Cardiac disease in pregnancy guideline (GL802)

Approval

<table>
<thead>
<tr>
<th>Approval Group</th>
<th>Job Title, Chair of Committee</th>
<th>Date</th>
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<tbody>
<tr>
<td>Maternity &amp; Children’s Services Clinical Governance Committee</td>
<td>Chair, Maternity Clinical Governance Committee</td>
<td>6th July 2018</td>
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Change History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
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<td>June 2015</td>
<td>J Ablett (Consultant Obstetrician), Dr A Elkington (Consultant Cardiologist), Lucy MacKillop, Consultant Obstetric Physician, John Radcliffe hospital, Oxford</td>
<td>Addendum to guideline – pg. 10</td>
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<td>5.2</td>
<td>March 2016</td>
<td>J Ablett (Consultant Obstetrician), Dr A Elkington (Consultant Cardiologist), Lucy MacKillop, Consultant Obstetric Physician, John Radcliffe hospital, Oxford</td>
<td>Reviewed – no changes only to proforma where Syntocinon changed to Oxytocin</td>
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| 6.0     | May 2018   | J Ablett (Consultant Obstetrician), Dr A Elkington (Consultant Cardiologist), Lauren Williams (Consultant Anaesthetist), Dr Lucy MacKillop (Consultant Obstetric Physician, John Radcliffe hospital, Oxford) | Reviewed
Pg 8 - name changed to job title
Pg 9 - Syntocinon replaced with Oxytocin & Carbetocin
Pg 10 - name changed
Pg 10 - 5.5 Antibiotics - BMI criteria changed from 35 to 30
Pg 12 addendum updated
Pg 14 care plan updated
Pg 16-21 – TV OAHSN Maternal Medicine guideline added |
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Overview: Cardiac disease is the most common cause of indirect maternal death in the UK (2.3 per 100,000 maternities in 2006-2008 trienniums). Deaths from cardiac disease are more frequent than those from thromboembolic disease or bleeding. Appropriate multidisciplinary care should be given with suitable plans for all stages of pregnancy and delivery.

Click this link for a printable version of ‘quick reference guide for referral for patients with cardiac disease in pregnancy’ Cardiology Guideline - quick referral guide.doc and Quick ref guide cardiac disease in pregnancy_OCT13.pdf

The Quick Reference Guide can also be seen at bottom of this document - Link to guide

1.0 Introduction

As our population changes, more women with corrected congenital heart defects reaching adulthood, older mothers, more smokers and more obese women with ischemic heart disease risks and immigrants with rheumatic heart disease will become pregnant and require specialist care.

Despite the potential for significant maternal morbidity most patients with cardiac disease can expect a satisfactory outcome with careful pre-pregnancy, antenatal, intrapartum and postnatal management. Normal physiological pregnancy-related changes can aggravate underlying cardiac disease, leading to associated morbidity and mortality.

The outcome and safety of pregnancy are related to:

- Presence and severity of pulmonary hypertension;
- Presence of cyanosis (arterial oxygen saturation 80%);
- Functional NYHA (New York Heart Association) class, determined by level of activity that leads to dyspnoea;
- Haemodynamic significance of the lesion.

This guideline will hopefully set out whom to refer, when to refer and to whom, in order that appropriate care may be given to those at risk of cardiac disease and complications.

Any woman with cardiac disease should be offered pre-pregnancy assessment and counselling. Genetic counselling may also be required for inheritable conditions such as Marfan’s syndrome or cardiomyopathy.

2.0 Physiology

Profound haemodynamic changes occur during pregnancy and labour. By 8 weeks gestation the cardiac output has already increased by 20% reaching a maximum increase of 40% by 28 weeks gestation. Heart rate and stroke volume increase and peripheral resistance decreases. The plasma volume also increases by 50%.
During the second stage of labour, the cardiac output rises by a further 50%. After delivery, when the uterus contracts, 500ml blood is released into the maternal circulation. The later stages of labour and the early puerperium are thus the time when anyone with significant heart disease is most at risk.

3.0 Pathophysiology

In general, those with regurgitant (leaky) valvular lesions and mild or moderate left to right shunts tolerate pregnancy better than those with stenotic lesions or right to left shunts as they tolerate the physiological changes better. Pulmonary hypertension carries a significant risk of maternal death. Cyanotic lesions will affect the fetal growth and IUGR may occur.

Predictive indicators of maternal cardiac complications during pregnancy (stroke, arrhythmia, pulmonary oedema and death) are:

- Prior cardiac event or arrhythmia;
- NYHA classification above class II;
- Myocardial dysfunction (left ventricular ejection fraction < 40%);
- Cyanosis (women with oxygen saturation below 80-85% have increased risk of IUGR and fetal loss, and thromboembolism secondary to the reactive polycythaemia);
- Left heart obstruction (mitral valve area < 2 cm2, aortic valve area < 1.5 cm2 and aortic valve gradient > 30 mmHg);
- Symptomatic arrhythmias requiring treatment (Brady arrhythmia or tachyarrhythmia)

If no predictive factors present at the start of pregnancy only 5% develop cardiac complication, if 1 factor 30% risk, and if 2 or more factors the risk is 70%, these facts are important in patient counselling.

4.0 Cardiac Conditions

4.1 Structural Abnormalities

The incidence of congenital heart disease in pregnancy is rising as women with more severe defects, who have undergone corrective surgery as children are now able to have children themselves. The most common of these are corrected patent ductus arteriosus, arterial septal defect and ventricular septal defect. With no other complications, these generally do well in pregnancy.

The most common acquired heart disease worldwide is rheumatic heart disease, caused by rheumatic fever in childhood.

Antibiotics prophylaxis may be required for delivery – see Antibiotic treatment & prophylaxis guidelines for Obstetrics (GL787)
a) Valvular

(i) Aortic stenosis
This condition is unlikely to cause problems unless the pressure gradient across the valve is severe. If severe, the complications arise due to the restricted capacity to increase the cardiac output. Beta blockers may be used to control the symptoms of angina, dyspnoea and syncope and hypertension, though heart failure may be a contraindication for treatment. Any patient who develops angina, dyspnoea or resting tachycardia should be admitted to hospital for rest. Balloon valvuloplasty is sometimes considered for severe cases Regional analgesia may also be a problem due to vasodilatation.

(ii) Mitral stenosis
Mitral stenosis accounts for 90% of rheumatic heart disease. If undiagnosed this may be dangerous in pregnancy. Even if a woman is generally asymptomatic, she may deteriorate during pregnancy and develop pulmonary oedema. Treatments may include beta blockers and diuretics. Balloon valvuloplasty is sometimes considered for severe cases.

Fluid overload, supine and lithotomy positions should be avoided. Epidural and vaginal deliveries (+/- AVD to shorten 2nd stage) are not contraindicated.

(iii) Regurgitant valves
Systemic vasodilatation and a fall in peripheral vascular resistance reduce afterload and act to reduce regurgitation in pregnancy. Providing there is no left ventricular dysfunction both mitral and aortic regurgitation are well tolerated in pregnancy. Heart failure can be safely treated with diuretics, digoxin and hydralazine/ or nitrates to `off-load` left ventricle.

(iv) Artificial heart valves
Mechanical heart valves require lifelong anticoagulation. Warfarin produces the lowest risk for the mother but has risks to the fetus of teratogenesis, intracerebral bleeding and fetal loss. Heparin does not cross the placenta but has a higher risk of maternal thrombosis. They need to continue full anticoagulation throughout the pregnancy. When heparin is used, low dose aspirin (75 mg/day) should be added. Heparin dose and compliance should be monitored with anti- Xa level. All women should thus be thoroughly counselled prior to pregnancy regarding these risks. A plan should be made to cover delivery and anticoagulation postnatally. In the event of bleeding or the need for urgent delivery in a fully anticoagulated patient, warfarin may be reversed with recombinant human factor VIIa / fresh frozen plasma and vet K, and heparin with protamin.
b) Non-valvular

(i) Marfan’s syndrome
This is an autosomal dominant condition and genetic counselling is essential. In pregnancy this condition carries a risk of aortic dissection and rupture. Pregnancy is contraindicated if the aortic root diameter is greater than 4-4.5cm. Regular echocardiograms should be performed to assess this throughout pregnancy. Beta blockers may reduce the rate of dilatation and thus the risk of complications.

Dissection of thoracic aorta (type A): There has been a recent increase in the maternal deaths from ruptured aneurysm or dissection of thoracic aorta, mortality rate is high. Symptoms are acute severe chest pain, with interscapular radiation and systolic hypertension.

(ii) Cyanotic congenital heart disease
This carries significant risks for the mother and fetus. Problems include worsening cyanosis and risk of IUGR and fetal loss. There is also a risk of thromboembolic disease from the associated polycythaemia. There is a significant risk of development of associated pulmonary hypertension, which may be potentially fatal.

Fallot’s tetralogy, if corrected and with no pulmonary hypertension, may do well in pregnancy, though heparin, oxygen and bed rest may be required for management. There are significant risks to the fetus from IUGR and prematurity.

Eisenmenger’s syndrome carries a 40% maternal mortality, with most of the deaths occurring following delivery. Patients with this condition should be strongly counselled against pregnancy or offered termination.

(iii) Cardiomyopathy
Hypertrophic obstructive cardiomyopathy (HOCM) is usually due to an autosomal dominant inheritance and genetic counselling should be offered. It is mostly well tolerated in pregnancy, though beta blockers may be used for symptom control. Hypotension should be avoided as this may increase left ventricular outflow tract obstruction.

(iv) Peripartum cardiomyopathy
This is defined as the development of heart failure in the absence of a known cause, occurring in late pregnancy or up to 5 months post partum. Risk factors include multiple pregnancy, hypertension, increasing maternal age and those of Afro-Caribbean origin. Symptoms include dyspnoea, pulmonary and/or peripheral oedema and palpitations. There may be tachycardia and tachypnoea together with signs of cardiac failure and dysrhythmias. The diagnosis requires echocardiography.
Management includes treatment for heart failure, including ACE inhibitors following delivery. Prophylactic anticoagulation should be used as the risk of thromboembolic disease is thought to be as high as 40%.

Maternal mortality may be as high as 50% for a severe and acute presentation. Prognosis depends on normalisation of left ventricular size and function within 6 months of delivery. For those where the disease resolves, the recurrence risk appears to be less than 25%, though high risk care will be advocated.

(v) **Coarctation of the aorta**

Though most cases are surgically corrected already, some have residual narrowing, or by aneurysm formation. Assess with MRI pre-pregnancy. Adequate control of blood pressure cannot be maintained during exercise, and this brings the risk of cerebral haemorrhage or aortic dissection, so exertion needs to be avoided. Blood pressure should be treated with B blockers. Normal delivery is possible but in severe disease second stage should be shortened.

4.2 **Dysrhythmias**

Sinus tachycardia and palpitations may be a normal feature of pregnancy. Ectopic beats are common in both mother and fetus and generally have no adverse effects on either. However, investigations should be performed to exclude, anaemia, thyroid disease, together with an examination of cardiovascular and respiratory symptoms. A 12 lead ECG should be performed.

Referral to the Cardiology Department should be for those with ECG abnormalities, severe dysrhythmias or who are symptomatic (e.g. syncope or severe breathlessness).

**Sudden arrhythmic death syndrome (SADS):** Is sudden unexpected cardiac death (i.e. presumed fatal arrhythmia) where all other causes of sudden collapse are excluded. The physiological stresses of pregnancy and delivery are thought to bring out an underlying potential cardiac arrhythmia. Unfortunately these deaths are unpredictable.

4.3 **Myocardial infarction/ Ischemic Heart Disease and Hypertension**

Ischaemic heart disease has become a common cardiac cause of death in pregnancy (11 cases of maternal deaths in 2006-2008 triennium). Risk factors include advanced maternal age, smoking, diabetes, obesity, hypertension and a positive family history. It occurs mostly from the third trimester until post partum.

Investigations and management are similar with to non pregnant, except avoidance of ACE and statins.
Hypertension should be adequately treated but drug therapy may need to be altered pre pregnancy to avoid ACE inhibitors, diuretics and cholesterol lowering agents.

4.4 Previously undiagnosed cardiac disease in pregnancy

We all should be aware that in anyone with the following symptoms and/or signs, cardiac disease should be considered:
- unexplained tachycardia
- hypotension
- new onset shortness of breath
- chest pain
- palpitations associated with symptoms such as collapse or syncope

Such patients may require ECG, Echo, CXR, ABG and cardiology review as part of their investigations.

5.0 Referrals

5.1 Combined Obstetric Cardiac Clinic

This clinic occurs monthly and is managed jointly by Dr Andrew Elkington, Consultant Cardiologist and Miss Jill Ablett, Consultant Obstetrician.

All referral letters should be directed through Miss Ablett to arrange appointments. Urgent referrals can be arranged through Miss Ablett’s secretary (cat 6 x3663) or questions can be directed to Miss Ablett via email.

Some patients with complex cardiac conditions especially those with cyanosis or pulmonary hypertension may be referred for assessment or delivery at a Regional Cardiac Unit.

If no appointment is required, only an Echocardiogram or ECG, these can be arranged directly with the department.

If an inpatient referral is required the patient details should be added to the ‘cardiologist of the Week’ list referrals on EPR. There are now twice daily ward rounds and a Cardiologist on call every night.

5.2 Anaesthetic

All pregnant women with cardiac conditions should be referred for an anaesthetic opinion. They should be referred to the Consultant Anaesthetic Antenatal clinic and offered an appointment.

Close co-operation between the anaesthetist, cardiologist and obstetrician is important to ensure optimal management. The anaesthetic management plan will
address the following issues, which are affected by the nature and severity of any disorder.

- If a woman tolerates pregnancy well than she is likely to tolerate delivery.
- Appropriate analgesia for labour is vital to reduce additional stress on the myocardium and may prevent problems caused by the increased cardiac output / workload at each contraction. For many of these women an epidural is the ideal labour analgesic and they should be expedited as medically necessary.
- Fluid balance should be adjusted for the particular disorder. Ideally normovolaemia should be achieved. However, as a general rule stenotic lesions should be ‘well-filled’ whilst regurgitant lesions will tolerate relative hypovolaemia better.
- Oxytocic agents should be used with caution as many have adverse affects on the cardiovascular system. Ergometrine causes vasoconstriction, Syntocinon vasodilatation and tachycardia while carboprost (haemabate) can cause bronchospasm and pulmonary hypertension. Both Carbetocin and Oxytocin should be diluted and given slowly, observing the effects. Depending on the cardiac condition ergometrine and carboprost may even be contraindicated.
- The third stage of labour may not be well tolerated because of the significant autotransfusion that occurs at placental separation. There may be a need for vasodilatation at that point. This could be provided by regional analgesia/anaesthesia but specific agents such as glycerol nitrate may be required.
- Some women may require higher monitoring during labour. This may be merely continuous ECG recording but facilities for invasive monitoring of blood pressure and central venous pressure are available.
- A plan for anaesthesia for operative delivery will also be made. It may be appropriate for some of these women to be having an elective Caesarean section. The best way to provide a stable anaesthetic will be thought through as a guide in case of the need for emergency delivery.
- Some women will require antibiotics at delivery and this should be according to the agreed guideline based on the risk of endocarditis.
- If a woman is on anticoagulation because of a valve replacement it is vital that a plan should be made with the haematologists to cover cessation or alteration of medication for delivery. If delivery needs to be expedited within the proscribed period after administration of anticoagulant agents the risks and benefits of performing a block must be evaluated at the time, though this will be discussed at the antenatal assessment.
- Many women will need prophylactic anticoagulation in the post-natal period.
5.3 Fetal Medicine

Any woman with a congenital heart abnormality has an increased risk of a fetal cardiac anomaly. The background rate in the general population is 3 per 1000. This increases 10 fold if the mother has a cardiac anomaly and may be as high as 10% if both parents are affected. Thus a fetal cardiac scan should be performed at 24 weeks by Dr Suruchi Arora or Miss Surabhi Bisht.

5.4 Labour

Patients with cardiac disease who require any specific management or precautions should have a care plan filled out. Link for intrapartum management plan as appendix

5.5 Antibiotics

Antibacterial prophylaxis is NOT recommended for the prevention of endocarditis in patients undergoing obstetric procedures

Any infection in patients at risk of endocarditis should be investigated promptly and treated appropriately after discussion with Consultant Microbiologist.

Those deemed at risk include: valve replacement, acquired valvular heart disease with stenosis or regurgitation, structural congenital heart disease, hypertrophic cardiomyopathy or previous episode of infectious endocarditis

These antibiotics should be given only in the presence of suspected sepsis for these cardiac conditions (listed above) for LSCS or other procedures such as repair of third and fourth degree tears, manual removal of placenta, EUA or procedures where antibiotics would be routinely given.

Recommended regime for Caesarean section or other obstetric procedure in the presence of suspected sepsis and structural cardiac condition

- IV Coamoxiclav  1.2 gram + Gentamicin 5mg/Kg at induction of anaesthetic. If BMI more than 30 add 1g IV amoxicillin to Coamoxiclav and see antibiotic guideline GL787 and links for drug dosage calculations).

OR

- Teicoplanin 10mg/Kg bolus IV + Gentamicin 5mg/Kg IV at induction of anaesthetic if penicillin allergic or if patient has received more than one dose of any penicillin in the preceding month.
6.0 References

4. RCOG Good Practice No.13, June 2011: Cardiac Disease and Pregnancy
5. NICE guideline 64 – Prophylaxis against infective endocarditis. March 2008
Addendum to Cardiac Guideline

March 2015

More complex cardiac cases should be discussed with the Silver Star Team at John Radcliffe Hospital – either Dr Lucy MacKillop or Dr Liz Orchard. Where necessary women can be seen in their combined cardiac clinic and certain cases may need delivery at JRH. Many women will share care between RBH and JRH combined cardiac obstetric clinics. All complex women will need a care plan in their notes regardless of place of delivery, in case of emergency admission.

All of the following should be discussed with JRH and appropriate plans made for care and delivery:

1) Marfans with dilated aortic root
2) Cardiomyopathy with LV ejection fraction <45%
3) Valve replacements (type dependent)
4) Moderate or severe mitral or aortic stenosis
5) Corrected complex congenital heart disease (e.g. Fallots, coarctation)
6) Hypertrophic cardiomyopathy with LV outflow obstruction (additional anaesthetic high risk)

June 2018

The Maternal Medicine Network for the AHSN has recently published guidelines which include cases for referral and discussion with the Silver Star and Obstetric Physician teams in Oxford. This is included in Appendix 2, see page 16 onward below.

Jill Ablett, Consultant Obstetrician and Medical Lead
Andrew Elkington, Consultant Cardiologist
Lucy MacKillop, Consultant Obstetric Physician, John Radcliffe hospital, Oxford
26.6.18
Quick reference guide for referral of patients with cardiac disease in pregnancy

1. Pre-pregnancy counselling
   Patients with the following conditions need referral, preferably before they become pregnant (Refer to Dr Andrew Elkington and Miss Jill Ablett for antenatal care)
   - Artificial heart valves
   - Symptomatic stenotic valvular disease
   - Congenital cardiac abnormalities (corrected or unconnected)
   - Cyanotic heart disease
   - Eisenmenger’s syndrome/ pulmonary hypertension
   - Previous peripartum cardiomyopathy
   - Severe hypertension or symptomatic ischemic heart disease

2. Cardiology referral ASAP
   The following patients need referral to the cardiologists’ as soon as possible in early pregnancy and should be referred to Miss Ablett for booking in the usual way. Miss Ablett will prioritise patients for the combined obstetric cardiac clinic.
   - Any of the above conditions, whether or not seen for pre pregnancy assessment
   - Any woman with known or suspected cardiac disease who is currently asymptomatic
   - Asymptomatic, stenotic or regurgitant valvular lesions
   - Any woman with abnormalities on an echocardiogram, following referral for a murmur
   - Symptomatic dysrrythmias, ECG abnormalities

3. Urgent cardiology referral
   Urgent assessments can be referred to the “Cardiologist of the Week” or discussed with Registrar on call (contact through switchboard)

4. Anaesthetic Referral
   All pregnant women with cardiac conditions need referral to the Anaesthetic Department. (Referrals to Dr Guy Jackson or Dr Doug Barker via antenatal clinic)

5. Genetic Counselling
   Patients with the following conditions need referral for genetic counselling as autosomal dominant inheritance (Refer to Oxford or D/W Dr Elkington)
   - Marfan’s syndrome
   - Hypertrophic obstructive cardiomyopathy (HOCM)

6. Fetal Medicine Referral
   Any woman with a congenital cardiac abnormality needs referral for a fetal cardiac scan at 24 weeks (Refer to Miss S Bisht or Dr Arora)

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# Cardiac Disease in pregnancy – intrapartum management plan

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<th>Obstetric team</th>
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## Planned Mode of delivery
- Elective LSCS
- Trial of vaginal delivery

## Elective LSCS

### Uterine contraction aids
- Elective compression suture
- Rusch balloon
- Oxytocin bolus:
  - Normal protocol
  - 5u in 20ml 0.9% Saline given over 10 minutes
- Oxytocin infusion:
  - 30u in 500ml at 100ml/hr
  - __u in ___ ml at __ml/hr
- Carbetocin 100mcg over 1 minute
- No Oxytocin infusion within 4 hours of Carbetocin

## Monitoring: ECG / SaO2 / NIBP / Arterial line / Central line

## Vaginal Delivery – first stage

### TEDS
### HDU chart
### Prophylactic antibiotics: ________________
### Continue normal medications
### Early epidural
- As soon as in established labour
- If and when requested
### Augmentation
### CTG monitoring
### Maternal monitoring
### ECG
### Central venous access
### Arterial line
### Hourly urine output

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**Author:** J Ablett, A Elkington, L Williams, L MacKillop  
**Job Title:** Consultant Obstetrician, Consultant Cardiologist, Consultant Anaesthetist, Consultant Obstetric Physician (J Radcliffe Hospital)  
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**This document is valid only on date last printed**
### Cardiac Disease in pregnancy – intrapartum management plan

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### Guidance on certain clinical situations

#### Uterotonics

Syntocinon causes hypotension, due to peripheral vasodilation and decreased cardiac contractility, and may be poorly tolerated especially if fixed cardiac output (stenotic lesions). Oxytocin infusions can have an ADH-like effect and may precipitate fluid overload. In some cases it is appropriate to give Oxytocin in a lower dose, diluted in smaller volumes and / or infused slowly.

Carbetocin is a long acting Oxytocin analogue which appears to cause relatively little cardiovascular disturbance. In most cases it is probably safe to use but should be given slowly.

Ergometrine causes an increase in systemic vascular resistance and should be avoided in some cases of congenital heart disease (ischaemic heart disease, coarctation and pulmonary hypertension).

Carboprost (haemabate) and misoprostol are contraindicated in patients with myocardial ischaemia. Carboprost may also cause bronchoconstriction.

#### Intravenous fluids

**General principles:**
- Maintain normovolaemia
- Monitor input and output closely to avoid fluid overload
- Use volumetric fluid pump
Key Recommendations

- All women with medical conditions should be assessed pre-conceptually for optimisation of their health and their medication; women with high-risk medical conditions should be referred for specialist pre-conceptual advice. This will require liaison with primary care (see recommended actions).

- Local maternity service guidelines for common and serious medical problems in pregnancy should include Appendix 2 which are criteria for referral for opinion/transfer of care to an obstetric medicine tertiary referral centre, in order to reduce the risk of severe maternal morbidity and mortality.

- A maternal medicine network should be developed to improve the care of all women with medical co-morbidities in the TV region. Ultimately this should encompass training, shared learning, audit and governance.

Background

The aim of this guideline is to reduce the risk of (indirect) maternal mortality and severe morbidity and the associated neonatal mortality and morbidity.

Maternal death from indirect causes is not falling in the UK at the same rate as direct deaths. \(^1\) 68% of women dying in the most recent MMRACE(UK) report had medical co-morbidities (including obesity) and in 41% of cases, assessment identified improvements to care which may have made a difference to the outcome. Maternal medical conditions are also significantly associated with neonatal morbidity and mortality. \(^2\)

The formation of a maternal medicine network, as recommended in Safer Maternity Care (November 2013) [https://www.gov.uk/government/publications/safer-maternity-care-progress-and-next-steps], aims to deliver coordinated and specialist care for women in the region with complex medical conditions. The network approach to delivering care has been embraced by many specialties of medicine, surgery and maternity, with fetal medicine, and is already practiced in an ad-hoc way for medical problems in the maternity population. This document aims to formalise this approach and describe the operational aspects of this network.
Maternal medicine issues:

1. Pre-conceptual counselling

Pre-conceptual counselling for women with medical problems is advocated by several professional bodies, national guidelines, confidential enquiries and audits including RCOG, NICE5 and MBRACE(UK)3. The purpose of pre-conceptual counselling is to:

- inform women of the potential risks of pregnancy
- ensure understanding of the need for increased monitoring during pregnancy
- optimise health and medications prior to pregnancy.

This can be delivered in primary care. However, where confer a particularly high risk of pregnancy complications or where medications may be particularly harmful to the fetus, referral for secondary or tertiary level counselling is appropriate. A pre-conceptual counselling service is available at OUH for all medical conditions (Email: silver.star@oh.nhs.net).

Examples of such conditions include:

- Women with heart disease
- Women on long term anticoagulation
- Women with T1 or T2 diabetes mellitus and Hba1c > 7.5%
- Women with epilepsy on AEDs
- Women on known teratogenic medication e.g. methotrexate, sodium valproate, warfarin
- Women with CHD 4 or 5

It is acknowledged that timely identification of such women in primary care will be challenging and it is recommended that representatives from primary care are invited to a meeting to discuss how this could be achieved.

2. Local Maternity Guidelines

Conditions which require a local guideline specific to management of women in pregnancy include:

- Epilepsy
- Hypertension in pregnancy including pre-eclampsia
- Diabetes mellitus (T1, T2, GDM)
- Bleeding disorders e.g. haemophilia, thrombocytopenia
- Heart disease
- Acute VTE
- Prevention of VTE
- Sickle cell disease

A list (hyperlink) of national guidelines to support the development of local guidelines are listed below:

- [Epilepsy (RCOG, 2016)](RCOG)6
- [Hypertension (NICE, 2010)](NICE)7

Local guidelines should include an individualised care plan for these women that includes when and by whom they will be followed up once discharged from hospital. Clear documentation of communication between all the healthcare teams including the lead obstetrician, anaesthetist, physician, GP, community midwife and obstetric physician where applicable, is of utmost importance to ensure women don’t get ‘lost to follow up’ at this critical time.

3. Referral for an opinion/ transfer to an obstetric medicine tertiary referral centre.

The threshold for referral should depend on local obstetric expertise and on the availability of anaesthetic and intensive care services. Appendix 1 lists the conditions where early pregnancy referral to an obstetric medicine tertiary referral centre for an opinion/transfer should be considered by the local hospital.

Where women meeting criteria for referral are not referred this should be agreed by the responsible local obstetrician, the relevant physician and anaesthetic services and, preferably, local neonatology services.

A process of communication between the local and tertiary referral hospital should be developed to ensure all healthcare professionals have access to, and up-to-date knowledge of, the woman and her current clinical situation (with documented evidence of this). It is anticipated that access to a secure database of “high risk” cases could be developed.

Obstetric medicine consultant review should comprise a recommended pregnancy plan, which will be developed in conjunction with, as appropriate, anaesthetic, obstetric and specialist medical (e.g. cardiology) input. If transfer of care is not performed there will be a list of indications for re-referral.
### Appendix 2 – OAHSN Thames Valley Maternal Medicine Network Regional guideline

#### Appendix 1 – Conditions for consideration of referral for obstetric/maternal medicine opinion or transfer of care.

<table>
<thead>
<tr>
<th>Subspecialty</th>
<th>Consider transfer of care</th>
<th>Consider referral for opinion</th>
<th>Local Hospital (planned care)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiology</strong></td>
<td>Unoperated ASD/VSD/PDA</td>
<td>Tetralogy of Fallot</td>
<td>Repaired ASD/VSD/PDA with no arrhythmia, LV/RV dysfunction</td>
</tr>
<tr>
<td></td>
<td>Systemic right ventricle Fontan circulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cyanotic heart disease (unrepaired)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other complex congenital heart disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arhythmias</strong></td>
<td>Arrhythmias that are problematic or requiring 2 or more agents</td>
<td>SVT</td>
<td>Atrial fibrillation</td>
</tr>
<tr>
<td><strong>Aortic disease</strong></td>
<td>Marfan syndrome with dilated aorta</td>
<td>Marfan syndrome with normal aorta</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loosy-Dietz syndrome (irrespective of aortic dimensions)</td>
<td>Bicuspid AV with Aorta &lt;45 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turner’s syndrome (irrespective of aortic dimensions)</td>
<td>Aorta &lt;45 mm in association with bicuspid aortic valve</td>
<td></td>
</tr>
<tr>
<td><strong>Valvular heart disease</strong></td>
<td>Any mechanical valve</td>
<td>Any bioprosthesis valve</td>
<td>Mild to moderate AS/AR, MR, PS/PR with no evidence of LV/RV dysfunction</td>
</tr>
<tr>
<td></td>
<td>AS/AR – moderate or severe or with evidence of LV dysfunction</td>
<td>MR severe or with evidence of LV dysfunction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MS</td>
<td>PS/PR severe or with evidence of RV dysfunction</td>
<td></td>
</tr>
<tr>
<td><strong>Pulmonary arterial hypertension (any cause)</strong></td>
<td>Left ventricular impairment (any cause)</td>
<td>Hypertrophic cardiomyopathy</td>
<td>Previous peripartum cardiomyopathy</td>
</tr>
</tbody>
</table>

#### Previous myocardial infarction

- Pheochromocytoma
- Type 1 diabetes mellitus with significant renal impairment or autonomic neuropathy
- Uncontrolled hypothyroidism
- Hypersparathyroidism with raised calcium
- Adrenal tumours
- Congenital adrenal hyperplasia

#### Previous aortic dissection

- Beta thalassemia major
- New VTE in pregnancy ≥6 weeks before expected delivery
- Haemophilia carrier
- Aplastic anaemia

#### Haematology

- Sickle cell disease
- Previous or current HIV/TBP
- Beta thalassemia major
- New VTE in pregnancy ≥6 weeks before expected delivery
- Haemophilia carrier
- Aplastic anaemia

#### Hepatology

- Liver transplant
- Any degree of portal hypertension

#### Infectious Diseases

- HIV
- Malaria in current pregnancy

#### Metabolic Medicine

- Phenylketonuria, glycogen storage disorders, urea cycle defects, galactosemia, fatty acid oxidation defects, peroxisomal disorders, inherited hyperphosphatemia and lysosomal storage disorders

#### Oncology

- Current malignancy requiring chemotherapy

#### Renal Medicine

- CKD 5
- Renal (≥3+ pancreas) transplant
- CKD 3-4
- Heavy proteinuria (≥5g) due to pre-existing kidney disease
- GN on maintenance immunotherapy
- CKD 1-2
### Appendix 2: Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEDs</td>
<td>Anti-epileptic medication</td>
</tr>
<tr>
<td>ANCA</td>
<td>Anti-nuclear cytoplasmic antibody</td>
</tr>
<tr>
<td>Anti-GBM</td>
<td>Anti-glomerular basement membrane</td>
</tr>
<tr>
<td>AS/AR</td>
<td>Aortic stenosis/aortic regurgitation</td>
</tr>
<tr>
<td>ASD</td>
<td>Atrial septal defect</td>
</tr>
<tr>
<td>BSH</td>
<td>Buckinghamshire, Oxfordshire and West Berkshire</td>
</tr>
<tr>
<td>CKD</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>CTD</td>
<td>Connective tissue disease</td>
</tr>
<tr>
<td>GDM</td>
<td>Gestational diabetes mellitus</td>
</tr>
<tr>
<td>GN</td>
<td>Glomerulonephric</td>
</tr>
<tr>
<td>HUS</td>
<td>Haemolytic uraemic syndrome</td>
</tr>
<tr>
<td>ILD</td>
<td>Interstitial lung disease</td>
</tr>
<tr>
<td>MMRACE(UK)</td>
<td>Mothers and Babies: Reducing Risk through Audits and Confidential Services across the UK</td>
</tr>
<tr>
<td>MS/WR</td>
<td>Meningeal/encephalic/white matter reabsorption</td>
</tr>
<tr>
<td>NIKE</td>
<td>National Institute for Health and Care Excellence</td>
</tr>
<tr>
<td>PDA</td>
<td>Patent ductus arteriosus</td>
</tr>
<tr>
<td>PS/PR</td>
<td>Pulmonary stenosis/pulmonary regurgitation</td>
</tr>
<tr>
<td>RCOG</td>
<td>Royal College of Obstetricians and Gynaecologists</td>
</tr>
<tr>
<td>SLE</td>
<td>Systemic lupus erythematosus</td>
</tr>
<tr>
<td>T1</td>
<td>Type 1</td>
</tr>
<tr>
<td>T2</td>
<td>Type 2</td>
</tr>
<tr>
<td>TTP</td>
<td>Thrombotic thrombocytopenic purpura</td>
</tr>
<tr>
<td>VSD</td>
<td>Ventricular septal defect</td>
</tr>
<tr>
<td>VTE</td>
<td>Venous thromboembolic disease</td>
</tr>
</tbody>
</table>

#### Appendix 2 – OAHSN Thames Valley Maternal Medicine Network Regional guideline

<table>
<thead>
<tr>
<th>Respiratory</th>
<th>Respiratory Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystic fibrosis</td>
<td></td>
</tr>
<tr>
<td>Lung transplant</td>
<td></td>
</tr>
<tr>
<td>Restrictive lung disease (e.g. ILD, kyphoscoliosis) with FVC &lt;50%</td>
<td></td>
</tr>
<tr>
<td>Any pulmonary condition currently receiving immunotherapy</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rheumatology</th>
<th>Rheumatological Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ehlers-Danlos type VI (vascular type)</td>
<td></td>
</tr>
<tr>
<td>Scleroderma</td>
<td></td>
</tr>
<tr>
<td>Any CTD with evidence of extra-articular manifestations involving heart, lungs or kidneys</td>
<td></td>
</tr>
<tr>
<td>SLE with renal, cardiac or cerebral involvement</td>
<td></td>
</tr>
<tr>
<td>Vasculitis (anti-GBM or ANCA-positive)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neurology</th>
<th>Neurological Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myasthenia gravis</td>
<td></td>
</tr>
<tr>
<td>Previous ischaemic stroke</td>
<td></td>
</tr>
<tr>
<td>Previous intracranial haemorrhage</td>
<td></td>
</tr>
<tr>
<td>Untreated intracranial aneurism</td>
<td></td>
</tr>
<tr>
<td>Myotonic dystrophy</td>
<td></td>
</tr>
<tr>
<td>Pituitary apoplexy</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3: Transfer of women with medical comorbidities with TV

- Insert primary care/preconceptual issues when finalised
- Meets criteria for referral (Appendix 1)
- Obstetric, anaesthetic and medical agreement
- Referral for obstetric med opinion
- One off consultation/advice, with criteria for re-referral
- Regular local review
- Care in tertiary centre
- Local care

Appendix 4 - Referral Form

Referral for Obstetric Medicine Opinion or Transfer of Care

- Referrer's details:
  - Referrer's name
  - Role (circle one)
  - Referring hospital
  - Date of referral
  - Referrer's phone number
  - Referrer's email

- Patient's details:
  - Name
  - Date of birth
  - Current gestation
  - Address
  - Telephone

- Reason for referral
- Main reason for referral
- Please include past relevant investigations:

- Other relevant medical problems and medications used:
  - Please list all other medical problems (and medications, if any)
  - 1)
  - 2)
  - 3)
  - 4)

- Please include copies of all relevant correspondence and imaging results that are not accessible outside your Trust.
- If in doubt, please discuss these referrals with Dr Lucy MacKee or Charlotte Prew: suzie.mackee@nuh.nhs.uk
- Please email this referral to suzie.mackee@nuh.nhs.uk
- Completed/Awaiting review
- Date completed/Awaiting review
- Approved/Rejected for review
Appendix 2 – OAHSN Thames Valley Maternal Medicine Network Regional guideline

Recommended Actions:

Immediate:
Check all trusts have guidelines above (all Trusts)
Consultation period re guideline and recommended actions (all Trusts)

Before June 2018:
Discussion of on line tool to record all women meeting criteria for referral and embed within local clinical governance structure (LMK/ clinical governance group)
Meet with primary care to discuss identification of women at risk (LMK/ LH primary care reps)

June 2018:
Maternity Network Steering Group to ratify guidelines following
Embed referral guidelines (Appendix 3)
Develop plan for maternal medicine network

References