



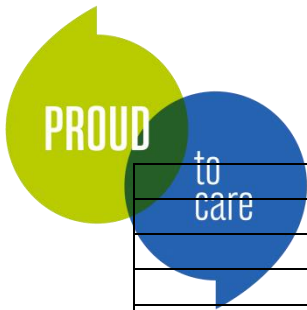
**Guideline for the Management of Diabetes in Pregnancy**

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## Section Headings

### **1.0 Introduction**

The guideline uses the terms 'woman' or 'mother' throughout. These should be taken to include people who do not identify as women but who are pregnant.

Approximately 700,000 women give birth in England and Wales each year, and up to 5% of pregnancies involve women with diabetes. Approximately 87.5% of pregnancies complicated by diabetes are estimated to be due to gestational diabetes mellitus (GDM) (which may or may not resolve after pregnancy), with 7.5% being due to type 1 diabetes and the remaining 5% being due to type 2 diabetes. (NICE, 2015)

Diabetes in pregnancy is associated with risks to both the woman and the developing fetus. Miscarriage, pre-eclampsia, preterm labour and stillbirth are more common in women with pre-existing diabetes. Congenital malformations, macrosomia, birth injury, perinatal mortality and postnatal problems such as hypoglycaemia are more common in the newborn of women with pre-existing diabetes. In addition, diabetic retinopathy can worsen rapidly during pregnancy. Maternity services must ensure implementation of robust processes to manage the risks associated with pre-existing diabetes.

### **2.0 Objective**

The aim of this guideline is to ensure that evidence-based information and best practice guidance is available for all staff involved in caring for women with Diabetes during pregnancy, the intrapartum and postpartum period.

### **3.0 Scope**

This guideline applies to all staff working in the maternity unit who care for women with diabetes.

## **4.0 GESTATIONAL DIABETES (GDM)**

This guideline should be used alongside the routine antenatal care guideline:  
<https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TAD/Antenatal%20Care>

### **4.1 Previous Gestational diabetes**

All women with GDM in a previous pregnancy will be referred for shared care at booking. They will be reviewed in any consultant clinic to discuss choice of care in pregnancy.

Women will be offered either:

- To be treated as having GDM in this pregnancy and commence blood glucose monitoring
- Or to have an OGTT (oral glucose tolerance test) at 16 weeks; and a further OGTT at 24-28 weeks if the result of the first OGTT is normal (NICE 2015).

Women who choose to be treated as having GDM during this pregnancy will:

- Be referred to the Specialist Diabetes Team (Diabetes Specialist Midwife DSM, Diabetes Specialist Nurse DSN and Diabetes Specialist Dietitian for Diabetes DSD)



- Be given an antenatal clinic follow up appointment in the combined medical disorders clinic.
- Attend for a group education session which is held every Friday at 1pm in the antenatal clinic. Contact antenatal admin team on 01226 432239 to book.
- If not suitable for group education e.g. non-English speaking, learning disabilities, can have a one to one education session.  
Contact DSM (6077) to arrange, if unavailable contact ANC

#### **4.2 GTT (oral glucose tolerance test)**

Oral Glucose Tolerance Test (OGTT) is the test of choice during pregnancy. HbA1c is not suitable for diagnosing gestational diabetes (NICE 2015).

Offer women with any of the risk factors for gestational diabetes a 2-hour OGTT between 24 and 28 weeks. (NICE 2015)

**If steroids have been given in the antenatal period and an OGTT is required, consider delaying the OGTT until one week after steroids have been given.**

#### **Risk factors which require OGTT to be offered**

- BMI >30 kg/m<sup>2</sup> (NICE 2015).
- Previous baby over 4.5kg (NICE 2015).
- Family history – 1st degree relative. (NICE 2015).
- Previous gestational diabetes and the woman opts for GTT instead of being treated as having GDM in this pregnancy
- Ethnicity – women from Asian (including Chinese), African and Afro-Caribbean background are two to four times more likely to develop type 2 diabetes than white women
- Polycystic ovarian syndrome
- Patients receiving HAART (Highly Active Antiretroviral Therapy) for HIV (WOHL et al 2006)
- Women on the antipsychotic medications Haloperidol, Chlorpromazine, Sulpiride, Flupenthixol, Zuclopenthixol, Clozapine, Olanzapine, Risperidone or Quetiapine
- Previous unexplained stillbirth (RCOG 2010)
- Estimated fetal weight above 90<sup>th</sup> centile and/or abdominal circumference > 95<sup>th</sup> centile on ultrasound scan
- Polyhydramnios
- Glycosuria 2+ on one occasion or 1+ on two occasions

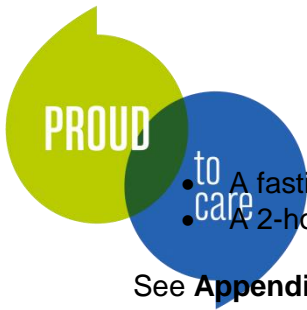
Women with previous bariatric surgery with risk factors for gestational diabetes are not suitable for OGTT due to the risk of dumping syndrome. Instead offer a fasting blood sugar between 26+0 and 28+0 weeks; and show them how to record blood glucose levels over a period of a week.

Following self-monitoring, results must be reviewed by the Diabetes Specialist Nurses and a decision made regarding follow up care. If indicative of gestational diabetes, the woman will be transferred into the Obstetric Medical Clinic for ongoing diabetes review.

See **Appendix 1** for the Procedure for Oral Glucose Tolerance Test

#### **4.3 Diagnosis of GDM**

Gestational diabetes is confirmed if the woman has either:



- A fasting plasma glucose level of 5.6 mmol/L or above OR
- A 2-hour plasma glucose level of 7.8 mmol/L or above

See **Appendix 2** for the Pathway for Management of OGTT Results

Women with a diagnosis of GDM will be reviewed by the DSM and diabetes specialist dietitian at the gestational diabetes group education session within a week of diagnosis.

At this session, there will be teaching and explanation on:

- The use of monitoring equipment and sensyne GDM health app.  
See **Appendix 3**: Procedure for GDM-health patient held application
- Self-monitoring of blood glucose daily and targets levels
- The fact that treatment includes changes in diet and exercise, and may involve medications
- A healthy diet during pregnancy
- The fact that regular exercise (such as walking for 30 minutes after a meal) improves blood glucose control
- The fact that good blood glucose control throughout pregnancy will reduce the risk of:
  - Fetal macrosomia
  - Trauma during birth (for the woman and baby),
  - Induction of labour and /or caesarean section,
  - Neonatal hypoglycaemia and perinatal death
- Blood investigation: HbA1c to exclude pre-existing diabetes
- The fact that follow up will occur the next week in the Joint Diabetes Antenatal Clinic
- The fact that care will be transferred to the Obstetric Consultant with a specialist interest in diabetes in pregnancy.  
Patients with complex medical conditions may need to remain under their original consultant.  
In these cases, diabetes monitoring will continue with the Diabetes Team with the DSM liaising with appropriate consultant

If not suitable for group education e.g. non-English speaking, learning disabilities, can have a one to one education session.

Contact DSM (6077) to arrange, if unavailable contact ANC

#### **4.5 Treatment**

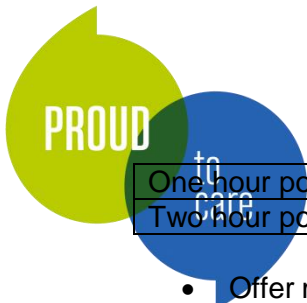
Following initiation of blood glucose monitoring if targets are not met with dietary changes and exercise, women may require Metformin and/or insulin to achieve the target blood glucose levels.

#### **Fasting levels at diagnosis:**

Fasting blood glucose < 7.0 mmol/l	Offer a trial of diet and exercise changes.
Fasting blood glucose ≥ 7.0mmol/l	Offer immediate treatment with insulin, with or without metformin depending on women's preference <b>and</b> diet and exercise changes.
Fasting blood glucose 6.0 - 6.9 mmol/l <b>AND</b> complications such as macrosomia or polyhydramnios	Offer immediate treatment with insulin, with or without metformin depending on women's preference <b>and</b> diet and exercise changes

#### **GDM Target Levels**

Fasting blood glucose	< 5.3mmol/l
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One hour post prandial	< 7.8mmol/l
Two hour post prandial	<6.4 mmol/l

- Offer metformin if 3 or more out of 7 fasting levels are above target within 1 to 2 weeks
- Offer insulin instead of metformin if metformin is contraindicated or not tolerated by the woman
- Offer addition of insulin to changes in diet, exercise and metformin for women with GDM if blood glucose targets are still not met

#### **4.6 Antenatal Appointments**

See **Appendix 4** for timetable of clinic appointments

Appointments are with the multidisciplinary team consisting of: Obstetricians, DSM, DSN and diabetes specialist dietitian and will:

- be in addition to routine antenatal care provided by named Community Midwife
- advise consultant care and delivery in an obstetric unit
- advise women to take regular exercise to improve blood glucose levels.
- advise treatment initiation may be necessary if blood glucose levels are above target despite dietary and lifestyle adjustments.
- occur every 1-4 weeks depending on blood glucose levels to ensure effective treatment

#### **4.7 Assessment of Fetal Growth**

Women diagnosed with gestational diabetes with no other risk factors for growth restriction should be offered a growth scan at 32 and 36 weeks gestation.

Women with GDM and other risk factors should follow the serial scan pathway (see link)

<https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TAD/Fetal%20Growth>

#### **4.8 Antenatal Harvesting of Colostrum**

Antenatal colostrum expression provides an opportunity to harvest colostrum, to provide breastmilk when a neonate is unable to breastfeed and to avoid formula supplementation. This could stabilise blood glucose in babies whose mothers have diabetes.

Harvesting discussion will take place between 34 and 36 weeks and a referral will be made to the Infant Feeding Team.

#### **4.9 Timing and Mode of Delivery**

Timing and mode of birth should be discussed with all pregnant women with diabetes during antenatal appointments, especially during the third trimester. (NICE 2015)

Women with GDM should be advised to give birth no later than 40 weeks plus 6 days. Elective birth by induced labour or (if indicated) by caesarean section should be offered to women who have not given birth by this time. (NICE 2015)

Elective birth before 40 weeks plus 6 days should be considered for women with gestational diabetes who have maternal or fetal complications. (NICE 2015)



If fetal weight estimation is normal and the patient has good blood glucose control on oral hypoglycaemic therapy: **deliver between 38+0 and 40+0**

If there are other concerns regarding fetal or maternal complications, e.g. macrosomia, poor glycaemic control and use of insulin therapy, delivery will be individualised but should be planned **between 38-39 weeks**.

For women with GDM who have an ultrasound diagnosed macrosomic fetus, the risks and benefits of vaginal birth, induction of labour and caesarean section should be discussed. See Guideline for the Management of Large for Gestational Age fetus for more information:

<https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TADDocs/Management%20of%20the%20large%20for%20gestational%20age%20fetus.pdf>

#### **4.10 Intrapartum Care of Gestational Diabetes**

The care plan will reflect the management of and care for the woman's individual needs. It will be recorded on the Electronic Patient Record (EPR) by either the DSM or DSN, and will document the diabetes management plan for delivery which is agreed at the 36 weeks clinic appointment.

##### **Induction of Labour**

- Blood glucose monitoring and treatment will continue as per pregnancy regime.
- Patients with BMI < 45 who are diet controlled or well controlled with metformin and with no other complications can have outpatient induction of labour.

##### **All women with GDM will be**

- Advised to aim for blood glucose levels between 4-8mmol/l as this decreases the incidence of neonatal hypoglycaemia and fetal distress.
- Offered continuous Electronic Fetal Monitoring during labour.
- Advised hourly Blood Glucose monitoring in established labour is recommended.
- Informed VRIII (variable rate intravenous insulin infusion) during labour is recommended if blood glucose levels become unstable e.g. if blood glucose levels are above 8 mmol/l for two consecutive hours

##### **Women with GDM on insulin**

- Who are not on multiple daily doses of insulin (background and fasting acting insulin for meals) should not require a VRIII for delivery.
- Who do not initially require VRIII but have 2 consecutive hourly blood glucose levels above 8 mmol/l should be advised to commence VRIII if clinically appropriate

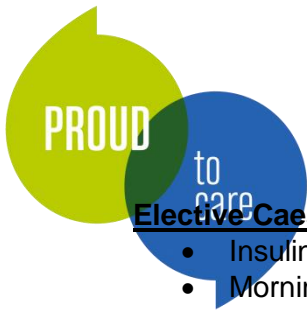
If syntocinon is required during labour, ensure it is diluted with normal saline and infused through a separate line. **Do not give further glucose.**

**If VRIII required, refer to Appendix 5:** Guidance for Setting up a VRIII

##### **Elective Caesarean Section for Women with diet or metformin controlled GDM**

- If currently managed with Metformin to have as prescribed the evening before caesarean section
- Morning list: fast from midnight
- Afternoon list: fast following light breakfast up to 7 AM
- VRIII not required





### **Elective Caesarean Section for Women with GDM on Insulin:**

- Insulin as prescribed the night before
- Morning list: fast from midnight
- Afternoon list: fast following light breakfast up to 7 AM. If managed with meal time insulin omit breakfast insulin dose
- Blood glucose prior to section - if blood glucose >8 mmol/L commence VRIII prior to theatre

#### **4.11 Postnatal GDM Management**

Postnatal management is discussed by the DSN at 36 weeks in the Joint Diabetes Clinic  
This should include:

- Lifestyle advice to reduce risks of developing Type 2 diabetes
- The postnatal appointment with GP for
  - fasting plasma glucose test at the 6-week postnatal check
  - OR an HbA1c if after 13 weeks
  - annual HbA1c due to continued risk factor for developing Type 2 diabetes
- The increased risk of diabetes in future pregnancies

#### **Following delivery**

- Discontinue metformin and/or insulin and VRIII, if used, immediately after delivery
- Perform random monitoring of blood glucose levels prior to discharge to exclude persisting hyperglycaemia which may indicate undiagnosed type 1 diabetes.
  - Women with blood glucose levels >11mmol/l should be reviewed prior to discharge by the Diabetes Team, or if they are unavailable, by an obstetrician

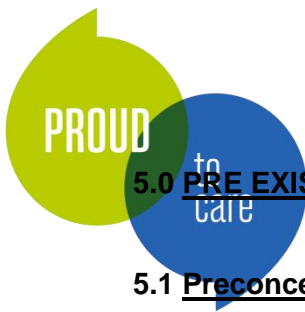
#### **4.12 Neonatal Care**

- The mother should be made aware of the benefits of breast-feeding on metabolic control for both her and her baby.
- Feeding should be advised within 30 minutes of birth and this aspect of care must be documented.
- Skin to skin contact should be initiated at birth to prevent neonatal hypothermia and hypoglycaemia.
- Test neonatal blood glucose levels according to the following guideline:

<https://portal.bdgh->

[tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TADDocs/Neonatal%20hypoglycaemia%20v6.pdf](https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TADDocs/Neonatal%20hypoglycaemia%20v6.pdf)

- Once neonatal blood glucose levels are normal, glucose monitoring can be discontinued and responsive feeding encouraged.
- Do not transfer to community care until blood glucose levels are maintained. Babies must be feeding well.



## **5.0 PRE EXISTING-DIABETES**

### **5.1 Preconceptual Care**

Women with diabetes should be advised by the Diabetes Specialist Nurse Service or Primary Care to avoid an unplanned pregnancy and be encouraged to seek advice when planning a pregnancy.

When women with diabetes are planning a pregnancy, information provided should cover:

- the role of diet, body weight and exercise
- the need for diabetic retinopathy and nephropathy assessment before and during pregnancy
- that good glycaemic control before conception and throughout pregnancy will reduce, but not eliminate, the risk of miscarriage, congenital malformation, stillbirth and neonatal death.
- the risks of hypoglycaemia during pregnancy
- the increased risk of having a baby who is large for gestational age, which increases the likelihood of induction of labour, instrumental and caesarean section deliveries
- that the baby has an increased risk of admission to a neonatal unit

#### **Pre-conceptual optimisation of glycaemic control**

- Refer to DSN through single point access (SPA): Telephone 01226 435678.
- Strongly advise against pregnancy if HbA1c  $\geq 86$  mmol/mol.
- Establish glycaemic control with HbA1c assessment.
- Measure monthly until target value of  $< 48$  mmol/mol is achieved.
- Advise any reduction in HbA1c may reduce risks but pregnancy should definitely be avoided with levels  $\geq 86$  mmol/mol (NICE 2015).
- Review medication:
  - If taking Metformin this should be continued
  - Other oral hypoglycaemic agents should be stopped if advised by diabetes team
- Stop statins, Angiotensin-converting enzyme (ACE) inhibitors and angiotensin-II receptor antagonists and consider alternative antihypertensives.
- Advise Folic Acid 5mg and arrange prescription. To be continued until 12 weeks gestation.
- Use isophane insulin (also known as NPH insulin) as the first choice for long-acting insulin during pregnancy. Consider continuing treatment with long-acting insulin analogues (insulin detemir or insulin glargine) for women with diabetes who have established good blood glucose control before pregnancy. (NICE 2008)
- If using insulin discuss hypoglycaemia. Provide Glucagon kit and glucogel. Offer blood ketone testing strips for women with Type 1 diabetes.
- Advise referral to the Specialist Dietitian for Diabetes.
- Encourage continued self-monitoring of blood glucose and agree individualised targets.
- Ensure retinal screening pathway in place.
- Complete a renal assessment using microalbuminuria, U&E's and eGFR. Refer to a nephrologist before discontinuing contraception if:
  - serum creatinine is  $> 120$   $\mu$ mol/L
  - or eGFR is less than 45ml/minute/1.73m<sup>2</sup> (NICE 2015)



## **5.2 Antenatal Care for Women with pre-existing Diabetes**

This is in accordance with routine antenatal care. Refer to link below:

<https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TAD/Antenatal%20Care>

All pregnant women with pre-existing diabetes will be cared for by the multidisciplinary team of Consultant Obstetricians, Consultant Endocrinologist, DSN, Diabetes Specialist Dietitian and DSM.

Refer to **Appendix 6** for Timetable of Clinic Appointments

## **5.3 Organisation of Antenatal Care**

Women whose pregnancy is complicated by Type 1 or Type 2 diabetes will:

- Be referred to the DSM at pregnancy confirmation and an appointment arranged for the joint diabetes antenatal clinic within one week of referral. (NICE 2015).
- Have contact with the Joint Diabetes Antenatal Clinic for assessment of glycaemic control every 1-2 weeks this will be through face to face appointments monthly and by telephone in between if virtual glucose monitoring systems are used.

As a minimum woman with pre-existing diabetes will be seen by the:

- **Consultant Obstetrician** at the dating scan appointment and then after the serial growth scan appointment at 28 weeks.
- **Obstetrician**, with Consultant overview, after 20-week Anatomy and Placental localisation scan, and remainder of serial growth scan appointments. They will be reviewed in between depending on the individual management plan.
- **Endocrinologist** at dating scan appointment and reviewed thereafter at the request of the Diabetes Specialist Nurse or Consultant Obstetrician
- **DSN and Specialist Dietician for Diabetes** at each appointment, with **DSM** input as required

### **Contact details**

The DSN or the inpatient Diabetes Specialist Nurse can be contacted by telephoning SPA on 01226 435678.

The DSM can be contacted by telephoning: 01226 436077 or 07591987221.

For urgent inpatient diabetes advice/review by an endocrinologist:

- **Monday-Thursday contact the In Reach Endocrine Consultant via switch.**
- **Friday contact the Diabetes Centre on 5678 (single point access) and request diabetes clinician review.**
- **Out of hours and weekends contact Medical Registrar on call, ensuring this is followed up with diabetes review when able to access.**

## **5.4 Retinal Screening Pathway**

Offer retinal screening pathway in each trimester of pregnancy

Following the first antenatal clinic appointment the DSM or DSN will refer women for retinal assessment to the relevant diabetes eye screening team.

Eye Screening Team will refer to Ophthalmologist if there is evidence of pre-proliferative retinopathy or macular oedema detected by screening.



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.

Diabetic retinopathy should not be considered a contraindication to vaginal birth.

### **5.5 Renal Assessment during Pregnancy**

For renal assessment in pregnancy perform:

- 24-hour urine collection for protein at the first contact and repeat in each trimester
- **OR** Urinary Albumin Creatinine ratio (ACR) at the first contact and repeat in each trimester

If urine ACR > 20mg/mmol: also complete 24-hour total urine protein.

If urine ACR ≤ 20mg/mmol and blood pressure is normal: continue with urine ACR.

Referral to a nephrologist should be considered if:

- The serum creatinine is abnormal (120 micromol/litre or more)
- The urinary albumin creatinine ratio is greater than 30 mg/mmol
- The total protein excretion exceeds 2 g/day (NICE 2015)

eGFR should not be used during pregnancy

Thromboprophylaxis should be considered for women with proteinuria above 5 g/day (Albumin: Creatinine Ratio greater than 220mg/mmol) (macroalbuminuria).

### **5.6 Preventing Pre-eclampsia and Neural Tube Defects**

Advise:

- Aspirin 150 mg to all women with pre-existing diabetes from 12 weeks until delivery unless any allergies / contraindications.
- Folic acid 5 mgs once daily until 12 weeks pregnant. If not already taking - commence at booking
- Pregnancy supplements which include Vitamin D.

### **5.7 Monitoring Fetal Growth and Wellbeing**

Advise:

- Dating scan and anatomy scan at 20 weeks.
- Ultrasound monitoring of fetal growth, amniotic fluid volume and dopplers every 4 weeks from 28 weeks.
- An individualised approach to monitoring fetal growth and wellbeing for women with diabetes and a risk of fetal growth restriction e.g. macrovascular disease and/or nephropathy.

### **5.8 Managing Diabetes in Pregnancy**

- Advise women with insulin-treated diabetes of the risks of hypoglycaemia and impaired awareness of hypoglycaemia in pregnancy, particularly in the first trimester.
- Advise to have available a fast-acting form of glucose and when to use.
- Provide glucagon to pregnant women with type 1 diabetes and instruct the woman and her partner or other family members in its use.
- Provide pregnant women with type 1 diabetes with blood ketone testing strips and a meter.
- Advise pregnant women with diabetes to seek urgent medical advice if they become hyperglycaemic, have blood ketones >1.5mmol/l or are unwell.



### **5.9 Monitoring Blood Glucose Levels**

Advise pregnant women with Type 1 and Type 2 diabetes of the target levels for good glycaemic control:

- Fasting below 5.3 mmol/L
- 1 hour after meals: below 7.8 mmol/L or
- 2 hours after meals: below 6.4 mmol/L
- Bedtime below 7.8mmol/l

Be aware the target level may not be achievable if problematic hypoglycemia occurs.

### **5.10 CGM (Continuous Glucose Monitoring) in Pregnancy**

CGM measures glucose continually in the interstitial fluid using a small sensor that is worn on the skin. Its accuracy is comparable to capillary blood glucose testing.

The CONCEPTT trial in 2017 showed that compared to intermittent capillary glucose monitoring, CGM, resulted in:

- More women achieving their blood glucose target
- A reduction in large for gestational age babies
- Fewer caesarean sections
- A reduction in neonatal hypoglycaemia
- Fewer neonatal intensive care unit admissions

CGM should be offered to all pregnant women with Type 1 diabetes (NICE 2020).

See **Appendix 7**: Procedure for Continuous Glucose Monitoring in Pregnancy

#### **If admitted to hospital during pregnancy:**

- Women using CGM can continue to self-manage with CGM provided they are confident the sensor is working well.
- If an adverse glucose level is identified on CGM a capillary blood glucose should be checked before action is taken.
- If VRIII (Variable Rate Intravenous Infusion of Insulin) is required, hourly capillary blood glucose should be undertaken Refer to **Appendix 5** for VRIII Guidance

### **5.11 Monitoring HbA1c**

- Measure HbA1c levels in all pregnant women with pre-existing diabetes at booking to determine level of risk.
- Measure HbA1c levels in the 2nd and 3rd trimesters to assess level of risk.
- The level of risk for pregnancy increases with an HbA1c level > 48 mmol/mol



## **6.0 INTRAPARTUM CARE FOR WOMEN WITH PRE-EXISTING DIABETES**

In all cases the care plan will reflect the management of and interim care for the women's individual needs and will be recorded on EPR.

### **6.1 Timing and Mode of Delivery**

- Discuss the timing and mode of birth with pregnant women with diabetes during antenatal appointments, especially during the third trimester.
- Pregnant women with diabetes who have an ultrasound-diagnosed macrosomic fetus should have the risks and benefits of vaginal birth, induction of labour and caesarean section explained. (NICE 2015)
- Advise pregnant women with type 1 or type 2 diabetes and no other complications to have an elective birth by either induction of labour, or by elective caesarean section if this is indicated, between 37+0 weeks and 38+6 weeks of pregnancy.
- Diabetes should not in itself be considered a contraindication to attempting vaginal birth after a previous caesarean section.
- Offer antenatal harvesting of colostrum prior to planning delivery. See section 4.8

### **6.2 Fetal Monitoring**

Continuous electronic fetal monitoring in labour should be recommended to all women with diabetes.

### **6.3 Blood Glucose Control during Induction and Labour**

Women will have an intrapartum and postnatal plan for management of their diabetes made in the Joint Diabetes Antenatal Clinic at 36 weeks this will be undertaken by the DSN and documented on EPR.

#### **During cervical ripening or induction:**

Blood glucose testing, insulin and/or oral treatments should continue as per pregnancy regime.

#### **Once established in labour or labour augmented:**

Commence VRIII for women with diabetes treated with multiple daily doses of insulin.

See **Appendix 5:** Guidance for VRIII

Prior to VRIII commencing measure capillary blood glucose and obtain bloods for FBC, U&E's and haematocrit

Monitor capillary blood glucose every hour during labour and birth and ensure that it is maintained between 5 and 8 mmol/l

Long acting insulins will continue during VRIII

Short acting insulins will be stopped once the VRIII is commenced

Women with Type 2 diabetes but not on multiple daily doses of insulin will not require VRIII unless:

- Capillary blood glucose reading >8mmol/l on 2 consecutive readings
- And/or urinary ketones ++ or more on urinary dipstick
- And/or blood ketones > 1.5 mmol/L

#### **Women on insulin pumps**

Insulin pumps are becoming a more popular technology for people with diabetes.

A VRIII is recommended during labour in place of their insulin pump. This will allow staff to manage glucose levels during labour when it becomes difficult for self-management.

Start VRIII when labour commences or augmentation is about to start



Women who choose to continue to use their insulin pump during labour will have been advised by the diabetes team and have a plan documented on EPR. Without this pre-arranged plan VRIII will be required.

Transfer to VRIII if:

- The woman is unable to manage her own insulin needs
- Blood glucose >8.0 mmol/L on two consecutive occasions
- Urinary ketones ++ or more on urinary dipstick
- Blood ketones > 1.5 mmol/L

If transfers to VRIII, stop pump completely and restart postnatally following discontinuation of VRIII

#### **6.4 Management of Elective LSCS**

- On admission, obtain bloods for U & E's and venous random blood glucose.
- Women with Type 1 diabetes will require VRIII.
- **Women with Type 2 diabetes not on multiple daily doses of insulin will not require VRIII for elective surgery unless pre-surgery BG level >8mmol/l.**

For women scheduled on a morning List

- Admit morning of caesarean section at 7am
- Fast from midnight
- Omit morning insulin
- Commence VRIII no later than one hour prior to LSCS
- Check capillary blood glucose reading prior to start of VRIII

For women scheduled on an afternoon List

- Admit 11:30am
- Usual insulin with breakfast no later than 7am then fast
- Commence VRIII no later than one hour prior to LSCS
- Check capillary blood glucose reading prior to VRIII

For women on an Insulin Pump, the DSM should liaise with the anaesthetist during the pre-operative assessment appointment in the Antenatal Day Unit.

If suitable for insulin pump therapy peri operatively then the plan will be documented on EPR. Without this VRIII during LSCS will be required.

### **7.0 POSTNATAL MANAGEMENT OF WOMEN WITH PRE-EXISTING DIABETES**

Postnatal management is discussed by the DSN at 36 weeks in the Joint Diabetes Clinic. It will be the same regardless of mode of delivery.

#### **7.1 Insulin Dependent Pre-Pregnancy**

Reduce rate of VRIII by 50% after delivery.

Discontinue VRIII when able to tolerate tea and toast

For short acting insulin with tea and toast as per usual insulin regime

If persistent vomiting, continue VRIII until able to tolerate fluids and light diet.

Start postnatal insulin regime as advised by diabetes team.

If not available, advise patient to reduce insulin to pre-pregnancy dose or take a 25% reduction of their dose at 12 weeks.

#### **7.2 Non-insulin Dependent Pre-Pregnancy**



Stop VRIII following delivery of placenta.  
Eat and drink as normal.  
Restart pre-pregnancy treatment

### **7.3 Patients on Insulin Pump Therapy**

Reduce rate of VRIII by 50% after delivery

Commence insulin pump when tolerating tea and toast; discontinue VRIII an hour later to allow for an overlap

The woman should self-manage their pump settings to pre-pregnancy insulin levels, or 50% of current pregnancy dose if she is unaware of these

For Diabetes team review when able.

### **Continued Postnatal Management**

Post-delivery to self-manage own diabetes care once VRIII discontinued

Revert to glucose monitoring on CGM, if using.

Advise woman if adverse glucose level is identified on CGM a capillary blood glucose should be checked before action is taken.

Capillary glucose levels pre and post meals while an inpatient is advised if not using CGM

Aim for blood glucose levels between 6 mmol/l -10 mmol/l.

If breastfeeding insulin requirements will be lower and a snack will be required before or during breastfeeding or whilst expressing.

Follow up will be with DSN.

Inform women about the importance and options of contraception and the need for preconception care when planning pregnancies.

## **8.0 DIABETIC KETOACIDOSIS (DKA)**

DKA is a serious complication of patients with diabetes that can be potentially life-threatening and is associated with significant fetal mortality and maternal morbidity.

DKA can occur at lower glucose levels and more rapidly than in non-pregnant patients.

Symptoms of DKA include:

- Nausea/vomiting
- Abdominal pain
- Increased thirst and urination
- Dehydration
- Blurred eyesight
- Tachypnoea/tachycardia
- Fruity smelling breath

**DKA should always be considered when a pregnant woman with diabetes feels unwell.**

### **8.1 Diagnosis of DKA:**

**All three of the following must be present (JBDS-IP, 2022):**

- capillary blood glucose above 11 mmol/L
- capillary ketones above 3 mmol/L or urine ketones ++ or more
- venous blood gas pH less than 7.3 and/or bicarbonate less than 15 mmol/L

### **8.2 Immediate Management**

DKA is a medical emergency requiring prompt treatment.

Pregnant women with DKA need prompt review by the medical or diabetes team alongside obstetricians and anaesthetists





Key management will be fluid resuscitation and correction of hyperglycaemia, ketonaemia and acidosis.

Follow trust DKA management:

[Management of Diabetic Ketoacidosis DKA in Adults.pdf \(trent.nhs.uk\)](#)

If not acidotic and therefore not in DKA, but unwell and blood ketones >1.5mmol/l or rising, start on VRIII

For urgent inpatient diabetes advice/review by an endocrinologist:

- **Monday-Thursday contact the In Reach Endocrine Consultant via switch.**
- **Friday contact The Diabetes Centre on 5678 (single point access) and request diabetes clinician review.**
- **Out of hours and weekends contact Medical registrar on call, ensuring this is followed up with diabetes review when able to access.**

## **9.0 BLOOD KETONES TESTING IN PREGNANCY**

Blood ketone testing is more reliable compared to urine testing for ketones. Betahydroxybutyrate, the main component of ketone bodies in DKA, is present in blood only.

Blood ketone meters are located in antenatal day unit and the antenatal/postnatal ward. Training is provided by the Diabetes Specialist Midwife.

See **Appendix 8**: Procedure for blood ketone monitoring in pregnancy

### **Indications for blood ketone testing**

- In well women, capillary blood ketone testing is usually ONLY indicated in those with known diabetes, unless requested by the Diabetes Team or senior Obstetric/Anaesthetic Team
- To differentiate between DKA and hyperglycaemia without ketosis.
- If clinically unwell with sepsis and worsening of MOEWS
- If there is sustained hyperglycaemia >16mmol/l on two occasions within four hours.
- If the patient has symptoms of DKA.

See **Appendix 9**: How to interpret blood ketone levels

## **10.0 HYPOGLYCAEMIA IN PREGNANT WOMEN WITH DIABETES**

### **Treatment of blood glucose level < 4mmol/l in women with Gestational Diabetes**

Symptoms of hypoglycaemia include sweating, shaking, dizziness, anxiety or the woman reports feeling unwell rather than just hunger.

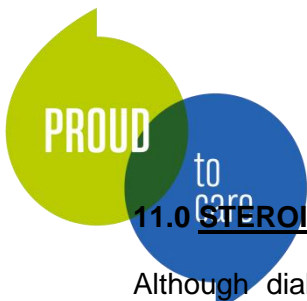
If the woman is symptomatic, offer food/drink or give IV dextrose if nil by mouth.

If on diet/metformin and the woman is asymptomatic, no action needs to be taken.

If on insulin or VRIII, treat as 'hypo' and follow hypoglycaemia guidelines. (**Appendix 10**)

### **Treatment of blood glucose level < 4mmol/l in women with Pre-existing Diabetes**

Refer to **Appendix 10**: Hypoglycaemia Management with Diabetes



## **11.0 STEROID ADMINISTRATION IN WOMEN WITH DIABETES**

Although diabetes in pregnancy is not a contraindication to antenatal steroids, steroid administration can cause a rise in maternal blood glucose levels and precipitate ketoacidosis.

The deterioration in glycaemic control caused by steroids can last for 2-3 days after the second dose.

Maternal hyperglycaemia prior to delivery or in labour increases the risk of neonatal hypoglycaemia and morbidity.

Women with diabetes who require steroids because preterm labour is suspected should be an in-patient on the BBC or Antenatal ward

Care should be in line with the Guideline for Preterm labour.

<https://portal.bdgh->

[tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TAD/Preterm%20labour%20v1](https://portal.bdgh-tr.trent.nhs.uk/SiteDirectory/TrustApprovedDocuments/TAD/Preterm%20labour%20v1)

If the woman's diabetes is managed with insulin and she is having steroids prior to elective LSCS:

- Advise to increase all insulin doses by 30% from 6 hours after the first dose of steroids
- Maintain this for 12-24 hour following the second dose of steroids then revert back to the usual insulin doses.
- Can self-monitor at home following review by DSM or DSN if there are no other concerns.
- Monitoring should comprise:
  - Close observation of CGM if using
  - If capillary glucose testing - check a fasting sample; pre and one-hour post meal; and before bed
- If blood glucose readings are above 8.0 mmol/l for two consecutive hours, admission for VRIII will be required

When VRIII is started:

- All long acting /intermediate insulins to be continued
- Stop short acting Insulin
- Oral metformin to continue whilst on VRIII

Refer to **Appendix 5** for VRIII guidance

## **12.0 Roles and responsibilities**

### **12.1 Midwives**

To provide screening for GDM and supporting healthy lifestyles

### **12.2 Diabetes Specialist Midwife**

Supporting women with monitoring blood glucose levels and other technologies, on-going support with diet, lifestyle and maintaining glucose levels. Ensuring pregnancy screening for diabetes carried out as appropriate

### **12.3 Diabetes MDT including Diabetes Nurse Specialist, Diabetes Specialist Dietitian and Consultant Endocrinologist**

Review and support of women with diabetes in pregnancy.

### **12.4 Obstetricians**



To provide care for women with diabetes in pregnancy in accordance with appropriate guidance from confirmation of pregnancy/ diagnosis of condition to delivery.

### **12.5 Paediatricians**

To attend delivery when their presence is requested.

### **12.6 Anaesthetists**

To attend when their presence is requested and provide analgesia/anaesthesia to the women for operations and procedures as appropriate.

## **13.0 Associated documents and references**

Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. Lancet 2017 Nov 25;390(10110):2347-2359

JBDS-IP guidelines: Management of glycaemic in pregnant women with diabetes on the Obstetric wards and delivery units; May 2017

JBDS 02: The management of DKA in Adults  
March 2012

NICE (2015) Diabetes in Pregnancy: management of diabetes and its complications from preconception to the post-natal period. Guideline NG3. NICE, London.

NICE (2022) Diabetes Type 2: What are the Risk Factors? Clinical knowledge summaries

RCOG (2010) Late Intrauterine Fetal Death and Stillbirth. Green-top guidelines no 55

## **14.0 Training and resources**

Training will be delivered as outlined in the Maternity Training Needs Analysis. This is updated on an annual basis.

## **15.0 Monitoring and audit**

The Diabetes Specialist Midwife continues to collect data on all pregnant women with pre-existing diabetes for the 2 yearly National Diabetes in Pregnancy Audit (NDIP). The NDIP publishes reports with national themes and provide service level data to benchmark against national outcomes and NICE guidance. The results and themes from the audit data are presented annually at CBU governance.

Any adverse incidents relating to the guideline for the management of diabetes in pregnancy will be monitored via the incident reporting system. Any problems will be actioned via the case review and root cause analysis action plans. The action plans are monitored by the risk midwife to ensure that improvements in care are made. The trends and any root cause analysis are discussed at the monthly risk meetings to ensure that appropriate action has been taken to maintain safety.

The guideline for the management of diabetes in pregnancy will be audited in line with the annual audit programme, as agreed by the CBU. The audit action plan will be reviewed at the monthly risk management meetings on a quarterly basis and monitored by the risk midwife to ensure that improvements in care are made.



## **16.0 Equality and Diversity**

This section is mandatory for all Trust Approved Documents and must include the statement below:

The Trust is committed to an environment that promotes equality and embraces diversity in its performance as an employer and service provider. It will adhere to legal and performance requirements and will mainstream equality, diversity and inclusion principles through its policies, procedures and processes. This guideline should be implemented with due regard to this commitment.

To ensure that the implementation of this guideline does not have an adverse impact in response to the requirements of the Equality Act 2010 this policy has been screened for relevance during the policy development process and a full equality impact assessment is conducted where necessary prior to consultation. The Trust will take remedial action when necessary to address any unexpected or unwarranted disparities and monitor practice to ensure that this policy is fairly implemented.

This guideline can be made available in alternative formats on request including large print, Braille, moon, audio, and different languages. To arrange this please refer to the Trust translation and interpretation policy in the first instance.

The Trust will endeavor to make reasonable adjustments to accommodate any employee/patient with particular equality, diversity and inclusion requirements in implementing this guideline. This may include accessibility of meeting/appointment venues, providing translation, arranging an interpreter to attend appointments/meetings, extending policy timeframes to enable translation to be undertaken, or assistance with formulating any written statements.

### **16.1 Recording and Monitoring of Equality & Diversity**

This section is mandatory for all Trust Approved Documents and must include the statement below:

The Trust understands the business case for equality, diversity and inclusion and will make sure that this is translated into practice. Accordingly, all guidelines will be monitored to ensure their effectiveness.

Monitoring information will be collated, analysed and published on an annual basis as part of Equality Delivery System. The monitoring will cover the nine protected characteristics and will meet statutory employment duties under the Equality Act 2010. Where adverse impact is identified through the monitoring process the Trust will investigate and take corrective action to mitigate and prevent any negative impact.



## Procedure for Oral Glucose Tolerance Test

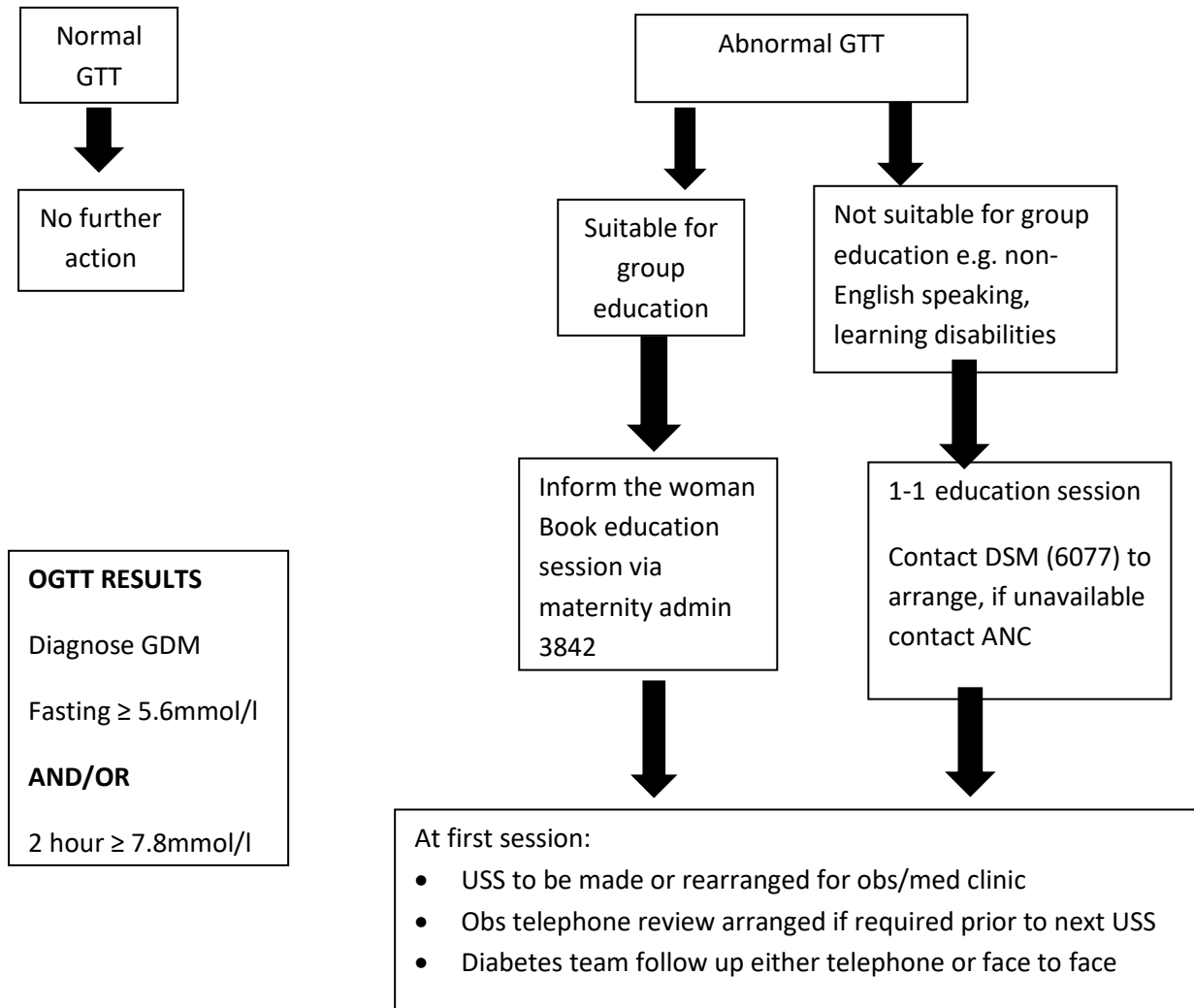
### Management pre OGTT test

- Rationale should be discussed in ANC.
- Appointment made for 26-28/40, with 26 weeks being preferential time, and letter with information given to the woman.
- Normal diet for 3 days prior to the test.
- No food from midnight before test. Water only.
- No smoking is advised until completion of the test
- Essential medications only before GTT eg labetalol, thyroxine. Withhold ferrous sulphate, pregnancy vitamins etc

### Procedure

- Ensure woman has fasted as instructed
- Explain the test and obtain consent
- Obtain fasting venous blood sample
- Woman to drink 300 mls of Rapirose (this is available in a tamper-proof sealed packet; it does not require measuring out). This should all be drunk within 5 minutes.
- Obtain venous blood sample 2 hours after drinking the Rapirose.
- Advise women to bring food and drink for consumption following the procedure.
- Document on careflow
- Inform the patient she will be contacted if an abnormal result is found, usually the next working day

**Pathway for Management of OGTT results**



Women with GDM not on scan pathway to have growth scans at 32 and 36 weeks.

Group education sessions are on a Friday afternoon at 1pm in the ANC with DSM and Dietitian.

Education includes teaching on blood glucose monitoring, dietary and lifestyle advice



## Procedure for GDM-health patient held application

GDM-Health is a health application designed for people with gestational diabetes to allow for remote monitoring of blood glucose levels and communication with healthcare professionals. The mobile app downloads data from the user's blood glucose meter and sends it to a secure website which is visible to healthcare professionals.

### Suitable for

- Women with GDM
- Smartphone users
- Women who understand English and the instructions
- Women who are able to consent

### Use of GDM application allows clinicians to

- View BG readings
- See alerts for: "high" or "low" blood glucose readings according to NICE glucose targets for GDM
- Send messages to women to support the management of their condition
- See the medication the patient is taking

### GDM Health app set up

- Clinical staff will login securely via the Trust website.
- The diabetes midwife has superuser status to allow new clinician access
- If there are problems accessing or inputting information, contact customer support: [ghm-support@sensynehealth.com](mailto:ghm-support@sensynehealth.com)
- The Diabetes Midwife (or delegated midwife) will text women information via Accurx in advance of their first appointment
- The Diabetes Midwife or member of the diabetes team will signpost the women to the videos on the trust website regarding the app and will demonstrate the technique.
- The Diabetes Midwife or member of the diabetes team will arrange follow up with the diabetes team and obstetric staff.
- At each follow up the diabetes midwife or member of the diabetes team will access the woman's glucose levels via GDM app



### GDM Health Process

On diagnosis of GDM, the woman is contacted by the community midwife or antenatal clinic by telephone to make an appointment.  
If the woman fits the inclusion criteria the information regarding the GDM Health app and consent is sent to her via Accurx text with instructions on how to download the app and activate it.  
The midwife or diabetes midwife will then add the woman's record to the database



At the appointment the Diabetes Midwife or diabetes dietitian will ensure the woman has consented to and downloaded the app.  
The Diabetes Midwife/midwife or diabetes dietitian will demonstrate the procedure for checking blood glucose and transmitting the information to the database.



Women checks blood glucose



Reading transfers via Bluetooth to database



Information appears on database



Midwife/Diabetes team arrange follow up and give contact details for diabetes team.  
Information documented on careflow



Follow up appointments diabetes midwife/diabetes team to access database and review readings. To discuss as appropriate: dietary advice/start or increase metformin/start or increase insulin



Diabetes midwife/diabetes team to send prescription electronically to GP if required.  
Update database and careflow at each contact





**Appendix 4: Timetable of appointments for women with gestational diabetes**

<b>GESTATION</b>	<b>WITH WHO</b>	<b>ACTION</b>
<b>12-16 weeks</b>  <b>(early diagnosis)</b>	<b>Group education with Diabetes Specialist Midwife and Diabetes Specialist Dietitian</b>	Discuss implications of GDM. Importance of good glycaemic control to reduce risk of macrosomia, trauma at birth, Induction of labour/ LSCS, neonatal hypoglycaemia, perinatal death. Discussion re treatment includes changes in diet and exercise, and could involve medication. Information leaflets given and signposted to education videos. Target levels explained, given contact details. All women should be encouraged to take regular exercise e.g. 30-minute walk after a meal to improve blood glucose control. All women to be given a blood glucose monitor and receive teaching to use the equipment including use of GDM health app for food diary and glucose reading diary. Letter to be sent to GP informing of diagnosis.
<b>1 week following group session</b>	<b>Diabetes Team</b>	Blood glucose review.
	<b>DSN/DSM/DSD</b>	Follow up arranged for telephone or face to face appointment as appropriate.
	<b>Obstetrician</b>	Advice given re medication if required. Discuss risks.
<b>20 weeks</b>	<b>Diabetes Team</b>	Individual obstetric risks and OGTT reviewed for individualised plan.
	<b>Obstetrician</b>	Antenatal, intrapartum and postnatal care pathway explained.
<b>24 weeks</b>	<b>Diabetes Team</b>	BG review.
	<b>Community midwife</b>	Routine AN care.
<b>24-26 weeks</b>	<b>Group education session</b>	Majority of women with GDM enter the antenatal pathway here. Group session as above Arrange serial growth scans if not following a current pathway.
<b>1 week following group session</b>	<b>Diabetes Team</b>	Blood glucose review.
	<b>DSN/DSM/DSD</b>	Follow up arranged for telephone or face to face appointment as appropriate Advice given re medication if required.
<b>28 weeks</b>	<b>Diabetes Team</b>	Blood glucose review.
	<b>Obstetrics/Midwife</b>	Routine AN care and bloods. Anti D if applicable. Growth scan review if required. Review TRAF.
<b>31 weeks</b>	<b>Community midwife</b>	Routine AN care.
<b>32 weeks</b>	<b>Diabetes Team</b>	BG review.
	<b>Obstetrics/Midwife</b>	Review growth scan. Routine AN care as required.

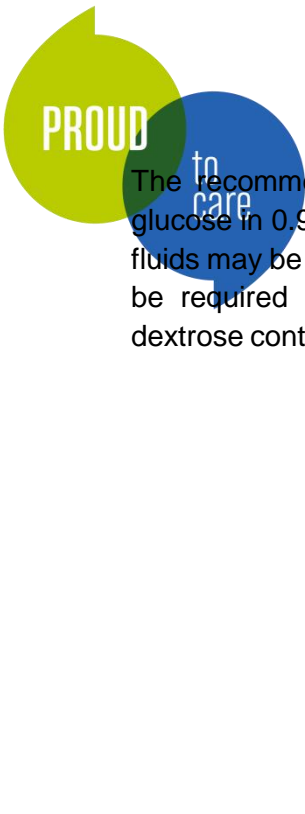


34 weeks	<b>Community midwife</b>	Routine AN care.
36 weeks	<b>Diabetes Team</b>	BG review and follow up management as required.
	<b>Obstetrics/Midwife</b>	Routine AN care. Time/mode of delivery planned. Diabetes birth plan. AN harvesting discussion. GP letter for PN follow up.

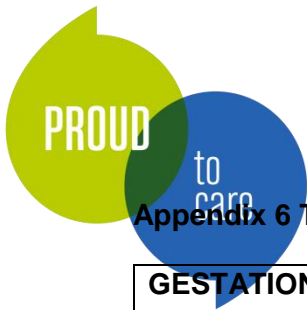


**Variable rate intravenous insulin infusion (vriii) protocol for pregnancy and labour**

Algorithm	1	2	3
	Most patients will start here	For women not controlled on Algorithm 1 or on >80 units/day of insulin	For women not controlled on algorithm 2 after diabetes or medical review
<b>Blood Glucose (mmol/l)</b>	<b>Insulin rates (units/hour)</b>		
<5.0	STOP INSULIN FOR 20 MINUTES. If <4mmol/l: Treat hypo as per guidelines. Check BG in 15 minutes		
5.0 - 5.5	0.2	0.5	1.0
5.6 - 7.0	0.5	1.0	2.0
7.1 - 8.5	1.0	2.0	3.0
8.6 - 11.0	1.5	3.0	4.0
11.1 - 14.0	2.0	4.0	5.0
14.1 - 17.0	2.5	5.0	6.0
17.1 - 20.0	3.0	6.0	7.0
>20.1	4.0	7.0	8.0
<b>ALGORITHM USE</b>			
<ul style="list-style-type: none"> <li>• ALL women with diabetes should have hourly BG testing in established labour or whilst on VRIII</li> <li>• Continue patient's dose of long acting background insulin.</li> <li>• For patients on CSII pumps: If the diabetes team advise continuing the basal rate while on VRIII.</li> </ul>			
<b>Insulin prescription: (IV chart)</b> Human soluble insulin (Human Actrapid) 50 units in 49.5 ml sodium chloride 0.9% intravenously via syringe driver			
<b>Fluid to be used in pregnancy:</b> <ul style="list-style-type: none"> <li>• 500ml 5% dextrose in 0.9% saline (NaCl) with 20mmol Potassium Chloride (KCL) via IVAC infusion pump</li> <li>• Aim to keep Potassium (K) between 4.0 - 5.0mmol/L. Check U+Es daily to ensure not hyponatraemic especially when on Oxytocin.</li> <li>• Infuse at 50 mls/ hour</li> </ul>			
Target BG level 5-8 mmol/l			
Check BG every hour whilst on VRIII			
Move to higher algorithm if BG is > target and is not dropping			
Move to the lower algorithm if BG falls below 4mmol/l or is dropping too fast			



The recommended substrate fluid to be administered alongside the VRIII is 500mls 5% glucose in 0.9% saline (NaCl) and 0.15% KCl (20mmol/L) at 50mls/hr. Additional intravenous fluids may be required as per clinical need e.g. haemorrhage. VRII without substrate fluid may be required in some cases e.g. fluid overload, hyponataemia and pre-eclampsia. Pure dextrose containing fluids should be avoided due to the risk of hyponatraemia. (JBDS-IP 2022)

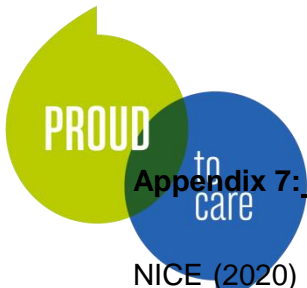


**Appendix 6 Timetable for clinic appointments for women with pre-existing diabetes**

<b>GESTATION</b>	<b>WITH WHO</b>	<b>ACTION</b>
<b>1<sup>st</sup> appointment</b>  <b>As soon as possible after pregnancy confirmed</b>	<b>Diabetes Team, DSN/DSM/DSD</b>	Ensure booking and dating scan in place Blood glucose and ketone monitoring equipment given Blood glucose target agreed and review of medication Ensure prescribed folic acid 5mg Dietary advice and review of carbohydrate counting management Offer use of CGM for pregnancy Diabetes bloods HbA1c and renal screen and urine ACR Refer for retinal screening pregnancy pathway. Discuss implication of diabetes in pregnancy and importance of good glycaemic control on pregnancy and neonatal outcomes Discuss need for close monitoring 1-2 weekly Advice on hypoglycaemia awareness Ensure has supply of glucagon Discuss sick day rules Arrange follow up by telephone if able to access virtual BG review otherwise face to face
<b>Dating appointment</b>	<b>Obstetric/Diabetes Team/Midwifery review</b>	Routine observations Dating scan and 1 <sup>st</sup> trimester screening Book anomaly and serial growth scans for 28, 32 and 36 weeks Review booking and diabetes bloods Prescribe Aspirin 150mg and Vit D supplements (included within pregnancy vitamins) from 12 weeks Review of medications
	<b>Endocrinology</b>	BG review Medication and management plan review
<b>16 weeks</b>	<b>Diabetes Team</b>	BG review Review retinal screening or ensure has appointment
	<b>Midwife</b>	Ensure has CMW appointment Or if attends antenatal clinic: Routine observations
<b>20 weeks</b>	<b>Diabetes Team</b>	BG review Routine observations
	<b>Obstetric/Midwife</b>	Review anomaly scan. Bloods for FDNA if applicable.
<b>24 weeks</b>	<b>Diabetes Team</b>	BG review and follow up arranged. Hba1c and renal screen. Ensure 2 <sup>nd</sup> trimester retinal screening booked. Routine AN care
	<b>Midwife</b>	Order anti-d and book appointment for administration
<b>28 weeks</b>	<b>Diabetes Team</b>	BG review Review growth scan



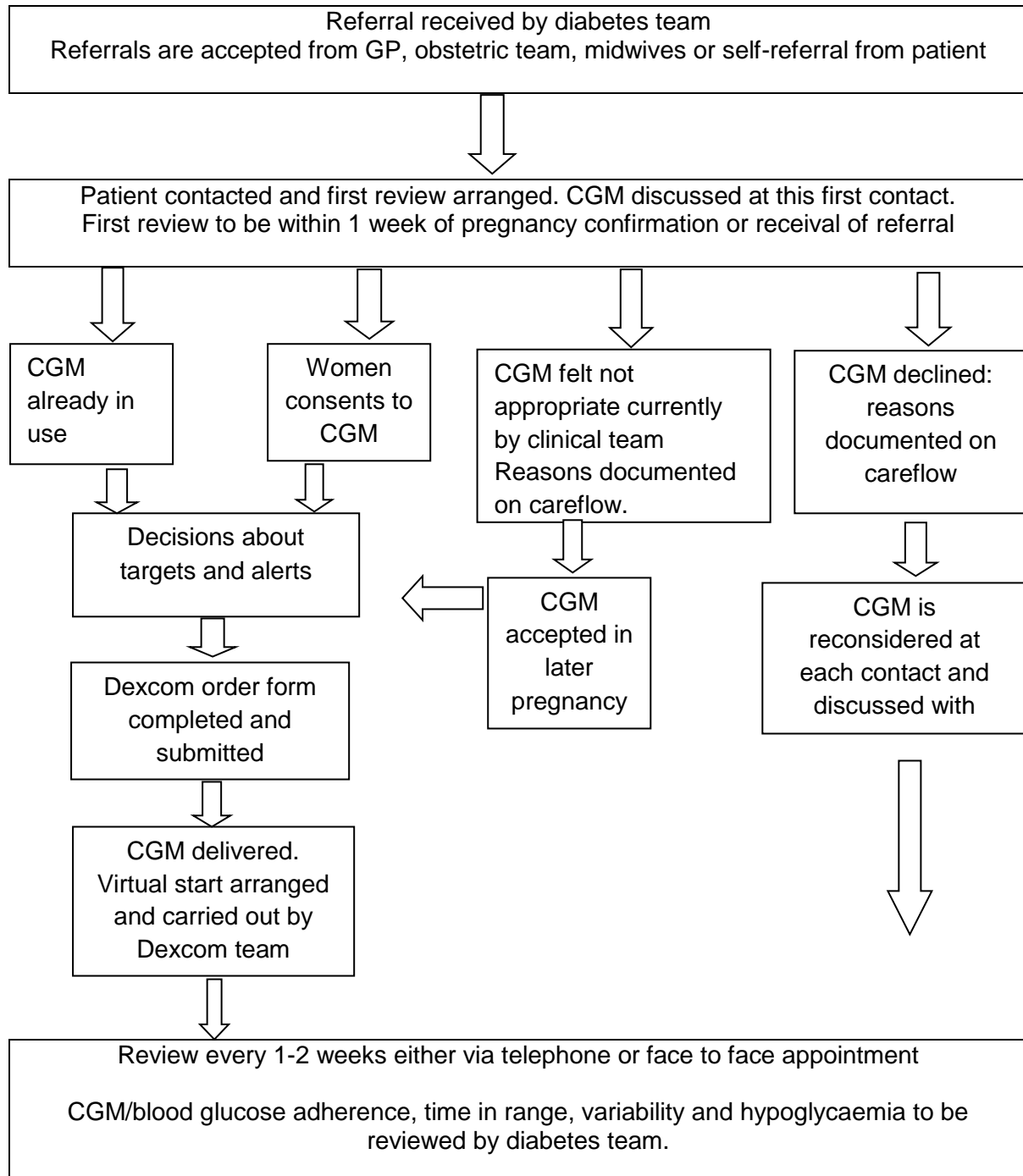
	<b>Obstetric/Midwife</b>	Ensure routine AN carried out Ensure routine bloods taken for FBC, group and antibodies Anti-D offered if required
<b>32 weeks</b>	<b>Diabetes Team</b>	Review BG levels Ensure 3 <sup>rd</sup> trimester retinal screening booked
	<b>Obstetric/Midwife</b>	Ensure routine AN care Review growth scan
<b>34 weeks</b>	<b>Diabetes Team</b>	Review BG levels
	<b>Midwife</b>	Hba1c and renal screen Discuss AN harvesting
<b>36 weeks</b>	<b>Diabetes Team</b>	BG levels reviewed DSN to recommend post-delivery insulin/metformin plan and document on Careflow
	<b>Midwife Obstetrics</b>	Diabetes plan for delivery including VRIII and neonatal care discussed Ensure routine AN care and FBC Review growth scan Timing and mode of delivery



## Appendix 7: Procedure for Continuous Glucose Monitoring in Pregnancy

NICE (2020) recommends that women with Type 1 diabetes are offered continuous glucose monitoring (CGM) in pregnancy. Women will be offered this at their first early pregnancy contact with the diabetes team. Education for the use of Dexcom sensors and management will be provided to allow for continual glucose monitoring.

### Continuous Glucose Monitoring (CGM) for Pregnant Women with Type 1 Diabetes)



## Procedure for blood ketone monitoring in pregnancy

Pregnancy is a ketogenic state. Women with diabetes are at higher risk of developing diabetic ketoacidosis (DKA) when they are pregnant. Prompt detection of ketones is key to early treatment (DTN-UK 2020). Staff caring for pregnant women with pre-existing diabetes need education in use of blood ketone testing equipment.

### Indications for blood ketone testing

- In well women, capillary blood ketone testing is usually **ONLY** indicated in women with known diabetes, unless requested by the diabetes team or senior obstetric/anaesthetic team
- Testing for ketones is indicated to differentiate between DKA and hyperglycaemia without ketosis
- If clinically unwell with sepsis and worsening of MOEWS
- If there is sustained hyperglycaemia  $>16\text{mmol/l}$  on two occasions within four hours.
- If the patient has symptoms of DKA.

Blood ketone meters are located in antenatal day unit and the antenatal/postnatal ward.

### Calibration

**Calibration**

- Calibration is required when using the meter for the first time
- To obtain an accurate blood glucose reading, the meter must be calibrated once for each new box of test strips
  - The meter should be calibrated to match the test strips being used
- Retain the calibration bar for the duration of that box








### Performing Quality Control (QC) tests



- A QC must be carried out monthly on the ketone meter and prior to patient use. If QC is not performed misleading results may led to inappropriate management.
- QC solution is stable for 90 days from opening or until expiry date, whichever is sooner
- Check results and document results on the file in the ketone meter box.

### Performing Quality Control (QC) tests

1. Open the foil test strip packet at the notch and tear down to remove the test strip
  - i. Check that the LOT number printed on the test strip foil packet and instructions for use match
2. Insert the test strip into the meter until it stops
3. The meter will turn on
4. When the  blinks, press the  button until this icon appears 
5. The meter is now ready for you to apply control solution to the test strip
  - i. Invert the control solution bottle to mix the solution
  - ii. Wipe the QC solution nozzle with a clean gauze/tissue before and after each test\*
6. Apply a drop of the control solution with the meter in a horizontal (flat) position to avoid it entering the test strip port

\* Replace the cap securely on the bottle immediately after use

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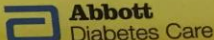


### Performing Quality Control (QC) tests


7. Hold the control solution to the test strip until 3 short lines appear on the screen
8. The results will be displayed after a 5-second countdown
  - i. Compare the control solution results to the range printed on the blood glucose test strip instructions for use; the results should fall within this range\*
  - ii. The results will be stored in memory as a control solution result
9. If results are out-of-range
  - i. Repeat the test
  - ii. Ensure you follow correct procedure & technique for QC testing
10. If the repeated result is out-of-range follow hospital protocol for out-of-range results

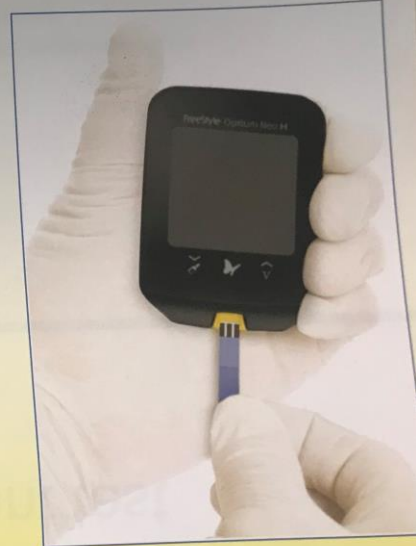
\* The QC solution range is a target for the QC solution only, not for blood glucose levels



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ADCMDP140077 Date of preparation: January 2014



## Performing a patient test

1. Open the foil test strip packet at the notch and tear down to remove the test strip
2. Insert the test strip into the meter until it stops
3. The meter will turn on
  - i. Check that the LOT number of test strip you are using appears
4. The  blinks, indicating the meter is ready for you to apply a sample to the test strip
  - i. Ensure you follow hospital protocol for sample collection



**Note:** If testing glucose on venous blood press the  to mark the test until  appears indicating that the meter is now ready for you to apply venous blood to the test strip



### How to interpret blood ketone levels

Level	Interpretation
Less than 0.6 mmol/L	Normal range. Do nothing now Consider rechecking if concerns persist
0.6 – 1.5 mmol/L	Ketones present. May indicate a problem developing. Needs more insulin, inform DSN or doctor
Greater than 1.5 mmol/L	Significant risk of DKA. Contact doctor and DSN
Greater than 3.0mmol/L	See DKA protocol Urgent diabetic or medical review



**Hypoglycaemia Management**

**HYPO BOX: TREATMENT OF HYPOGLYCAEMIA IN PATIENTS WITH DIABETES**

<p>Hypoglycaemia is a blood glucose of 4 mmol/l or less.          Wherever possible, check blood glucose level prior to treatment.          If patient asymptomatic, repeat test</p>		
<b>4 mmol/L</b>	<b>2-3mmol/L</b>	<b>1 mmol/L</b>
<b>MILD</b> <b>Patient conscious and able to swallow</b>  Trembling, sweating, hungry, tingling, headache, anxiety, palpitations, nausea, forgetfulness	<b>MODERATE</b> <b>Patient conscious and able to swallow but in need of assistance</b>  Difficulty concentrating, confusion, weakness, drowsiness, headache, dizziness, difficulty focusing and speaking	<b>SEVERE</b> <b>Patient unconscious and unable to swallow</b>  Unconscious, fitting
<b>STEP 1</b>		
<b>Administer 10-20g fast acting glucose</b> 3-5 GlucoTabs (4g glucose per tablet) OR 1 x 60ml bottle of Glucojuice	<b>Administer 1-2 tubes of GlucoGel</b> (10g glucose per tube) Ensure gag reflex is present	<b>Check airway</b>  <b>Place patient in recovery position</b> <b>Intramuscular injection of Glucagon 1mg</b>
<b>STEP 2</b>		
Wait 15 minutes and recheck glucose levels, and record. If reading is still below 4 mmol/L, or if no physical improvement, repeat STEP 1		Once patient is conscious, give sips of Glucose Liquid Blast or Lucozade Recheck glucose level every 15 minutes to ensure increase to at least 4 mmol/L
<b>ALWAYS FOLLOW UP WITH A SLOWLY DIGESTED/ STARCHY CARBOHYDRATE</b> Check glucose level. Once it is at 4 mmol/L or over and patient is recovered, eat a minimum of 15g slowly digested/starchy carbohydrate e.g 1 x slice/sandwich of low GI bread (ideally multigrain or granary); two digestive biscuits, glass of milk, banana, small carton of fruit juice. Recheck glucose levels after 15 minutes.		
<b>NOTE: Insulin should NEVER be omitted following an episode of hypoglycaemia.</b>		

(JBDS-IP 2021)



## Glossary of terms

ACR: Urinary albumin creatinine ratio

BMI: Body Mass Index

BG: Blood Glucose

CBG: capillary plasma glucose finger test measurement of blood glucose level

CGM: Continuous Glucose Monitor Sensor technology that measures glucose levels via interstitial fluid to allow monitor of glucose levels 24 hours a day

DKA Diabetic Ketoacidosis: Medical emergency requiring immediate management

DSN: Diabetes Specialist Nurse

DSM: Diabetes Specialist Midwife

GDM: Gestational Diabetes Mellitus

GP: General Practitioner

HbA1c: Glycosylated haemoglobin: A 3 months average of the amount of glucose bound to haemoglobin. Used as a measure of glycaemic control or one way to diagnosis diabetes

NICE: National Institute Clinical Excellence

OGTT Oral Glucose tolerance test

RCOG: royal college of obstetricians and gynaecologists

SPA: single point access

VRIII: Variable Rate Intravenous Insulin Infusion: Protocol to achieve normal glycaemia for diabetes in patients



**Appendix 12 (must always be the last appendix)**

Maintain a record of the document history, reviews and key changes made (including versions and dates)

Version	Date	Comments	Author

**Review Process Prior to Ratification:**

Name of Group/Department/Committee	Date
Reviewed by Maternity Guideline Group	N/A
Reviewed at Women's Business and Governance meeting	17/03/2023
Approved by CBU 3 Overarching Governance Meeting	22/03/2023
Approved at Trust Clinical Guidelines Group	N/A
Approved at Medicines Management Committee (if document relates to medicines)	N/A



**Trust Approved Documents (policies, clinical guidelines and procedures)**

**Approval Form**

Please complete the following information and attach to your document when submitting a policy, clinical guideline or procedure for approval.

<b>Document type (policy, clinical guideline or procedure)</b>	Clinical guideline
<b>Document title</b>	Guideline for the management of Diabetes in Pregnancy
<b>Document author</b> (Job title and team)	Diabetes Specialist Midwife / Labour ward lead obstetrician / Maternity Guideline Group/Endocrinologist
<b>New or reviewed document</b>	Reviewed- Replaces Diabetes in pregnancy
<b>List staff groups/departments consulted with during document development</b>	Kirstie Rickerby Diabetes Specialist Midwife Dr Fawzy Consultant Obstetrician Dr Khanem Consultant Obstetrician Dr Uchegbu Consultant Endocrinologist
<b>Approval recommended by (meeting and dates):</b>	WB&G 17/03/2023 CBU3 Governance 22/03/2023
<b>Date of next review (maximum 3 years)</b>	23/03/2026
<b>Key words for search criteria on intranet (max 10 words)</b>	Diabetes Pregnancy
<b>Key messages for staff (consider changes from previous versions and any impact on patient safety)</b>	
<b>I confirm that this is the <u>FINAL</u> version of this document</b>	Name: Jade Carritt Designation: Governance Midwife

**FOR COMPLETION BY THE CLINICAL GOVERNANCE TEAM**

<p><b>Approved by (group/committee):</b> CBU Governance</p> <p><b>Date approved:</b> 22/02/2023</p> <p><b>Date Clinical Governance Administrator informed of approval:</b> 23/03/2023</p> <p><b>Date uploaded to Trust Approved Documents page:</b> 28/03/2023</p>
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