Reference Number: *UHBOBS109* **Version Number:** 2	**Date of Next Review:** *October 2020* **Previous Trust/LHB Reference Number:** UHB1

Fetal Heart Irregularities & Arrhythmias, Antenatal Management of

Introduction and Aim

This Clinical Guideline will aid clinicians in determining correct management of women who present with signs of antenatal Fetal Heart Irregularities & Arrhythmias

Scope

This procedure applies to all of our staff in all locations including those with honorary contracts

Equality Health Impact Assessment	*An Equality Health Impact Assessment (EHIA) has not been completed.*
Documents to read alongside this Procedure	*Antenatal Care Guideline*
Approved by	*Maternity Professional Forum*

Accountable Executive or Clinical Board Director	*Ruth Walker, Executive Nurse Director*
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Summary of reviews/amendments

Version Number	Date of Review Approved	Date Published	Summary of Amendments
UHB1	*Feb 2012*	*Feb 2012*	*New Document*

2	27/11/2017	15/01/2018	Reviewed and Updated by Orhan Uzun

Flow Chart for Initial Prenatal Management of Fetal Heart Arrhythmias Detected in Midwifery Led and Consultant Led Antenatal Clinics

If fetal heart rate is between 110 & 180 bpm (regardless of rhythm) give advice (see below) & check FH weekly – refer if FHR outside limits

Referral

By CMW / GP only if:

i – sustained HR >180bpm

ii – sustained HR < 110bpm

on auscultation (regardless of FH rhythm)

Seen in OAU same day

1) Full Antenatal Assessment
2) Abdominal Palpation
3) Fetal Auscultation → perform CTG >26/40
4) Baseline temperature, pulse, resps & blood pressure
5) Urinalysis

If no fetal heart arrhythmia present

1) Discharge
2) Follow-up as planned in ANC/CMW
3) Re-referral to OAU if any concerns regarding fetal movements or recurring fetal heart arrhythmia

If fetal heart arrhythmia present

1) Review by Senior Obstetrician for simple reassurance and advice (see below)
2) Weekly auscultation of the fetal heart by midwife
3) Routine antenatal ultrasound monitoring on a weekly basis should be satisfactory to exclude the development of sustained arrhythmia or fetal hydrops (The fetal heart rate is therefore being checked twice weekly)
4) Referral to Fetal Medicine / fetal echocardiogram not indicated unless there are signs of developing fetal hydrops or sustained HR arrhythmia i.e.
   i – sustained HR >180bpm
   ii – sustained HR < 110bpm
5) If CTG is impossible to interpret, then delivery by Caesarean section may be required. (However "physiological stress" of labour may precipitate conversion to a normal FHR)

Advice for women with benign arrhythmias

1) Abstaining from smoking, consuming stimulant beverages containing caffeine and foods containing excessive vanilla, chocolate etc.
2) Avoid stimulant medications such as Ephedrine, Salbutamol, nasal sprays, Otrivine etc.
3) The reduction of maternal stress would suffice in resolving these benign arrhythmias in the majority of fetuses
4) Women should be advised about fetal movements & to report any changes

Prenatal Management of Fetal Heart Arrhythmias in Fetal Medicine (1)

(Persistent Fetal Tachycardia >180bpm)

Urgent Referral to Fetal Medicine Department or to Consultant in Delivery Suite when there is no Fetal Medicine Consultant

Immediate Investigations and Treatment Following Referral

1) Fetal Medicine Consultant or Consultant Obstetrician at Delivery Suite contacts on call Paediatric/Fetal Cardiologist to discuss investigations and treatment including fetal echocardiogram
2) If the mother needs admission and treatment following steps are advised for the fetal medicine/obstetric consultant:
a) Urgent US scan of fetal well being to exclude any other abnormalities, hydrops etc.
b) Admit the mother under a named obstetrician
c) Maternal FBC, TFT's, LFT's and U&E's
d) Obtain maternal ECG
d) Urgent adult cardiology consultation to assess maternal cardiovascular status to decide safety of antiarrhythmic treatment.
e) Adult Cardiologist to review maternal ECG to assess baseline maternal HR, PR interval (PR should not prolong beyond 240ms from baseline, 2SD) , QRS duration (QRS duration should not increase by > 25% whilst on treatment) and QTc should not prolong beyond 480ms from baseline)
5) If all of the above criteria are met admit to Delivery Suite to commence Digoxin and Flecainide therapy

Drug Therapy to Reverse Persistent Fetal Tachycardia >180bpm

It has been found in previous cases that administrating Digoxin and Flecainide as a combination drug therapy has a better therapeutic effect in reversing persistent fetal tachycardia.

Maternal cardiovascular status should be checked by an adult cardiologist to make sure that there is no contraindication to either medications before commencing treatment.

Digoxin: Digoxin is usually given as a dose of 250 mcg tds. If there is hydrops or atrial flutter digoxin loading dose will be given as 500mcg bid 12 hourly in the first 24 hours. Day 2 onwards digoxin dose will be reduced to 250mcg tds.
3 to 5 days after digoxin treatment (or earlier if there is any sign of toxicity such as vision disturbance, yellow vision, severe dizziness), digoxin trough level should be checked at least 6 hours after the last dose is given. The levels should be maintained between 1.0-2.6 nmol/L or 0.8 to 2.0 mcg/L. Levels are analysed daily at Llandough in Toxicology (02920 716894 or direct dial 726894 and can be sent through the usual collection system specimen must be marked as urgent).

Flecainide: Flecainide is usually given as a dose of 100mg tds. 3 to 5 days after Flecainide treatment Flecainide trough levels should be checked at least 6 hours after the last dose is given. Flecainide levels should be maintained between 0.15 to 0.9 mg/L.
Levels are analysed weekly at Llandough in Toxicology (02920 716894 or direct dial 726894 – samples must be sent by taxi).
If therapeutic levels are attained and conversion does not occur then Flecainide can be increased to 200mg BID after discussion with the adult cardiologist and fetal cardiologist.

In case of abnormal digoxin levels or ECG changes adult cardiology consultation should be sought immediately.

Subsequent Prenatal Management of Persistent Fetal Tachycardia >180bpm

1) Woman must be managed jointly by a team consisting of Adult Cardiologist Paediatric/Fetal Cardiologist and a Fetal Medicine Consultant with an appropriate input and counselling by a Consultant Neonatologist

2) At least weekly visits to FMD for:
- a – Maternal serum levels of Flecainide and Digoxin to ensure therapeutic levels and avoid toxicity
- b – ECG (PR interval should not be prolonged beyond 240ms from baseline, 2SD) (QRS duration should not increase more than > 25% whilst on treatment) and QTc should not prolong beyond 480ms from the baseline)
- c – FBC & U&E
- d – USS to assess fetal well being including fetal heart rate and rhythm

3) Will have regular fetal medicine and fetal echocardiogram checks

4) The mother should be delivered at UHW or alternative suitable obstetric unit to enable early assessment of the baby by a Paediatric Cardiologist or Paediatrician with a Special Interest in Cardiology i.e., ECG, echocardiogram, Holter

4) Mode and timing of delivery will largely depend on fetal heart rate and rhythm and general condition of the fetus. If unable to undertake continuous fetal heart monitoring in labour, then Caesarean Section is the preferred method of delivery. If the heart rate is less than 180 bpm normal delivery should be considered.

Prenatal Management of Fetal Heart Arrhythmias (2)

(Persistent Fetal Bradycardia <110bpm)

Urgent Referral to Fetal Medicine Department or to Consultant in Delivery Suite when there is no Fetal Medicine Consultant

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Immediate Investigations and Treatment Following Referral

1) Fetal Medicine Consultant or Consultant Obstetrician at Delivery Suite contacts on call Paediatric/Fetal Cardiologist to discuss investigations and treatment including fetal echocardiogram
2) If the mother needs admission and treatment following steps are advised for the fetal medicine/obstetric consultant:
a) Urgent US scan of fetal well being to exclude any other abnormalities, hydrops etc.
3) Urgent Anti Ro and Anti La antibody screen

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Drug Therapy to Reverse Persistent Fetal Bradycardia >100bpm

Betamimetics (Salbutamol) and Dexamethasone are the drug of choice
Doses: Salbutamol 2-8mg BD, Dexamethasone 4-8mg OD two seeks then 2-4mg OD continue as appropriate

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Subsequent Prenatal Management of Persistent Fetal Bradycardia <110bpm

1) Woman must be managed jointly by a Fetal Medicine Consultant, Adult Cardiologist Paediatric/Fetal Cardiologist with appropriate input and counselling by a Consultant Neonatologist
2) At least weekly visits to FMD for USS to assess fetal well being including fetal heart rate and rhythm
3) Weekly auscultation by a midwife (Thus fetal heart rate is being checked twice weekly), if heart rate falls below 60bpm – urgent (same day) referral to Fetal Medicine or Paediatric Cardiology
4) Will have regular fetal echocardiogram checks and the mother should be delivered at UHW to enable early assessment of the baby by a with Paediatric Cardiologist
5) Mode and timing of delivery will largely depend on fetal heart rate and rhythm and general condition of the fetus. If unable to undertake continuous fetal heart monitoring in labour Caesarean Section is the preferred method of delivery

Incidence of Prenatal Fetal Heart Arrhythmia:

"*Premature atrial and ventricle contractions are not infrequently seen in the normal fetus, newborn population and children alike and commonly they do not need any treatment or investigation or any further follow up. However, although it is rare, less than 2% of patients with an irregular heart rate may go on to develop fast or slow hearty rate during or after pregnancy and may continue to have an irregular heart rate following birth but all can be dealt with appropriately."*

Antenatal Management of Prenatal Fetal Heart Arrhythmia:

"On the basis of ectopic beats or irregular heart rate we would not recommend a routine cardiac referral but simple obstetric heart rate check twice weekly by a midwife and routine antenatal ultrasound monitoring on a weekly basis should be satisfactory to exclude the development of sustained arrhythmia or hydrops"

"Simple reassurance and advice for abstaining from smoking, consuming excess amount of calcium containing foods (milk products), stimulant beverages (Excess caffeine, tea, coffee, hot chocolate, coke, energy drinks) and food (excess vanilla, chocolate etc.) and avoiding stimulant medications (Ephedrine, Salbutamol, nasal sprays, Otrivine etc.) with the reduction of maternal stress would suffice in resolving these benign ectopic beats in the majority of cases in fetal life."

"Even if they do not resolve, they are unlikely to cause significant haemodynamic abnormalities unless they are a sign of fetal distress or associated oligohydramnios or polyhydramnios, all of which are beyond my expertise. I am sure the patient's obstetrician, midwife and radiology colleagues would be performing routine CTG's and other investigations to exclude fetal distress in suspected cases, since it may result in unexpected fetal loss. Patients would also be advised to monitor fetal movements in such cases and asked to come to hospital immediately if fetal movement is significantly reduced."

"We would advise that patients with irregular heart rate in their fetuses should be simply reassured and routine weekly obstetric ultrasound be performed, just to make sure that there is no emerging sustained bradycardia (less the 80 bpm) or tachycardia (more than 180 bpm) or development of fetal distress or fetal hydrops."

"If the heart rate irregularity becomes increased in intensity, occurring more often than 1 in every 5 normal beats, or does not resolve within two weeks with the usual recommendations or if it results in fetal compromise and hydrops, than a cardiac specialist opinion should be sought."

" In such cases where there is genuine obstetric concern about the wellbeing of the fetus or the mother and, in the case of sustained arrhythmia, we would strongly recommend that the individual consultant should ring the on-call

paediatric cardiologist to discuss the best type of action, investigation and recommendation"

Background to Management of Prenatal Fetal Heart Irregularities & Arrhy **Appendix 2**

Extrasystoles were first described in 1890 by Sir James Mackenzie when he observed that the chambers of the heart could beat out of their correct order.1

The normal heart rate and rhythm is determined by the sino-atrial node in the right atrium which acts as the pacemaker for the heart. This node discharges electric current through the atria causing them to contract. The electric current then passes through the atrio-ventricular node which lies within the lower interatrial septum. Electrical impulses pass from here along the right and left bundles of His and excite the ventricular muscles causing their contraction. The sino-atrial node has a nerve supply and is hormone sensitive which allows regulation of the heart beat according to different activities, stress and excitement.

Extrasystoles are essentially extra beats, or contractions, which interrupt the normal regular rhythm of the heart. They occur when there is electrical discharge from somewhere in the heart other than the sino-atrial node. Atrial extrasystoles occur when the discharge arises from the atria and ventricular extrasystoles occur when the discharge arises from the ventricles.

Atrial extrasystoles
These are common in healthy people with normal hearts, especially with advancing age. They can also occur when there is increased pressure on the atria such as in cardiac failure or mitral valve disease and, in such cases, may occur prior to the development of atrial fibrillation. They are exacerbated by alcohol and caffeine.2

Ventricular extrasystoles
These can occur in people with normal hearts but are more commonly found in those with structural heart disease. They are the commonest type of arrhythmia that occurs after myocardial infarction. They may also occur in severe left ventricular hypertrophy, hypertrophic cardiomyopathy and congestive cardiac failure.2

Significance of extrasystoles
Extrasystoles can occur frequently in people with completely normal hearts. In themselves, they do not cause any problems. However, they can also be a feature of certain cardiac disease. Usually, ventricular extrasystoles have no significance but rarely, they may induce ventricular fibrillation and can be associated with sudden cardiac death.

Structurally normal hearts
The British Heart Foundation Factfile from March 2005 states that ventricular ectopics, in the absence of structural heart disease or a family history of sudden death, are benign and do not require specialist intervention or specific drug therapy.3 Another source states that long-term follow-up of normal people with many extrasystoles reveals that they have the same life expectancy as normal people with no extrasystoles.2 However, their prognostic significance is a matter of controversy. If extrasystoles, in people with otherwise normal hearts, occur during exercise and in the recovery period after exercise, an increased mortality risk does seem to exist.4,5

A recent Danish study has also shown that apparently healthy, middle-aged and elderly subjects with frequent ventricular premature complexes, defined as ? 30/hour, have a poor prognosis.6

Structurally abnormal hearts

In those with structurally abnormal hearts, the presence of ventricular extrasystoles does seem to impact mortality. Frequent ectopy marks an increased risk of sudden cardiac death and specialist advice should be sought.3 Those with more than 10 extrasystoles per hour after myocardial infarction have an increased risk of mortality, particularly sudden death. Frequent extrasystoles also have a negative prognosis in congestive cardiac failure.

Risk factors for extrasystoles

- Can occur in normal hearts where the prevalence of extrasystoles increases with age
- Acute myocardial infarction
- Structural heart disease, including valvular heart disease, cardiomyopathy, severe ventricular hypertrophy
- Congestive cardiac failure
- Electrolyte disturbances, including hypokalaemia, hypomagnesemia, hypercalcaemia
- Drugs, including digoxin, aminophylline, tricyclic antidepressants, cocaine, amphetamines
- Caffeine excess
- Alcohol excess
- Infection
- Stress
- Surgery
- Hyperthyroidism

Presentation

- Palpitations are the main reported symptom. There is an awareness of a change in the force, rate or rhythm of the heart beat. Extrasystoles usually occur after a normal heart beat and are followed by a pause until the normal heart rhythm returns. Therefore, they may be felt as 'missed' or 'skipped' beats. Alternatively, they can be felt as a thud or strange sensation like a somersault in the chest. Other people may experience one or two extra heart beats. They can be uncomfortable and cause significant anxiety in some people.
- Light-headedness and syncope
- Atypical chest pain
- Fatigue
- As a coincidental finding on a routine ECG

Investigations

- 12 lead ECG: The extrasystoles will only be picked up if they are occurring at the time that the ECG is performed.

- Ambulatory ECG monitoring: It is more likely that ambulatory ECG monitoring will pick up the extrasystoles.
- Echocardiography: This provides information about ventricular function and heart structure and can detect valvular and other abnormalities.
- Electrolyte levels: Including potassium, calcium and magnesium.
- Thyroid function tests: Hyperthyroidism should be treated if detected.
- Exercise stress testing: This may be needed if ischaemic heart disease is suspected or there is an exercise-induced arrhythmia.

ECG findings

In atrial extrasystoles there is a premature P wave which looks different from a normal P wave and may be hidden in the ST segment or T wave of the preceding sinus beat. It may be followed by either a normal QRS complex, or the PR interval may be prolonged, or the impulse may not be conducted at all.

The ECG findings in ventricular extrasystoles show wide, bizarre-looking QRS complexes that are not preceded by a P wave.2

Management

Structurally normal hearts

- Reassurance: In someone with an otherwise normal heart, the key management principle is reassurance that extrasystoles are not dangerous.
- Avoidance of caffeine, nicotine and alcohol: This may help reduce the frequency and sometimes abolish the extrasystoles.
- Drug treatment: Anxiolytic drugs may be helpful. Beta-blockers and calcium channel blockers may be needed in some symptomatic people. Care must be taken as the risk of treatment may outweigh the benefits as anti-arrhythmic drugs may actually be pro-arrhythmic. Specialist advice should be taken.
- Catheter ablation of the ectopic focus: This is rarely used and only if symptoms warrant.

Hearts with structural abnormalities

- Treatment of the underlying heart disease: This is the main priority, for example reperfusion after myocardial infarction and optimal treatment for congestive cardiac failure.
- Electrolyte balance: This should be monitored and corrected as necessary.
- Blood pressure: This should be controlled.
- Anti-arrhythmic drug treatment: The Cardiac Arrhythmia Suppression Trial was started with the aim of looking at the effects of arrhythmia suppression after myocardial infarction. It was terminated early after preliminary results showed that the suppression of ventricular arrhythmias did not improve survival and, in fact, caused an increase in mortality. The drugs involved in this trial were flecainide, encainide and moricizine.8 Beta-blockers are currently the drug of choice for the prophylaxis and treatment of arrhythmias post myocardial infarction.
- Implantable cardiac defibrillators: These may be needed in patients deemed to be at high risk of sudden cardiac death.

Prevention

Avoidance of aggravating factors such as stress, caffeine, alcohol and nicotine.

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Footnote from Dr Uzun:

It is recommend to also read the AHA Scientific Statement (2014): Diagnosis and Treatment of Fetal Cardiac Disease. Available online at:
http://circ.ahajournals.org/content/early/2014/04/23/01.cir.0000437597.44550.5d

Table 14. Antiarrhythmic Drugs

Drug	Therapeutic Maternal Dose Range	Therapeutic Level and Effect	Toxicity
Digoxin	LO: 1200-1500 µg/24 h IV, divided every 8 h MD: 375-750 µg/d divided every 8 to 12 h PO (Fetal intramuscular dose: 88 µg/kg Q12 h, repeat 2 times)	0.7-2.0 ng/mL Nausea, fatigue, loss of appetite, sinus bradycardia, first-degree AV block, rare nocturnal Wenckebach AV block	Nausea/vomiting +++, sinus bradyarrhythmia or AV block +++, proarrhythmia Fetal intramuscular: sciatic nerve injury or skin laceration from injection
Flecainide	100-300 mg/d divided every 8-12 h PO	0.2-1.0 µg/mL Mild P and QRS widening, first-degree AV block, QTc 0.48 s, headache	Visual/CNS symptoms, BBB, QTc ::::0.48 s, maternal/fetal proarrhythmia
Sotalol	160-480 mg/d divided every 8 to 12 h PO	Levels not monitored Bradycardia, first-degree AV block, P and QRS widening, QTc 0.48 s	Nausea/vomiting, dizziness, QTc ::::0.48 s, fatigue, BBB, maternal/fetal proarrhythmia
Amiodarone	LO: 1800-2400 mg/d divided every 6 h for 48 h PO; lower {800-1200 mg PO) if prior drug therapy MD: 200-600 mg/d PO Consider discontinuation of drug and transition to another agent once rhythm is converted or hydrops has resolved.	0.7-2.8 µg/mL Maternal/fetal sinus bradycardia, decreased appetite, first-degree AV block, P and QRS widening, QTc 0.48 s	Nausea/vomiting ++, thyroid dysfunction ++, photosensitivity rash, thrombocytopenia, BBB, QTc ::::0.48 s, maternal/fetal proarrhythmia, fetal torsades with LOTS, fetal goiter, neurodevelopmental concerns
Propranolol	60-320 mg/d divided every 6 h PO	25-140 ng/mL First-degree AV block, bradycardia, increased uterine tone	Fatigue, bradycardia +++, hypotension +++, AV block, fetal growth restriction, increased uterine tone
Lidocaine	LO: 1-1.5 mg/kg IV followed by infusion of 1-4 mg/min	1.5-5 µg/mL	Nausea/vomiting ++, CNS symptoms, proarrhythmia
Mexiletine	600-900 mg/day divided every 8 h PO	0.5-2 µg/mL	Nausea/vomiting ++, CNS symptoms, proarrhythmia
Magnesium sulfate	LO: 2-6 g IV over 20 min followed by 1-2 g/h Treatment for >48 h is not recommended but redosing may be considered if VT recurs	<6 mEq/L Monitor patellar reflex	Fatigue, CNS symptoms, STOP for loss of patellar reflex and/or levels of >6 mEq/L Levels >5 mEq/L associated with maternal changes on ECG and proarrhythmia

Proarrhythmia means worsening of an arrhythmia as the result of treatment.

AV indicates atrioventricular block; BBB, bundle-branch block; CNS, central nervous system; ECG, electrocardiogram; IV, intravenously; LO, loading dose; LOTS, long QT syndrome; MD, maintenance dose; PO, orally; VT, ventricular tachyarrhythmia; and +++, very common; ++, common; and +, occasional.