Milton Keynes University Hospital NHS Foundation Trust

Guideline			
Diabetes in Pregnancy			
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Disclaimer

Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.

The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

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Guideline Statement

Diabetes affects 2-5% of pregnancies, and its prevalence is increasing. This guideline has been developed in response to the publication of NICE guidelines for care of women with diabetes in pregnancy. It should be used in conjunction with 'Diabetes in Pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period' (NICE 2015).

To ensure that all women with pre-existing diabetes type 1 or 2, and those who are at risk of developing or who develop gestational diabetes, receive optimal care resulting in the best possible outcome for mother and baby.

Executive Summary

- Diabetes mellitus is a disorder of carbohydrate metabolism and is associated with increased risks to the woman and to the developing fetus
- While women with diabetes in pregnancy continue to receive routine antenatal care, the guideline focuses on extra care according to their clinical needs
- The aim of the guideline is to ensure that women are given support to achieve as near normal glycaemic control as possible in order to improve outcome for both mother and baby.
- Care is given in the Joint Clinic by the Diabetes Team.

1.0 Roles and Responsibilities:

All women with diabetes in pregnancy are seen at the Joint Obstetric/Medical clinic by the diabetes team which consists of the following:

- Consultant Obstetrician with interest in diabetes – decision-making and care-planning.
- Consultant Diabetologist with interest in pregnancy – decision-making and care-planning.
- Obstetric registrars/SHOs – decision-making and care-planning with reference to consultants.
- Diabetes Lead Midwife (DLM) – pre-conception, antenatal, intrapartum and postnatal advice and support for women and staff.
- Diabetes Specialist Nurses (DSNs) –Midwives – preconception, antenatal, intrapartum and postnatal advice and support with management of diabetes for women and staff
- Dietician – dietary advice and support
- Retinal screening - retinal screening for women with pre-existing diabetes

The women are also cared for by:

- Midwives

- Nursery nurses and maternity care assistants – caring for babies of diabetic mothers.

2.0 Scope of document

This guideline applies to all women with pre-existing diabetes (type 1 and type 2) who become pregnant, all women who meet the criteria for screening for gestational diabetes, and all women who develop gestational diabetes.

3.0 Implementation and dissemination of document

The information within this document will be disseminated throughout the maternity unit by being contained within the hardcopy guidelines folder available in all clinical areas and by being available on the hospital intranet.

4.0 Processes and procedures

4.1 Background

There are 3 types of diabetes:

Type 1 diabetes mellitus – an absolute deficiency of insulin production, due to autoimmune destruction of the insulin-producing beta cells in the islets of Langerhans in the pancreas. 5-15% of all people with diabetes

Type 2 diabetes mellitus – a relative deficiency of insulin production, and/or the insulin produced is not effective (insulin resistance). 85-95% of all people with diabetes.

Gestational diabetes (GDM) - carbohydrate intolerance of varying severity which is diagnosed in pregnancy and may or may not resolve after pregnancy." (NICE 2008)

Approximately 87.5% of pregnancies complicated by diabetes are due to gestational diabetes (which may or may not resolve after pregnancy), 7.5% are due to type 1 diabetes and the remaining 5% due to type 2 diabetes (NICE 2015). The incidence of type 2 diabetes is increasing in line with rising obesity rates and the changing ethnic population, as is the incidence of gestational diabetes.

Diabetes in pregnancy is associated with risks to the woman and to the developing fetus. Miscarriage, pre-eclampsia and preterm labour are more common in women with pre-existing diabetes. In addition, diabetic retinopathy can worsen rapidly during pregnancy. Stillbirth, congenital malformations, macrosomia, birth injury, perinatal mortality and postnatal adaptation problems (such as hypoglycaemia) are more common in babies born to women with pre-existing diabetes.

4.2 Gestational Diabetes

4.2.1 Screening for Gestational Diabetes

NICE (2008) recommends screening for GDM using risk factors as follows:

- BMI ≥30
- Previous macrosomic baby (≥4.5 kg)
- Family history of diabetes (1st degree relative)
- Family origin as follows:
  - South Asian (India, Pakistan, Bangladesh)
  - Black African/Caribbean
  - Middle Eastern (Saudi Arabia, UAE, Iraq, Jordan, Syria, Oman, Qatar, Kuwait, Lebanon, Egypt)
- Be aware that glycosuria of 2+ or above on 1 occasion or of 1+ or above on 2 or more occasions detected by reagent strip testing during routine antenatal care may indicate undiagnosed gestational diabetes. If this is observed, consider further testing to exclude gestational diabetes.(NICE, 2015)
- Increased maternal age 40 years or above (Screening for gestational diabetes mellitus: U.S. Preventive Services Task Force recommendation statement, 2014).
- PCOS (Diabetes Care, 2010 Jan; 33(Suppl1): S11-S61,doi: 10,2337/dc10-S011).

4.2.2 Women with previous Gestational Diabetes

- Do not use fasting plasma glucose, random blood glucose, HbA1c, glucose challenge test or urinalysis for glucose to assess risk of developing gestational diabetes. **[2015]**

Offer women who have had gestational diabetes in a previous pregnancy:

- early self-monitoring of blood glucose **or**
- a 75 g 2-hour OGTT as soon as possible after booking (whether in the first or second trimester), and a further 75 g 2-hour OGTT at 24–28 weeks if the results of the first OGTT are normal. **[new 2015]**

4.2.3 Women with risk factors for Gestational Diabetes

- Offer women with any of the other risk factors for gestational diabetes, a 75 g 2-hour OGTT at 24–28 weeks. **[2015]**
- For women with accelerated growth and/or polyhydramnios after 34 weeks see Appendix 1

4.2.4 Diagnosis of gestational diabetes

- If the 75 g oral glucose tolerance test (OGTT) is used to test for gestational diabetes, diagnosis should be made using the criteria defined by the World Health Organization:

- Diagnose gestational diabetes if the woman has either:
  1. a fasting plasma glucose level of 5.6 mmol/litre or above or
  2. a 2 hour plasma glucose level of 7.8 mmol/litre or above (NICE, 2015)

- NICE 2015 guideline recommends offering women with a diagnosis of gestational diabetes a review with the joint diabetes and antenatal service within 1 week**.**
- Inform the primary healthcare team when a woman is diagnosed with gestational diabetes **[new 2015]**

4.2.5 Management of gestational diabetes

On diagnosis:

- Refer to Diabetes Midwife for home blood glucose monitoring. **[2015]**
- Give patient information leaflet Gestational Diabetes Mellitus.
- Explain to women with gestational diabetes:

  1. about the implications (both short and long term) of the diagnosis for her and her baby
  2. that good blood glucose control throughout pregnancy will reduce the risk of fetal macrosomia, trauma during birth (for her and her baby), induction of labour and/or caesarean section, neonatal hypoglycaemia and perinatal death
  3. that treatment includes changes in diet and exercise, and could involve medicines, eg metformin and/or insulin. **[new 2015]**

- Use the same capillary plasma glucose target levels for women with gestational diabetes as for women with pre-existing diabetes **[2015]** Advise pregnant women with any form of diabetes to maintain their capillary plasma glucose below the following target levels, if these are achievable without causing problematic hypoglycaemia:
  - fasting: 5.3 mmol/litre

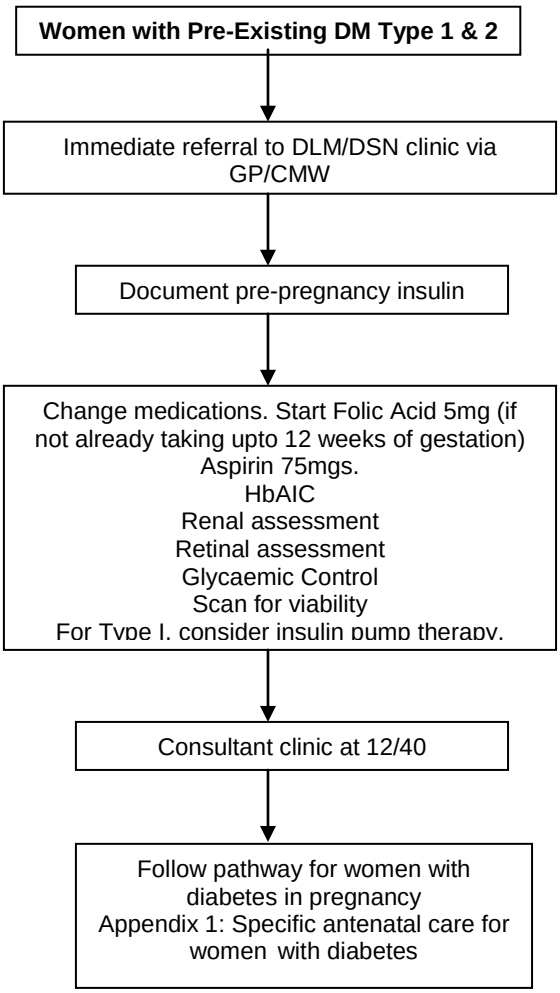
    and
  - 1 hour after meals: 7.8 mmol/litre **or**
  - 2 hours after meals: 6.4 mmol/litre. **[new 2015]**

- Test urgently for ketonaemia if a pregnant woman with any form of diabetes presents with hyperglycaemia or is unwell, to exclude diabetic ketoacidosis. [new 2015]
- Tailor blood glucose-lowering therapy to the blood glucose profile and personal preferences of the woman with gestational diabetes. **[new 2015]**
- Offer women advice about changes in diet and exercise at the time of diagnosis of gestational diabetes. **[new 2015]**
- Advise women with gestational diabetes to eat a healthy diet during pregnancy, and emphasise that foods with a low glycaemic index should replace those with a high glycaemic index. **[new 2015]**
- Refer all women with gestational diabetes to a dietitian. **[new 2015]**
- Advise women with gestational diabetes to take regular exercise (such as walking for 30 minutes after a meal) to improve blood glucose control. **[new 2015]**

- Offer a trial of changes in diet and exercise to women with gestational diabetes who have a fasting plasma glucose level below 7 mmol/litre at diagnosis. **[new 2015]**
- Offer metformin[2] to women with gestational diabetes if blood glucose targets are not met using changes in diet and exercise within 1–2 weeks. **[new 2015]**
- Offer insulin instead of metformin to women with gestational diabetes if metformin is contraindicated or unacceptable to the woman. **[new 2015]**
- Offer addition of insulin to the treatments of changes in diet, exercise and metformin[2] for women with gestational diabetes if blood glucose targets are not met. **[new 2015]**
- Offer immediate treatment with insulin, with or without metformin[2], as well as changes in diet and exercise, to women with gestational diabetes who have a fasting plasma glucose level of 7.0 mmol/litre or above at diagnosis. **[new 2015]**
- Consider immediate treatment with insulin, with or without metformin[2], as well as changes in diet and exercise, for women with gestational diabetes who have a fasting plasma glucose level of between 6.0 and 6.9 mmol/litre if there are complications such as macrosomia or hydramnios. **[new 2015]**.
- Consider glibenclamide[4] for women with gestational diabetes:
    - in whom blood glucose targets are not achieved with metformin but who decline insulin therapy **or**
    - who cannot tolerate metformin. **[new 2015]**
- To remain in contact with Diabetes Lead Midwife on a 1-2 weekly basis
- Give patient information leaflet Expressing Colostrum Antenatally.
- Advise that the birth should take place in a hospital with advanced neonatal resuscitation skills available 24 hours a day.
- The rest of the antenatal, intrapartum and postnatal care should be managed as below for women with pre-existing diabetes. Women should still receive routine care with community midwife as appropriate in between appointments at the Joint Clinic (See Appendix 1: Specific antenatal care for women with diabetes)

4.3 Pre-Existing Type 1 and 2 Diabetes Mellitus

Initial pathway for women with pre-existing Type 1 & 2 diabetes mellitus



4.3.1 Antenatal care for women with Pre-Existing Diabetes (Types 1 & 2) and women who develop gestational diabetes

Monitoring blood glucose

Advise pregnant women with type 1 diabetes to test their fasting, pre-meal, 1-hour post-meal and bedtime blood glucose levels daily during pregnancy. **[new 2015]**
Advise pregnant women with type 2 diabetes or gestational diabetes who are on a multiple daily insulin injection regimen to test their fasting, pre-meal, 1-hour post-meal and bedtime blood glucose levels daily during pregnancy. **[new 2015]**
Advise pregnant women with type 2 diabetes or gestational diabetes to test their fasting and 1-hour post-meal blood glucose levels daily during pregnancy if they are:

- on diet and exercise therapy **or**
- taking oral therapy (with or without diet and exercise therapy) or single-dose intermediate-acting or long-acting insulin. **[new 2015]**

Target blood glucose levels

Agree individualised targets for self-monitoring of blood glucose with women with diabetes in pregnancy, taking into account the risk of hypoglycaemia. **[2008]**

Advise pregnant women with any form of diabetes to maintain their capillary plasma glucose below the following target levels, if these are achievable without causing problematic hypoglycaemia:

- fasting: 5.3 mmol/litre
  and
- 1 hour after meals: 7.8 mmol/litre **or**
- 2 hours after meals: 6.4 mmol/litre. **[new 2015]**

Advise pregnant women with diabetes who are on insulin or glibenclamide to maintain their capillary plasma glucose level above 4 mmol/litre. **[new 2015]**

Monitoring HbA1c

Measure HbA1c levels in all pregnant women with pre-existing diabetes at the booking appointment to determine the level of risk for the pregnancy. **[new 2015]**

Consider measuring HbA1c levels in the second and third trimesters of pregnancy for women with pre-existing diabetes to assess the level of risk for the pregnancy. **[new 2015]**

Be aware that level of risk for the pregnancy for women with pre-existing diabetes increases with an HbA1c level above 48 mmol/mol (6.5%). **[new 2015]**

Measure HbA1c levels in all women with gestational diabetes at the time of diagnosis to identify those who may have pre-existing type 2 diabetes. **[new 2015]**

Do not use HbA1c levels routinely to assess a woman's blood glucose control in the second and third trimesters of pregnancy. **[2008]**

Managing diabetes during pregnancy

Insulin treatment and risks of hypoglycaemia

Be aware that the rapid-acting insulin analogues (aspart and lispro) have advantages over soluble human insulin during pregnancy and consider their use. **[2008]**

Advise women with insulin-treated diabetes of the risks of hypoglycaemia and impaired awareness of hypoglycaemia in pregnancy, particularly in the first trimester. **[2008]**

Advise pregnant women with insulin-treated diabetes to always have available a fast-acting form of glucose (for example, dextrose tablets or glucose-containing drinks). **[2008, amended 2015]**

Provide glucagon to pregnant women with type 1 diabetes for use if needed. Instruct the woman and her partner or other family members in its use. **[2008, amended 2015]**

Offer women with insulin-treated diabetes continuous subcutaneous insulin infusion (CSII; also known as insulin pump therapy) during pregnancy if adequate blood glucose control is not obtained by multiple daily injections of insulin without significant disabling hypoglycaemia and if appropriate[5]. **[2008**

Continuous glucose monitoring

Do not offer continuous glucose monitoring routinely to pregnant women with diabetes. **[new 2015]**

Consider continuous glucose monitoring for pregnant women on insulin therapy:

- who have problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) **or**
- who have unstable blood glucose levels (to minimise variability) **or**
- to gain information about variability in blood glucose levels. **[new 2015]**

Ensure that support is available for pregnant women who are using continuous glucose monitoring from a member of the joint diabetes and antenatal care team with expertise in its use. **[new 2015]**

Ketone testing and diabetic ketoacidosis

Offer pregnant women with type 1 diabetes blood ketone testing strips and a meter, and advise them to test for ketonaemia and to seek urgent medical advice if they become hyperglycaemic or unwell. **[new 2015]**

Advise pregnant women with type 2 diabetes or gestational diabetes to seek urgent medical advice if they become hyperglycaemic or unwell. **[new 2015]**

Test urgently for ketonaemia if a pregnant woman with any form of diabetes presents with hyperglycaemia or is unwell, to exclude diabetic ketoacidosis. **[new 2015]**

During pregnancy, admit immediately women who are suspected of having diabetic ketoacidosis for level 2 critical care[6], where they can receive both medical and obstetric care. **[2008]**

Nb If women who are insulin treated feel unwell, advise to ring Labour Ward – see Appendix 5: Flowchart for management of women with insulin-treated diabetes telephoning Labour Ward or ADAU for advice

Retinal assessment during pregnancy

Offer pregnant women with pre-existing diabetes retinal assessment by digital imaging with mydriasis using tropicamide following their first antenatal clinic appointment (unless they have had a retinal assessment in the last 3 months), and again at 28 weeks. If any diabetic retinopathy is present at booking, perform an additional retinal assessment at 16–20 weeks. **[2008, amended 2015]**

Diabetic retinopathy should not be considered a contraindication to rapid optimisation of blood glucose control in women who present with a high HbA1c in early pregnancy. **[2008]**

Ensure that women who have preproliferative diabetic retinopathy or any form of referable retinopathy diagnosed during pregnancy have ophthalmological follow-up for at least 6 months after the birth of the baby. **[2008, amended 2015]**

Diabetic retinopathy should not be considered a contraindication to vaginal birth. **[2008]**

Renal assessment during pregnancy

If renal assessment has not been undertaken in the preceding 3 months in women with pre-existing diabetes, arrange it at the first contact in pregnancy. If the serum creatinine is abnormal (120 micromol/litre or more), the urinary albumin:creatinine ratio is greater than 30 mg/mmol or total protein excretion exceeds 0.5 g/day, referral to a nephrologist should be considered (eGFR should not be used during pregnancy). Thromboprophylaxis should be considered for women with nephrotic range proteinuria above 5 g/day (albumin:creatinine ratio greater than 220 mg/mmol). **[2008, amended 2015]**

Detecting congenital malformations

Offer women with diabetes an ultrasound scan for detecting fetal structural abnormalities, including examination of the fetal heart (4 chambers, outflow tracts and 3 vessels), at 20 weeks. **[2008, amended 2015]**

Monitoring fetal growth and wellbeing

Offer pregnant women with diabetes ultrasound monitoring of fetal growth and amniotic fluid volume every 4 weeks from 28 to 36 weeks. **[2008]**

Routine monitoring of fetal wellbeing (using methods such as fetal umbilical artery Doppler recording, fetal heart rate recording and biophysical profile testing) before 38 weeks is not recommended in pregnant women with diabetes, unless there is a risk of fetal growth restriction. **[2008, amended 2015]**

Provide an individualised approach to monitoring fetal growth and wellbeing for women with diabetes and a risk of fetal growth restriction (macrovascular disease and/or nephropathy). **[2008, amended 2015]**

Organisation of antenatal care

Offer immediate contact with a joint diabetes and antenatal service to women with diabetes who are pregnant. **[2008]**

Ensure that women with diabetes have contact with the joint diabetes and antenatal service for assessment of blood glucose control every 1–2 weeks throughout pregnancy. **[2008, amended 2015]**

At antenatal appointments, provide care specifically for women with diabetes, in addition to the care provided routinely for healthy pregnant women (see the NICE guideline on antenatal care). Table 1 describes how care for women with diabetes differs from routine antenatal care. At each appointment, offer the woman ongoing opportunities for information and education. **[2008, amended 2015]**

Table 1 Timetable of antenatal appointments

Appointment	Care for women with diabetes during pregnancy
Booking appointment (joint diabetes and antenatal care) – ideally by 10 weeks	Discuss information, education and advice about how diabetes will affect the pregnancy, birth and early parenting (such as breastfeeding and initial care of the baby). If the woman has been attending for preconception care and advice, continue to provide information, education and advice in relation to achieving optimal blood glucose control (including dietary advice). If the woman has not attended for preconception care and advice, give information, education and advice for the first time, take a clinical history to establish the extent of diabetes-related complications (including neuropathy and vascular disease), and review medicines for diabetes and its complications. Offer retinal assessment for women with pre-existing diabetes unless the woman has been assessed in the last 3 months. Offer renal assessment for women with pre-existing diabetes if this has not been performed in the last 3 months. Arrange contact with the joint diabetes and antenatal clinic every 1–2 weeks throughout pregnancy for all women with diabetes. Measure HbA1c levels for women with pre-existing diabetes to determine the level of risk for the pregnancy. Offer self-monitoring of blood glucose or a

	75 g 2-hour OGTT as soon as possible for women with a history of gestational diabetes who book in the first trimester. Confirm viability of pregnancy and gestational age at 7–9 weeks.
16 weeks	Offer retinal assessment at 16–20 weeks to women with pre-existing diabetes if diabetic retinopathy was present at their first antenatal clinic visit. Offer self-monitoring of blood glucose or a 75 g 2-hour OGTT as soon as possible for women with a history of gestational diabetes who book in the second trimester
20 weeks	Offer an ultrasound scan for detecting fetal structural abnormalities, including examination of the fetal heart (4 chambers, outflow tracts and 3 vessels).
28 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Offer retinal assessment to all women with pre-existing diabetes. Women diagnosed with gestational diabetes as a result of routine antenatal testing at 24–28 weeks enter the care pathway.
32 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Offer nulliparous women all routine investigations normally scheduled for 31 weeks in routine antenatal care.
34 weeks	No additional or different care for women with diabetes.
36 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Provide information and advice about: • timing, mode and management of birth • analgesia and anaesthesia • changes to blood glucose-lowering therapy during and after birth • care of the baby after birth • initiation of breastfeeding and the effect of breastfeeding on blood glucose control • contraception and follow-up.
37^{+0} weeks to 38^{+6} weeks	Offer induction of labour, or caesarean section if indicated, to women with type 1 or

	type 2 diabetes; otherwise await spontaneous labour
38 weeks	Offer tests of fetal wellbeing
39 weeks	Offer tests of fetal wellbeing. Advise women with uncomplicated gestational diabetes to give birth no later than 40^{+6} weeks

Women with diabetes should also receive routine care according to the schedule of appointments in the NICE guideline on antenatal care, including appointments at 25 weeks (for nulliparous women) and 34 weeks, but with the exception of the appointment for nulliparous women at 31 weeks.

4.3.2 Antenatal corticosteroids

Diabetes should not be considered a contraindication to antenatal steroids for fetal lung maturation or to tocolysis. **[2008]**

In women with insulin-treated diabetes (GDM or pre-existing) who are receiving steroids for fetal lung maturation, give additional insulin according to an agreed protocol and monitor them closely. **[2008, amended 2015] See appendix 4**

Do not use betamimetic medicines for tocolysis in women with diabetes. **[2008**

- women using insulin pump see Insulin Management Plan for Pregnant Women utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period

4.3.3 Intrapartum Care

Timing and mode of birth
Discuss the timing and mode of birth with pregnant women with diabetes during antenatal appointments, especially during the third trimester. **[new 2015]**

Advise pregnant women with type 1 or type 2 diabetes and no other complications to have an elective birth by induction of labour, or by elective caesarean section if indicated, between 37^{+0} weeks and 38^{+6} weeks of pregnancy. **[new 2015]**

Consider elective birth before 37^{+0}weeks for women with type 1 or type 2 diabetes if there are metabolic or any other maternal or fetal complications. **[new 2015]**

Advise women with gestational diabetes to give birth no later than 40^{+6} weeks, and offer elective birth (by induction of labour, or by caesarean section if indicated) to women who have not given birth by this time. **[new 2015]**

Consider elective birth before 40^{+6} weeks for women with gestational diabetes if there are maternal or fetal complications. **[new 2015]**

Diabetes should not in itself be considered a contraindication to attempting vaginal birth after a previous caesarean section. **[2008]**

Explain to pregnant women with diabetes who have an ultrasound-diagnosed macrosomic fetus about the risks and benefits of vaginal birth, induction of labour and caesarean section. **[2008]**

Anaesthesia

Offer women with diabetes and comorbidities such as obesity or autonomic neuropathy an anaesthetic assessment in the third trimester of pregnancy. **[2008]**

If general anaesthesia is used for the birth in women with diabetes, monitor blood glucose every 30 minutes from induction of general anaesthesia until after the baby is born and the woman is fully conscious. **[2008]**

Blood glucose control during labour and birth (Appendix 3)

Monitor capillary plasma glucose every hour during labour and birth in women with diabetes, and aim to maintain between 4 and 7 mmol/litre. **[2008, amended 2015]**

Intravenous dextrose and insulin infusion should be commenced for women with type 1 diabetes from the onset of established labour. **[2008]**

Use intravenous dextrose and insulin infusion during labour and birth for women with diabetes whose capillary plasma glucose is >7.0 on 2 consecutive readings. **[2008, amended 2015]**

Remember that some women labour and deliver rapidly and there may not be time to commence the intravenous insulin infusion – it is more important for these women to receive appropriate labour care. Neonatal and maternal blood glucose can be monitored postnatally as usual

4.3.4 Elective Caesarean Section

Women with pre-existing type 1 diabetes

- Women to take normal hypoglycaemic therapy the night before elective CS, to fast from midnight and to attend Ward 9 at 0730 without having had either their morning dose of insulin or breakfast. They will be placed FIRST on the morning caesarean section list. Sliding scale (Appendix 3c) to be commenced as soon as possible and continued until tolerating normal diet and able to resume their insulin injections as per the postnatal plan in their notes
- If general anaesthesia is required, monitor blood glucose every 30 minutes until the woman is fully conscious

Women with pre-existing type 2 diabetes or gestational diabetes

- Women to take normal treatment the night before elective CS, to fast from midnight, and to attend Ward 9 at 0730.
- Monitor capillary blood glucose on an hourly basis and if more than two consecutive readings of ≥7.0 mmol/l commence intravenous insulin infusion

- If sliding scale commenced, continue as per regimen for management of labour in insulin-treated patients (Appendix 3c) and discontinue after delivery

4.3.5 Neonatal care

Initial assessment and criteria for admission to intensive or special care

Advise women with diabetes to give birth in hospitals where advanced neonatal resuscitation skills are available 24 hours a day. **[2008]**

Babies of women with diabetes should stay with their mothers unless there is a clinical complication or there are abnormal clinical signs that warrant admission for intensive or special care. **[2008]**

Carry out blood glucose testing routinely in babies of women with diabetes at 2–4 hours after birth. Carry out blood tests for polycythaemia, hyperbilirubinaemia, hypocalcaemia and hypomagnesaemia for babies with clinical signs. **[2008]**

Perform an echocardiogram for babies of women with diabetes if they show clinical signs associated with congenital heart disease or cardiomyopathy, including heart murmur. The timing of the examination will depend on the clinical circumstances. **[2008]**

Admit babies of women with diabetes to the neonatal unit if they have:

- hypoglycaemia associated with abnormal clinical signs
- respiratory distress
- signs of cardiac decompensation from congenital heart disease or cardiomyopathy
- signs of neonatal encephalopathy
- signs of polycythaemia and are likely to need partial exchange transfusion
- need for intravenous fluids
- need for tube feeding (unless adequate support is available on the postnatal ward)
- jaundice requiring intense phototherapy and frequent monitoring of bilirubinaemia
- been born before 34 weeks (or between 34 and 36 weeks if dictated clinically by the initial assessment of the baby and feeding on the labour ward). **[2008]**

Do not transfer babies of women with diabetes to community care until they are at least 24 hours old, and not before you are satisfied that the baby is maintaining blood glucose levels and is feeding well. **[2008]**

Preventing and assessing neonatal hypoglycaemia

All maternity units should have a written policy for the prevention, detection and management of hypoglycaemia in babies of women with diabetes. **[2008]**

Test the blood glucose of babies of women with diabetes using a quality-assured method validated for neonatal use (ward-based glucose electrode or laboratory analysis). **[2008]**

Women with diabetes should feed their babies as soon as possible after birth (within 30 minutes) and then at frequent intervals (every 2–3 hours) until feeding maintains pre-feed capillary plasma glucose levels at a minimum of 2.0 mmol/litre. **[2008, amended 2015]**

If capillary plasma glucose values are below 2.0 mmol/litre on 2 consecutive readings despite maximal support for feeding, if there are abnormal clinical signs or if the baby will not feed orally effectively, use additional measures such as tube feeding or intravenous dextrose. Only implement additional measures if one or more of these criteria are met. **[2008, amended 2015]**

Test blood glucose levels in babies of women with diabetes who present with clinical signs of hypoglycaemia, and treat those who are hypoglycaemic with intravenous dextrose as soon as possible. **[2008, amended 2015]**

4.3.6 Postnatal care

Postnatal plan of care should be recorded antenatally in pregnancy notes.

Blood glucose control, medicines and breastfeeding

Women with pre-existing diabetes which was insulin-treated before pregnancy should reduce their insulin immediately after birth and monitor their blood glucose levels carefully to establish the appropriate dose. **[2008]**

Explain to women with insulin-treated pre-existing diabetes that they are at increased risk of hypoglycaemia in the postnatal period, especially when breastfeeding, and advise them to have a meal or snack available before or during feeds. **[2008]**

Women who have been diagnosed with gestational diabetes should discontinue blood glucose-lowering therapy immediately after birth. **[2008]**

Women with pre-existing type 2 diabetes who are breastfeeding can resume or continue to take metformin[2] and glibenclamide[4] immediately after birth, but should avoid other oral blood glucose-lowering agents while breastfeeding. **[2008]**

Women with diabetes who are breastfeeding should continue to avoid any medicines for the treatment of diabetes complications that were discontinued for safety reasons in the preconception period. **[2008]**

Information and follow-up after birth
Women with pre-existing diabetes

Refer women with pre-existing diabetes back to their routine diabetes care arrangements. **[2008]**

Remind women with diabetes of the importance of contraception and the need for preconception care when planning future pregnancies. **[2008]**

Women diagnosed with gestational diabetes

Test pre-meal blood glucose in women who were diagnosed with gestational diabetes to exclude persisting hyperglycaemia before they are transferred to community care. **[2008]**

Remind women who were diagnosed with gestational diabetes of the symptoms of hyperglycaemia. **[2008]**

Explain to women who were diagnosed with gestational diabetes about the risks of gestational diabetes in future pregnancies, and offer them testing for diabetes[7] when planning future pregnancies. **[2008, amended 2015]**

For women who were diagnosed with gestational diabetes and whose blood glucose levels returned to normal after the birth:

- Offer lifestyle advice (including weight control, diet and exercise).
- Offer a fasting plasma glucose test 6–13 weeks after the birth to exclude diabetes (for practical reasons this might take place at the 6-week postnatal check).
- If a fasting plasma glucose test has not been performed by 13 weeks, offer a fasting plasma glucose test, or an HbA1c test if a fasting plasma glucose test is not possible, after 13 weeks.
- Do not routinely offer a 75 g 2-hour OGTT. **[new 2015]**

For women having a fasting plasma glucose test as the postnatal test:

- Advise women with a fasting plasma glucose level below 6.0 mmol/litre that:
  - they have a low probability of having diabetes at present
  - they should continue to follow the lifestyle advice (including weight control, diet and exercise) given after the birth
  - they will need an annual test to check that their blood glucose levels are normal
  - they have a moderate risk of developing type 2 diabetes, and offer them advice and guidance in line with the NICE guideline on preventing type 2 diabetes[8].

- Advise women with a fasting plasma glucose level between 6.0 and 6.9 mmol/litre that they are at high risk of developing type 2 diabetes, and offer them advice, guidance and interventions in line with the NICE guideline on preventing type 2 diabetes[8]
- Advise women with a fasting plasma glucose level of 7.0 mmol/litre or above that they are likely to have type 2 diabetes, and offer them a diagnostic test to confirm diabetes. **[new 2015]**

For women having an HbA1c test as the postnatal test:

- Advise women with an HbA1c level below 39 mmol/mol (5.7%) that:
  - they have a low probability of having diabetes at present
  - they should continue to follow the lifestyle advice (including weight control, diet and exercise) given after the birth
  - they will need an annual test to check that their blood glucose levels are normal
  - they have a moderate risk of developing type 2 diabetes, and offer them advice and guidance in line with the NICE guideline on preventing type 2 diabetes[8].
- Advise women with an HbA1c level between 39 and 47 mmol/mol (5.7% and 6.4%) that they are at high risk of developing type 2 diabetes, and offer them advice, guidance and interventions in line with the NICE guideline on preventing type 2 diabetes[8].
- Advise women with an HbA1c level of 48 mmol/mol (6.5%) or above that they have type 2 diabetes and refer them for further care. **[new 2015]**

Offer an annual HbA1c test to women who were diagnosed with gestational diabetes who have a negative postnatal test for diabetes. **[new 2015]**

Offer women who were diagnosed with gestational diabetes early self-monitoring of blood glucose or an OGTT in future pregnancies. Offer a subsequent OGTT if the first OGTT results in early pregnancy are normal. **[2008, amended 2015]**

4.3.7 Care for women with Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period

See Insulin Management Plan for Pregnant Women utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period.

NB Where women and their partners are unable to manage the insulin pump, allow pump to continue running and commence intravenous insulin infusion in addition to pump as per sliding scale

5.0 Governance

5.1 Document review history

Version	Date	Name	Reason
5		Erum A Khan Jan Liddie Faryal Nizami Shanti Chandran	Updated guideline to reflect 2015 NICE guidance.

5.2 Consultation History

Stakeholders Name/Board	Area of Expertise	Date Sent	Date Received	Comments	Endorsed Yes/No
Matrons			June 2017	No comments	Yes
Head of Midwifery			June 2017	No comments	Yes
Consultant Midwife and Matrons			June 2017	No comments	Yes
Consultants			June 2017	No comments	Yes
Registrars/SHO and Midwives			June 2017	No comments	Yes

5.3 Audit and monitoring

Audit Criteria	Tool	Audit Lead	Frequency of Audit	Responsible Committee	How changes will be implemented	Responsibility for Actions
a) Numbers of women who develop GDM, their related risk factors and birth outcomes b) Numbers of	a-c) Audit/ statistics	a-c) Diabetes lead midwife/ DSNs a-c) Lead obstetrici	a-c) Annually	a-c) Maternity CIG		a-c) Diabetes lead midwife/DSNs a-c) Lead obstetrician

women with pre-existing diabetes and birth outcomes c) Adherence to the above guideline for all women with pre-existing diabetes and gestational diabetes.		an for diabetes				for diabetes

5.4 Equality Impact Assessment

This document has been assessed using the Trust's Equality Impact Assessment Screening Tool. No detailed action plan is required. Any ad-hoc incident which highlights a potential problem will be addressed by the monitoring committee.

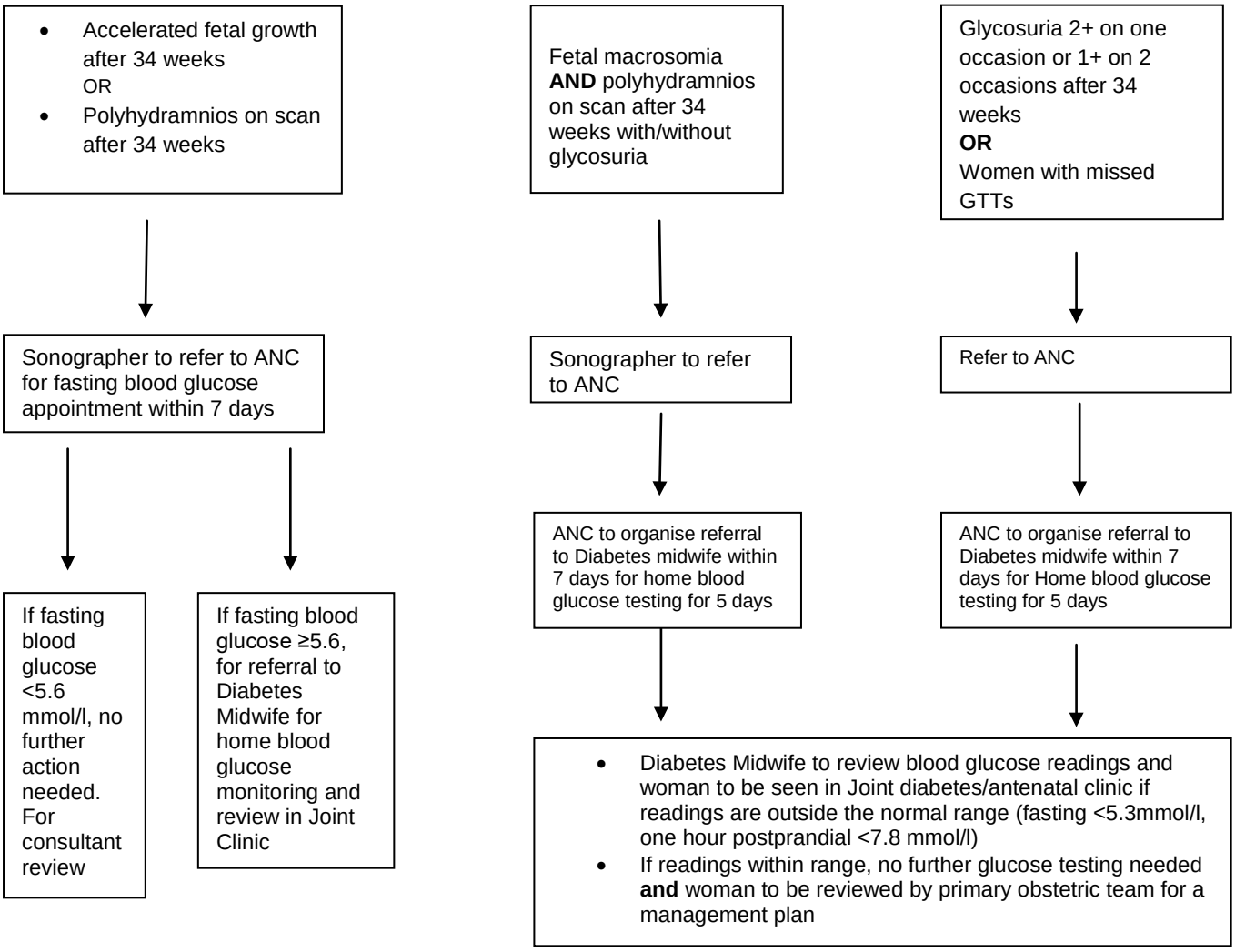
Impact	**Age**	**Disability**	**Race**	**Gender**	**Religion or Belief**	**Sexual Orientation**
Do different groups have different needs, experiences, issues and priorities in relation to the proposed policy?	No	No	No	No	No	No
Is there potential for or evidence that the proposed policy will not promote equality of opportunity for all and promote good relations between different groups?	No	No	No	No	No	No
Is there potential for or evidence that the proposed policy will affect different population groups differently (including possibly discriminating against certain groups)?	No	No	No	No	No	No
Is there public concern (including media, academic, voluntary or sector specific interest) in potential discrimination against a particular population group or groups?	No	No	No	No	No	No

Appendix 1: Management of Women with Polyhdramnios and/or accelerated growth at 34 weeks

Macrosomia is defined as Estimated Fetal Weight (EFW) more than 90th centile. OGTT is not a validated test for third trimester. 5-10 days of Home Blood Glucose Monitoring (HBGM) is a better alternative as gives a wider picture of glycemic control. This is evidence level C.

One pre prandial and three postprandial blood glucose readings to be monitored daily.

PATHWAY FOR MANAGEMENT OF ACCELERATED FETAL GROWTH AND/OR POLYHYDRAMNIOS ON SCAN, GLYCOSURIA AND MISSED OGTT AFTER 34 WEEKS



Appendix 2: Treatment recommendations for gestational diabetes

Treating gestational diabetes has been shown to improve outcome for both women and babies (Crowther et al 2005). Treatments include blood glucose monitoring, lifestyle modifications such as diet and exercise in the first instance, and dhypoglycaemic agents metformin and/or insulin if lifestyle modifications are not effective. The primary goal of intervention is to maintain near normal glycaemic control in order to reduce morbidity and mortality in women and babies (NICE 2008).

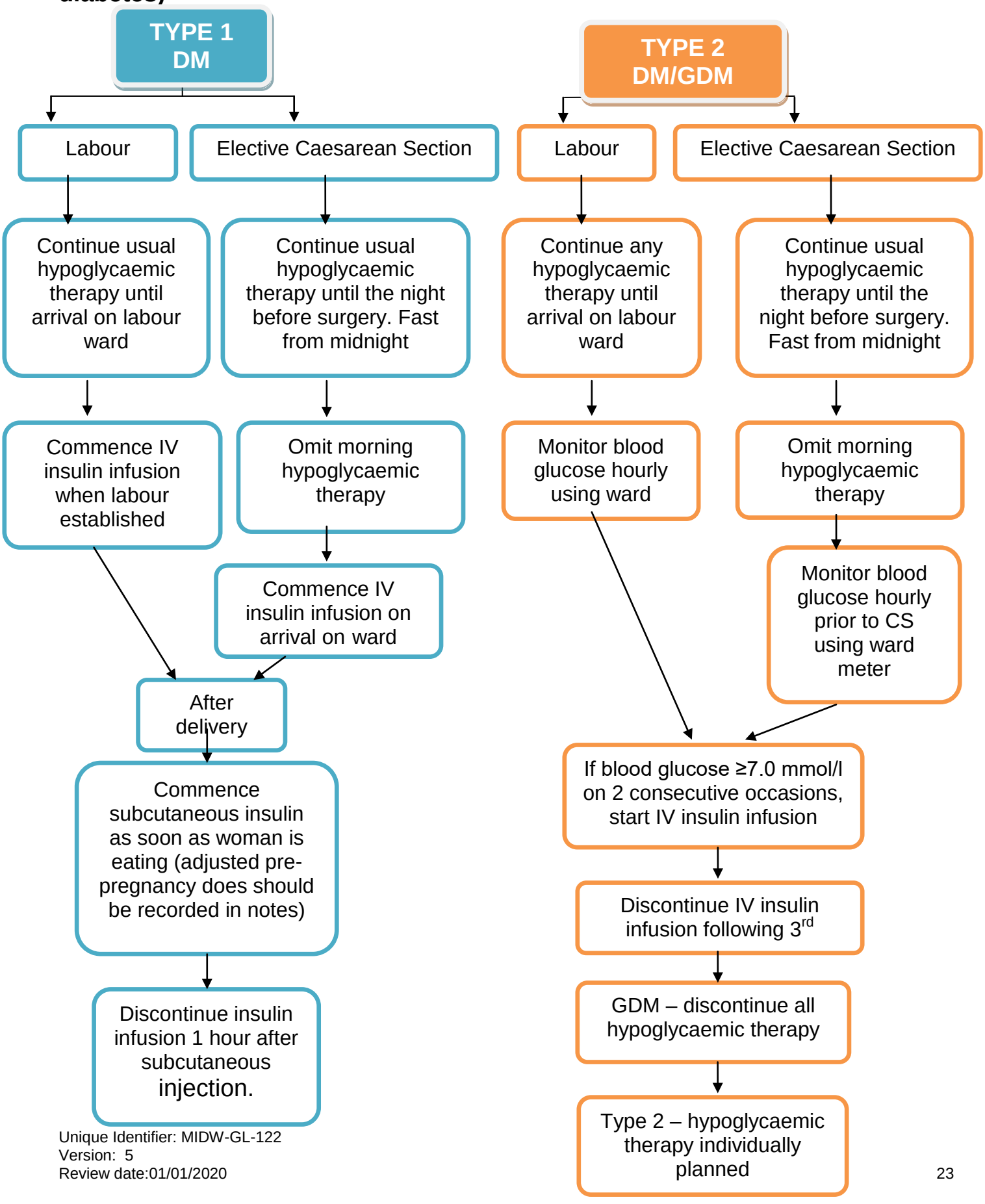
Decisions about treatment should be made based on fasting and 1 hour postprandial blood glucose readings, and treatment should be initiated if near-normal control cannot be achieved by diet alone.

Hypoglycaemic therapy should also be considered for women with GDM if ultrasound suggests incipient fetal macrosomia (AD >70th centile) at diagnosis.

On diagnosis of GDM:

- Women to start monitoring blood glucose and liaise with the Diabetes Midwife within 1 week either by telephone or email with blood glucose readings
- Give immediate dietary advice, and offer next available dietitian appointment
- If near-normal glycaemic control is not achieved during a period of 1-2 weeks or if the abdominal circumference on scan is >70th centile, consider hypoglycaemic therapy
  - Diabetes midwife may make the decision to initiate treatment and discuss with the woman to obtain informed consent (metformin is unlicensed for use in pregnancy)
  - Diabetes midwife to arrange prescription request for GP
    - Metformin**:**
      - Start on 500 mg BD and increase to 1 g BD after 4 days if required
      - Woman to maintain at least weekly contact with Diabetes Midwife until blood glucose stable, and to be reviewed in Joint Clinic as per guideline
      - Discontinue postnatally
      - Metformin may also be given as modified release or in oral solution if necessary
    - Insulin**:**
      - Give full education, written information (See Patient Information Leaflet
      - Starting Insulin in Gestational Diabetes Mellitus), and insulin passport
      - Novorapid™ (rapid acting) – with meals, dose as required, usually starting at 4-6 units and increasing in increments of 1-2 units depending on glycaemic control
      - Insulatard™ (intermediate acting) – at bedtime, dose as required, usually starting at 4-6 units and increasing in increments of 1-2 units depending on glycaemic control
      - The Diabetes Midwife may make recommendations to increase or decrease insulin at his/her discretion depending on glycaemic control
      - Woman to maintain at least weekly contact with Diabetes Midwife or Diabetes Specialist Nurse and to be reviewed in Joint Clinic as per guideline
      - Discontinue postnatally

Appendix 3a: Observation of blood glucose in labour and caesarean section for women with diabetes in pregnancy (Type 1, Type 2 and gestational diabetes)



Appendix 3b: Observation of blood glucose in labour and caesarean section for women with diabetes in pregnancy (Type 1, Type 2 and gestational diabetes)

Patient Label

Date/time	Blood glucose (mmol/l)	IV insulin infusion required (Yes/No)	Rate (mls/hr)	Syringe vol (mls)	Comments

Appendix 3c: Management of blood glucose during labour and caesarean section in women with diabetes who require intravenous insulin infusion

Patient Label

1. No food and no subcutaneous insulin once labour established
2. Set up IV with 1 litre 5% Dextrose and 20mmol K+ as potassium chloride to run 8 hourly (125ml.hour)
3. Set up syringe driver with a 50 ml pre-filled insulin syringe for IV use and connect via Y connector to IV line: one ml/hour is equivalent to one unit of soluble human insulin/hour
4. Measure capillary blood glucose using ward based blood glucose meter every hour
5. Adjust insulin rate according to sliding scales as shown: dose usually ranges from 0.5-6 units/hour. Aim to keep blood glucose 4-7mmol/l.
6. After delivery:

Women with pre-existing diabetes treated with insulin prior to pregnancy:

- Continue intravenous insulin infusion after delivery, and commence subcutaneous insulin as soon as practicable when woman is eating. This will be either next meal time or, if in the evening, the 2200 insulin injection at their adjusted pre-pregnancy dose (this should be recorded in the antenatal notes).
- Discontinue intravenous insulin infusion 1 hour after subcutaneous injection. See flow chart Appendix 3a

Women with pre-existing diabetes treated by diet or oral hypoglycaemics prior to pregnancy or gestational diabetes:

- Stop the intravenous insulin infusion after delivery. See flow chart 3a

Sliding Scale

Blood Glucose (mmol/l)	Insulin (units/hour)
0-3.9	0
4.0-7.9	2
8.0-12.9	4
>13#	6

and urgently contact Consultant (bleep 1062) or Specialist Registrar (Bleep 1549)

INSULIN AND FLUID CHART

Date	Start time	Fluid	Volume (ml)	Batch No	Infusion Rate	Time Started	Set Up By (Initials)	Added By (Initials)	Dr's Signature
		50 mls Sodium Chloride 0.9% with 50 units soluble human insulin (pre-filled)	**50ml**		**0-6 ml/hour**				
		50 mls Sodium Chloride 0.9% with 50 units soluble human insulin (pre-filled)	**Up to 50ml**		**0-6 ml/hour**				
		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				
		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				
		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				
		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				

		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				
		5% Dextrose with Potassium 20 mmol	**1 litre**		**125ml/h**				

MANAGEMENT OF BLOOD GLUCOSE FOR WOMEN TAKING INSULIN WHO REQUIRE ANTENATAL STEROIDS FOR FETAL LUNG MATURATION

PATIENT LABEL

NB Women may self-manage at home unless the Diabetes Team have recommended admission. Normal blood glucose range is fasting/pre-meal <5.3mmol/l, one hour after meals <7.8 mmol/l

Women to be advised to increase all insulin doses by 20% from the next meal following administration of first steroid injection

↓

Monitor blood glucose pre and post meals and before bed

↓

To be admitted if outside target* on more than two consecutive readings, if any readings >12.0 mmol or if any concerns

↓

On admission monitor blood glucose hourly using ward meter and record overleaf. Inform Diabetes Midwife/Nurse of admission

↓

OBSERVATION OF BLOOD GLUCOSE IN WOMEN TAKING INSULIN WHO REQUIRE ANTENATAL STEROIDS FOR FETAL LUNG MATURATION ONCE IV INSULIN COMMENCED

PATIENT LABEL

Date/time	Blood glucose Mmol/l	IV insulin infusion required (Yes/No)	Rate (mls/hr)	Syringe vol (mls)	Comments

Milton Keynes University Hospital NHS Foundation Trust

Patient Label

Appendix 4: Management of blood glucose for women with diabetes in pregnancy who require intravenous insulin infusion following administration of antenatal steroids

1. Women should **eat and drink as usual and continue with their usual insulin or metformin therapy**
2. Set up syringe driver with a with a 50 ml pre-filled insulin syringe for IV use and connect via Y connector to IV line: one ml/hour is equivalent to one unit of soluble human insulin/hour
3. Measure capillary blood glucose using ward based blood glucose every hour
4. Adjust insulin rate according to sliding scales as shown: dose usually ranges from 0.5-6 units/hour.
5. Aim to keep blood glucose 4-7mmol/l
6. Discontinue intravenous insulin infusion when no additional IV insulin needed to control blood glucose (i.e. 0 units of insulin/hour) for 2-4 consecutive hours

Sliding Scale

Blood Glucose (mmol/l)	**Insulin (units/hour)**
0-3.9 #	0
4.0-7.9	0
8.0-12.9	2
>13 #	4

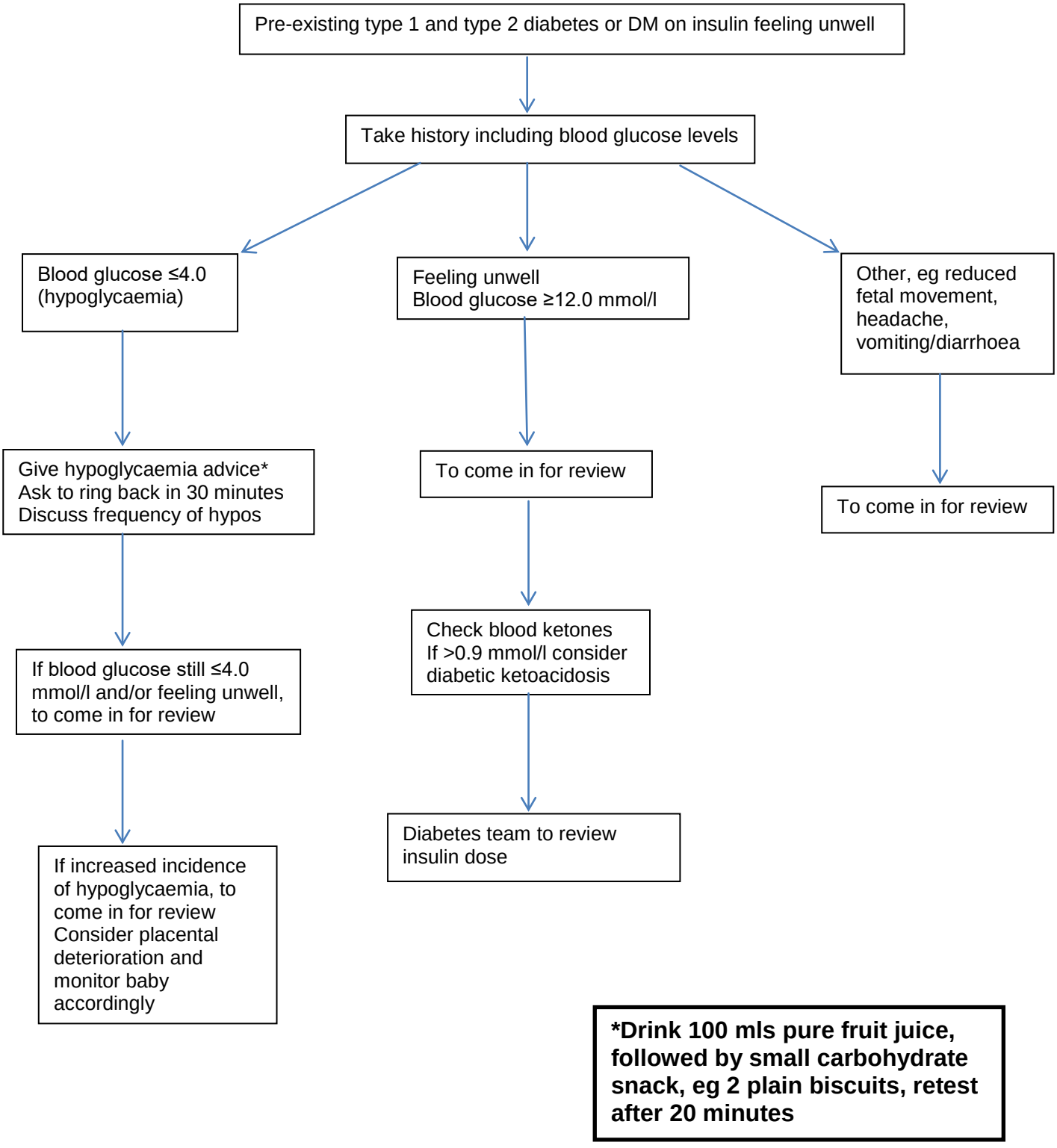
 # and urgently contact Consultant (Bleep 1062) or Specialist Registrar (Bleep 1549)

INSULIN AND FLUID CHART

INSULIN AND FLUID CHART

Date	Start time	Fluid	Volume (ml)	Batch No	Infusion Rate	Time Started	Set Up By (Initials)	Added By (Initials)	Dr's Signature
		50 mls Sodium Chloride 0.9% with 50 units soluble human insulin (pre-filled)	**50ml**		**0-4 ml/hour**				
		50 mls Sodium Chloride 0.9% with 50 units soluble human insulin (pre-filled)	**50ml**		**0-4 ml/hour**				

Appendix 5: Pathway for Women with insulin-treated diabetes telephoning ADAU/Labour Ward



***Drink 100 mls pure fruit juice, followed by small carbohydrate snack, eg 2 plain biscuits, retest after 20 minutes**