

Scope:

This guideline applies to the management of diabetes and its complications from pre-conception to the postnatal period. This applies to obstetric, midwifery, neonatology and diabetology staff.

Legal Liability (standard UHL statement):

Guidelines issued and approved by the Trust are considered to represent best practice. Staff may only exceptionally depart from any relevant Trust guidelines providing always that such departure is confined to the specific needs of individual circumstances. In healthcare delivery such departure shall only be undertaken where, in the judgement of the responsible health professional' it is fully appropriate and justifiable – such decision to be fully recorded in the patient's notes.

Monitoring:

This is based on a review of incident forms by the Risk Manager in conjunction with the clinical lead, and will include trend analysis if considered necessary, and referred to the Perinatal Risk Group where appropriate. Any action points / plans will then be referred to the Maternity Services or Neonatal Governance Group.

Background:

The National Institute for Health and Clinical Excellence (NICE) published clinical guideline 63f, Diabetes in Pregnancy, in March 2008 (updated June 2008). The guideline states:

Miscarriage, pre-eclampsia and preterm labours are more common in women with pre-existing diabetes, and 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.

This guideline is the NICE Diabetes in Pregnancy guideline with additions where appropriate to explain implementation within UHL.

Contents:

1. Key priorities for implementation	Page 2
2. Pre-conception care	Page 3
3. Gestational diabetes	Page 6
4. Antenatal care	Page 8
5. Intrapartum care	Page 12
6. Neonatal care	Page 13
7. Postnatal care	Page 14

Key priorities for implementation

• Pre-conception care

- Women with diabetes who are planning to become pregnant should be informed that establishing good glycaemic control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death. It is important to explain that risks can be reduced but not eliminated.
- The importance of avoiding unplanned pregnancy should be an essential component of diabetes education from adolescence for women with diabetes.
- Women with diabetes who are planning to become pregnant should be offered pre-conception care and advice before discontinuing contraception.

• Antenatal care

- If it is safely achievable, women with diabetes should aim to keep fasting blood glucose concentrations between 4.0 and 5.5 mmol/litre and 1-hour postprandial blood glucose below 7.8 mmol/litre during pregnancy. In order to minimise the risks of maternal hypoglycaemia women will be advised to regard 4.0 mmol/l as the safe lower limit. (Note: the postprandial glucose target is equivalent to a 2 hour value below 7.0 mmol/l).
- Women with insulin-treated diabetes should be advised of the risks of hypoglycaemia and hypoglycaemia unawareness in pregnancy, particularly in the first trimester.
- During pregnancy, women who are suspected of having diabetic ketoacidosis should be admitted immediately for level 2 critical care, where they can receive both medical and obstetric care.
- Women with diabetes who have HbA1c \geq 8.0% at booking should be offered antenatal ultrasound examination of the outflow tracts as well as four-chamber view of the fetal heart at 18–22 weeks.

• Neonatal care

- Babies of women with diabetes should be kept with their mothers unless there is a clinical complication or there are abnormal clinical signs that warrant admission for intensive or special care.

• Postnatal care

- Women who were diagnosed with gestational diabetes should be offered lifestyle advice (including weight control, diet and exercise) and offered a fasting plasma glucose measurement as a minimum at the 6-week postnatal check and annually thereafter. Local opinion is that the standard should be an oral glucose tolerance test (OGGT) in order to identify women with impaired glucose tolerance who might benefit from proven lifestyle interventions to prevent the development of diabetes.

Pre-conception care

- **Information and advice**

- Offer information, care and advice to women with diabetes who are planning to become pregnant before they discontinue contraception.
- Give pre-conception care in a supportive environment. Encourage the woman's partner or a family member to attend.
- This should build on previous care given in routine appointments with healthcare professionals, including the diabetes care team (see box 1).

Box 1 Encouraging women with diabetes to seek pre-conception care

Starting from adolescence:

- Healthcare professionals should give information about the benefits of pre-conception glycaemic control at each contact with women of child-bearing potential and with all types of diabetes.
- The diabetes care team should record the woman's intentions regarding pregnancy and contraceptive use at each contact.
- The importance of avoiding unplanned pregnancy should be an essential component of diabetes education.
- If women are planning pregnancy, they should be seen by healthcare professionals with appropriate competence to give advice – Level 2 of the Leicester 'Service Model for Diabetes'.
- If women have additional medical or obstetric problems which further increase risk in pregnancy, they should be referred to LGH or LRI for specialist pre-pregnancy counselling – Level 3 of the Leicester 'Service Model for Diabetes'.

- **Give advice and information on:**

- The risks of diabetes in pregnancy (see box 2) and how to reduce them with good glycaemic control, diet, body weight and exercise, including weight loss for women with a body mass index (BMI) over 27 kg/m².
- Hypoglycaemia and hypoglycaemia unawareness.
- Pregnancy-related nausea/vomiting and glycaemic control.
- Retinal and renal assessment.
- When to stop contraception.
- Taking folic acid supplements (5 mg/day) from pre-conception until 12 weeks of gestation.
- Review of, and possible changes to, medication, glycaemic targets and self-monitoring routine.
- Frequency of appointments and local support, including emergency telephone numbers.

Box 2 Risks of diabetes in pregnancy

Risks to women and babies include:

- Fetal macrosomia
- Birth trauma (to mother and baby)
- Induction of labour or caesarean section
- Miscarriage
- Congenital malformation
- Stillbirth
- Transient neonatal morbidity
- Neonatal death
- Obesity and/or diabetes developing later in the baby's life.

• **Care, assessment and review:**

Offer:

- Folic acid supplements (5 mg/day).
- Blood glucose meter for self-monitoring.
- Ketone testing strips to women with type 1 diabetes and advise to use if hyperglycaemic or unwell.
- Diabetes structured education programme.
- Monthly HbA1c.
- Retinal assessment by digital imaging with mydriasis using tropicamide (unless carried out in previous 6 months).
- Renal assessment (including microalbuminuria) before stopping contraception.

Consider:

- Referral to a nephrologist if serum creatinine is 120 micromol/litre or more or the estimated glomerular filtration rate (eGFR) is less than 45 ml/minute/1.73 m².

Review:

- Current medications for diabetes and its complications (see box 3).
- Glycaemic targets and glucose monitoring (see box 4).

Box 3 Safety of medications before and during pregnancy

- Metformin may be used before and during pregnancy, as well as or instead of insulin.
- Rapid acting insulin analogues (NovoRapid® insulin aspart and Humalog® insulin lispro) are safe to use in pregnancy and have advantages over soluble human insulin during pregnancy.
- Evidence about the use of long-acting insulin analogues during pregnancy is limited. Isophane (NPH) insulin is the first-choice long-acting insulin during pregnancy.
- Women already established on long acting insulin analogues (Levemir® insulin detemir or Lantus® insulin glargine) may wish to continue with them despite the lack of long term safety data.

Before or as soon as pregnancy is confirmed:

- Stop oral hypoglycaemic agents, apart from metformin, and commence insulin if required.
- Stop angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists and consider alternative antihypertensives.
- Stop statins.

Box 4 Blood glucose targets and monitoring

- Agree individualised blood glucose targets for self-monitoring.
- Advise women who need intensification of hypoglycaemic therapy to increase the frequency of self-monitoring to include fasting and a mixture of pre- and postprandial levels.
- Offer monthly HbA_{1c}.
- Advise women to aim for an HbA_{1c} < 6.5% if possible.
- Inform women that any reduction in HbA_{1c} may reduce risks, even if this target is not achievable.
- Advise women with HbA_{1c} above 10% to avoid pregnancy.
- Do not offer rapid optimisation of glycaemic control until after retinal assessment and treatment are completed.

Gestational diabetes

Box 5 Risk factors for screening

- BMI above 30 kg/m² at booking.
- Previous macrosomic baby weighing 4.5 kg or greater.
- Previous gestational diabetes.
- First-degree relative with diabetes.
- Family origin with a high prevalence of diabetes (South Asian, Black Caribbean and Middle Eastern).

• Screening and diagnosis:

Offer:

- Screening for gestational diabetes using risk factors (see box 5) at the booking appointment.
- If the woman has had gestational diabetes previously, offer a 2-hour 75 g oral glucose tolerance test (OGTT) as soon as possible after booking in order to detect diabetes that may have pre-dated conception. If the result is normal a further OGTT at 24–28 weeks should be performed to detect a recurrence of gestational diabetes.
- Women who present with glycosuria at booking should be offered an immediate OGTT (due to the high prevalence of undiagnosed type 2 diabetes in the local population).
- An OGTT to test for gestational diabetes at 24–28 weeks if the woman has any other risk factors.

Do not offer:

- Screening for gestational diabetes using fasting plasma glucose, random blood glucose, glucose challenge test or urinalysis for glucose.

• Information and advice before screening and testing:

Advise that:

- There is a small risk of birth complications if gestational diabetes is not controlled.
- Gestational diabetes will respond to changes in diet and exercise in most women.
- Insulin injections may be needed if diet and exercise do not control blood glucose levels.
- Extra monitoring and care may be needed during pregnancy and labour.

- **Information and advice after diagnosis:**

Give information and advice on:

- The risks of gestational diabetes (see box 6) and how to reduce them with good glycaemic control.
- Diet, body weight and exercise, including weight loss for women with a BMI over 27 kg/m².
- Self-monitoring of blood glucose.
- Individualised targets for blood glucose.

Box 6 Risks of gestational diabetes
Risks to women and babies include: <ul style="list-style-type: none">- Fetal macrosomia- Birth trauma (to mother and baby)- Induction of labour or caesarean section- Transient neonatal morbidity- Neonatal hypoglycaemia- Perinatal death- Obesity and/or diabetes developing later in the baby's life.

- **Hypoglycaemic therapy:**

Consider hypoglycaemic therapy for women with gestational diabetes:

- If lifestyle changes do not maintain blood glucose targets over a period of 1–2 weeks
- If ultrasound shows incipient fetal macrosomia (abdominal circumference above the 70th percentile) at diagnosis.

If hypoglycaemic therapy is required:

- Tailor hypoglycaemic therapy to the individual woman.
- The usual treatment will be with insulin – often a rapid-acting analogues (NovoRapid® insulin aspart or Humalog® insulin lispro), with one or more meals. Women who refuse to take insulin may be offered glibenclamide or metformin instead.

Antenatal care

This information is supplementary to routine antenatal care.

- **Offer:**

- Immediate referral to a joint diabetes and antenatal clinic at LGH (Tuesday pm) or LRI (Wednesday pm), by telephone or fax (*see below for numbers*).
- Contact with the diabetes care team every 1–2 weeks to assess glycaemic control. Telephone contact may be useful to facilitate this in order to avoid additional visits to hospital.
- Advice on where to have the birth, which should be in a hospital with advanced neonatal resuscitation skills available 24 hours a day.
- Information and education at each appointment.
- Care specifically for women with diabetes, in addition to routine antenatal care, as described below.

- **Specific antenatal care for women with diabetes:**

Key:

- Appointment including specific diabetes care
- Appointment including routine care only
- No routine care appointment

First appointment (joint diabetes and antenatal clinic)

- Offer information, advice and support on glycaemic control (see boxes 7–9).
- Take a clinical history.
- Review medications (see box 3).
- Offer retinal and renal assessment if these have not been performed in the previous 12 months (see boxes 10–11).



7–9 weeks

- Confirm viability of pregnancy and gestational age.



Booking appointment (ideally by 10 weeks)

- Discuss information, education and advice about how diabetes will affect pregnancy, birth and early parenting (such as breastfeeding and initial care of the baby).



16 weeks

- Offer retinal assessment to women with pre-existing diabetes who had signs of diabetic retinopathy at the first antenatal appointment (see box 10).



20 weeks

- Offer four-chamber view of the fetal heart and outflow tracts if booking HbA1c \geq 8.0% (see box 12).
- Offer scans that would be offered at 18–20 weeks in routine antenatal care.

<p>25 weeks</p> <ul style="list-style-type: none"> • Offer routine care only (appointment for nulliparous women). <p style="text-align: center;">↓</p>
<p>28 weeks</p> <ul style="list-style-type: none"> • Offer ultrasound monitoring of fetal growth and amniotic fluid volume (see box 12). • Offer retinal assessment to women with pre-existing diabetes who did not have diabetic retinopathy at their first antenatal clinic visit. <p style="text-align: center;">↓</p>
<p>31 weeks</p> <ul style="list-style-type: none"> • No appointment (routine care offered to nulliparous women at 32 weeks). <p style="text-align: center;">↓</p>
<p>32 weeks</p> <ul style="list-style-type: none"> • Offer ultrasound monitoring of fetal growth and amniotic fluid volume. • Offer investigations that would be offered to nulliparous women at 31 weeks in routine antenatal care. <p style="text-align: center;">↓</p>
<p>34 weeks</p> <ul style="list-style-type: none"> • Offer routine care only. <p style="text-align: center;">↓</p>
<p>36 weeks</p> <ul style="list-style-type: none"> • Offer ultrasound monitoring of fetal growth and amniotic fluid volume. • Offer information and advice about: <ul style="list-style-type: none"> - timing, mode and management of birth - analgesia and anaesthesia (including anaesthetic assessment for women with comorbidities, such as obesity or autonomic neuropathy) - changes to hypoglycaemic therapy during and after birth - initial care of the baby - initiation of breastfeeding and the effect of breastfeeding on glycaemic control - contraception and follow-up. <p style="text-align: center;">↓</p>
<p>38 weeks</p> <ul style="list-style-type: none"> • Offer induction of labour, or caesarean section if indicated. • Offer tests of fetal wellbeing for women waiting for spontaneous labour. <p style="text-align: center;">↓</p>
<p>39 weeks</p> <ul style="list-style-type: none"> • Offer tests of fetal wellbeing for women waiting for spontaneous labour. <p style="text-align: center;">↓</p>
<p>40 weeks</p> <ul style="list-style-type: none"> • Offer tests of fetal wellbeing for women waiting for spontaneous labour. <p style="text-align: center;">↓</p>
<p>41 weeks</p> <ul style="list-style-type: none"> • Offer tests of fetal wellbeing for women waiting for spontaneous labour.

Box 7 Blood glucose targets and monitoring

- Agree individualised targets for self-monitoring.
- Typically advise women to test their blood glucose fasting and 1-hour after meals.
- Typically advise women to aim for a fasting blood glucose of between 4.0 and 5.5 mmol/litre and 1-hour postprandial blood glucose below 7.8 mmol/litre.
- The presence of diabetic retinopathy should not prevent rapid optimisation of glycaemic control in women with a high HbA_{1c} in early pregnancy.
- Do not measure HbA_{1c} routinely in the second and third trimesters.

Box 8 Additional care for women taking insulin

Offer:

- Concentrated oral glucose solution to all women taking insulin.
- Glucagon to women with type 1 diabetes if their partner is willing to administer it.
- Insulin pump therapy if glycaemic control using multiple injections is not adequate and the woman experiences significant disabling hypoglycaemia.

Advise:

- Women to test their blood glucose before going to bed at night.
- On the risks of hypoglycaemia and hypoglycaemia unawareness, especially in the first trimester with particular reference to driving.
- Women and their partners or family members on the use of oral glucose solutions and glucagon for hypoglycaemia.

Box 9 Detecting and managing diabetic ketoacidosis

If diabetic ketoacidosis (DKA)[†] is suspected during pregnancy, admit women immediately for high dependency care*, where both medical and obstetric care are available. Admission is to the delivery suite or the emergency medical unit at LGH depending on gestation and individual circumstances. Admission is to the medical admissions unit at LRI.

For women with type 1 diabetes:

- Offer ketone testing strips and advise women to test their ketone levels if they are hyperglycaemic or unwell.
- Exclude diabetic ketoacidosis as a matter of urgency in women who become unwell.

Although a trace of ketonuria in the fasting state is common in pregnancy, a higher concentration of ketonuria is likely to indicate decompensation of diabetes. It is possible to develop diabetic ketoacidosis in pregnancy with blood glucose concentrations close to the normal range.

Guidelines

[†]Refer to UHL Diabetic Ketoacidosis (DKA) guideline (InSite article number 10019).

*Refer to 'Admissions to HDU' (DMS number 18769).

Box 10 Retinal assessment for women with pre-existing diabetes**Offer retinal assessment:**

- As soon as possible after the first contact in pregnancy if it has not been performed in the past 12 months
- At 16–20 weeks if any retinopathy has been recorded.
- At 28 weeks if the first assessment is normal

Retinal assessment should be carried out by digital imaging with mydriasis using tropicamide, the images graded as top priority, with results sent to the appropriate Consultant Diabetologist.

Box 11 Renal assessment for women with pre-existing diabetes**Offer:**

- Renal assessment at the first contact in pregnancy if it has not been performed in the past 12 months.

Consider:

- Referral to a nephrologist if serum creatinine is abnormal (120 micromol/litre or more) or total protein excretion exceeds 2 g/day
- Thromboprophylaxis if proteinuria is above 5 g/day.

Do not offer:

- eGFR during pregnancy.

Box 12 Monitoring and screening fetal development**Offer:**

- Antenatal ultrasound examination of the fetal cardiac outflow tracts in addition to routine anomaly scanning at 18–22 weeks for women with booking HbA1c \geq 8.0%.
- Ultrasound monitoring of fetal growth and amniotic fluid volume every 4 weeks from 28 to 36 weeks
- Individualised monitoring of fetal wellbeing to women at risk of intrauterine growth restriction (those with macrovascular disease or nephropathy).

Do not offer:

- Tests of fetal wellbeing before 38 weeks, unless there is a risk of intrauterine growth restriction.

Intrapartum care

- **Information and advice:**

Give information on:

- The risks and benefits of vaginal birth, induction of labour and caesarean section if the baby has macrosomia identified by ultrasound.
- The possibility of vaginal birth in women with diabetic retinopathy.
- The possibility of vaginal birth after previous caesarean section.

Care for preterm labour:

- Consider antenatal steroids for fetal lung maturation in preterm labour or if early elective birth is planned.
- Consider tocolytic medication (but not betamimetic drugs) to suppress labour if indicated.
- Monitor glucose levels of women taking steroids for fetal lung maturation closely and advise on taking supplementary insulin according to an agreed protocol.

Care after 38 weeks:

Offer:

- Induction of labour, or caesarean section if indicated, after 38 weeks if the baby has grown normally.

Care during labour and birth:

Monitor:

- Blood glucose hourly and aim to maintain it at between 4 and 7 mmol/litre.
- Blood glucose every 30 minutes if a general anaesthetic is used.

Consider intravenous dextrose and insulin:

- For women with type 1 diabetes.
- For women whose blood glucose is not maintained between 4 and 7 mmol/litre.

Care prior to elective Caesarean section:

- Adjust insulin dosage to account for pre-operative fasting

Monitor:

- Blood glucose hourly and aim for blood glucose between 4 and 7 mmol/l.

Consider intravenous dextrose and insulin:

- For women with poorly controlled type 1 diabetes.
- For women whose blood glucose is not maintained within 4 and 7 mmol/l.

Neonatal care

- The baby should stay with the mother unless extra neonatal care is required (see box 13).
- Do not transfer babies into community care until they are at least 24 hours old, maintaining their blood glucose levels and feeding well.

Box 13 Admission to a neonatal unit

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

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

• Test:

- For polycythaemia, hyperbilirubinaemia, hypocalcaemia and hypomagnesaemia if the baby has clinical signs.
- For heart abnormalities using an echocardiogram if the baby has clinical signs associated with congenital heart disease or cardiomyopathy.

• Preventing, detecting and managing neonatal hypoglycaemia

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

Advise:

- Women to feed their babies as soon as possible (within 30 minutes of birth) and then at frequent intervals (2–3 hours) until pre-feeding blood glucose levels are maintained at 2 mmol/litre or more.

Test the baby's blood glucose levels:

- 2–4 hours after birth using a quality-assured method validated for neonatal use (ward-based glucose electrode or laboratory analysis)
- If he or she has signs of hypoglycaemia.

Give:

- Intravenous dextrose as soon as possible if the baby has clinical signs of hypoglycaemia.
- Tube feeding or intravenous dextrose if the baby has blood glucose levels below 2 mmol/litre on two consecutive readings despite maximal feeding support, has abnormal clinical signs or will not feed orally effectively.

Postnatal care

Information and advice

- **Advise:**
 - Women with diabetes who are breastfeeding to continue to avoid drugs for complications that were discontinued for safety reasons.
 - On the importance of contraception and pre-conception care when planning future pregnancies.
- **Advise women with insulin-treated pre-existing diabetes:**
 - To reduce insulin immediately after birth as advised by the diabetes team and to monitor their blood glucose concentrations to establish correct dose.
 - About the risk of hypoglycaemia, especially while breastfeeding.
 - To have food available before or during breastfeeding.
- **Advise women with type 2 diabetes:**
 - That they can resume or continue taking metformin and glibenclamide while breastfeeding.
 - Not to take any other oral hypoglycaemic agents while breastfeeding.
- **Advise women with gestational diabetes:**
 - To stop taking hypoglycaemic medication immediately after birth.
 - On weight control, diet and exercise.
 - On the symptoms of hyperglycaemia.
 - On the risks of gestational diabetes in subsequent pregnancies and screening for diabetes when planning pregnancy.
- **Transfer and follow-up**

Offer women with gestational diabetes:

- A blood glucose test before transfer into community care.
- A modified OGTT during postnatal hospital stay (if it is extended e.g. after a caesarean section) or an OGTT at the 6 week postnatal check.

The NICE recommendation of a fasting glucose measurement is regarded as a minimum requirement and we strongly advocate an OGTT, as this will identify women with persistently abnormal glucose tolerance (IGT) for which there is good evidence of the efficacy of lifestyle intervention in preventing diabetes. Our local population has a high prevalence of diabetes and IGT.

Refer women with pre-existing diabetes:

- Back to routine diabetes care.

Offer ophthalmological follow-up:

- For women who have preproliferative diabetic retinopathy diagnosed in pregnancy, for at least 6 months after the birth.