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Authors' Title:	**Mr. D. Churchill** **Dr. A. Viswasnath** **Dr. M. Ghosh**
Policy Location:	**Intranet Antenatal Gudelines** **Delivery Suite Guidelines**

Content

PREGNANCY WITH PRE-EXISTING DIABETES MELLITUS

Pregnancy with pre-existing diabetes mellitus is known to be associated with adverse pregnancy outcomes namely miscarriage, congenital malformation, stillbirth, preterm labour, preeclampsia, macrosomia, birth injury, perinatal morbidity and mortality. The risk of the complications can be reduced by preconception care and care throughout the pregnancy.

Patient with pre-existing diabetes mellitus identified in community or at any clinic in New Cross Hospital should be referred to the next joint diabetic antenatal clinic.

The management comprises of the following parts:

1. Pre-conception Care
2. Antepartum Care
3. Intrapartum Care
4. Postnatal Care

Pre-conception care for women with pre-existing diabetes

***Aim**: To empower women with diabetes to make the experience of pregnancy and childbirth a positive one by providing information, advice and support that will help to reduce the risks of adverse pregnancy outcomes for mother and baby.*

Importance of good glycaemic control

- Establishing good glycaemic control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death.

- The risks can be reduced but not eliminated.

Referral for pre-conception care:

- Referrals can be made by fax or by telephone by GPs or directly by women contemplating pregnancy at following numbers:

1. Combined Antenatal clinic on 01902 695145,
2. Diabetes Specialist Midwife on 01902 695146 and
3. Diabetes Centre on 01902 695317.

- Clinic appointments will be flexible to fit in with the work/home commitments of the prospective parents.

Information about diabetes in pregnancy

- Women planning pregnancy should be offered information about how diabetes affects pregnancy and how pregnancy affects diabetes.

Support during pregnancy

- Additional time and effort is required to manage diabetes during pregnancy and that there will be frequent contact with healthcare professionals. Women should be given information about the local arrangements for support, including emergency contact numbers.

Contraception

- Contraception is recommended until good glycaemic control has been established.

Dietary review:

- Women should be offered a dietetic review during pre-conception care. They should receive advice about balanced diet and information regarding carbohydrate counting/assimilation if necessary.

- Women who have a body mass index above 27 kg/m^2 should be offered advice regarding weight loss prior to conception.

Medications:

- Folic acid: Women should be advised to take folic acid (5 mg/day) prior to conception and until 12 weeks of gestation to reduce the risk of neural tube defect.

- Antihypertensive Medication: Angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists should be discontinued before conception. Alternative antihypertensive agents suitable for use during pregnancy should be substituted.

- Statins: Statins should be discontinued before pregnancy or as soon as pregnancy is confirmed.

Glycaemic control:

- Home Glucose Monitoring: Regular monitoring of blood glucose at home is recommended and an up to date glucometer should be offered if necessary. Women requiring intensification of hypoglycaemic therapy are advised to increase the frequency of monitoring to include fasting, pre and postprandial levels.

- Women with type-1 diabetes should be offered ketone strips and advice on testing.

- Individualised targets for self-monitoring of blood glucose should be agreed taking into account the risk of hypoglycaemia.

- **Pre meals 4-6 mmol/l**
- **1 hour post prandial <7.8 mmol/l**

- Women are encouraged to maintain their HbA_{1c} as close to normal as possible (preferably ~ 6.1%) for at least 3 months prior to conception. Women with HbA_{1c} above 10% should be strongly advised to avoid conception.

- Continuous subcutaneous insulin infusion should be considered for women who are unable to achieve the glycaemic targets.

- Hypoglycaemia: Patients should be educated in self-management of hypoglycaemia and glucogel should be issued. Women with type-1 diabetes should be provided with glucagon and appropriate training.

- Women with type-2 diabetes may be advised to use metformin as an adjunct or alternative to insulin in the preconception period. All other oral hypoglycaemic agents should be discontinued before pregnancy and insulin substituted.

- Rapid-acting insulin analogues (aspart and lispro) do not adversely affect the pregnancy or the health of the fetus or newborn baby and are safe during pregnancy.

- There is insufficient evidence regarding the use of long-acting insulin analogues during pregnancy. Therefore isophane insulin (also known as NPH insulin) remains the first choice during pregnancy. In some women, insulin analogues may offer benefits over isophane insulin in terms of flexibility and improved glycaemic control with less risk of hypoglycaemia. Informed consent should be obtained and documented if women wish to use long-acting analogue insulin in pregnancy.

Retinal assessment in the pre-conception period:

- Women should be offered retinal assessment at their first appointment (unless an annual retinal assessment has occurred within the previous 3 months)

- Retinal assessment should be carried out by digital screening as recommended by the UK National Screening Committee. Women should be encouraged to make an appointment with an accredited optometrist for digital screening. Walk-in screening service is available at the diabetes centre, New Cross Hospital from 9:00 AM to 1:00 PM (Monday to Friday).

- Women with significant retinopathy should be advised to avoid rapid optimization of glycaemic control and to defer pregnancy until retinopathy is treated and is stable.

Renal assessment in the pre-conception period:

- Women with diabetes should be offered a renal assessment, including urine for estimation of microalbuminuria

- Referral to a nephrologist should be considered if serum creatinine is abnormal (120 micromol/litre or more or the estimated glomerular filtration rate is less than 45 ml/minute/1.73 m^2), or in the presence of significant proteinuria before discontinuing contraception.

Investigations:

- Bloods: FBC, HbA1c, TFT's, LFT's, U&E's and

- Urine: Urine for microalbuminuria if not already requested in preceding 3 months.

- Check immunity status for Rubella.

Smoking cessation:

- All women planning a pregnancy and who smoke should be advised with respect to smoking cessation and referred to smoking cessation services if required.

Antenatal care for women with pre-existing diabetes

Aim: To provide high quality, vigilant antenatal care, through intensive monitoring, which detects and manages complications efficiently and effectively, encourages and helps women with diabetes to achieve a safe, satisfying experience where mortality and morbidity rates are kept at the lowest levels possible.

Initial booking visit

- Early booking between 6-9 weeks to the joint diabetes/antenatal clinic.

Clinical assessment

- A full medical, obstetric, family and social history should be taken at the booking appointment. Appointments are to be made for 08.30 hrs on a Friday morning.

- Routine information for pregnancy to be given.
- Examination:
  a) Baseline blood pressure
  b) Urinalysis paying particular attention for any signs of a urine infection, ketones, glucose and/or protein.

- Review by the diabetes team to assess glycaemic control and adjustment of dose of insulin or metformin.

- Retinal examination (Digital retinal photography) for the detection of retinopathy should be arranged unless it has been done in the previous 3 months. The Wolverhampton Retinal Screening Programme should be informed by completing the 'Notification form' and the woman should be given the information leaflet named 'Diabetic retinopathy screening during pregnancy'.

Investigations

- Routine bloods for pregnancy are taken, plus thyroid function test, urea and electrolytes, HbA1c and blood glucose. A urine sample for microalbuminuria estimation should be sent.
- Initial scan for viability and gestation is to be performed.

Management

Glycaemic control

Monitoring:

- The glucose monitor should be quality checked and an up to date meter issued if necessary.
- Monitoring technique should be assessed

- Women with type-1 diabetes should be issued ketone strips and advice about testing
- Women should be advised to undertake self-monitoring of blood glucose (up to 5-6 times per day) to include fasting and a mixture of pre-and postprandial levels.

Hypoglycaemia:

- Risk of hypoglycaemia is increased in pregnancy and women should be warned regarding reduced awareness especially in the first trimester.

- Women with diabetes should be educated in self-management of hypoglycaemia and glucogel should be issued. Women with type-1 diabetes should be provided with Glucagon and appropriate training.

- Salient aspects relating to driving should be discussed and documented.

Glycaemic targets:

- Individualised targets for self-monitoring of blood glucose should be agreed taking into account the risk of hypoglycaemia.

- If it is safely achievable, women are encouraged to maintain glycaemic targets as close to normal as possible:

- **Fasting 4-6 mmol/L**
- **Pre meals 4-6 mmol/L**
- **1 hour post prandial <7.8 mmol/L**

Diet & lifestyle:

- Dietetic review should be offered preferably at the booking visit.

- Regular physical activity should be encouraged.

Insulin type & regime:

- Intensive insulin regime with multiple daily injections is usually necessary to achieve good glycaemic control.

- Continuous subcutaneous insulin infusion should be considered for women who are unable to achieve the glycaemic targets during pregnancy.

- Rapid-acting insulin analogues (aspart and lispro) do not adversely affect the pregnancy or the health of the fetus or newborn baby and are safe during pregnancy.

- Isophane insulin (also known as NPH insulin) remains the first choice during pregnancy. In some women, insulin analogues may offer benefits over isophane insulin in terms of flexibility and improved glycaemic control with less risk of hypoglycaemia. Informed consent should be obtained and

documented if women wish to continue long-acting analogue insulin in pregnancy.

Ketoacidosis /'Sick days':

- Women with type-1 diabetes are susceptible to develop ketoacidosis during pregnancy.

- Women should advised to test for urinary ketones if glucose is >12 mmol/L or if they are unwell, especially if vomiting, irrespective of the glucose value.

- In case of suspected ketoacidosis, the woman needs urgent medical attention. The diabetes outreach can be contacted on 01902 695649 or via hospital switch board (01902 307999) during working hours. The midwife on the delivery suite should be contacted on 01902 694031 out of hours.

- The women with suspected ketoacidosis should be admitted.

- The Diabetes Specialist Outreach Team (diabetes outreach) or the on-call medical team (out of hours) should be informed immediately.

- The contact numbers are :

1. **Bleep 7461 (Registrar on Emergency Assessment Unit)**

2. **Extension: 5317 (Diabetes Centre).**

- If ketoacidosis is confirmed then intensive management is indicated and will involve prescription of sliding scale of insulin (refer to hospital DKA guidelines). Both obstetric and medical consultant should be informed and patient may need to be managed on the high dependency unit.

Review by Diabetes Specialist Outreach Team

- The Diabetes Specialist Outreach Team should be informed if there are any glycemia related issues. The team is based at Diabetes Centre and can be contacted via switchboard.

Retinopathy:

- Women should be offered retinal assessment at their first appointment (unless an annual retinal assessment has occurred within the previous 3 months)

- Additional screening is necessary between 16-20 weeks if mild background retinopathy is noted at booking.

- Women should receive information regarding digital screening in pregnancy (leaflet) and Wolverhampton Digital retinal screening programme should be notified (notification form). Facilities to undertake digital screening during pregnancy is available at the diabetes centre, New Cross Hospital. A walk-in screening service is available (without the need for prior appointment) at the

diabetes centre, New Cross Hospital from 9:00 AM to 1:00 PM (Monday to Friday). To book an appointment for an afternoon clinic please contact retinal screening administration team on 01902 695629

- Pre-existing retinopathy can deteriorate during the pregnancy. Women with more than background retinopathy noted during pregnancy should be referred to the Hospital Eye Service for further assessment.

- Women with pre-existing retinopathy may already be under ophthalmology care. In such cases, the ophthalmologist should be informed with a request for an earlier review and close follow-up during pregnancy and post partum.

Nephropathy & Hypertension:

- Pre-existing nephropathy can be associated with poor pregnancy outcome. Proteinuria transiently increases during pregnancy returning to normal in the post partum period.

- A full renal assessment (Blood for U&E and Urine for dipstick and estimation of microalbumin) should be undertaken at booking.

- Women with normal microalbuminuria do not need any further testing during pregnancy.

- All women with nephropathy need close monitoring during pregnancy. Referral to the nephrologist should be considered if serum creatinine is abnormal (120 micromol/litre or more) or the estimated glomerular filtration rate (eGFR) is less than 45 ml/minute/1.73 m^2, or in the presence of significant proteinuria not attributed to pre-eclampsia. All referrals should be discussed with the consultant or senior registrar.

- Threshold to initiate treatment for hypertension and targets should be determined based on individual cases.

- Preeclampsia should be managed as per the hospital guidelines.

Medications:

- Folic acid (5 mg/day) should be given until 12 weeks of gestation.

- Angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists should be discontinued as soon as pregnancy is confirmed. Alternative antihypertensive agents suitable for use during pregnancy should be substituted.

- Statins should be discontinued as soon as pregnancy is confirmed.

Smoking cessation: All pregnant women who smoke should be encouraged and supported to stop. A referral to the smoking cessation service should be made if appropriate.

Schedule of Antenatal visits

- The frequency of visits will depend on the individual woman's glucose control and the presence any diabetic or obstetric complications. The schedule of visits for obstetric care is shown in the table below.

- Contact with the diabetic team must be on a fortnightly basis. This can be through the diabetic antenatal clinic or via telephone.

- Each woman must be risk assessed at each visit and the surveillance through the antenatal clinic is increased if problems occur. After 36 weeks monitoring must be tailored to the individual woman's condition and will depend upon her diabetic control and obstetric state.

Clinical Assessment at subsequent visit after booking

- Antenatal checks are done as for all routine pregnancies. Blood pressure, urine, abdominal palpation documenting the symphysio-fundal height, presentation and fetal heart rate.

- Signs and symptoms of urinary or vaginal infection need to be investigated and treated promptly, often before microbiological confirmation is received.

- Digital retinal imaging should be repeated in the 2nd and 3rd trimester

- Routine urinalysis and blood pressure readings are closely monitored as women with diabetes are at a high risk of developing pre-eclampsia.

Screening

- Mothers must be offered screening for Down's syndrome with the first trimester screening test.

- Mothers must be offered an anomaly scan between 18 and 20 weeks gestation.

Investigations

- HbA1c estimation should be requested at booking and to be repeated at interval of 8 weeks.

- Ultrasound scan for fetal growth and liquor volume is performed at regular intervals from 28 weeks of gestation. It helps in early detection of macrosomia with polyhydramnios or intra uterine growth restriction with oligohydramnios.

- At 28 weeks give the patient information on monitoring of fetal movements.

36 weeks onwards

- Visits are tailored to each individual woman but a minimum weekly contact by telephone or antenatal visits to check the glucose readings and making necessary adjustments to the insulin doses.

- Ultrasound scans for growth and liquor volume are to be done every fortnight.

- Weekly scans for liquor volumes and umbilical artery doppler, will be needed unless the woman is well controlled with diet, metformin or insulin.

- It may be necessary to supplement monitoring with CTG. **(**This will be decided by the Consultant)

- The woman is asked to closely monitor the baby's movements and to attend the hospital for monitoring if they are reduced. This should include a CTG and an umbilical artery Doppler measurement.

- Mode of delivery should be discussed by the consultant or senior obstetrician between 34 - 36 weeks and agreed with the woman prior to admission for delivery.

- Delivery should be planned after 38 weeks gestation in women with well controlled diabetes and no other complications.

- **Any reduction in insulin requirements without a reason is treated with caution and close monitoring of both the mother and baby are necessary. Referral for consultant obstetric opinion is required in this instance**.

Schedule of Obstetric appointments

Appointment	***Care of the woman during pregnancy***
First appointment; ideally 6 - 9 wks	Advice on optimising glucose control. Obstetric booking reviewing current medication. Booking bloods. Baseline HbA1c & it should be repeated 8 weekly. Offer retinal assessment
10-13 weeks	Scan to confirm viability. Obstetric review to set dates & discuss any issues regarding screening. Review by diabetic team.
16-18 weeks	Review by both diabetic and obstetric team
20 weeks	Anomaly scan including 4-chamber view of heart and outflow tracts, followed by review by obstetric team
24-25 weeks	Antenatal review (both the teams) and HbA1c
28–29 weeks	Antenatal assessment by both teams USS for fetal growth, LV and Umbilical Artery Doppler study
32 -33 weeks	Antenatal assessment by both teams USS for fetal growth, LV and Umbilical Artery Doppler study
34-35 weeks	Antenatal assessment and discussion re plans for delivery
36-37 weeks	Antenatal assessment by both teams USS for fetal growth, LV and Umbilical Artery Doppler study
38 weeks	Antenatal assessment Obstetric directed assessment
39 weeks	Antenatal assessment Obstetric directed assessment
40 weeks	Antenatal assessment Obstetric directed assessment

Intrapartum care of women with Pre-existing Diabetes

Plan of delivery:

The decision on the mode and time of delivery should be taken by 36 weeks after discussing with the consultant.

- **Induction of labour** Induction of labour should be arranged after 38 weeks gestation depending on the woman's diabetic control and obstetric state. The pregnancy should only progress to 40 weeks after discussing with the Consultant Obstetrician.

- For women with **macrosomic babies** a discussion must take place on the risks and benefits of a vaginal delivery.

- Induction should be commenced on the **Maternity Triage Unit** according to the guidelines for normal induction of labour. A full and comprehensive risk assessment should be performed and documented on admission to central delivery suite.

- If other pregnancy complications are present, induction should take place on the Delivery suite informing them in advance.

- The woman continues on her present regime of insulin and diet until in established labour.

Management of labour

- All women must have continuous electronic fetal heart rate monitoring when in established labour. Any significant abnormalities on the C.T.G. should be investigated with fetal blood sampling.

- Once in established labour the woman should remain N.B.M (nil by mouth). All women should have at least hourly glucose monitoring during labour. If the woman has required insulin during the pregnancy, sliding scale of insulin with 5% Dextrose is commenced as per the regimen (Table 1).

- Regularly test the urine (at least every 2 hours) during labour for ketones especially if blood glucose is more than10 mmol/l. If ketones appear, obstetric and diabetes teams should be contacted.

- Regular assessment in labour for diagnosis of slow progress in established labour

First stage of labour

- V/E at 4hourly interval and to actively manage slow progress once diagnosed.
- The progress should be 1cm/hour.
- The slow progress must be treated appropriately with a syntocinon infusion given through a **separate i.v. cannula** (if the woman is on sliding scale of insulin).

Second stage of labour

- Women with epidural analgesia: To wait for 1 hour before pushing unless there is any concern for fetal or maternal wellbeing.
- Women without epidural analgesia: May start pushing from the beginning of second stage.
- An obstetric registrar review is to be considered after 1 hour of pushing if the woman has not delivered or delivery is not imminent.
- All deliveries should be achieved within 3 hours of total second stage(in women on epidural analgesia) and within 2 hours of total second stage(in women without epidural analgesia) **The syntocinon augmentation in second stage is to be taken with caution.**
- A senior midwife must be present at the delivery and an Obstetric Registrar to be readily available if needed.
- Paediatricians must be informed when the woman is about to give birth.

Elective Caesarean Section in women with Pre-existing Diabetes

A. Elective Caesarean section before 38+6 weeks

Women should have antenatal steroid

- All women need to be admitted the previous day on to the antenatal ward.
- 2 doses of 12 mg Betamethasone to be administered IM 12 hours apart.
- Women should to be admitted at 8AM and the first dose of steroid should be given by 9AM.
- Sliding scale should be started in all patients.
- The admitting midwife needs to ensure that the preoperative bloods are done.

B. Elective Caesarean section after 38+6 weeks

Women **do not need** to have antenatal steroid

Women on insulin

- Admit the day before the scheduled operation onto the antenatal ward.
- The admitting midwife needs to ensure that the preoperative bloods are done
- Routine pre-op procedure including a computerised C.T.G. should be done.
- The mother should have her normal bedtime insulin dose and a snack before being kept **N.B.M**. (nil by mouth) from midnight.
- If a woman becomes hypoglycaemic during the night she should be treated with Dextrose tabs as these will dissolve quickly in the mouth and are not contra indicated when N.B.M (nil by mouth). Along with the treatment, arrangement for transfer to the delivery suite should be made urgently. The woman must then be commenced on a sliding scale.
- On the day of caesarean section-The morning insulin dose should be omitted and sliding scale of insulin should be started between 07.00 - 08.00 hrs. **The infusion should not be delayed for any reason.**

2. Women not on insulin- Do not need admission on the previous day.

Management of threatened preterm labour in women with Pre-existing Diabetes

- If delivery is anticipated before 36 weeks gestation, corticosteroids must be given for the prevention of neonatal respiratory distress syndrome.
- Individualised plan to be made for each patient.
- Atosiban can be used to arrest labour if necessary.
- Neonatal Unit to be informed.

Antenatal steroid administration in women with Pre-existing Diabetes

Indication

1. Threatened preterm labour before 36 weeks
2. Planned caesarean section before 38+6 weeks
3. Delivery planned before 36 weeks for fetal or maternal reason

- 2 doses of 12 mg Betamethasone to be administered IM 12 hours apart.
- Sliding scale should be started in all patients.
- Sliding scale should be continued for 24 hrs after the 2nd dose of betamethasone.

Sliding scale insulin regime in women with Pre-existing Diabetes

- A combination of Insulin and Dextrose is given via the same cannula using a 'Y' connector.
- Insulin sliding scale is commenced during labour, after steroid injection for suspected pre-term labour and if the mother's glucose control becomes unstable or needs to be nil by mouth for any reason.
- Insulin infusion: 50 units of Human Actrapid insulin in 50 mls of 0.9% Normal Saline in a 50 ml syringe. (1ml = 1unit of insulin) This is given via a syringe pump and the rate of infusion is determined by the sliding scale.
- Glucose infusion: 5% Dextrose 1,000mls with 20 mmol KCL (potassium chloride) at 100mls/hr using the Gemini pump for accuracy. (* Change to 10% dextrose infusion when Blood Glucose<4mmol/L)
- Monitor blood glucose hourly (30 minutes if the insulin rate has been altered)
- Aim to maintain glucose in the range of 4-7 mmol/l during labour to reduce risk of neonatal hypoglycaemia.
- If blood glucose is >10 mmol/l or if patient is unwell check for ketonuria.
- If there any concerns regarding fluid overload, change to 10% dextrose @ 50 mls/hr with appropriate potassium supplementation

Table 1

Blood glucose (mmols/L)	Insulin infusion rate mls/hr	
<4.0	0.5* **	
4.1 - 6.0	1.0	
6.1 - 9.0	2.0	
9.1 - 12.0	3.0	
12.1-15.0	4.0	
>15.0	6.0	

* Stop insulin infusion for 15 minutes and treat hypoglycaemia orally with glucogel or with 50 mls of 20% dextrose. If necessary increase infusion rate of 5% dextrose to 150 ml/hr or change to 10% dextrose.

In women with Type 1 Diabetes, the insulin infusion should be recommenced after 15 minutes.

** **Insulin rate of 0 ml/hr can be maintained if blood glucose is <4mmol/L in women with Type-2 diabetes**.

- **Seek advice from diabetic team if blood glucose levels in a woman on sliding scale are not maintained below 8mmol/L.**

Discontinuing the sliding scale insulin post delivery in women with pre-existing diabetes

- Insulin infusion rate should be halved on delivery of placenta to avoid risk of hypoglycaemia
- Continue insulin infusion until the patient is ready to eat and drink.
- Post delivery subcutaneous insulin doses are generally recorded in the antenatal notes (tracer card and/or hand held record) of the patient.
- If the information is not available insulin to be prescribed at pre-pregnancy dose. If unsure the diabetes specialist team should be contacted.
- Insulin infusion should be discontinued 30 minutes after subcutaneous insulin injection.
- Blood glucose monitoring is recommended for at least first 48 hours following delivery. A combination of pre and post meals should be monitored. If the woman is breast feeding she should also check her blood glucose levels before bed, as these women are at higher risk of hypoglycaemia. Thereafter, women should continue to monitor their blood glucose levels as pre-pregnancy state.
- Breastfeeding increases the risk of hypoglycaemia. Mothers are encouraged to have extra carbohydrate snack and may need to be reduce insulin (by around 15-20%)

Post natal care of Women with Pre-existing Diabetes

- Normal postnatal care to be provided to all mothers.
- Daily inspection of all wounds and any signs of infection treated promptly.
- Diabetes specialist team should be informed in case of concern with glycaemic control.
- Breastfeeding is encouraged for all mothers.
- Women with type 2 diabetes who are breastfeeding can resume to take metformin immediately following birth but other oral hypoglycaemic agents should be avoided while breastfeeding.
- Women who are breastfeeding should continue to avoid any drugs for the treatment of diabetic complications that were discontinued for safety reasons in the preconception period.
- Contraceptive advice to be offered before discharge.
- Postnatal follow up at 6 weeks to be made at the combined diabetes/ ANC.
- Women at particular high risk i.e. with a BMI>40 should remain under the care of the community midwife until day 28 post partum.

Care of the baby

- Breastfeeding has clear health benefits for both the mother and her baby and should therefore be encouraged and supported.
- The baby should stay with the mother unless extra neonatal care is required.
- To help with the first feed and to stabilize the babies temperature baby should remain in skin to skin contact, the use of a hat for the baby to prevent heat loss should be considered.
- Mother should be offered help with the first breastfeed within 30 minutes of birth
- Advise women to feed their babies at frequent intervals (at least 2-3 hours) until pre-feeding blood glucose levels are maintained at 2.6mmols or more for three consecutive readings (follow flow chart for babies at risk of hypoglycaemia see appendix 1)

- If baby is not ready for a feed skin to skin contact should continue and mother be shown how to hand express colostrum.
- Colostrum should be given to the baby either via baby licking from nipple or via syringe until baby is ready for breastfeed. Mother may have harvested colostrum antenatally and this can be given to the baby. If colostrum is not available follow the flow chart for supplementation.

- **The baby's blood glucose levels should be tested 2-4 hours after birth** using a quality assured method validated for neonatal use (ideally prior to the second post birth feed) or earlier if baby has signs of hypoglycaemia.
- Within 24 hours observe and record a full breastfeed using the prompt sheet in the baby's post natal notes.

- **Admit the baby to a neonatal unit** if he or she:

1. is hypoglycaemic with abnormal signs
2. has respiratory distress or jaundice that requires monitoring or treatment
3. has signs of cardiac decompensation, neonatal encephalopathy or polycythaemia
4. needs intravenous fluids
5. needs tube feeding (unless adequate support is available on the postnatal ward)
6. is born before 34 weeks (or between 34 and 36 weeks if dictated clinically by initial assessment).

- **Do not transfer babies into the community** until they are at least 24 hours old, maintaining blood glucose levels and feeding well.

- Observe the baby for signs of jaundice.

Management of Gestational Diabetes Mellitus (GDM)

Gestational diabetes is defined by the World Health Organization (WHO) as 'carbohydrate intolerance resulting in hyperglycaemia of variable severity with onset or first recognition during pregnancy'. Gestational diabetes mellitus (GDM) is known to be associated with maternal and foetal complications.

Screening of GDM:

1. The women with prior history of gestational diabetes: A 2 hour oral glucose tolerance test (OGTT) with 75 gm glucose is booked at 16–18 weeks, followed by the same OGTT at 26-28 weeks if the first test is normal.

2. The following high risk group of women should be screened for GDM by 2 hour OGTT with 75 gm glucose at 26-28 weeks of gestation:

a) Women with previous baby weighing ≥ 4.5 Kg
b) Women with BMI ≥ 35
c) Family history of diabetes (First degree relative with diabetes)

The OGTT results are evaluated against the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria.

Diagnosis of GDM:

Diagnosis of GDM will be based on the 2hr OGTT results evaluated against the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria.

The following table shows comparison of IADPSG criteria for diagnosis of GDM.

	IADPSG
Fasting Plasma Glucose	≥ 5.1 mmol/L
1 hour glucose	≥ 10 mmol/L
2 hour glucose	≥ 8.5 mmol/L

Antenatal care for women with GDM

- **Referral to joint diabetic ANC at earliest opportunity**
- **Review by Diabetes Specialist Midwife**
- **Review by Obstetric and Diabetic team**

Clinical Assessment at diagnosis

A full medical, obstetric and family history should be taken at the booking appointment

1. Bloods:
   HbA1C, Fructosamine, Urea and electrolytes, Lipid Profile (Triglycerides HDL & LDL Cholesterol, specific requests should be stated on the blood form, this is a fasting sample)
2. Ambulatory Blood Pressure monitoring
3. Growth scan with Liquor volume and Umbilical artery Doppler Study.

Clinical Assessment at subsequent visit after diagnosis

- Antenatal checks are done as for all routine pregnancies. Blood pressure, urine, abdominal palpation documenting the symphysio-fundal height, presentation and fetal heart rate.
- Close monitoring of urinalysis and blood pressure is done as women with GDM are at a high risk of developing pre-eclampsia.

Investigations

- HbA1c & Fructosamine estimation should be requested at diagnosis and to be repeated at interval of 8 weeks.

- Ultrasound scan for fetal growth and liquor volume is performed at regular intervals in third trimester as in women with pre-existing diabetes. It helps in early detection of macrosomia with polyhydramnios or intra uterine growth restriction with oligohydramnios.

- At 28 weeks the patient information on monitoring of fetal movements is to be given.

Dietary assessment

All newly diagnosed women with GDM should be given dietary advice. They should be advised to choose carbohydrates from low glycaemic index sources, lean proteins and a balance of polyunsaturated fats and monounsaturated fats. They should be reviewed by the dietician if needed.

Monitoring of blood glucose

All women with GDM should be issued a glucometer. They should be advised to monitor fasting blood glucose and at 1 hr postprandial.

- **Glycaemic targets**:

Pre-meal 4-6 mmol/L

1 hour postprandial <7.8 mmol/L. Postprandial targets may need to be tighter if there is evidence of accelerated fetal growth/macrosomia.

- **Hypoglycaemic therapy:**

- Hypoglycaemic therapy should be considered for women with gestational diabetes if diet and life-style measures fail to maintain blood glucose targets during a period of 1–2 weeks or if ultrasound suggests incipient fetal macrosomia at diagnosis.

- Hypoglycaemic therapy for women with GDM which may include metformin and regular insulin. Their dose should be tailored to the glycaemic profile of, and acceptability to, the individual woman (NICE 2008).

- **Metformin:**

Metformin is an effective treatment option for women with GDM although around 50% requires additional insulin. No adverse fetal outcome was noted when compared to insulin therapy but a slightly increased risk of preterm labour was seen with metformin use. **Metformin is contraindicated in women with hepatic & renal impairment. It is advisable to avoid use of metformin in pre-eclampsia or if there is any concerns regarding foetal growth retardation.**

36 weeks onwards

- Visits are tailored to each individual woman.

- Weekly scans for liquor volumes and umbilical artery doppler will be needed unless the woman is well controlled with diet and/or insulin/metformin.

- It may be necessary to supplement monitoring with CTG. (This will be decided by the consultant)

- The woman is asked to closely monitor the baby's movements and to attend the hospital for monitoring if they are reduced. This should include a CTG and an umbilical artery Doppler measurement.

- In case of concern with glycaemic control, women can contact:
    - The Diabetes specialist Midwife (Ext 5146)
    - The Diabetes specialist Nurse (Ext 5317)
- Mode and time of delivery should be discussed by the consultant or senior obstetrician between 36-37 weeks and agreed with the woman prior to admission for delivery.
- Aim delivery by 40 weeks gestation in well controlled women with uncomplicated pregnancies

Schedule of Obstetric appointments

Appointment	***Care of the woman during pregnancy***
Following diagnosis	Advice on Diet, life-style changes. Advice on optimising glucose control. Obstetric review. Baseline Investigations
28–29 weeks	Antenatal assessment by both teams USS for fetal growth, LV and Umbilical Artery Doppler study
32 -33 weeks	Antenatal assessment by both teams USS for fetal growth, LV and Umbilical Artery Doppler study
36-37 weeks	Antenatal assessment by both teams. Discussion about Delivery USS for fetal growth, LV and Umbilical Artery Doppler study
38 weeks	Antenatal assessment Obstetric directed assessment
39 weeks	Antenatal assessment Obstetric directed assessment
40 weeks	Antenatal assessment Obstetric directed assessment

Intrapartum care for women with GDM

Plan of delivery:

The decision on the mode and time of delivery should be taken by 37 weeks after discussing with the consultant.

- Induction of labour**:** Induction of labour should be arranged by 40 weeks gestation depending on the woman's diabetic control and obstetric state.
- For women with macrosomic babies, a discussion must take place on the risks and benefits of a vaginal delivery.
- Induction should be commenced on the Maternity Triage Unit according to the guidelines for normal induction of labour. A full and comprehensive risk assessment should be performed and documented on admission.
- If other pregnancy complications are present, induction should take place on the Delivery suite informing them in advance.
- The woman continues on her present regime of insulin and diet until in established labour.
- In a case of induction, syntocinon infusion should be started immediately after ARM unless the woman is in active labour.

Management of labour

- All women must have continuous electronic fetal heart rate monitoring when in established labour. Any significant abnormalities on the C.T.G. should be investigated with fetal blood sampling.
- Once in established labour the woman should remain N.B.M (nil by mouth). All women should have hourly glucose monitoring during labour. If the blood glucose is>8mmol/L on two occasions, sliding scale of insulin with 5% Dextrose should be commenced as per the regimen (Table 1).
- Regular assessment in labour for diagnosis of slow progress in established labour

First stage of labour

- V/E at 4hourly interval and to actively manage slow progress once diagnosed.
- The progress should be 1cm/hour.
- The slow progress must be treated appropriately with a syntocinon infusion given through a **separate i.v. cannula** (if the woman is on sliding scale of insulin).

Second stage of labour

- Women with epidural analgesia: To wait for 1 hour before pushing unless there is any concern for fetal or maternal wellbeing.
- Women without epidural analgesia: May start pushing from the beginning of second stage.
- An obstetric registrar review is to be considered after 1 hour of pushing if the woman has not delivered or delivery is not imminent.
- All deliveries should be achieved within 3 hours of total second stage(in women on epidural analgesia) and within 2 hours of total second stage(in women without epidural analgesia) The syntocinon augmentation in second stage is to be taken with caution.
- A senior midwife must be present at the delivery and an Obstetric Registrar to be readily available if needed.
- Paediatricians must be informed when the woman is about to give birth.
-

Elective Caesarean Section in women with GDM

If the elective caesarean section is considered before 38+6 weeks, women should have antenatal steroid.

1. All women with GDM need to be admitted the previous day in antenatal ward for steroid administration.
2. 2 doses of 12 mg Betamethasone to be administered IM 12 hours apart.
3. Women should to be admitted at 8AM and the first dose of steroid should be given by 9AM.
4. The admitting midwife needs to ensure that the preoperative bloods are done.
5. **Women on insulin**: Sliding scale to be started along with the first dose of steroid.
6. **Women on metformin or diet :**
7. During administration of steroid blood glucose needs to be monitored 7 times a day (Pre-meal, Post-meal and Bed-time).
8. Sliding scale should be started if one reading is > 10mmol/L or if two readings are >8mmol/L.

If the elective caesarean section is considered after 38+6 weeks, women do not need to have antenatal steroid

1. **Women with GDM on insulin** should be admitted the day before onto the antenatal ward and preoperative management is as same as the pre-existing diabetes. Sliding scale of insulin needs to be commenced between 7-8 AM on the day of caesarean.
2. **Women with GDM on metformin or diet** should be admitted on the day of operation. The morning dose of metformin should be omitted on the day of operation.
3. Routine pre-op procedure including a computerised C.T.G. should be done.

Management of threatened preterm labour in women with GDM

- If delivery is anticipated before 36 weeks gestation, corticosteroids must be given for the prevention of neonatal respiratory distress syndrome.
- Individualised plan to be made for each patient.
- Atosiban can be used to arrest labour if necessary.
- Neonatal Unit to be informed.

Antenatal steroid administration in women with GDM

Indication

1. Threatened preterm labour before 36 weeks
2. Planned caesarean section before 38+6 weeks
3. Delivery planned before 36 weeks for fetal or maternal reason

- 2 doses of 12 mg Betamethasone to be administered IM 12 hours apart.

1. **Women on insulin**: All women should be admitted and sliding scale should be started along with first dose of steroid. Sliding scale should be continued for 24 hrs after the 2nd dose of betamethasone.

2. **Women on metformin or diet:**

a) Women can have the steroid administered in clinic/FAU.
b) During administration of steroid blood glucose should be monitored 7 times a day (Pre-meal, post-meal and bed-time). They need to check the blood glucose 7 times a day at home
c) The women should refer themselves to triage if one reading is > 10mmol/L or if two readings are >8mmol/L for sliding scale.

Sliding scale of insulin regime for women with GDM

- A combination of Insulin and Dextrose is given via the same cannula using a 'Y' connector.
- Insulin sliding scale is commenced during labour, after steroid injection for suspected pre-term labour and if the mother's glucose control becomes unstable or needs to be nil by mouth for any reason.
- Insulin infusion: 50 units of Human Actrapid insulin in 50 mls of 0.9% Normal Saline in a 50 ml syringe. (1ml = 1unit of insulin) This is given via a syringe pump and the rate of infusion is determined by the sliding scale.
- Glucose infusion: 5% Dextrose 1,000mls with 20 mmol KCL (potassium chloride) at 100mls/hr using the Gemini pump for accuracy. (* Change to 10% dextrose infusion when Blood Glucose<4mmol/L)
- Monitor blood glucose hourly (30 minutes if the insulin rate has been altered)
- Aim to maintain glucose in the range of 4-7 mmol/l during labour to reduce risk of neonatal hypoglycaemia.
- If blood glucose is >10 mmol/l or if patient is unwell check for ketonuria
- If there any concerns regarding fluid overload, change to 10% dextrose @ 50 mls/hr with appropriate potassium supplementation.

Table 1

Blood glucose (mmols/L)	Insulin infusion rate mls/hr	
<4.0	0.5*	
4.1 - 6.0	1.0	
6.1 - 9.0	2.0	
9.1 - 12.0	3.0	
12.1-15.0	4.0	
>15.0	6.0	

* Stop insulin infusion for 15 minutes and treat hypoglycaemia orally with glucogel or with 50 mls of 20% dextrose. If necessary increase infusion rate of 5% dextrose to 150 ml/hr or change to 10% dextrose

Seek advice from diabetic team if blood glucose levels in a woman on sliding scale are not maintained below 8mmol/L.

Discontinuation of sliding scale in women with GDM: The Insulin and Dextrose regime may be discontinued as soon as convenient after delivery of placenta. Blood glucose measurements should be undertaken three times a day (before breakfast, lunch and dinner) in the first 48 hours. This is to ensure that blood sugar levels are returning to normal, although this may take as long as 6 weeks.

Post natal care of the Mother

- Normal postnatal care to be provided to all mothers.
- Daily inspection of all wounds and any signs of infection treated promptly.
- Breastfeeding is encouraged for all mothers
- Contraceptive advice to be offered before discharge.
- Postnatal follow up at 6 weeks to be made: (See Post natal follow up)

a. GP for postnatal check up

b. Fasting Blood glucose in hospital (ANC). Appointment to be given directly to the woman before discharge.

- Women at particular high risk i.e. with a BMI>40 should remain under the care of the community midwife until day 28 post partum.

Care of the baby

- Breastfeeding has clear health benefits for both the mother and her baby and should therefore be encouraged and supported.
- The baby should stay with the mother unless extra neonatal care is required.
- To help with the first feed and to stabilize the babies temperature baby should remain in skin to skin contact, the use of a hat for the baby to prevent heat loss should be considered.
- Mother should be offered help with the first breastfeed within 30 minutes of birth
- Advise women to feed their babies at frequent intervals (at least 2-3 hours) until pre-feeding blood glucose levels are maintained at 2.6mmols or more for three consecutive readings (follow flow chart for babies at risk of hypoglycaemia see appendix 1)

- If baby is not ready for a feed skin to skin contact should continue and mother be shown how to hand express colostrum.
- Colostrum should be given to the baby either via baby licking from nipple or via syringe until baby is ready for breastfeed. Mother may have harvested colostrum antenatally and this can be given to the baby. If colostrum is not available follow the flow chart for supplementation.

- **The baby's blood glucose levels should be tested 2-4 hours after birth** using a quality assured method validated for neonatal use (ideally prior to the second post birth feed) or earlier if baby has signs of hypoglycaemia.
- Within 24 hours observe and record a full breastfeed using the prompt sheet in the baby's post natal notes.

- **Admit the baby to a neonatal unit** if he or she:

1. is hypoglycaemic with abnormal signs
2. has respiratory distress or jaundice that requires monitoring or treatment
3. has signs of cardiac decompensation, neonatal encephalopathy or polycythaemia
4. needs intravenous fluids
5. needs tube feeding (unless adequate support is available on the postnatal ward)
6. is born before 34 weeks (or between 34 and 36 weeks if dictated clinically by initial assessment).

- **Do not transfer babies into the community** until they are at least 24 hours old, maintaining blood glucose levels and feeding well.

- Observe the baby for signs of jaundice.

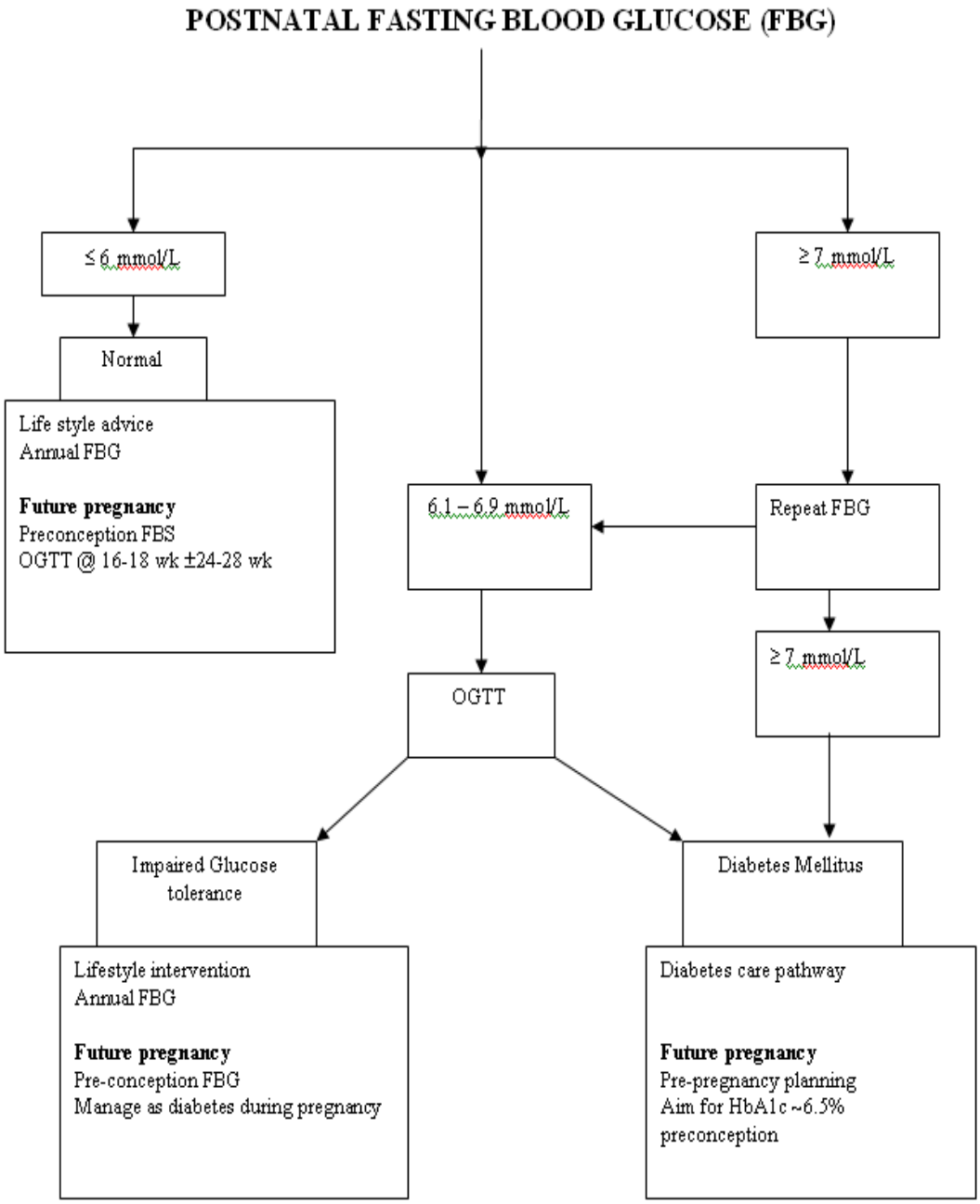
Post natal follow up of Women with GDM

- Fasting blood glucose must be arranged at 6 weeks post partum in the antenatal clinic. If abnormal, repeat FBG and/or an oral glucose tolerance test may be necessary (see flow chart). All abnormal results should be reported to the patient's general practitioner to take appropriate action.

- Women with a normal result should be informed of the risk of developing type-2 diabetes later on in life. Lifestyle advice (including weight control, diet and exercise) should be provided. The patient's GP should be advised to undertake annual fasting blood glucose estimation.

- Women with GDM should be informed about the risks of gestational diabetes in future pregnancies and they should be offered screening (fasting plasma glucose) for diabetes when planning future pregnancies.

Algorithm for Postnatal Follow-up with Fasting Blood Glucose



Monitoring

For monitoring compliance and effectiveness refer to 'Monitoring and Audit' guideline

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4. Antenatal Corticosteroids to reduce Neonatal Mortality and Morbidity: Royal College of Obstetricians and Gynaecologists. *Green-top guideline No 7*: October 2010.

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The Royal Wolverhampton Hospitals NHS Trust

OBSTETRICS AND GYNAECOLOGY
GUIDELINES FOR PRACTICE

The prevention and management of Hypoglycaemia of the newborn.

Date of implementation:	**2012**
Date of review:	**2015**
Person responsible for implementation and review:	*Maggie Dawidziak and Amanda Costello*
Policy location:	**Trust Intranet**

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1.0 Introduction

1.1 Breastfeeding has known health benefits for both mothers and their babies. This guideline has been developed to ensure that breastfeeding may be protected by the avoidance of unnecessary supplementation with artificial milk, whilst ensuring the safety of babies at risk of developing neonatal hypoglycaemia.

1.2 Healthy term babies often feed infrequently in the first 24-48 hours after birth. Because they are able to mobilise energy stores through a process known as counter-regulation, they are not likely to suffer any ill effects.

1.3 Some babies, however, are less able to mount this response, for example those born preterm, small for gestational age, compromised at birth or who have neonatal infection. In addition, babies born to diabetic mothers may initially produce too much insulin, rendering them prone to lower blood glucose levels.

1.4 A prolonged period of hypoglycaemia, particularly if associated with clinical signs ("symptomatic hypoglycaemia") may lead to neurological impairment. It should not be assumed that only breastfed babies are at risk. Babies fed with infant formula and who fall into the "at risk" category should also be monitored closely, following these guidelines, and their mothers supported with effective feeding

2. Identification of babies at risk of developing neonatal hypoglycaemia

2.1 The following groups should be considered "at risk": Preterm (<37 weeks gestation), IUGR, Low birth weight (<2.5kg), Babies of mothers with maternal diabetes, Hypothermia, Infection/other illness in the baby, Severe intrapartum asphyxia, Maternal use of beta-blockers, such as Labetolol.

There is no evidence to label large babies as "at risk" in the absence of maternal diabetes.

2.2 Clinical signs of hypoglycaemia

Clinical signs (or "symptoms") indicate that the baby is vulnerable to harm from hypoglycaemia and they should be acted upon straight away.

Altered level of consciousness, apnoea, cyanosis, hypothermia and convulsions are all signs of hypoglycaemia and requires urgent referral to a paedetrician.

"Jitteriness" is not a definitive sign of hypoglycaemia. Many babies will appear jittery on handling. It is important to be sure that this movement is not simply a response to stimuli.

Excessive repetitive movements of one or more limbs, which are unprovoked and usually relatively fast, would require urgent referral to a paedetrician.

3. Establishing breastfeeding

3.1 All mothers and babies should have skin-to-skin contact at birth and an early breastfeed (unless baby requires immediate transfer to NNU)

3.2 Early skin-to-skin contact plays an important role in maintaining the temperature and therefore the stability of blood glucose levels in the neonate, and in promoting an early breastfeed. Early skin to skin contact should continue for as long as the mother wishes and at least until after the first breastfeed. Babies should wear a hat in order to prevent heat loss.

3.3 Ongoing skin-to-skin contact will continue to aid thermo-regulation and encourage frequent breastfeeds. Normal body temperature should be maintained, as hypoglycaemia is more likely to occur when newborns become cold.

3.4 Mothers of "at risk" babies should be encouraged to respond to early feeding cues should their baby exhibit these. However, these babies should not be relied upon to exhibit cues and therefore a proactive approach to feed frequency is needed.

3.5 In order to enhance early metabolic adaptation, frequent, effective, feeds are needed. There should not be more then 3 hrs between feeds; more frequent feeds are often needed to ensure sufficient intake.

3.6 The baby should be offered the breast whenever he/she shows signs of hunger, even where this occurs less than 3 hrs since the previous feed.

3.7 Mothers will be supported to breastfeed at each feed "At risk" newborns who are able to suckle adequately should continue to breastfeed.

3.8 Where feeding at the breast is not achievable, the mother will be encouraged and supported to hand express frequently and expressed breastmilk (EBM) is offered.

3.9 If blood glucose concentration is low despite frequent breastfeeding, supplementary EBM should be provided by syringe, cup or nasogastric tube. Frequent small volumes of colostrum will be easily digested and absorbed by the baby.

4. Monitoring well being

41. Effective, ongoing observation of the baby's condition is vital – lack of feeding may be a sign of illness. Ensuring that the baby exhibits a normal level of arousal is fundamental to this aim. The baby should be woken and lifted from the cot to enable effective assessment of level of consciousness.

4.2 Prior to each feed babies should be observed for:-

Level of consciousness, tone, temperature, respiration and colour/perfusion

Findings should be recorded and documented in the babies' notes.

A full breastfeed should be observed, an assessment made, and recorded in the babies' notes, any action taken/planned should also be documented.

5. Blood Glucose Measurements

5.1 Refer to the Sample Flow Chart for the management of BREASTFED babies at risk of hypoglycemia on postnatal wards (pg 39).

5.2 Blood glucose should never be recorded routinely in asymptomatic babies under 3 hours of age. Prior to this age babies naturally experience a fall in blood glucose concentration which resolves even in the absence of nutritional intake. Recording the blood glucose this early is likely to lead to unnecessary intervention.

5.3 Blood glucose should be monitored pre feed. Hypoglycaemia is most likely to occur in the first 24-48 hours of life. Pre-feed monitoring allows the lowest possible level to be identified.

5.4 All blood glucose tests should be measured using an accurate ward based machine. Do not use reagent strips as they are unsuitable for diagnosing neo natal hyperglycaemia.

5.5 If a pre feed blood glucose level is below 2.6mmols then a post feed blood glucose should be measure one hour post feed. Allowing an hour to elapse after the feed will enable optimum digestion/absorption.

5.6 If blood glucose levels remain lower than the 2.6mmols despite breastfeeding / EBM, the baby should be reviewed by a paediatrician with a view to further investigation and appropriate management.

5.7 Supplementation with infant formula is only recommended when blood glucose estimation is below 2.6mmol and breastfeeding/expressing EBM is not successful, or has been insufficient to increase BG to acceptable level.

5.8 If infant formula is required in response to documented hypoglycaemia, then 8-10 ml/kg should be offered by cup.

5.9 Mothers should continue to receive support with hand expressing and help with breastfeeds.

5.10 The indications for the prescription of the infant formula should be discussed with the parents and explanations documented.

5.11 Hypoglycaemia of unusual severity, e.g. <1.1mmol, or which does not resolve despite adequate feeding, indicates underlying illness and should be treated urgently. The baby will require urgent transfer to NNU for further investigations and is likely to require intravenous glucose.

References

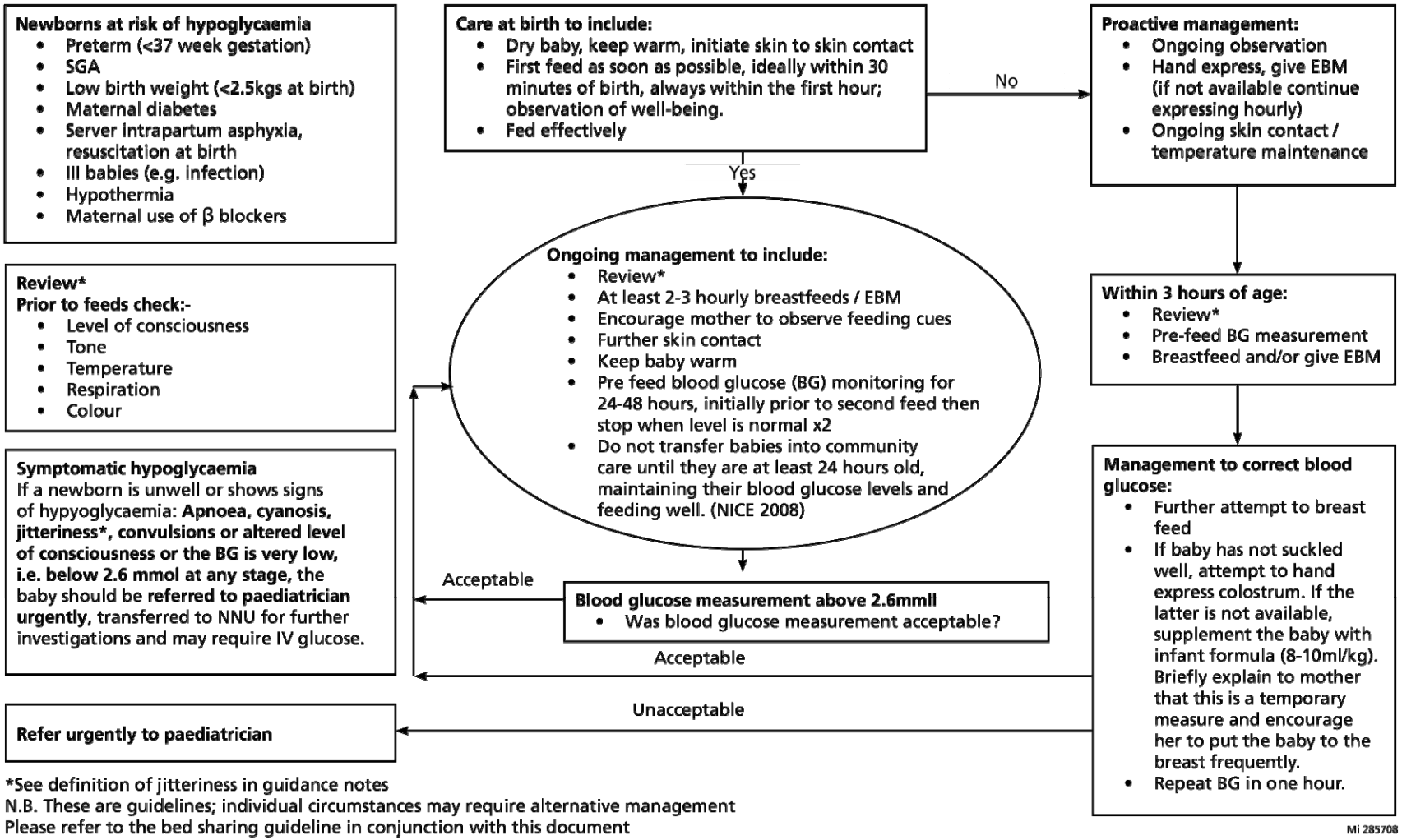
WHO (1977) Hypoglycaemia of the Newborn. Review of the Literature. WHO Geneva.

The Confidential Enquiry into Maternal and Child Health (CEMACH). (2007) Diabetes and Pregnancy: caring for the baby after birth. Findings of a National Enquiry: England, Wales and Northern Ireland. CEMACH, London.

Royal Wolverhampton Hospitals Trust (2008) Breastfeeding Policy

The Royal Wolverhampton Hospitals NHS
NHS Trust

Sample Flow Chart for the management of BREASTFED babies at risk of hypoglycaemia on postnatal wards



*See definition of jitteriness in guidance notes
N.B. These are guidelines; individual circumstances may require alternative management
Please refer to the bed sharing guideline in conjunction with this document

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