disease presenting for contraceptive or pre-pregnancy advice

Contraception and preconception care and risk stratification (Algorithm 2)

GP/sexual and reproductive healthcare

Early pregnancy and antenatal care management (Algorithm 3)

Women with cardiac disease, known to service, re-presenting in pregnancy

Intrapartum and early postnatal care management (First 24 Hours) (Algorithm 4)

Abortion service (and where necessary miscarriage) (Algorithm 3)

Postnatal care management (After 24 Hours) (Algorithm 5)
INTRODUCTION

Purpose

Women with cardiac disease in pregnancy are at high risk of complications and cardiac disease is the leading cause of maternal death⁴. Cardiac disease in pregnancy is associated with risks to the woman and to the developing fetus.

This clinical guideline and referral protocol has been developed to promote seamless, multidisciplinary care for women with congenital or acquired cardiac disease who live in the North West of England, North Wales or Isle of Man. The document is intended to:

- Promote the appropriate referral of women to tertiary services when required, whilst providing as much care as appropriate locally, to ensure optimal quality of care and outcomes.
- Provide advice, guidance and support for the management of cardiac disease and its complications in women of reproductive age who may need contraceptive advice, are planning to become pregnant or those who are already pregnant.
- Build on existing relevant guidelines for routine care during the antenatal, intrapartum and postpartum periods. It focuses on areas where additional or different care should be offered to women with cardiac disease who are at risk of, or develop complications in pregnancy and childbirth, and their newborn babies.

Development of multidisciplinary care networks, with relevant clinical guidelines and clear pathways of care and referral mechanisms, should facilitate more women delivering locally.

Terminology

The term ‘cardiac disease’ is used in these guidelines to refer to pre-existing cardiac disease – both congenital and acquired.

The term ‘women’ is used in these guidelines to refer to all females of childbearing age, including young women who have not yet transferred from paediatric to adult services.

Service Provision Arrangements

Within the North West of England and North Wales (including Isle of Man population) cardiology services for adults with congenital cardiac disease are set up as a hub and spoke model.

For those with acquired cardiac disease, cardiology service provision is provided from District General Hospitals and Tertiary Centres.

For obstetric services, joint obstetric and cardiology clinics are held at the following hospitals:

Central Manchester University Hospitals NHS Foundation Trust (CMFT)
Liverpool Women's NHS Foundation Trust (LWH)

It is desirable that joint obstetric and cardiology clinics are held at Blackpool Teaching Hospitals NHS Foundation Trust (BFWH) and Betsi Cadwaladr University Health Board – Wrexham Maelor Hospital (BCUHB – WM) for low to moderate risk pregnancies. Currently these clinics are not up and running and if need be these patients can be referred to CMFT or LWH.

See Appendix B (p. 45) for contact details and Appendix C (p.46) for referral details.
Woman and Baby-centred Care

This guidance offers best practice advice on the care of women with cardiac disease who need contraceptive advice, are planning to become pregnant, or who are already pregnant, and their newborn babies.

Treatment and care should take into account women’s needs and preferences. Women with cardiac disease should have the opportunity to make informed decisions about their care and treatment, in partnership with healthcare professionals.

General communication between healthcare professionals and women is essential. It should be supported by evidence-based written information tailored to the woman’s needs. Treatment and care, and the information women are given about it, should be culturally appropriate. It should also be accessible to women with additional needs such as physical, sensory or learning disabilities, and to women who do not speak or read English.

Care of young women in transition between paediatric and adult cardiology services should be planned and managed. Adult and paediatric cardiology healthcare teams should work jointly to provide care for young women with cardiac disease.
KEY PRIORITIES FOR IMPLEMENTATION

Contraception and Preconception

- A proactive approach to contraception advice and preconception counselling and education should be started in adolescence (at age 12-15 years, depending on individual maturity). Advice on safe and effective contraception options should include the importance of avoiding an unplanned pregnancy. This is facilitated by close working relationship between paediatric cardiologists, paediatric cardiac liaison nurses and patient groups.

- Women should be given information on all of the safe and effective contraception choices available for them and know where to go for expert advice when needed.

- Women with cardiac disease should be given information about pre-pregnancy counselling and support at each contact with healthcare professionals from adolescence.

- The intentions of women with cardiac disease regarding contraceptive use and pregnancy should be documented at each contact with their cardiac team from adolescence.

- Preconception care for women with cardiac disease should be given in a supportive environment.

- If the woman is not planning a pregnancy, or is advised that a pregnancy is unsafe, she should be given advice about the safe and effective contraceptive options available for them and how to access abortion services. If necessary she should be referred to sexual and reproductive healthcare.

- All women with cardiac disease who are planning to become pregnant should be offered preconception care and advice before discontinuing contraception.

- All women of reproductive age with cardiac disease should have access to specialised multidisciplinary preconception counselling in a joint obstetric and cardiac clinic, to empower them to make choices about pregnancy.

- Women with cardiac disease are often at increased risk when assisted conception is undertaken. The advice of the multidisciplinary team should be sought before any such treatment is commenced.

- Women with cardiac disease should ideally have a planned pregnancy managed by a multidisciplinary team which includes obstetricians, midwives, cardiologists, nurses, anaesthetists, and where appropriate, neonatologists.
Antenatal Care (ideally by 6-8 weeks but no later than 12+6 weeks)

- Women known to a joint obstetric and cardiac clinic may self refer once pregnancy is confirmed. Women presenting through other clinics (for example antenatal or cardiac) should be referred for consultant-led obstetric care in a maternity unit where there is a joint obstetric/cardiology clinic or a cardiologist with expertise in the care of women with heart disease in pregnancy. This should be done as early in pregnancy as possible (aim for within 4 weeks).

- All pregnant women with heart disease should be assessed clinically as soon as possible (aim for within 4 weeks) by the multidisciplinary team and appropriate investigations undertaken.

- All pregnant women with cardiac disease should undergo risk stratification by the multidisciplinary team to determine the frequency and content of antenatal care.

- Following multidisciplinary assessment and risk stratification, appropriate care can be arranged at a district general hospital or tertiary unit (hospital/s able to provide combined obstetric, cardiological and surgical expertise in the care of women with cardiac disease), according to the complexity of the cardiac disease, the risk assessment and the locally available facilities and expertise.

- In women with low risk obstetric cardiac lesions, unnecessary investigation and intervention should be avoided, and the woman should deliver in their local hospital.

- All pregnant women with cardiac disease requiring treatment or care by other specialists should have an integrated care plan developed and agreed between all specialities involved.

- An escalation and transfer protocol must be available in all units. Those involved in transfers have the responsibility for ensuring that everything necessary is done to achieve a safe transfer. The decision to transfer must involve a consultant.

- Termination of pregnancy services should be accessible for women with cardiac disease for medical conditions precluding safe pregnancy, or for other reasons. Women referred for a termination of pregnancy should be given an appointment as quickly as possible, within 2 weeks.
Intrapartum and Early Postnatal Care (First 24 hours) and Neonatal Care

- Management of intrapartum care should be delivered by a team experienced in the care of women with cardiac disease (obstetrician, anaesthetist and midwife), with a cardiologist readily available for advice, and as a minimum on a consultant obstetrician-led unit with anaesthetic services on site.

- A clear plan for management of labour and the puerperium in women with cardiac disease should be established in advance, be well documented and be distributed widely (including to the woman herself) so that all personnel likely to be involved in the woman’s intrapartum and postpartum care are fully informed. Appropriate consultants should be contacted if there is any doubt about the management plan (e.g. unbooked women, in utero transfers or women who are admitted prior to a care plan being finalised). Contact details can be found in Appendix A.

- Spoke centres caring for pregnant women with cardiac disease should have facilities for prolonged high-level maternal surveillance within the obstetric high dependency unit (HDU), as well as the ability to contact a cardiologist if necessary.

- Delivery should occur at the Hub for those women who may, or are likely to need, intensive therapy unit (ITU) and the extended team (cardiac anaesthetist, specialist cardiologist, haematologist, perfusionist and cardiac surgeon).

- There should be a policy to access adult critical care facilities (ITU) should they become necessary during intrapartum and/or postpartum care.

Postnatal Care (after 24 hours)

- Women with cardiac disease should be offered lifestyle advice (including weight control, diet and exercise) and appropriate contraception advice.

- Women with cardiac disease should be supported with breastfeeding and appropriate advice given taking her needs and medication into account.

- Women with cardiac disease should have their medication reviewed and any alterations required detailed in their obstetric cardiology care management plan.

- Women with cardiac disease should have appropriate cardiology follow-up arranged prior to discharge from maternity care.
ALGORITHM 2

SUMMARY

CONTRACEPTION AND PRECONCEPTION CARE PATHWAY FOR WOMEN WITH CONGENITAL OR ACQUIRED CARDIAC DISEASE

Women presents for contraception advice

GP, sexual and reproductive healthcare, transition services, cardiology

Planning first or subsequent pregnancy

Pre-pregnancy and pregnancy advice service

PRECONCEPTION CLINICAL ASSESSMENT

History and physical examination, Baseline investigations, Risk factors (Table 2), Functional status (Table 3), Pharmacological assessment (Table 4)

OBSTETRIC CARDIAC RISK STRATIFICATION (Table 5)

Low risk obstetric cardiac lesion

Moderate risk obstetric cardiac lesion

High risk obstetric cardiac lesion

PRECONCEPTION COUNSELLING AND SUPPORT

CONTRACEPTION OPTIONS (Table 6 and Table 7 and Graph 1)

CLINICAL AND LIFESTYLE MANAGEMENT PRIOR TO CONCEPTION

Give patient contact details for self referral at conception to joint obstetric/cardiologist clinic

Planning first or subsequent pregnancy

Pre-pregnancy and pregnancy advice service

GP, sexual and reproductive healthcare, transition services, cardiology

CONTRACEPTION OPTIONS (Table 6 and Table 7 and Graph 1)

CLINICAL AND LIFESTYLE MANAGEMENT PRIOR TO CONCEPTION

Give patient contact details for self referral at conception to joint obstetric/cardiologist clinic

Planning first or subsequent pregnancy

Pre-pregnancy and pregnancy advice service

GP, sexual and reproductive healthcare, transition services, cardiology
RECOMMENDED MANAGEMENT

Algorithm 2 demonstrates the recommended pathway for contraception advice and preconception care for women with cardiac disease.

1. CLINICAL ASSESSMENT

1.1 History and Physical Examination

The following should be elucidated at the preconception assessment clinic:
- Cardiac diagnosis;
- A past history of congenital or acquired heart disease;
- A family or personal history of congenital heart disease;
- A history of hypertension;
- A history of breathlessness, fatigue, oedema or presyncope/syncope;
- Previous cardiac surgical or catheter-based procedures;
- Complete family history to assess the need for genetics referral to offer informed genetic counselling.

It should be remembered that physiological changes to the haemodynamic status in pregnancy alter the presentation of a variety of cardiac conditions.

1.2 Baseline Investigations

- **Blood tests** – all patients should have haemoglobin and other tests if appropriate (e.g. urea and electrolytes and blood glucose).
- **Oxygen Saturations** – if appropriate.
- **Electrocardiogram (ECG)** – a 12 lead resting ECG should be done in all patients.
- **Echocardiography (Echo)** – if appropriate.
- **Exercise Tolerance Test (ETT)** – if appropriate.
- **Cardiac Position Emission Tomography (CPET)** – if appropriate.
- **Transosoesophageal Echo (TOE)** – if appropriate.
1.3 Risk Factors

Table 2 Predictors of Maternal Risk for Cardiac Complications

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-morbidities</td>
<td>Diabetes; Asthma; Obesity (BMI &gt; 35), Hypertension</td>
</tr>
<tr>
<td>Past obstetric history</td>
<td>Previous caesarean section; Previous baby with congenital heart disease; Previous adverse outcome</td>
</tr>
<tr>
<td>Past medical and surgical history</td>
<td>Previous VTE</td>
</tr>
<tr>
<td>Family history</td>
<td>Unprovoked venous thromboembolism in a first degree relative; congenital heart disease</td>
</tr>
<tr>
<td>Genetic issues</td>
<td>Di-George Syndrome; Marfan’s Syndrome</td>
</tr>
<tr>
<td>Allergies</td>
<td>Medications; Latex</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>Smoking; Recreational drugs; Alcohol</td>
</tr>
</tbody>
</table>

1.4 Functional Status

Table 3 NYHA Classification of Cardiovascular Disease

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Patients who are not limited by cardiac disease in their physical activity. Ordinary physical activity does not precipitate the occurrence of symptoms such as fatigue, palpitations, dyspnoea and angina.</td>
</tr>
<tr>
<td>II</td>
<td>Patients on whom the cardiac disease causes a slight limitation in physical activity. These patients are comfortable at rest but ordinary physical activity will precipitate symptoms.</td>
</tr>
<tr>
<td>III</td>
<td>Patients in whom the cardiac disease results in a marked limitation of physical activity. They are comfortable at rest but less that ordinary physical activity will precipitate symptoms.</td>
</tr>
<tr>
<td>IV</td>
<td>Patients in whom the cardiac disease results in the inability to carry on physical activity without discomfort. Symptoms may be present even at rest, and discomfort is increased by any physical activity.</td>
</tr>
</tbody>
</table>
1.5 Pharmacological Assessment

1.5.1 Commonly used cardiovascular drug classes may be potential teratogens or contraindicated in pregnancy. See Table 4 (p.17).

1.5.2 Women with cardiac disease should be informed about the safety of medications before conception, throughout their pregnancy and for breast feeding. See Table 4 (p.17).

1.5.3 Certain medications may need to be discontinued before conception or as soon as pregnancy is confirmed. Medications which may impact adversely on pregnancy should be reviewed and the benefits and risks considered. Alternatives suitable for use during pregnancy should be substituted.

1.5.4 Women taking warfarin should be advised to make direct contact with the joint obstetric/cardiac clinic as soon as pregnancy is confirmed to arrange an appointment to convert to low molecular weight heparin as the former crosses the placenta causing fetal loss or abnormalities.

1.5.5 Women with mechanical prosthetic or biomechanical heart valves, for whom the risk of thromboembolic events is increased, need careful consideration of their anticoagulation regime in pregnancy. Given that this situation is rare and that there is no clear evidence about the best anticoagulant regime, these women should be seen, or discussed with CMFT (Regional specialist unit/Hub centre). Early referral is imperative so that the advantages and disadvantages of the different regimes can be discussed with each woman and individualised management decisions made.

1.5.6 Other medications which may impact adversely on pregnancy (e.g. statins, ACE inhibitors) should be reviewed and the benefits, risks and possible alternatives considered.
### Table 4  Potential Teratogens or Contraindications in Pregnancy and Breastfeeding Guidelines

<table>
<thead>
<tr>
<th>DRUG GROUP</th>
<th>POTENTIAL TERATOGENS, CONTRAINDICATIONS AND CONSIDERATIONS</th>
<th>Alternatives</th>
<th>Breastfeeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta blockers</td>
<td>Growth restriction particularly if BP maintained &lt; 110/70</td>
<td>Monitor fetal growth</td>
<td>Most experience with labetalol but may not be ideal choice for the cardiac considerations</td>
</tr>
<tr>
<td>Digoxin</td>
<td>Prematurity Low birth weight</td>
<td>Not necessary</td>
<td>Monitor fetal growth</td>
</tr>
<tr>
<td>Diuretics</td>
<td>Decreased placental perfusion</td>
<td>Not necessary</td>
<td>Monitor fetal growth</td>
</tr>
<tr>
<td>Warfarin</td>
<td>Warfarin embryopathy, fetal CNS abnormalities</td>
<td>Preconception if possible or as soon as pregnant</td>
<td>Specialist advice if mechanical heart valves as benefit may outweigh risks Detailed ultrasound scan if not stopped before 6 completed weeks gestation and serial growth scans</td>
</tr>
<tr>
<td>Low Molecular Weight Heparin</td>
<td>Fetal – none Effect on maternal bone density, and very small risk of maternal thrombocytopenia</td>
<td>Not necessary</td>
<td>Check maternal platelets at booking. As the greatest risk of heparin induced thrombocytopenia is in the first month of use, check platelet count weekly for 4 weeks after commencing low molecular weight heparin. (Full blood count is routinely checked at 28 weeks and this should suffice)</td>
</tr>
<tr>
<td>Statins</td>
<td>Potential teratogenicity</td>
<td>Preconception if safe to do so, or as soon as pregnancy confirmed</td>
<td>If inadvertently exposed, risk not high enough to warrant offering termination of pregnancy, but fetal medicine referral and detailed scan advised</td>
</tr>
<tr>
<td>DRUG GROUP</td>
<td>POTENTIAL TERATOGENS, CONTRAINDICATIONS AND CONSIDERATIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACE Inhibitors and Angiotensin Receptor Antagonists</td>
<td>Congenital malformation, particularly heart defects Fetal renal dysfunction and oligohydramnios which may be irreversible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before conception if possible, but if not as soon as pregnancy confirmed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If unable to stop (due to risk of heart failure), monitor with serial ultrasound scan and detailed fetal medicine review and fetal echocardiography by 22 weeks if not already indicated</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other inotropes e.g. Beta blockers If being used for BP control, other antihypertensives (labetalol, methyldopa, nifedipine or amlodipine)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenosine</td>
<td>None known</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No data, probably safe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrates</td>
<td>Decreased placental perfusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor fetal growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No data, probably safe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Limited data, probably safe.
2. OBSTETRIC CARDIAC RISK STRATIFICATION

Cardiac lesions that are not problematic in non-pregnant women may be poorly tolerated in pregnancy and may lead to maternal or fetal complications. The nature and severity of the lesion is important. Specific congenital or acquired cardiac lesions can be classified as low, moderate or high risk during pregnancy (see Table 5 below).

Table 5 Specific Congenital and Acquired Cardiac Lesions and Risk Features Associated with Pregnancy

<table>
<thead>
<tr>
<th>Low risk obstetric cardiac lesions</th>
<th>Moderate risk obstetric cardiac lesions</th>
<th>High risk obstetric cardiac lesions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repaired cardiac lesions with no residual cardiac dysfunction (fetal echo may be indicated)</td>
<td>Haemodynamically significant mitral stenosis</td>
<td>Eisenmenger syndrome</td>
</tr>
<tr>
<td>Bioprosthetic valve replacement with normal function</td>
<td>Moderate aortic stenosis</td>
<td>Significant pulmonary hypertension</td>
</tr>
<tr>
<td>Isolated mitral valve prolapse with no significant regurgitation</td>
<td>Cyanotic congenital heart disease – unrepaired or palliated</td>
<td>Severe aortic stenosis/aortic coarctation</td>
</tr>
<tr>
<td>Non critical mitral stenosis with minimal limitation of maternal physical activity</td>
<td>Aortic coarctation</td>
<td>NYHA class 3 or 4 functional status/presence of severe systemic ventricular dysfunction</td>
</tr>
<tr>
<td>Bicuspid aortic valve without significant stenosis or regurgitation</td>
<td>Mechanical heart valves</td>
<td>Marfan syndrome with dilated aortic root (≥4cm)</td>
</tr>
<tr>
<td>Mild to moderate pulmonary stenosis</td>
<td>Ischaemic heart disease</td>
<td>Critical mitral stenosis &lt;1cm²</td>
</tr>
<tr>
<td>Small left to right shunts</td>
<td>Transplant recipients</td>
<td>Cardiomyopathy with poor left ventricular function (Ejection Fraction ≤40%)</td>
</tr>
<tr>
<td></td>
<td>Cardiomyopathy with acceptable left ventricular function (Ejection Fraction &gt;40%)</td>
<td></td>
</tr>
</tbody>
</table>

**Low risk lesions** – Women with low risk lesions usually tolerate pregnancy well.

**Moderate risk lesions** – Women with moderate risk lesions may need close hemodynamic monitoring during labour, delivery and for several hours in the postpartum period.

**High risk lesions** – The conditions listed are associated with increased maternal and fetal mortality. Pregnancy is often not advised but if pregnancy should occur the risks of maternal mortality and morbidity must be assessed on an individual case basis. If the risks are extremely high, consideration of medical termination of the pregnancy is advised to safeguard maternal health. If the pregnancy is continued, these patients are best managed with the assistance of a cardiologist and maternal-fetal medicine specialist in a centre with high-risk obstetric facilities and a level 3 neonatal unit.
3 PRE-PREGNANCY COUNSELLING AND SUPPORT

3.1 It is essential that any woman who has cardiac disease who is planning to become pregnant undergoes pre-pregnancy counselling not just to assess her risk but to review medication. Ideally, women with cardiac disease should be offered information about the impact of their heart condition on pregnancy and how pregnancy affects their heart condition, well in advance of becoming pregnant, to allow them to make informed choices. It is important to explain that risks can be reduced but not eliminated. This discussion will be individualised to the patient according to the heart lesion, severity, obstetric history and co-morbidities. The information should cover:

i. Appropriate contraception options;
ii. Potential risks of pregnancy to the woman and fetus, including morbidity and mortality;
iii. The risks associated with pregnancies complicated by cardiac disease increase with the complexity of the cardiac lesion (in women or men with congenital heart disease, the increased risk of congenital heart disease in the fetus);
iv. That additional time and effort may be required to manage cardiac disease during pregnancy and that there will be frequent contact with healthcare professionals;
v. The potential increased risk of induction of labour and caesarean section;
vii. The possibility of transient morbidity in the baby in the neonatal period, which may require admission to the neonatal unit;
vii. Medication review; and
viii. Referral to genetics if appropriate (i.e. in those with Marfan’s syndrome).

3.2 Women with cardiac disease should be given information about pre-pregnancy counselling and support at each contact with healthcare professionals from adolescence.

3.3 Any medical, interventional or surgical treatments that can improve pregnancy outcome for the woman or baby should be discussed.

3.4 Women should be made aware of sources of support. Women may wish to access support at any stage from the time when they are first considering pregnancy until after the baby is born. Women with heart disease may have difficult decisions to make and may not always have a successful outcome to the pregnancy. Women should be given local telephone contact numbers for the joint obstetric and cardiac clinic to facilitate early contact once pregnancy is confirmed, including emergency telephone numbers (see Appendix C). Women may find access to peer support helpful (i.e. British Heart Foundation (BHF) or the Grown Up Congenital Heart (GUCH) Patient’s Association) and should be given contact details (see Appendix D).

4. CONTRACEPTION OPTIONS FOR WOMEN WITH CARDIAC DISEASE

4.1 It is recommended that the following principles and considerations are taken into account in the advice given for contraceptive options. The following summary has been undertaken using the following resources and it is recommended that the user of this guideline refers to the resources below for more detail if required:

- UK Medical Eligibility Criteria (UKMEC)\(^6\)
- Clinical Effectiveness Unit (CEU) Guidance (on all contraception published up to November 2010)\(^7\)
- Dhanjal MK. Contraception in women with heart disease (Chapter 2)\(^2\)
Principles and considerations:

i. Women with cardiac disease should be made aware of the appropriate contraceptive options available and offered as wide a choice as possible (see Table 6, p22 and Table 7, p.25);

ii. Degree of efficacy of method (see Graph 1, p27);

iii. Degree of efficacy of method particularly in relation to cardiac disease when pregnancy not advisable;

iv. Thrombotic risks of oestrogen-containing contraceptives;

v. Hypertensive risks of oestrogen-containing contraceptives;

vi. Infective risks associated with STI risk at time of IUD (intrauterine device)/IUS (Intrauterine system) insertion;

vii. Vagal stimulation with insertion of IUD/IUS;

viii. Bleeding risks with patients on warfarin (copper IUDs, intramuscular injections, implant insertion/removal);

ix. Effects of anaesthesia;

x. Effects of drug interactions.

4.2 All women should be given information on all the safe and effective choices for them before they need them and know where to get expert advice when needed.

4.3 Specialist contraception advice may be required as there are specific considerations with regard to contraception in women with cardiac disease, taking into account any increased risks of thrombosis or infection associated with various contraception methods and their interaction with the various heart lesions. Table 6 (p.22), Table 7 (p.25) and Graph 1 (p.27) give some guidance/principles but difficult/complex cases should be managed by sexual and reproductive healthcare specialists with cardiologists.

4.4 Women with cardiac disease should be made aware of the option of aborting a pregnancy (for cardiac risk or other reasons) and how to access it promptly should an unexpected pregnancy occur, or if they have a miscarriage (see p.32 for more details).
### Table 6 Contraceptive Options for Women with Cardiac Disease

The UK Medical Eligibility Criteria (UKMEC) Categories have been adopted:

<table>
<thead>
<tr>
<th>UK Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A condition for which there is no restriction for use of the contraceptive method</td>
</tr>
<tr>
<td>2</td>
<td>A condition where advantages of using the method generally outweigh the theoretical or proven risks</td>
</tr>
<tr>
<td>3</td>
<td>A condition where the theoretical or proven risks generally outweigh the advantages of using the method. Provision of the method requires expert clinical judgement and/or referral to a specialist contraceptive provider.</td>
</tr>
<tr>
<td>4</td>
<td>A condition which represents an unacceptable risk if the contraceptive method is provided.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPECIFIC CONSIDERATIONS</th>
<th>CONTRACEPTIVE METHODS FOR THROMBOEMBOLISM AND ANTICOAGULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combined hormonal (pill, patch or ring with oestrogen and progestagen)</td>
</tr>
<tr>
<td>Potential risk of thrombosis: e.g. thrombogenic mutation carrier. VTE Pers. History. Planned major surgery (&gt;30mts). This list is not exhaustive. Any risk of thrombosis must be considered</td>
<td>UKMEC 4</td>
</tr>
<tr>
<td>Potential risk of thrombosis: FH of First degree relative at &lt;45yrs Prolonged immobility due to illness</td>
<td>UKMEC 3</td>
</tr>
<tr>
<td>Anticoagulation therapy</td>
<td>UKMEC 4</td>
</tr>
<tr>
<td>SPECIFIC CONSIDERATIONS</td>
<td>CONTRACEPTIVE METHODS FOR CONGENITAL, VALVULAR &amp; ISCHAEMIC HEART DISEASE</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Combined hormonal (pill, patch or ring with oestrogen and progestagen)</td>
</tr>
<tr>
<td>Congenital heart disease &amp; Valvular heart disease – Uncomplicated</td>
<td>UKMEC 2</td>
</tr>
<tr>
<td>Congenital heart disease and Valvular heart disease – Complicated (i.e. unstable hemodynamics, ventricular dysfunction)</td>
<td>UKMEC 4</td>
</tr>
<tr>
<td>Current ischaemic heart disease / History of ischaemic heart disease</td>
<td>UKMEC 4</td>
</tr>
</tbody>
</table>

* Initiation of POP/Implant and Intra Uterine System in a patient with Ischaemic Heart Disease = UKMEC 2

Continuation of POP/Implant and Intra Uterine System in a patient who has recently developed Ischaemic Heart Disease = UKMEC 3*
Other Contraceptive Methods for Consideration for Women with Cardiac Disease

1. **Condoms and other barrier contraceptives**: These can be used irrespective of the severity of any cardiac illness, the only absolute contraindication being allergy to latex. Latex-free condoms are available. Condoms are the only proven method to offer additional protection against STI.

2. **Sterilisation**: There is no medical condition that would absolutely restrict a person’s eligibility for female sterilisation. Depending on the severity of the disease and the presence or absence of complications, female sterilisation is indicated as a Category C (Caution), D (Delay) or S (Special) procedure. Anaesthetic risks need to be considered.

3. **Fertility Awareness Based (FAB) methods** (i.e. calendar method and symptothermal methods): These are not contraindicated in cardiac patients. Unreliable ovarian function at the extremes of reproductive age and in the postpartum period must be considered. Referral to a trained FAB nurse specialist is recommended.
Table 7 Common Drugs Groups used in Cardiac Disease and Contraceptive Considerations Based on FSRH Guidance and BNF

<table>
<thead>
<tr>
<th>DRUG GROUP</th>
<th>CONTRACEPTIVE CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect of drug on contraceptives</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Digoxin</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Diuretics</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Warfarin</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Low molecular weight heparin</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Statins</td>
<td>Plasma concentration of norethisterone and ethinylestradiol increased by atorvastatin; plasma concentration of norgestrel and ethinylestradiol increased by rosvastatin</td>
</tr>
<tr>
<td>ACE inhibitors and Angiotensin receptor antagonists</td>
<td>Risk of hyperkalaemia when drospirenone given with ACE inhibitors</td>
</tr>
<tr>
<td>Adenosine</td>
<td>No known interactions</td>
</tr>
<tr>
<td>Nitrates</td>
<td>Nothing found</td>
</tr>
<tr>
<td>DRUG GROUP</td>
<td>CONTRACEPTIVE CONSIDERATIONS</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Bosentan</td>
<td></td>
</tr>
<tr>
<td>Tacrolimus</td>
<td></td>
</tr>
<tr>
<td>Sildenafil</td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
</tr>
<tr>
<td>Sitaxentan sodium</td>
<td></td>
</tr>
</tbody>
</table>
Graph 1 Efficacy of Contraceptive Methods

*Typical use refers to fact that most women occasionally use method incorrectly
COC = combined oral contraceptive
POP = progesterone-only pill
5. CLINICAL AND LIFESTYLE MANAGEMENT

5.1 Clinical Management

5.1.1 Communication and referral where appropriate with other clinicians to optimise management of co-morbidities (e.g. diabetologist, asthma team, renal team, cardiology or surgery).

5.1.2 There may be a genetic element in some forms of heart disease in that the chance of the fetus having congenital heart disease is increased.

5.1.3 Ideally, assessment should take place prior to pregnancy to see whether any surgical correction is required.

5.1.4 Women with signs of cardiac decompensation before pregnancy should be referred to a cardiologist and surgeon and may be advised to undergo operative repair before conception.

5.1.5 Any cardiac surgical interventions in women of childbearing age should take into account the effect they may have on pregnancy. For example, because of the risks associated with prosthetic mechanical valves in pregnancy, consideration should be given to using tissue valves for valve replacement.

5.2 Lifestyle Management

5.2.1 Women with cardiac disease should be offered lifestyle advice and management prior to conception, including:

   i. Smoking cessation
   ii. Dietetics
   iii. Weight management
   iv. Exercise

6 PRECONCEPTION PROFORMA

6.1 A preconception proforma may be used at the first consultation and a copy given to the woman for her own records. An example proforma is available in Appendix E (p.49).
ALGORITHM 3

SUMMARY

ANTENATAL CARE PATHWAY FOR WOMEN WITH CONGENITAL OR ACQUIRED CARDIAC DISEASE (IDEALLY BY 6-8 WEEKS BUT NO LATER THAN 12+6 WEEKS)

EARLY PREGNANCY CLINICAL ASSESSMENT
History and physical examination; Baseline investigations; Risk factors (Table 2); Functional Status (Table 3); Pharmacological assessment (Table 4)

OBSTETRIC CARDIAC RISK STRATIFICATION (Table 5)

- Low risk obstetric cardiac lesion
  - Local DGH cardiology and obstetric assessment
- Moderate risk obstetric cardiac lesion
  - MDT ASSESSMENT:
    - Specialist Obstetrician, Fetal and Maternal Specialist, Specialist Cardiologist, Specialist Midwife, Specialist Nurse, Neonatologist, Obstetric Anaesthetist, Cardiac Anaesthetist
- High risk obstetric cardiac lesion
  - Referral to Abortion Service (and where necessary miscarriage)

DEVELOP PREGNANCY MANAGEMENT PLAN FOR CARDIAC DISEASE (Use standard proforma)
1. Antenatal Care
2. Intrapartum and Early Postnatal Care (First 24 Hours) (See Algorithm 4)
3. Postnatal Care (See Algorithm 5)

IDENTIFY ADDITIONAL CARE NEEDS
- Fetal screening for congenital heart disease by 22-weeks gestation
- Maternal echo monitoring
- Counselling/Psychology
- Dietetics
- Genetics
- Lifestyle pathways
- Consider “hotel facilities” for women with high risk obstetric cardiac lesions
- Consider travel expenses

For all women, ongoing support from named specialist midwife during pregnancy

RE-ASSESS RISKS/NEEDS AT EACH ANTENATAL
- Local hospital staff activate policy
- Escalation required YES
- Escalation required NO
- Proceed with obstetric management plan for delivery. See Algorithm 4
RECOMMENDED MANAGEMENT

Algorithm 3 demonstrates the recommended pathway for antenatal care management in women with cardiac disease and is the stage where the appropriate place(s) of care is decided (i.e. general adult cardiology unit (DGH), regional adult cardiology tertiary unit (spoke) or regional specialist tertiary unit (hub)).

7. EARLY PREGNANCY CLINICAL ASSESSMENT

7.1 The woman will need a full review and assessment of her clinical status, as this may be her first contact with the service or sometime since her preconception assessment. See sections 1.1 to 1.5 (pp. 14 to 16). Women known to a joint obstetric and cardiology clinic may self refer once pregnancy is confirmed. Women presenting through other clinics (for example antenatal or cardiac) should be referred for consultant-led obstetric care in a maternity unit where there is a joint obstetric/cardiology clinic or a cardiologist with expertise in the care of women with heart disease in pregnancy. This should be done as early in pregnancy as possible (aim for within 4 weeks).

8. OBSTETRIC CARDIAC RISK STRATIFICATION

8.1 All women with cardiac disease should be risk stratified as low, moderate or high risk (see Table 5, p19):

- **Women with low risk obstetric cardiac lesion** should be referred to their own local cardiologist and if necessary a referral made to a tertiary centre for further assessment. Even if the woman is at low risk of maternal complications, consideration should be given to the fetal risks in view of the recurrence risk for congenital heart disease. Fetal echo, genetics referral or increased fetal monitoring may be needed.

- **Women with moderate risk obstetric cardiac lesion** need to be assessed at least once in a tertiary centre by a cardiologist and an obstetrician and if suitable delivery can be done locally.

- **Women with high risk obstetric cardiac lesion** should be followed up and deliver in the tertiary centre where appropriate obstetric and support is available for those with congenital heart disease. These women should deliver at CMFT (Regional Specialist Unit/Hub Centre), where CCU and cardiac surgical facilities are co-located on the same site as the maternity unit. Where appropriate, antenatal care may be shared with LWH, BFWH or BCUHM – WM.

9. MDT ASSESSMENT

9.1 All pregnant women with cardiac disease should be seen in a joint obstetric and cardiology clinic by 6-8 weeks, particularly if drug modification is required. In keeping with national guidance, all women should be seen antenatally by 10 weeks.

9.2 The core members of the multidisciplinary team should be obstetricians, fetal medicine specialists, cardiologists, specialist midwives, specialist nurses and obstetric anaesthetists. Where appropriate, neonatologists (some women will deliver growth-restricted or pre-term
babies), cardiac anaesthetists, and intensivists (some women will need intensive care) should also be involved in care where appropriate.  

9.3 Women with significant cardiac disease (some low risk, and all moderate and high risk) should be referred to the obstetric anaesthetist. High risk women should also be referred to a cardiac anaesthetist. This assessment may take place as part of the MDT assessment.

9.4 For some women (e.g. women with Marfan’s syndrome), genetics referral may be appropriate as the baby will need long term follow-up.

9.5 Antenatal appointments for women with cardiac disease should provide care specifically for women with cardiac disease, in addition to the care provided routinely for healthy pregnant women. Table 8 below describes where care for women with cardiac disease differs from routine antenatal care. At each appointment women should be offered on-going opportunities for information and education.

### Table 8 Specific Antenatal Care for Women with Cardiac Disease

<table>
<thead>
<tr>
<th>Appointment</th>
<th>Care for women with cardiac disease during pregnancy</th>
</tr>
</thead>
</table>
| First appointment (joint obstetric cardiology clinic) | Take a full clinical assessment to establish the extent of cardiac-related complications  
Identify baseline investigations required  
Review risk factors and functional status  
Review medications for cardiac disease and its complications  
Identify obstetric cardiac risk  
Offer information, advice and support |
| By 10-weeks | Confirm viability of pregnancy  
Discuss information, education and advice about how cardiac disease will affect the pregnancy, birth and early parenting (such as breastfeeding and initial care of the baby) |
| By 22-weeks | Offer fetal echo to women with congenital heart disease or if their partners have congenital heart disease |
| Number and timing of further appointments will be dependent on the nature and severity of cardiac disease. Some appointments may be with the local obstetric team or community midwife | Start regular tests of fetal-wellbeing for women with cardiac disease who are awaiting spontaneous labour, or offer caesarean section if indicated  
Offer information and advice about:  
• timing, mode and management of birth  
• analgesia and anaesthesia  
• fluid balance  
• medication  
• need for invasive maternal monitoring and postnatal management  
• management of the baby after birth  
• initiation of breastfeeding and the effect of medication on breastfeeding  
• contraception and follow-up |
10. **ABORTION SERVICES (AND WHERE NECESSARY MISCARRIAGE)**

10.1 It is vital to avoid any delays for women with cardiac disease in accessing services. Local referral pathways should be known in advance for all women with cardiac disease as there is no provision for late abortion in the North West of England within NHS services for women who do not have a fetal abnormality.

10.2 For women who opt for an abortion (whether recommended because of cardiac risk or for social reasons), or have miscarried, consideration should be given to the best place for this to occur, given the procedure related and anaesthetic risks associated with her cardiac disease. Clinical care should include a multidisciplinary approach, including the appropriate cardiologist, gynaecologist and anaesthetist (general and/or cardiac as appropriate).

10.3 The method of abortion could be medical or surgical, both have advantages and disadvantages, and the care team should decide on the most appropriate method based on the woman’s clinical risks and preferences.

10.4 The assurance that clinicians will be non-judgemental and supportive of a decision to abort a pregnancy is important.

11. **PREGNANCY CARE MANAGEMENT PLAN**

11.1 Individual care plans for the pregnancy and delivery need to be formulated and documented on the standard proforma (see Appendix F, p.51). The care plan should include clear documentation of:

i. Cardiac diagnosis  
ii. Current functional status  
iii. Current medication  
iv. Long term thromboprophylaxis details  
v. Co-morbidities  
vi. Need for fetal investigations and monitoring  
vii. A plan for management during labour, delivery and postpartum  
viii. Details of anaesthetic review  
ix. Contingency plans for complications such as preterm labour, postpartum haemorrhage  
x. Drugs which are contraindicated and suggested alternatives (taking breastfeeding into account)  
xii. Contact numbers for advice and referral  
xii. Planned postnatal follow-up  
ixiii. Key personnel and services involved in all phases of the pregnancy (including additional care i.e. counselling, psychology, dietetics, genetics)

11.2 The timing and delivery should be dictated by obstetric considerations. For planning of labour and delivery the following need to be considered:

i. mode of delivery  
ii. appropriate form of analgesia/anaesthesia  
iii. fluid balance  
iv. use of oxytocic drugs, anticoagulation, prophylactic antibiotics  
v. length of labour including second stage (whether active second stage is allowed); and  
vi. need for invasive maternal monitoring and postpartum management.
11.3 The obstetric cardiology care plan should be disseminated widely to all members of the multidisciplinary team, relevant ward areas, and a copy should be carried by the woman herself in her ‘hand held notes’.

11.4 Care plans or management should not be changed without consulting the appropriate consultant(s). If any additions are made, the aforementioned areas and healthcare professional should be informed. All changes must be made on the original document.

11.5 Correspondence (for example, referral letters) frequently contains summaries of the echo findings so these should be checked.

11.6 Cardiac surgery during pregnancy should only be considered for women who are refractory to medical treatment or when there is no catheter-based interventional alternative. Interventions during pregnancy should only be performed in centres with experienced teams and expertise in pregnancy and cardiac disease.

12. **FETAL SCREENING FOR CONGENITAL MALFORMATIONS (BY 22 WEEKS GESTATION)**

12.1 Women or men with structural congenital heart disease have an increased risk of having a baby with congenital heart disease. Pregnant women with congenital heart disease, or whose partners have congenital heart disease, should be offered a fetal echocardiogram antenatally. Women or men with functional congenital heart disease (i.e. patent ductus arteriosis (PDA), patent foramen ovale (PFO), atrial septal defect (ASD)) do not need fetal echocardiogram for their pregnancies as these conditions cannot be diagnosed antenatally.

12.2 Fetal echo should be performed by experienced fetal echocardiographers where prognosis and management can be discussed in detail with the woman and her family if an abnormality is detected.

12.3 The echo should be performed by 22-weeks gestation. A decision may be made to perform it earlier at times (include the estimated delivery date (EDD) in the referral letter). Referral patterns for fetal echo should follow the existing referral pathways to the Fetal Medicine Units at either CMFT or LWH. For contact details for fetal echo referral see Appendix B.

12.5 If the fetus is found to have congenital heart disease the tertiary centre should coordinate the management according to FASP Guidelines, regional guidelines or under the auspices of agreement with the local neonatal networks.

13. **MONITORING FETAL GROWTH AND WELLBEING**

13.1 Beta blockers are often a useful drug in pregnancy but may be associated with a small increased risk of intrauterine growth restriction. Fetal growth should be monitored regularly, using ultrasound measurement of fetal abdominal circumference if there is any clinical suspicion of poor growth.

13.2 Women who are cyanosed are also at risk of intrauterine growth retardation and fetal growth and wellbeing should be monitored regularly.
14. **IDENTIFY ADDITIONAL CARE NEEDS**

14.1 Women with cardiac disease should be offered lifestyle advice and management as appropriate, including counselling/psychology support, dietetics, genetics, lifestyle pathways.

14.2 Tertiary units should offer a hotel facility to enable women who live some distance from the hospital to stay on site, to avoid (a) a delay in receiving appropriate care when they go into labour and (b) the need to induce labour solely to avoid this risk.

15. **ESCALATION AND TRANSFER POLICY**

15.1 All women should have on-going support of a named specialist midwife throughout their pregnancy. The risks and needs should be assessed at each antenatal appointment.

15.2 In the event of a woman’s cardiac status deteriorating during pregnancy a review of place of care antenatally and intrapartum should be carried out and referral escalated upwards considered, for example, from DGH to Spoke or Hub, or from Spoke to Hub.

15.3 **The decision to transfer:** A consultant to consultant discussion should take place to decide appropriate timing of transfer (e.g. routine, urgent, emergency) and transport needs (e.g. own car; ambulance with or without accompanying trained/experienced staff from the transferring hospital, or paramedic ambulance) appropriate to clinical need.

15.4 **Pre-transfer:**

   i. The referring hospital should ensure the receiving consultant’s team are informed as per local transfer/escalation policy.

   ii. The receiving hospital should ensure all the relevant teams are informed of impending patient arrival.

   iii. If the escalation policy is enacted within normal working hours, the referring consultant should try to speak with a member of the specialist team from the receiving hospital, but failing that the consultant on call.

   iv. If the escalation policy is enacted outside of normal working hours, the referring consultant should speak with the on call consultant of the receiving hospital.

15.5 **Documentation and handover:**

   i. All relevant documentation/information should be communicated from the referring hospital to the receiving hospital and sent in full with the woman (including the woman’s records/clinical notes and relevant other documentation which will assist the receiving hospital/facility in planning and delivering safe effective care), ensuring the receiving unit has full details of the woman’s cardiac condition and requirements.

   ii. Agreement of the woman to transfer should be documented. In emergency situations when a woman is unable to agree to transfer, where possible, the next of kin should be informed of the decision to transfer. The responsibility for transfer rests with the consultant in charge of the woman’s care and the consent of the relatives is not always required.
SUMMARY

INTRAPARTUM AND EARLY POSTNATAL (FIRST 24 HOURS) AND NEONATAL CARE PATHWAY FOR WOMEN WITH CONGENITAL OR ACQUIRED CARDIAC DISEASE

- Low risk obstetric cardiac lesion
- Moderate risk obstetric cardiac lesion
- High risk obstetric cardiac lesion

**DGH**
- Obstetric Unit
- Obstetric Anaesthetist
- Neonatal Team/Paediatrician

**LWH / BFWH / BCUHB**
- Obstetric Unit
- Obstetric High Dependency Unit
- Obstetric Anaesthetist
- Neonatal Team/Paediatrician

**CMFT**
- Obstetric Unit
- Obstetric High Dependency Unit
- Intensive Care Unit
- Cardiac Surgeon
- Cardiac Anaesthetist
- Obstetric Anaesthetist
- Specialist Obstetrician
- Specialist Midwife
- Specialist Cardiologist
- Haematologist
- Perfusionist
- Neonatal Team/Paediatrician (co-located)

**INTRAPARTUM MANAGEMENT**
See guidelines for advice on: Anticoagulation; Analgesia; Fluid balance; Blood pressure control; Premature labour; Prophylactic antibiotics; and Maternal and fetal monitoring in labour.

**Normal delivery unless obstetric or cardiac indicators for caesarean section present (Table 9)**

**EARLY POSTNATAL CARE (First 24 Hours)**
- All women with cardiac disease
- Moderate and high risk obstetric cardiac lesions may require HDU/ITU monitoring and cardiologist input

**NEONATAL CARE**
- Assessment for admission to intensive or special care
- Echocardiogram if fetal echo showed signs of congenital heart disease
- Specialist neonatal care for those babies with congenital heart disease or cardiac decompensation

**Escalation required**
- YES: Local hospital staff activate policy
- NO: Proceed with obstetric management plan for delivery
**RECOMMENDED MANAGEMENT**

Algorithm 4 demonstrates the recommended pathway for intrapartum (see points 16 to 26), early postnatal care (first 24 hours) (see points 27 to 29) and neonatal care (see point 30).

**INTRAPARTUM MANAGEMENT FOR WOMEN WITH CARDIAC DISEASE**

16. There is a broad spectrum of types and severity of cardiac disease in pregnancy, and one protocol is not appropriate for all women. The following principles apply to the management of most women with cardiac disease:

- **Senior input and multidisciplinary care** are imperative. Senior staff including the consultant obstetrician, consultant anaesthetist, and possibly consultant cardiologist, should be informed of the woman’s admission.

- **Minimising any additional load on the cardiovascular system** from delivery and the puerperium. This is usually best achieved by aiming for the spontaneous onset of labour, providing effective pain relief with low-dose regional analgesia, and if necessary assisting vaginal delivery with instruments such as ventouse or forceps, limiting or even avoiding active maternal bearing down (‘pushing’). If labour is induced normal induction regimes can be used but consideration may need to be given to volume restricting syntocinon infusions if they are used.

- **Vaginal delivery** is the preferred mode of delivery over caesarean section, under regional anaesthesia, for most women with cardiac disease unless obstetric or specific cardiac considerations determine otherwise. See Table 7 for indications for caesarean section.

- **Supine hypotension** must be avoided. If a woman is lying down she should be encouraged to lie on her side or be effectively wedged. A wedge or full left lateral position should be used in all cases of maternal collapse or resuscitation.

17. **ANTICOAGULATION**

17.1 Most women with cardiac disease who require anticoagulation are now managed on subcutaneous low molecular weight heparin throughout pregnancy, with close monitoring of heparin levels. The case notes within the woman’s obstetric cardiology care management plan should be consulted for anticoagulation management. If stated, or no care plan has been completed, the consultant haematologist should be contacted when the woman is admitted. It needs to be remembered that protamine only partially reverses effects of low molecular weight heparin.

17.2 If the woman requires delivery while on warfarin contact the consultant haematologist immediately for advice regarding reversal with maternal vitamin K and possibly factor cover, and the interim use of heparin.
17.3 Clopidogrel is a platelet antagonist with a very long half-life and no antagonist. Women with cardiac disease on this drug are at risk of bleeding and haematoma formation if they deliver whilst taking it. There should be meticulous attention to haemostasis whether this is at LSCS or after a normal delivery. Perineal trauma must be repaired by a senior operator in theatre.

18. **ANALGESIA**

18.1 Women with cardiac disease should see the obstetric anaesthetist antenatally to discuss analgesia. When a woman with cardiac disease is admitted to the delivery suite the anaesthetic staff should be involved early. The anaesthetist will decide what types of analgesia are appropriate for the woman. In some cases epidural analgesia, or combined spinal epidural anaesthesia, with invasive maternal monitoring is the method of choice. **Remember that intramuscular injections should be avoided in those women who are anticoagulated.**

19. **FLUID BALANCE**

19.1 In women with cardiac disease fluid balance needs to be assessed accurately. Large fluid shifts occur around the time of delivery.

19.2 Hypotension due to hypovolaemia is dangerous for women with some types of cardiac disease, for example aortic stenosis. For many women with cardiac disease fluid overload could precipitate heart failure. There should be a careful assessment of fluid balance using an hourly input/output chart and an hourly urometer in high risk cases. At times central venous pressure lines and an arterial line may be indicated. Blood loss should be assessed as accurately as possible, weighing swabs, pads, etc... There should be meticulous attention to haemostasis.

19.3 Pulse and blood pressure should be charted on a HDU chart.

19.4 An hourly urometer should be used to facilitate monitoring of fluid balance.

19.5 Meticulous care must be taken to avoid air embolism through intravenous lines particularly if there is a right to left circulatory connection (e.g. ASD, or ventricular septal defect (VSD)).

20. **BLOOD PRESSURE CONTROL**

20.1 For some cardiac conditions hypotension is poorly tolerated. Prompt and accurate replacement of lost volume is necessary. At times central venous pressure lines and an arterial line may be indicated. Vasoactive medications e.g. nifedipine should be used with extreme care and only after discussion with a consultant.

20.2 For other cardiac conditions, hypertensive surges may be poorly tolerated. Syntocinon is preferred to syntometrine. For women with severe heart disease this may need to be given as an infusion (Syntocinon 5u in 20 mls over 20 mins).

21. **PREMATURE LABOUR**

21.1 Tocolytics should not be commenced without prior discussion with the consultant obstetrician, as they may severely compromise cardiac function, especially nifedipine and ritodrine. Atosiban has the least cardiovascular side effects of all the tocolytics and is the tocolytic of choice for women with severe cardiac disease. If it is not available in a hospital
then the consultant obstetrician on call should be contacted and their advice taken on the choice of tocolytic. Steroids for fetal lung maturity are not contraindicated.

22. PROPHYLACTIC ANTIBIOTICS

22.1 Current NICE guidelines state that antibiotic prophylaxis against infective endocarditis should not be offered for gynaecological and obstetric procedures or childbirth\(^1\). This is based on one small study of bacteraemia rates at elective LSCS. The NICE guidelines also state that the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient. Some women, following discussion of the risks and benefits, may therefore choose to have antibiotic prophylaxis because of the serious nature of endocarditis and the low risk of anaphylaxis. These issues should be discussed with the woman by the cardiologist prior to delivery.

22.2 If a woman chooses to have antibiotic prophylaxis, it should be given prior to elective section or from the time of membrane rupture for those in labour. The suggested regime is:

- Amoxycillin 1g IV then 500mg 6 hourly plus gentamicin 120mg IV repeated after 12 hours.
- For those that are allergic to penicillin, vancomycin 1g IV over 100 minutes should be given instead of amoxycillin, and repeated after 12 hours if the woman remains undelivered.

23. MATERNAL AND FETAL MONITORING IN LABOUR

23.1 Maternal monitoring will be dictated by the nature of the cardiac disease, decided by the anaesthetic staff and will usually involve ECG and invasive arterial blood pressure monitoring. The woman should be cared for in a high dependency area on the delivery suite and a high dependency chart should be used. Strict attention must be paid to monitoring fluid balance.

23.2 Women with cardiac disease have an increased risk of intrauterine growth restriction (IUGR) and this should have been monitored for antenatally. Women with cardiac disease also may not tolerate shifts in blood pressure and may become hypoxic. For these reasons, continuous electronic fetal monitoring is recommended.

24. LIMITATION OF ACTIVE SECOND STAGE

24.1 If the Valsalva manoeuvre is to be avoided there should be no active second stage. Delivery should not take place until the vertex is visible and preferably on the perineum, and then an elective forceps delivery (not ventouse as maternal effort is still required) should be performed.

24.2 If the active second stage is to be limited, allowing maximum descent of the vertex is sensible. This should be followed by elective instrumental delivery, if delivery is not achieved within 30 minutes of active pushing.

25. THIRD STAGE

25.1 Ergometrine and syntometrine are often contraindicated. Syntocinon should be given by slow intravenous infusion – 5 units in 20 mls over 20 minutes.
26. **CAESAREAN SECTION**

26.1 Indications for caesarean section are outlined in **Table 9** below. Many women with cardiac conditions pose complex anaesthetic challenges and cannot safely undergo rapid anaesthesia. There should be close communication with the anaesthetic registrar, consultant obstetrician and consultant cardiologist over any concerns about the fetal condition and woman’s progress through labour to allow for timely preparation and involvement of critical care and cardiac anaesthetic support if appropriate. If the woman has been seen antenatally by the anaesthetist there will be a plan documented in the notes but the initiation/conduct of any anaesthesia may be prolonged.

**Table 9 Indications for Caesarean Section**

<table>
<thead>
<tr>
<th>Cardiac Indicators*</th>
<th>Obstetric Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor ventricular function</td>
<td>Any obstetric indicators as per local hospital guidelines</td>
</tr>
<tr>
<td>Cyanotic heart disease or pulmonary hypertension</td>
<td></td>
</tr>
<tr>
<td>Myocardial ischaemia</td>
<td></td>
</tr>
<tr>
<td>Severe aortic or mitral valve stenosis</td>
<td></td>
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<tr>
<td>Dilated aortic root</td>
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</tbody>
</table>

* any cardiac condition where there is limited ability to increase cardiac output safely

27. **UTERINE HYPOTONIA**

27.1 In some women with cardiac disease bolus doses of syntocinon or syntometrine are contraindicated. An infusion of syntocinon 5 units in 20 mls over 20 mins should be used. In cases where uterine hypotonia is problematic mechanical methods such as bimanual compression and a B Lynch suture can be used. Misoprostol (1000 micrograms pr) has less vasoactive effects than carboprost (Hemabate) and should be used in preference to hemabate in women with cardiac disease who have uterine hypotonia.

28. **POSTNATAL MONITORING**

28.1 This is often a time of decompensation, hence observation on the delivery suite is appropriate. Fluid balance should be monitored closely. Heart failure is a particular concern, and staff should not become complacent just because delivery has been successfully achieved.

28.2 A HDU chart should be used where appropriate. Women with moderate to high risk obstetric cardiac lesions may require monitoring for more than 24 hours on HDU/ITU. An extended postnatal stay may be indicated. The woman’s cardiovascular system should be assessed daily until she leaves hospital (see Algorithm 5).
28.3 An extended postnatal stay may be indicated. The woman’s cardiovascular system should be assessed until the day she leaves hospital (see section on postnatal care (after 24 hours), pp 44 to 46).

29. **THROMBOPROPHYLAXIS**

29.1 Women with cardiac disease who have had a caesarean section should receive low molecular weight heparin thromboprophylaxis, and intermittent pneumatic compression (Flotrons) should be continued. Often an epidural infusion is used for post-op analgesia and low molecular weight heparin should not be commenced until after 6-hours of removal of the epidural catheter.

29.2 Women with cardiac disease should be advised to wear TED stockings for 28 days after having a caesarean section.

29.3 Thromboprophylaxis in other circumstances is not contraindicated in women with cardiac disease and can be given as per local hospital guidelines.

### NEONATAL CARE FOR WOMEN WITH CARDIAC DISEASE

30.1 Babies of women with cardiac disease should have an echocardiogram performed if they show clinical signs associated with congenital heart disease, including heart murmur.

30.2 Babies of women with patent ductus arteriosus (PDA), patent foramen ovale (PFO) or atrial septal defect (ASD) should have an echocardiogram performed.

30.3 Babies who are known to have congenital heart disease, or there are any concerns about fetal wellbeing/growth, the neonatologist should be present at delivery.

30.4 Babies with duct dependant heart lesions will need to be delivered in a maternity unit with a level 3 neonatal unit.
SUMMARY

POSTNATAL CARE (AFTER 24 HOURS) PATHWAY FOR WOMEN WITH CONGENITAL OR ACQUIRED CARDIAC DISEASE

Low risk obstetric cardiac lesion

Moderate risk obstetric cardiac lesion

High risk obstetric cardiac lesion

HAEMODYNAMIC MONITORING
Follow pregnancy management plan
Typically required for 24-72 hours. Should be extended to 10-14 days in women with pulmonary hypertension

PHARMACOLOGICAL ASSESSMENT

INFANT FEEDING TEAM
Guidelines for breastfeeding on cardiac drugs (Table 4)

HOSPITAL DISCHARGE SUMMARY
- Risk factors for subsequent pregnancies discussed. Contact details given for contraception advice service
- Cardiac follow-up after birth
- Summary letter from obstetrician to GP, Cardiologist and Patient, and other relevant clinicians
- Update patients cardiac hand held records

Links made with maternity care in the community
- Community Midwives
- GP
- Health Visitor
- Children’s Centre
- Respiratory team
- Diabetes team

Refer back to routine cardiology follow-up

Specialist cardiology follow-up
RECOMMENDED MANAGEMENT

Algorithm 5 demonstrates the recommended pathway for postnatal care (after 24 hours) for women with cardiac disease.

31. **HAEMODYNAMIC MONITORING**

31.1 Women with cardiac disease typically require haemodynamic monitoring for between 24 and 72 hours. Women with pulmonary hypertension will need extended haemodynamic monitoring.

31.2 Major haemodynamic alterations occur during pregnancy, labour and delivery and the postpartum period.

32. **PHARMACOLOGICAL ASSESSMENT**

32.1 All cardiac medication should be reviewed as doses may need changing. Any medication which was discontinued before/during pregnancy may need restarting, taking into account if the woman is breastfeeding (see section 1.5, p16).

33. **GUIDELINES FOR BREASTFEEDING ON CARDIAC DRUGS**

33.1 See Table 4 ‘Potential Teratogens or contraindications in Pregnancy and Breastfeeding Considerations’ (p.17).

34. **CONTRACEPTION**

34.1 Women with cardiac disease should be reminded of the importance of contraception. Contraceptive options should be discussed with women prior to discharge. If necessary, referral should be made to the joint obstetric and cardiac clinic, community gynaecology or sexual and reproductive health services for more detailed contraception advice.

35. **INFORMATION AND FOLLOW-UP AFTER BIRTH**

35.1 An extended postnatal stay may be indicated. The woman’s cardiovascular system should be assessed daily until she leaves hospital.

35.2 Women with cardiac disease should be informed about the risks in future pregnancies and the importance of preconception care when planning future pregnancies. This is particularly important for women with peripartum cardiomyopathy. Links should be made with maternity care for all future pregnancies.

35.3 Women with pre-existing cardiac disease should be referred back to their routine cardiac care arrangements. A follow-up review appointment should be arranged for 6-weeks after their discharge from hospital.
delivery. This may be at the joint obstetric/cardiologist clinic or local DGH cardiologist, as
detailed in the patient's pregnancy care management plan.

35.4 A comprehensive discharge summary should be prepared by the woman's obstetrician and
all caregivers, including the cardiologist and GP, and the patient, including:

I. A summary of events from the pregnancy;
II. Risk factors for subsequent pregnancies;
III. Medication plan;
IV. Contraceptive advice;
V. Cardiac plan; and
VI. Any referrals made.
SERVICE EVALUATION AND AUDIT

The Specialist ACHD Hub and Spoke Centres will work collaboratively with each other and local district hospitals to ensure audit. A key dataset that constitutes a complete obstetrics record has been agreed by the North West ACHD Strategic Board; the ACHD hub/spoke database will have the ability to collect the ACHD Obstetric fields/dataset.

To promote data collection for the purposes of service evaluation, audit and improvement the following data outlined in Tables 10 and 11 below needs to be collected by the Specialist ACHD Hub and Spoke Centres.

All Clinicians who are involved in the ACHD hub and spoke service need to participate in an annual North West ACHD Cardiology/Obstetric audit meeting. Feedback from these meetings needs to be disseminated to Specialist Hub and Spokes, DGH’s, Specialist Commissioners and the North West ACHD Strategic Board.

**Table 10  Audit Care Bundle for Access and Quality of Obstetric Care in Women with Cardiac Disease**

<table>
<thead>
<tr>
<th>Care Bundle:</th>
<th>Percentage of ACHD patients who have documentation in their medical record of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Multidisciplinary pre-conception advice received.</td>
</tr>
<tr>
<td>ii.</td>
<td>Appropriate* risk assignment.</td>
</tr>
<tr>
<td>iii.</td>
<td>Appropriate** referral from DGH to Spoke/Hub at first antenatal appointment.</td>
</tr>
<tr>
<td>iv.</td>
<td>Written maternity care plan detailing issues.</td>
</tr>
<tr>
<td>v.</td>
<td>Obstetric anaesthetic assessment undertaken during antenatal period.</td>
</tr>
<tr>
<td>vi.</td>
<td>Fetal echocardiogram by twenty-two-weeks gestation.</td>
</tr>
<tr>
<td>vii.</td>
<td>Labour and delivery in appropriate*** setting with availability of HDU/CCU/ITU bed if necessary.</td>
</tr>
<tr>
<td>viii.</td>
<td>Discharge summary provided to all caregivers and patient.</td>
</tr>
<tr>
<td>ix.</td>
<td>Antenatal review in Joint Cardiac/Obstetric clinic (Hub/Spoke).</td>
</tr>
</tbody>
</table>

**Objective:** To ensure that all eligible ACHD patients are offered appropriate access to specialist ACHD obstetric services.

**Rationale for inclusion:** The care bundle includes key measures of the quality of obstetric care that ACHD patients should receive, and defines what best-practice should look like. The Department of Health ACHD guidance identifies good practice in obstetric care to include management of pregnant patients with ACHD at Hub or Local centre (Spoke or DGH) according to complexity of condition, and acknowledges joint clinics between the cardiologist and obstetrician.

**Data Source:**
- **CURRENTLY POSSIBLE:**
  - Short term: Audit of patient medical records.
- **CURRENTLY UNAVAILABLE:**

**Unit of Analysis:**

- **i Numerator:** The number of ACHD patients receiving all nine indicators of care.
- **i Denominator:** Total number of ACHD patients delivering in the region.

**Involvement Noted As:** Increase in rate

**Care Setting:** Hub, Spoke, DGH

**Data Collection and Reporting:**
- Annually.
- Retrospective audit from delivery date based on financial year not calendar year.
- Data reported by Trust on PCT and Cardiac Network levels by ACHD pregnancy risk (low, moderate and high).

| Target: | March 2010: 80%  
March 2011: 90%  
March 2012: ≥95% |
|---|---|

<table>
<thead>
<tr>
<th>Inclusion / Exclusion Criteria:</th>
<th>Inclusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>i to viii - All simple, moderate and high risk pregnancies.</td>
<td></td>
</tr>
<tr>
<td>ii – ‘Appropriate risk assignment’ as defined by the obstetric/cardiac risk lesion in guidelines.</td>
<td></td>
</tr>
<tr>
<td>iii – ‘Appropriate referral’ refers to patients with moderate or high cardiac/obstetric risk lesions.</td>
<td></td>
</tr>
<tr>
<td>iv – ‘Appropriate setting’ as defined by the obstetric/cardiac risk lesion in guidelines (low – DGH, Moderate – Spoke, High – Hub).</td>
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<table>
<thead>
<tr>
<th>Exclusion:</th>
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<tbody>
<tr>
<td>i and iii – low risk pregnancies* (with no co-morbidities) on no medication and having appropriate general cardiac follow up. A list of low risk pregnancies are included in the guidelines.</td>
</tr>
<tr>
<td>vi – women with an ASD, PDA or PFO (see regional guidelines).</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure/Process/Outcome Measure:</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety/Effectiveness/Experience Measure:</td>
<td>Effectiveness</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Notes:</th>
</tr>
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<tbody>
<tr>
<td>The development of the ACHD Hub &amp; Spoke database includes adding an obstetric module. The minimum dataset should include the indicators listed within the care bundle to support reporting.</td>
</tr>
</tbody>
</table>

*Low risk obstetric cardiac lesions: |
<table>
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<tbody>
<tr>
<td>i. Repaired cardiac lesions with no residual cardiac dysfunction (fetal echo may be indicated).</td>
</tr>
<tr>
<td>ii. Bioprosthetic valve replacement with normal function.</td>
</tr>
<tr>
<td>iii. Isolated mitral valve prolapse with no significant regurgitation.</td>
</tr>
<tr>
<td>iv. Non-critical mitral stenosis with minimal limitation of maternal physical activity.</td>
</tr>
<tr>
<td>v. Bicuspid aortic valve without significant stenosis or regurgitation.</td>
</tr>
<tr>
<td>vi. Mild to moderate pulmonary stenosis.</td>
</tr>
<tr>
<td>vii. Small left to right shunts.</td>
</tr>
</tbody>
</table>
Table 11  Audit Indicator for Access and Quality of Obstetric Care in Women with Cardiac Disease

<table>
<thead>
<tr>
<th>Indicator:</th>
<th>Percentage of pregnant ACHD patients referred to Hub/Spoke who are seen within eight-weeks* of first antenatal booking.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective:</td>
<td>To ensure that all eligible patients are offered timely access to specialist ACHD obstetric services.</td>
</tr>
<tr>
<td>Rationale for inclusion:</td>
<td>This indicator defines what best practice should look like and supports national targets.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>CURRENTLY AVAILABLE: Hospital PAS data – Refer to treat targets.</td>
</tr>
</tbody>
</table>
| Unit of Analysis: | **Numerator:** The number of ACHD patients referred to Hub or Spoke (as appropriate) who were seen within eight-weeks of first antenatal booking.  
**Denominator:** Total number of first antenatal appointments at Hub / Spoke for ACHD patients. |
| Involvement Noted As: | Increase in rate |
| Care Setting: | Hub, Spoke |
| Data Collection and Reporting: | - Monthly.  
- Retrospective audit from delivery date based on financial year not calendar year.  
- Data reported by Trust on PCT and Cardiac Network levels by ACHD pregnancy risk (low, moderate and high). |
| Target: | March 2010: 75%  
March 2011: 85%  
March 2012: ≥95% |
| Inclusion / Exclusion Criteria: | **Inclusion:** All patient referrals including DGH, GP & self referrals  
**Exclusion:** Exception reporting: Patients who decline or DNA. |
| Structure/Process/Outcome Measure: | Process |
| Safety/Effectiveness/Experience Measure: | Effectiveness |
| Notes: | * Referral time within eight-weeks is recommended as Joint Cardiac/Obstetric clinics are either currently being held or planned bi-monthly. |
Appendix A
Cardiac Disease in Pregnancy
Guideline Development Group

Recommended good practice is based on the clinical experience and opinions of the guideline development group. Previous existing cardiology guidance developed by the Manchester Obstetric Group has been considered (contributors/authors: Dr Sarah Vause, Prof Bernard Clarke, Dr Vaikom Mahadevan, Dr Kath Grainger, Dr Paul Atkinson, Dr Gordon Yuill, Linda Griffiths, Claire Stanley and Paula Banda).

In development of this regional guidance the group ensured that stakeholder comments have been adequately considered and responded to. The group included members from the following perspectives: secondary care, tertiary care and sexual and reproductive healthcare. The members of the group were as follows:

**Dr Sarah Vause**
Consultant Obstetrician – Fetomaternal Medicine, Central Manchester and Manchester Children’s University Hospitals NHS Foundation Trust

**Dr Leanne Bricker**
Consultant Obstetrician – Fetomaternal Medicine, Liverpool Women’s Hospital NHS Foundation Trust

**Angela Haines**
Service Improvement Manager, ACHD, North West Cardiac and Stroke Networks

**Dr Ranjit More**
Consultant Cardiologist, Blackpool, Fylde and Wyre Hospitals NHS Foundation Trust

**Dr Kath Grainger**
Consultant Obstetrician, University Hospitals of Morecambe Bay NHS Trust

**Dr Gordon Yuill**
Consultant Anaesthetist, Salford Royal NHS Foundation Trust

**Dr Anne Webb**
Consultant in Sexual and Reproductive Healthcare, NHS Liverpool, Central Abacus

**Dr Indhu Prabakar**
Subspecialist Registrar in Sexual and Reproductive Health, NHS Liverpool, Central Abacus

**Jane Hill**
ACHD Specialist Nurse, Central Manchester and Manchester Children’s University Hospitals NHS Foundation Trust

**Dr John Duthie**
Consultant Obstetrician, Blackpool, Fylde and Wyre Hospitals NHS Foundation Trust

**Claire Stanley**
Specialist Midwife, Hypertension/Cardiac Disease, Central Manchester and Manchester Children’s University Hospitals NHS Foundation Trust

**Dr Richard Cowell**
Consultant Clinical Lead, North Wales Cardiac Network
## Cardiac Disease in Pregnancy
### Contact Details for Regional ACHD and Tertiary Centres

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Contact</th>
<th>Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Manchester Foundation Trust, Oxford Road, Manchester, M13 9WL</td>
<td>Dr Sarah Vause&lt;br&gt;Consultant in Fetal and Maternal Medicine (St Mary's)</td>
<td>Tel: 0161 276 6426&lt;br&gt;Fax: 0161 276 6143</td>
</tr>
<tr>
<td><em>(ACHD Hub Centre for North West of England, North Wales and Isle of Man and, ACHD Spoke Centre for Greater Manchester and Cheshire)</em></td>
<td>Professor Bernard Clarke&lt;br&gt;Consultant Cardiologist (Manchester Heart Centre)</td>
<td>Tel: 0161 276 4143</td>
</tr>
<tr>
<td></td>
<td>Dr Vaikom Mahadevan&lt;br&gt;Consultant Cardiologist - Adult Congenital Heart Disease (Manchester Heart Centre)</td>
<td>Tel: 0161 276 8098</td>
</tr>
<tr>
<td></td>
<td>Linda Griffiths&lt;br&gt;Specialist Nurse - Adult Congenital Heart Disease (Manchester Heart Centre)</td>
<td>Tel: 0161 276 7959 or 0161 276 1234&lt;br&gt;Bleep: 6994</td>
</tr>
<tr>
<td></td>
<td>Claire Stanley&lt;br&gt;Specialist Midwife Hypertension/Cardiac Disease (St Mary's)</td>
<td>Tel: 07905 821 273&lt;br&gt;Pager: 07659 547 408</td>
</tr>
<tr>
<td></td>
<td>Dr Rowena Cockerham&lt;br&gt;Consultant Anaesthetist, (Department of Anaesthetics, Manchester Royal Infirmary)</td>
<td>Tel: 0161 276 4552</td>
</tr>
<tr>
<td>Liverpool Women's Hospital, Crown St Liverpool, Merseyside L8 7SS</td>
<td>Dr Leanne Bricker&lt;br&gt;Consultant in Fetalmaternal Medicine</td>
<td>Tel: 0151 702 4211/0151 708 9988&lt;br&gt;Fax: 0151 702 4255</td>
</tr>
<tr>
<td><em>(ACHD Spoke Centre for Cheshire and Merseyside)</em></td>
<td>Dr Jaspal Dua&lt;br&gt;Consultant Cardiologist - Adult Congenital Heart Disease (Manchester Heart Centre)</td>
<td>Tel: 0161 901 0122</td>
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<td></td>
<td>Dr Ian Peart&lt;br&gt;Consultant Paediatric Cardiologist with an interest in Adult Congenital Heart Disease</td>
<td>Tel: 0151 252 5711</td>
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<td></td>
<td>Clare Fitzpatrick (Lead Midwife for Critical Care)&lt;br&gt;Pat Ryder (Outreach Midwife)</td>
<td>Tel: 0151 708 9988&lt;br&gt;Bleep 460 (Outreach bleep)</td>
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<td></td>
<td>Dr Charlene Grassman&lt;br&gt;Consultant Anaesthetist</td>
<td>Tel: 051 702 4132</td>
</tr>
<tr>
<td>Blackpool Fylde and Wyre Hospital, Whinney Heys Road, Blackpool, FY3 8NR,</td>
<td>Dr Elizabeth Haslett&lt;br&gt;Consultant Obstetrician</td>
<td>Tel: 01253 303448</td>
</tr>
<tr>
<td><em>(ACHD Spoke Centre for Lancashire and Cumbria)</em></td>
<td>Dr David Roberts&lt;br&gt;Consultant Cardiologist with an interest in Adult Congenital Heart Disease</td>
<td>Tel: 01253 657760&lt;br&gt;Fax: 01253 657845</td>
</tr>
<tr>
<td>Betws Cadwalader University Health Board – Wrexham Maelor Hospital, Croesnewydd Road, Wrexham, LL13 7TD <em>(ACHD Spoke Centre for North Wales)</em></td>
<td>Dr Raj Thaman&lt;br&gt;Consultant Cardiologist with an interest in Adult Congenital Heart Disease</td>
<td>Tel: 01978 727 801</td>
</tr>
</tbody>
</table>
# Cardiac Disease in Pregnancy

## Referral Details

### Central Manchester Foundation Trust (CMFT):

The joint obstetric/cardiac clinic at CMFT provides multidisciplinary tertiary care for women with heart disease who are pregnant, or who are considering pregnancy.

| Who? | Dr Sarah Vause, Consultant in Fetal and Maternal Medicine  
|      | Prof Bernard Clarke, Consultant Cardiologist  
|      | Dr Vaikom Mahadevan, Consultant Cardiologist, ACHD Specialist  |
| Where? | Antenatal Clinic, Central Manchester Foundation Trust  |
| When? | Weekly – Every Tuesday morning  |
| How? | Write to either Dr Sarah Vause, Prof Bernard Clarke or to Dr Vaikom Mahadevan  
| For an urgent appointment please telephone 0161 276 6426  |

Echocardiography and an ECG will be performed when the woman attends the clinic.

| Fetal Echo | Contact the Fetal Management Unit in Central Manchester Foundation Trust on 0161 276 6385 or write to Dr Gordon Gladman in the Fetal Management Unit at St Mary’s Hospital  |

| Escalation | In Hours and Out of Hours:  
| Consultant Obstetrician on 0161 276 1234  
| Consultant Cardiologist on 0161 276 1234  |

### Liverpool Women’s Hospital (LWH):

The joint obstetric/cardiac clinic at LWH provides multidisciplinary tertiary care for women with heart disease who are pregnant, or who are considering pregnancy. Maternal medicine clinics are provided at LWH in collaboration with the cardiology team from the Liverpool Heart and Chest Hospital NHS Foundation Trust.

| Who? | Dr Leanne Bricker, Consultant in Fetomaternal Medicine  
|      | Dr Ian Peart, Consultant Cardiologist with an interest in Adult Congenital Heart Disease  |
| Where? | Antenatal Clinic, Liverpool Women’s Hospital  |
| When? | Monthly – Tuesday afternoon  |
| How? | Write to Dr Leanne Bricker  
| For an urgent appointment please telephone 0151 702 4271  |

Echocardiography and an ECG will be performed when the woman attends the clinic.

| Fetal Echo | Contact Fetal Medicine Unit, Liverpool Women's NHS Foundation Trust on 0151 702 4211 or 0151 708 9988 ext. 4072 or fax: 0151 702 4255 with the details to arrange an appointment  
|            | You can also contact Dr Devender Roberts on 0151 708 9988 ext. 4638  |

| Escalation | In Hours:  
| Consultant Obstetrician on 0151 708 9988  
| Consultant Cardiologist on 0151 252 5711  
| Out of Hours:  
| Consultant Obstetrician on 0151 708 9988  
| Consultant Cardiologist on 0151 228 4811 (Alder Hey Switch Board, ask for Dr Ian Peart) / 0151 228 1616 (Liverpool Heart and Chest Hospital Switchboard, ask for Dr Jaspal Dua or on call cardiologist)  |
**Blackpool Fylde and Wyre Hospitals (BFWH):**
The joint obstetric/cardiac clinic at BFWH provides multidisciplinary tertiary care for women with heart disease who are pregnant, or who are considering pregnancy

| **Who?** | Dr Elizabeth Haslett, Consultant Obstetrician and Gynaecologist  
Dr David Roberts, Consultant Cardiologist with an interest in Adult Congenital Heart Disease |
| **Where?** | Antenatal Clinic, Blackpool, Fylde & Wyre Hospitals NHS Foundation Trust |
| **When?** | Monthly – Tuesday afternoon (first Tuesday in the month) |
| **How?** | Write to Dr Elizabeth Haslett |

**For an urgent appointment please telephone 01253 657 760**

Echocardiography and an ECG will be performed when the woman attends the clinic

| **Escalation** | **In Hours:**  
Consultant Obstetrician on 01253 303 448  
Consultant Cardiologist on 01253 657 760 |
| **Out of Hours:** | 01253 300 000 |
Patient Support Groups for Women with Cardiac Disease

British Heart Foundation (BHF)
Website: www.bhf.org.uk

Grown Up Congenital Heart Disease (GUCH) Patients Association

e-mail paula@guch.org
Website: www.guch.org.uk
Helpline: 0800 854 759
Northern Office: 01706 216534
JOINT OBSTETRIC CLINIC CARDIAC – PRECONCEPTION ASSESSMENT

Date:

Personnel present:

Cardiac diagnosis/interventions:

NYHA classification: (see reference at back) Level of care: (see reference at back)

Co-morbidities:

Named clinicians: Cardiologist Other

Medication:

Gynaecological and obstetric history:

Current contraception:

Family History:

Allergies:

Other relevant history/issues:
JOINT OBSTETRIC CLINIC CARDIAC – PRECONCEPTION ASSESSMENT

Investigations:

Echo:

Plan:

Letter dictated: Yes / No
Obstetric/cardiac team contact details given: Yes / No

Signature _______________________________________________________________

NYHA (New York Heart Association) CLASSIFICATION OF CARDIOVASCULAR DISEASE

<table>
<thead>
<tr>
<th>CLASS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Patients who are not limited by cardiac disease in their physical activity. Ordinary physical activity does not precipitate the occurrence of symptoms such as fatigue, palpitations, dyspnoea and angina.</td>
</tr>
<tr>
<td>II</td>
<td>Patients in whom the cardiac disease causes a slight limitation in physical activity.</td>
</tr>
<tr>
<td>III</td>
<td>Patients in whom the cardiac disease results in a marked limitation of physical activity. They are comfortable at rest but less than ordinary physical activity will precipitate symptoms.</td>
</tr>
<tr>
<td>IV</td>
<td>Patients in whom the cardiac disease results in the inability to carry on physical activity without discomfort. Symptoms may be present even at rest, and discomfort is increased by any physical activity.</td>
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</table>

Level 1

Highly complex lesions:
- Repairs with conduits, Rastelli, Fontan, Marfan syndrome with dilated aortic root, Ebstein anomaly, pulmonary atresia, Eisenmenger syndrome, repaired transposition of great arteries (arterial switch or atrial switch), congenitally corrected transposition of great arteries, pulmonary hypertension, cyanotic congenital heart disease

Level 2

Lesions of moderate complexity:
- Coarctation of aorta (repaired/native), repaired atrioventricular septal defect, aortic stenosis, pulmonary stenosis/regurgitation, tetralogy of Fallot, ventricular septal defect and aortic regurgitation, mechanical valves, hypertrophic cardiomyopathy, dilated cardiomyopathy

Level 3

Simple lesions:
- Repaired patent ductus arteriosus/ventriculoseptal defect/total anomalous pulmonary drainage/atrial septal defect, mild pulmonary stenosis/pulmonary regurgitation, small ventricular septal defect

Level 1 = Exclusive care in specialised unit
Level 2 = May have shared care with regional adult cardiology unit
Level 3 = Care predominantly in a general adult cardiology unit
Appendix F

Cardiac Disease in Pregnancy Management Plan

OBSTETRIC CARDIOLOGY CARE PLAN

Cardiac Diagnosis / Interventions

__________________________
NYHA classification: see reference at back

__________________________
Co-morbidities

__________________________
Level of care: see reference at back

Medication:

__________________________
Longterm thromboprophylaxis / anticoagulation  Yes / No if yes see haematology care plan

__________________________
Parity  EDD

__________________________
Past Obstetric Hx

__________________________
Anaesthetic referral  Yes / No if yes see anaesthetic care plan

__________________________
Fetal echocardiography  Yes / No

IF PATIENT ADMITTED TO LABOUR WARD PLEASE INFORM THE FOLLOWING:

Consultant Obstetrician on call  Yes / No
Consultant Anaesthetist on call  Yes / No
SpR Obstetrician on call  Yes / No
SpR Anaesthetist on call  Yes / No
SpR Cardiology  Yes / No
Consultant Cardiologist

Yes / No ____________________________________________

Other___________________________________________________________________________________

NYHA (New York Heart Association) CLASSIFICATION OF CARDIOVASCULAR DISEASE

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Level 1

Highly complex lesions:

Repairs with conduits, Rastelli, Fontan, Marfan syndrome with dilated aortic root, Ebstein anomaly, pulmonary atresia, Eisenmenger syndrome, repaired transposition of great arteries (arterial switch or atrial switch), congenitally corrected transposition of great arteries, pulmonary hypertension, cyanotic congenital heart disease

Level 2

Lesions of moderate complexity:

Coarctation of aorta (repaired / native), repaired atrioventricular septal defect, aortic stenosis, pulmonary stenosis / regurgitation, tetralogy of Fallot, ventricular septal defect and aortic regurgitation, mechanical valves, hypertrophic cardiomyopathy, dilated cardiomyopathy

Level 3

Simple lesions:

Repaired patent ductus arteriosus / ventriculoseptal defect / total anomalous pulmonary drainage / atrial septal defect, mild pulmonary stenosis / pulmonary regurgitation, small ventricular septal defect

Level 1 = Exclusive care in specialised unit
Level 2 = May have shared care with regional adult cardiology unit
Level 3 = Care predominantly in a general adult cardiology unit
Planned mode of delivery: Elective CS  Trial of Vaginal Delivery

Indication for Elective CS:

Elective CS  If patient admitted in spontaneous labour inform doctors identified previously

Preterm labour  Atosiban should be first line management

Vaginal delivery 1\textsuperscript{st} stage management

<table>
<thead>
<tr>
<th>HDU Chart</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG in labour</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Prophylactic antibiotics</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Arterial BP monitoring</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Early epidural analgesia</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Central Venous Access</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

Syntocinon augmentation of labour guidance: __________________________________________________________

Vaginal delivery 2\textsuperscript{nd} stage management

| Normal 2\textsuperscript{nd} stage | Yes / No |
| Active 2\textsuperscript{nd} stage | Yes / No |
| Duration ______ min/hours | |
| Elective forceps / delivery only | Yes / No |

Vaginal delivery 3\textsuperscript{rd} stage management

| Normal active management | Yes / No |
| Syntocinon: infuse 5iu in 20mls saline over 20 minutes | |

Postpartum haemorrhage

- Inform Consultant Obstetrician / SpR Obstetrician
  Consultant Anaesthetist / SpR Anaesthetist
- Mechanical compression methods preferable
- Close fluid balance: count all pads / hourly urometer / cvp / arterial line
- Caution using uterotonic: misoprostol in preference to haemabate

Post delivery

Minimum stay on labour ward  _____ hours / days
Length of hospital stay  _____ days
Postnatal medication plan

Breastfeeding advice

Postnatal follow up arrangements

Other considerations / instructions
REFERENCES


3 Consensus statement from the 51st Study Group: Heart Disease in Pregnancy (2006)


6 UK Medical Eligibility Committee can be found at www.fsrh.org Clinical Guidance

7 Clinical Effectiveness Unit Guidance can be found at www.fsrh.org Clinical Guidance

8 Faculty of Sexual and Reproductive Health care Clinical Guidance. Clinical Effectiveness Unit 2010 see www.fsrh.org Clinical guidance

