The Shrewsbury and Telford Hospital NHS Trust

Pre-existing and gestational Diabetes (Antenatal, Intrapartum and Postnatal Care)

Version 6.2

Lead Persons:	Laura Bangs, Diabetes lead Obstetrician Sarah Davies, DSM Lead
Care Group:	Women and Children's
First Implemented:	June 2010
This Version Implemented:	21st February 2025
Planned Full Review:	February 2028
Keywords:	Diabetes, pre-existing; Ketoacidosis
Comments:	This guideline must be read in conjunction with obesity guideline(121) postnatal care guideline(133),Colostrum collection(028) and newborn feeding guideline (013).Management of patients using an insulin pump (CSII) in pregnancy (1969), DKA Management Chart
Written by:	Guy Calcott, Consultant Obstetricians
Consultation:	David Barton, Consultant Endocrinologist Anna Green, Consultant Endocrinologist Sarah Davies, Diabetes Specialist Midwife Rhianedd Preece, Diabetes Specialist Nurse

Version	Implementation Date	History	Ratified By	Full Review Date
1	June 2010	Reviewed in line with CNST requirement. New in this format	MGG Maternity Governance	June 2013
2	September 2010	Minor amendment following CNST	MGG	Sept 2013
2.1	8th November 2012	CNST Level 3 requirement	GC Authorised	Sept 2013
2.2	30th July 2013	Updated auditable Standards/Monitoring & Audit Section	GC Authorised	Sept 2013
3	24th February 2014	Full review	MGG Maternity Governance	Feb 2017
3.3	30th September 2014	Revised due to reconfiguration. Actions from NICE Benchmarking	GC Authorisation MGG	Feb 2017
4	18th November 2015	Full Review following new NICE guidelines. Inclusion of the care aspect for gestational diabetes as per title (screening remains separate guidance).	Maternity Governance MGG	Nov 2018
4.1	18th April 2018	Minor revision to table 1 section 18-22 weeks	MGG	November 2018
5.0	31st October 2019	Full version review Update to management plan	MGG Maternity Governance	October 2024
5.1	9th April 2020	Temporary suspension refer to SOP076	Maternity Governance	October 2024

5.2	Sep-22	Temporary suspension ended. SOP076 (Obstetric Diabetic Service during coronavirus covid-19) removed and archived Sep-22 Reverted back to usual procedure	Louise Weaver (Clinical Audit)	October 2024
5.3	July 2023	Audit & Monitoring paragraph updated to reflect new process.	Louise Weaver (Clinical Audit)	October 2024
5.4	1st November 2023	Update to include SBLCBv3 standards	Maternity Governance	October 2024
5.5	24 January 2024	SBLCBv3 standard added – intermittently scanned CGM for Type 2 pregnant diabetics, DKA MDT care	National guidance	October 2024
5.6	7th January 2024	SBLCBv3 standard added – DKA appendix	National guidance	October 2024
6	21st February 2025	Full rewrite. Update with JBDRS guidance and benchmark to NICE and SBLCBv3.	Maternity Governance	February 2028
6.1	26th March 2025	VRII appendices under review	Maternity Governance	February 2028
6.2	22nd April 2025	Appendices removed	Maternity Governance	February 2028

1.0 Introduction

1.1 Approximately 700,000 women give birth in England and Wales each year, and up to 5% of these women have either pre-existing diabetes or gestational diabetes. Of women who have diabetes during pregnancy, it is estimated that approximately 87.5% have gestational diabetes (which may or may not resolve after pregnancy). Out of the women with preexisting diabetes during pregnancy, 55.8% have type 2 diabetes, 42.6% have type 1 diabetes, and 1.6% have other forms of diabetes (National Diabetes in Pregnancy 2023) The prevalence of type 1 diabetes and especially type 2 diabetes has increased in recent years. The incidence of gestational diabetes is also increasing as a result of higher rates of obesity in the general population and more pregnancies in older women.

1.2 Diabetes in pregnancy is associated with risks to the woman and to the developing fetus.

Women with preexisting diabetes are at higher risk of miscarriage, pre-eclampsia and preterm labour. In addition, diabetic retinopathy and nephropathy can worsen 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.

Gestational diabetes is associated with an increased risk of large for gestation newborns, macrosomia, gestational hypertension, preeclampsia, stillbirth and neonatal morbidity (including hypoglycemia, hyperbilirubinaemia and respiratory distress). Gestational diabetes increases the risk of obesity and abnormal glucose tolerance in the offspring.

1.3 This guideline is supported by patient information leaflets and Diabetes Specialist Midwives will promote awareness of these for pregnant women with diabetes.

2.0 Aim

To maximise the health and wellbeing of women living with diabetes prior to pregnancy, during pregnancy and the post-natal period, in order to reduce the risks of mortality and morbidity in both mother and child .

3.0 Objectives

3.1 To deliver a comprehensive, multidisciplinary maternity diabetes service capable of individualised woman centred care.

3.2 To provide education and patient information to enable informed decision making with respect to managing women's diabetes and pregnancy.

4.0 Definitions and Abbreviations.

4.1 **The Maternity Diabetes Service** consists of
Lead (consultant) obstetricians
Lead (consultant) endocrinologists
Diabetes Specialist Midwives **(DSM)**
Diabetes Specialist Nurses **(DSN)**
The service is supported by midwife sonographers and dieticians.

4.2 **Type 1 Diabetes.** There is an absolute deficiency of insulin production, due to autoimmune destruction of the insulin-producing beta cells in the Islets of Langerhans in the pancreas.

4.3 **Type 2 diabetes.** There is a relative deficiency of insulin production, and/or the insulin produced is not effective (insulin resistance).

4.4 **Gestational diabetes** is diabetes which is first diagnosed during pregnancy, it occurs when the pancreas cannot produce sufficient insulin to meet the extra needs of pregnancy.

4.5 **VRIII** -Variable Rate Intravenous Insulin Infusion

4.6 **Diabetic ketoacidosis (DKA)** is a state of absolute or relative insulin deficiency characterized by hyperglycaemia, dehydration, acidosis and ketosis.

4.7 **Hypoglycaemia** is a low blood glucose level. If left untreated it can lead to unconsciousness, convulsions and coma. Commonly hypolglycaemia is defined as a blood glucose <4mmols, however during pregnancy a blood glucose between 3.5 and 4 mmols may be normal and therefore <3.5 would be considered as hypoglycaemia.

4.8 **HbA1c** refers to glycated haemoglobin which reflects longer term blood glucose control, over the preceding 8 -12 weeks.

4.9 **Combined Endocrine Antenatal Clinic** refers to the specialist antenatal clinic led jointly by a consultant obstetrician and endocrinologist and where women with endocrine disorders in pregnancy, including diabetes are seen.

4.10 **Gestational Diabetes Antenatal Clinic** refers to the antenatal clinic led by a diabetes specialist midwife and where women with gestational diabetes are seen following diagnosis.

4.11 **GDM app is an** application for smart phones which enables remote access to home blood glucose monitoring results

4.12 **Freestyle Libre** 2 is a continuous glucose monitor (CGM). It measures interstitial glucose levels and not capillary BG levels.

4.13 **Freestyle libre 3** and Dexcom 1 plus are real time continuous glucose monitors. They automatically send the blood glucose readings to a paired smart phone

4.14 **Dexcom G7** is a real time continuous glucose monitor which is usually offered to patients with Type 1 diabetes on insulin pumps due to specific features, including the urgent low alarm.

4.15 **CSII** (continuous subcutaneous insulin infusion) is also known as insulin pump therapy. This should be offered to all pregnant women with Type 1 diabetes. The CSII offered must use a specific, pregnancy-approved algorithm that is different to the algorithms used for non-pregnant people with type 1 diabetes.

5.0 Process

5.1 Referral to the Maternity Diabetes Service

Referral is made via the referral form the on the MIS, or direct to the DSM. On receipt of the referral (usually by GP or community midwife) the diabetes specialist midwife will arrange an appropriate appointment with the diabetes antenatal service.

At this appointment contact telephone numbers will be given for the diabetes specialist midwives based in the antenatal clinic at PRH and emergency contact telephone numbers.

5.2 Preconception Care

It is recommended that women with diabetes who are planning to become pregnant are informed that establishing good glycaemic control before conception and continuing this throughout the pregnancy will reduce risks (NICE 2015). There is currently no pre-conception service available in SaTH. Women may be referred to the consultant endocrinologist to be seen in a general diabetes clinic if appropriate. The consultant endocrinologist will involve a consultant obstetrician if required. For reference appendix 5 summarises the information that should be provided at a preconception discussion where it is available.

5.3 Antenatal Care

5.3.1 Pre-existing diabetes

Women with pre-existing diabetes are seen in the combined endocrine antenatal clinic 2-6 weekly throughout pregnancy, depending on clinical need. Women will also receive care from their community midwife or GP if required.

- Women with **pre-existing diabetes** are usually seen at least 4 weekly until 32 weeks gestation and 2 weekly thereafter. Table 1 summarises the care pathway. Each woman will have an individual management plan agreed according to her specific needs, and this will be documented in the case notes.
- Women with pre-existing diabetes should have an HbA1c measured at the start of the third trimester and those with an HbA1c above 48mmol/mmol should be offered increased surveillance including additional diabetes nurse/dietetic support, more frequent face to face review (at least every two weeks) and input from their named, specialist Consultant to plan ongoing care and timing of birth decisions. (Saving Babies' Lives Care Bundle version 3 (see ref list))
- Women with diabetes and retinopathy requiring treatment during pregnancy and/or kidney impairment should be referred to the maternal medicine network where care can be delivered in a single MDT clinic. (See Complex Medical Conditions in Pregnancy: Referral to the Maternal Medicine Network Trust guideline).

Continuous glucose monitoring

- Women with type 1 diabetes should be offered real time continuous glucose monitoring (rtCGM) and be provided with appropriate education and support to use this (SBLCBv3, NG3).
- Women with type 1 diabetes who are unable to use rtCGM or express a clear preference for isCGM should be offered isCGM (NG3)
- Women with type 2 diabetes should have an objective record of their blood glucose recorded in their hospital records/EPR and be offered alternatives (e.g. CGM – Freestyle Libre 2) to blood glucose monitoring if glycaemic targets are not achieved. (SBLCBv3).
- Consider rtCGM for pregnant women who are on insulin therapy but do not have type 1 diabetes, if:
    - they have problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) or
    - they have unstable blood glucose levels that are causing concern despite efforts to optimise glycaemic control. (NG3)

CSII in pregnancy

• women with type 1 diabetes already on CSII should be offered to switch to HCL-CSII if not already on it

•women with type 1 diabetes not on CSII should have the option of HCL-CSII discussed in accordance with national guidelines (please note that at the time of writing this guideline, national guidelines do not give definitive advice on this).Table 1 Timetable of antenatal appointments for women with pre-existing Diabetes

Gestation	Care and management required	By whom
First appointment **(As soon as possible, aim <8 weeks)**	Review of diabetes history to establish degree of any diabetic complications. Review of all medications. Provide safer alternatives where necessary. This includes discussion regarding use of analogue insulin. Examination of insulin injection sites for signs of inflammation or lipodystrophy and advise accordingly. Provide education about blood glucose control and confirm that the woman can competently use a blood glucose meter or CGM where indicated. Agree individualised targets for self-monitoring bearing in mind the risk of hypoglycaemia and based on the following ideal targets**:** • **Fasting < 5 .3mmol/ litre** • **1 hour after meals <7.8mmol/ litre** Provide advice and support to achieve optimal glycaemic control. Advise to test blood glucose 4-6 times per day, before and after meals. Measure HbA1c to determine level of risk for the pregnancy. The optimal value is 48mmol/mol. Individual targets are likely to be discussed. For women treated with insulin, provide education regarding management of **hypoglycaemia** and loss of hypoglycaemia awareness in pregnancy. Advise women to maintain blood glucose levels above 4mmol/litre. Ensure all women have glucose gel and that women with Type 1 diabetes also have a glucagon injection kit, and that the woman and her partner understand how to use both. Advise women on a basal bolus insulin regimen to test blood glucose prior to bed and if less than 7mmols/litre advise a bedtime snack to prevent nocturnal hypoglycaemia. Provide education regarding management and awareness of hyperglycaemia. Women with type 1 diabetes will be advised to test for ketonaemia (**see Appendix 3 for management of diabetic ketoacidosis**) and what to do if they become unwell. Patients with Type 1 diabetes should be offered Hybrid Closed Loop (HCL) therapy through CamAPS FX and provide written information. If a patient declines CamAPS FX, they must have a risk vs benefits discussion with a Diabetes Consultant and document outcome. If they are existing patients on HCL using CamAPS FX with Ypsomed insulin pump, then sick day rules will be discussed. Provide education and information about the effect of diabetes on pregnancy, birth, breastfeeding and initial care of the baby.	**DSN** **DSM** **Dietician** **Obstetrician** **Diabetologist**

	Provide dietary advice supported by a patient information leaflet and refer all women with pre-existing diabetes to the dietician. Prescribe **folic acid 5mg** if not already prescribed by GP. Refer for digital **retinal assessment**. If normal, repeat at 28 weeks gestation. Women with retinopathy require assessment every trimester and will be offered the next retinal assessment from 16–20 weeks gestation. Perform **renal assessment** • Urine samples for MSU and microalbumin. • Urea and Electrolytes (U&Es) Check Thyroid Function Tests (**TFTs**) because of increased risk of other endocrine disorders. Perform **Ultrasound scan** to confirm viability and schedule dating scan. Advise consultant unit delivery Women with Type 1 diabetes will be contacted by the DSN every 1-2 weeks to support with glycemic optimisation	
Booking appointment (ideally by 10 weeks)	Routine pregnancy booking history. Screening discussed and blood tests obtained	**Community Midwife**
10–12 weeks	Dating ultrasound scan and screening for aneuploidy	**Midwife Sonographer**
12 – 16 weeks	Review of glycaemic control Commence low dose aspirin 150mg daily (to reduce risk of pre-eclampsia)	**Combined Endocrine ANC**
18-21+6 weeks	Mid trimester ultrasound scan including 4 chamber view of fetal heart and visualisation of cardiac outflow tracts.	**Midwife or obstetric sonographer**
26-28 weeks	Ultrasound scan for fetal growth and amniotic fluid volume; 4 weekly for remainder of pregnancy. Measure HbA1c (26-29+6 weeks) Repeat digital retinal imaging. Provide education and information about initiation of breastfeeding and the effects on glycaemic control. Women are advised that colostrum harvesting is available (Refer to guidelines Colostrum 028 and Newborn Feeding 013)	**Combined Endocrine ANC**
30-34 weeks	Review of glycaemic control. Ultrasound assessment of fetal growth and amniotic fluid volume. Delivery and post-natal plan to be discussed for all patients who are on CSII (Continuous Subcutaneous Insulin Infusion) and documented on the MIS.	**Combined Endocrine ANC**

34-36 weeks	Review of glycaemic control. Ultrasound assessment of fetal growth and amniotic fluid volume. Information and discussions will take place on the following subjects: • Timing, mode and management of birth • Analgesia and anaesthesia • Changes to blood glucose lowering therapy after birth • Initial care of her baby • Follow up and contraception An intrapartum insulin regimen for women with type 1 diabetes will be discussed and documented on the MIS. Post-natal glycaemic treatment will be agreed and documented on the MIS. Where a woman delivers and a plan has not been made usual practice would be to resume the pre-pregnancy treatment immediately unless contraindicated.	**Combined Endocrine ANC**
37-38 weeks	Offer induction of labour or caesarean section. Consider antenatal steroids if elective caesarean section planned before 37 completed weeks of gestation (see 5.9.2)	**Lead Obstetrician**
>38 weeks	Offer tests of fetal wellbeing depending on individual management plan if pregnancy continues beyond 38+6 weeks gestation.	**Lead Obstetrician**

Ketone testing and diabetic ketoacidosis – See also section 5.4 and appendix 3

- Offer blood ketone testing strips and a meter to pregnant women with type 1 diabetes. Advise them to test for ketonaemia and to seek urgent medical advice if they become hyperglycaemic or unwell.
- Advise pregnant women with type 2 diabetes or gestational diabetes to seek urgent medical advice if they become hyperglycaemic or unwell.
- Test urgently for ketonaemia if a pregnant woman with any form of diabetes presents with hyperglycaemia or is unwell.
- Immediately admit pregnant women with suspected diabetic ketoacidosis for level 2 critical care, where they can receive both medical and obstetric care**.**

Retinal assessment during pregnancy

- After pregnant women with pre-existing diabetes have had their first antenatal clinic appointment:
- offer referral for retinal assessment by digital imaging with mydriasis using tropicamide
- if they have diabetic retinopathy, offer an additional retinal assessment at 16 to 20 weeks
- offer another retinal assessment at 28 weeks.
- 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.

Renal assessment during pregnancy

Arrange a renal assessment at first contact during the pregnancy for women with pre-existing diabetes, if they have not had 1 in the last 3 months.

Consider referring pregnant women with diabetes to a nephrologist (Renal combined ANC) if:

- their serum creatinine is 120 micromol/litre or more or
- the urinary albumin:creatinine ratio is greater than 30 mg/mmol or
- total protein excretion exceeds 0.5 g/day.

Do not use eGFR to measure kidney function in pregnant women.

Consider thromboprophylaxis for pregnant women with nephrotic range proteinuria above 5 g/day (albumin:creatinine ratio greater than 220 mg/mmol).

5.3.2 Gestational Diabetes Mellitus

Women diagnosed with **gestational diabetes** will be seen by a DSM within a week of diagnosis and commenced on home blood glucose monitoring. The same blood glucose target levels apply as for women with pre-existing diabetes:

- **Fasting <5 .3mmol/ litre**
- **1 hour after meals <7.8mmol/ litre**

Women will be taught how to use the GDM app to upload their home blood glucose monitoring results to enable review by the DSM between hospital appointments.

Education regarding healthy diet during pregnancy will be supported by written information and advice that foods with a low glycaemic index should replace those with a high glycaemic index. Referral to a dietician will be offered.

Women will be encouraged to take regular exercise (such as walking for 30 minutes after a meal) to improve blood glucose control.

If blood glucose targets are not met following changes in diet and exercise within 1–2 weeks; metformin will be offered as first line oral hypoglycaemic therapy. If blood glucose targets are still not met, Insulin will be considered.

Insulin may be considered as first line hypoglycaemic therapy if metformin is contraindicated, glucose levels are very high (see below) or metformin is unacceptable to the woman.

Consider commencing immediate treatment with insulin, with or without metformin, in addition to changes in diet and exercise, in the following situations:

- Fasting plasma glucose ≥7.0mmol/litre at diagnosis
- Fasting plasma glucose 6.0 - 6.9mmol/litre at diagnosis **and** obstetric complications such as macrosomia or polyhydramnios

Contraindications to metformin in pregnancy include:

- Fetal growth restriction (limited evidence)
- Acute metabolic acidosis

Antenatal Appointments for women with GDM

Women with gestational diabetes are usually seen for an initial appointment in the gestational diabetes antenatal clinic, within 4 weeks of diagnosis. Follow up is at 4 weekly intervals to review glycaemic control and with ultrasound assessment of fetal growth, either in the GDM ANC or the combined endocrine ANC. When required, clinic appointments are supported by telephone contact with DSMs to review and optimise glycaemic control. The DSMs will review the glucose control every 2 weeks as a minimum (usually weekly) for women with good control. More frequent reviews will be performed for women with suboptimal control.

The Midwife led GDM clinic is suitable in the following situations:

- First appointment after diagnosis of GDM
- Well controlled GDM on diet alone, metformin or a low dose of basal insulin.

Women should be referred into the combined clinic for the next appointment within 2-4 weeks in the following circumstances:

- Failure to engage in care
- Poor glucose testing (persistent)
- Poor glucose control (more than 3 readings above target for 3 consecutive weeks despite treatment adjustments)

- Obstetric issues including growth abnormalities and placental complications
- Previous caesarean delivery (where MOD has not already been agreed)
- Women on treatment should be seen in combined clinic by 37 weeks
- Women well controlled on diet alone should be seen by 39 weeks

Where women have additional high risk medical conditions or obstetric conditions with stable diet controlled diabetes, they will continue to be seen in the primary clinic for that condition, supported by the team of diabetes specialist midwives, and will not be routinely seen in the combined clinic.

5.3.3 Management of women who do not engage in care

- Women who do not attend appointments should be managed in line with the maternity DNA policy found at: https://intranet.sath.nhs.uk/document_library/ViewPDFDocument.asp?DocumentID=17147
- In the first instance the history and notes will be reviewed and the woman will be contacted by telephone by the DSM/Obstetrician
- Where diabetes control is poor or monitoring is not being performed adequately an attempt should be made to contact the woman by the Obstetrician in clinic to discuss the risks of poor diabetes control
- Part of this assessment should include any barriers to communications including learning difficulties, as well as understanding of written English.
- A plan will be made for rescheduling any appointments or scans and documented on the MIS as a clinical note and the management plan updated.

5.3.4 The GDM App and communication

- The GDM app has been developed to provide a place for women to upload their blood sugars to be visible by the diabetes team remotely. It also allows instant messaging communication between the woman and the clinical care team.
- All women with GDM will be given access to the GDM app for recording of blood sugars, treatment and for instant messaging about dosing advice.
- All women with type 2 diabetes will be given access to the app, however those on Libre monitoring will not upload their sugars
- When women are set up on the app the DSM will ensure that the messaging system is working, and that there are no barriers to using that as a communication tool (for example non-english speaker or learning difficulties)
- If there are concerns about understanding of written English the primary method of communication should be by telephone.
- When the GDM app is reviewed and a message is sent, the DSM will also document the advice on the MIS.
- If a woman continues to have poor engagement or abnormal results after 3 text messages, a follow up telephone call should be made and the outcome documented.

5.4 **Management of diabetic ketoacidosis** (see Appendix 3)

The initial management of a pregnant woman with Diabetic Ketoacidosis (DKA) of pregnancy should be in accordance with the agreed pathways outlined in Pregnant women acutely attending hospital: Assessment and Admission Version 8.3 guideline. However, at later gestations (beyond 26+0 weeks) the woman should be admitted to a maternity high dependency area (delivery suite ward 24). For women with severe DKA, direct admission to an intensive care setting should be considered.

5.5 Management of Hypoglycaemia

For a quick reference see appendix 6

Adults with symptoms of hypoglycaemia who have a blood-glucose concentration greater than

4 mmol/litre, should be treated with a small carbohydrate snack such as a slice of bread or a normal meal, if due.

Any patient with a blood-glucose concentration less than 3.5 mmol/litre, with or without symptoms, and who is conscious and able to swallow, should be treated with a fast-acting carbohydrate by mouth. Fast-acting carbohydrates include Lift® glucose liquid (previously Glucojuice®), glucose tablets, glucose 40% gels (e.g. Glucogel®, Dextrogel®, or Rapilose®), pure fruit juice, and sugar (sucrose) dissolved in an appropriate volume of water. Oral glucose formulations are preferred as absorption occurs more quickly. Orange juice should not be given to patients following a low-potassium diet due to chronic kidney disease, and sugar dissolved in water is not effective for patients taking acarbose which prevents the breakdown of sucrose to glucose. Chocolates and biscuits should be avoided if possible, as they have a lower sugar content and their high fat content may delay stomach emptying.

If necessary, repeat treatment after 15 minutes, up to a maximum of 3 treatments in total. Once blood-glucose concentration is above 4 mmol/litre and the patient has recovered, a snack providing a long-acting carbohydrate should be given to prevent blood glucose from falling again (e.g. two biscuits, one slice of bread, 200–300 mL of milk (not soya or other forms of 'alternative' milk, e.g. almond or coconut), or a normal carbohydrate-containing meal if due). Insulin should not be omitted if due, but the dose regimen may need review.

Hypoglycaemia which does not respond (blood-glucose concentration remains below 3.5 mmol/litre after 30–45 minutes or after 3 treatment cycles), should be treated with intramuscular glucagon or glucose 10% intravenous infusion.

Glucagon is a polypeptide hormone produced by the alpha cells of the islets of Langerhans, which increases blood-glucose concentration by mobilising glycogen stored in the liver. The manufacturer advises that it is ineffective in patients whose liver glycogen is depleted, therefore should not be used in anyone who has fasted for a prolonged period or has adrenal insufficiency, chronic hypoglycaemia, or alcohol-induced hypoglycaemia. Glucagon may also be less effective in patients taking a sulfonylurea; in these cases, intravenous glucose will be required.

In an emergency, if the patient has a decreased level of consciousness caused by hypoglycaemia, intramuscular glucagon can be given by a family member or friend who has been shown how to use it. If glucagon is not effective after 10 minutes, glucose 10% intravenous infusion should be given.

Hypoglycaemia which causes unconsciousness is an emergency. Patients who are unconscious, having seizures, or who are very aggressive, should have any intravenous insulin stopped, and be treated initially with glucagon. If glucagon is unsuitable, or there is no response after 10 minutes, glucose 10% intravenous infusion, or alternatively glucose 20% intravenous infusion should be given. Glucose 50% intravenous infusion is not recommended as it is hypertonic, thus increases the risk of extravasation injury, and is viscous, making administration difficult.

A long-acting carbohydrate should be given as soon as possible once the patient has recovered and their blood-glucose concentration is above 4 mmol/litre (e.g. two biscuits, one slice of bread, 200–300 mL of milk (not soya or other forms of 'alternative' milk, e.g. almond or coconut), or a normal carbohydrate-containing meal if due). Patients who have received glucagon require a larger portion of long-acting carbohydrate to replenish glycogen stores (e.g. four biscuits, two slices of bread, 400–600 mL of milk (not soya or other forms of 'alternative' milk, e.g. almond or coconut), or a normal carbohydrate containing meal if due). Glucose 10% intravenous infusion should be given to patients who are nil by mouth.

If an insulin injection is due, it should not be omitted; however, a review of the usual insulin regimen may be required. Patients who self-manage their insulin pump may need to adjust their pump infusion rate. If the patient was on intravenous insulin, continue to check blood-glucose concentration every 15 minutes until above 3.5 mmol/litre, then re-start intravenous

insulin after review of the dose regimen. Concurrent glucose 10% intravenous infusion should be considered.

Hypoglycaemia caused by a sulfonylurea or long-acting insulin, may persist for up to 24–36 hours following the last dose, especially if there is concurrent renal impairment.

Blood-glucose monitoring should be continued for at least 24–48 hours

5.6 **Antenatal steroids (preterm labour)**

Diabetes is not a contraindication to antenatal steroids and tocolysis for preterm labour. Antenatal steroids have a hyperglycaemic effect for up to 72 hours after being commenced.

Women on multiple daily dosing

Women receiving antenatal steroids whose diabetes is insulin treated are likely to need additional insulin to control blood glucose levels (in particular pre-existing diabetes).

The target range for blood glucose during steroid treatment is 5.0-8.0 (post meal). Additional boluses of fast acting insulin may be considered under direction or a specialist. Advice should be sought from the diabetes specialist midwives and/or DSN. When target blood glucose cannot be achieved with additional subcutaneous insulin, or the appropriate expertise is not available, variable rate insulin infusion (VRIII) should be commenced when the blood glucose is above the target range. Women who are eating and drinking should continue all normal insulin doses whilst on VRIII.

As an alternative some women with pre-existing diabetes who are having planned steroids may have an individual plan made to increase their regular insulin, under the direction of the diabetes specialist nurse or physician. This will be clearly documented in the management plan on the MIS.

- If VRIII is used during steroid treatment (patient eating and drinking), the default fluid to run alongside should be **5% glucose in 0.9% saline with 0.15% KCl at a rate of 50 mL/h**. This should prescribed on the hospital prescription chart.

Women using insulin pump therapy (HCL)

Women on HCL on CamAPS should increase their insulin doses with meals as required (start with a 10% increase with meals, increasing to 50% if required). The use of BOOST and correction doses should be encouraged.

If BGL remain consistently at 12mmol/l or above for more than 2 hours, then the woman should turn off HCL but run pump in Open Loop and turn on temporary basal to 150% as well as increasing insulin with meals by 50%.

If after 2 hours of open loop, glucose remains consistently >12mmol/l, switch to VRIII. Ensure the insulin pump is removed.

Once BGL and ketones have resolved, ensure the insulin pump is reconnected for 30 minutes prior to stopping VRIII.

Women on diet/Metformin

Women treated with diet or metformin require close blood glucose monitoring and may require insulin treatment for a short period of time to control blood glucose levels.

5.7 Timing of birth

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

- The following table shows the timing of birth as agreed by the West Midlands IOL framework (v2). This is also supported by NICE guideline NG 3 and the ACOG Practice Bulletin No. 190: Gestational Diabetes Mellitus. Obstet Gynecol. 2018 (for GDM)

Diabetes in pregnancy				
These recommendations apply only to those patients where their diabetes mellitus (DM) is well managed and there are no maternal or fetal complications.				
1	Type 1 / 2 DM with no maternal or fetal complications	Offer IOL 37+0 - 38+6	All women with Type 1 / 2 DM with no maternal or fetal complications should be offered IOL 37+0 - 38+6	NICE Diabetes in pregnancy: management from preconception to the postnatal period NG 3 (2020)
2	Type 1 /2 DM with maternal or fetal complications	Individualised care plans	All women with Type 1 /2 DM with maternal or fetal complications should be given Individualised care plans	
3	Gestational Diabetes **DIET / LIFESTYLE CONTROLLED** with no maternal or fetal complications	Offer IOL between 40+0 - 40+6	All women with Gestational Diabetes DIET / LIFESTYLE CONTROLLED with no maternal or fetal complications should be offered IOL 40+0 - 40+6	
4	Gestational Diabetes **METFORMIN CONTROLLED** with no maternal or fetal complications	Offer IOL between 39+0 - 39+6	All women with Gestational Diabetes METFORMIN CONTROLLED with no maternal or fetal complications should be offered IOL 39+0 - 39+6	
5	Gestational Diabetes **INSULIN CONTROLLED** with no maternal or fetal complications	Offer IOL between 39+0 – 39+6	All women with Gestational Diabetes INSULIN CONTROLLED with no maternal or fetal complications should be offered IOL 39+0 – 39+6	
6	Gestational Diabetes with maternal or fetal complications: Poor glycaemic control. High insulin requirement, suspicions there was impaired glycaemic control prior to pregnancy, fetal macrosomia, polyhydramnios	Individualised care plans	All women with Gestational Diabetes with maternal or fetal complications should be given Individualised care plans	

- Additional complications may include:
  - Excess or reduced growth
  - Recurrent reduced fetal movements

- Diabetes alone should not be considered a contraindication to vaginal birth after a previous caesarean section.
- For pregnant women with diabetes who have an ultrasound-diagnosed macrosomic fetus, explain the risks and benefits of vaginal birth, induction of labour and caesarean section (see below).

5.8 **Mode of birth**

The decision regarding the mode of delivery is the responsibility of the obstetrician and is made on an individual basis in conjunction with the woman, giving consideration to the absolute EFW, growth trajectory and individual patient characteristics including obstetric history.

It is well known that pregnancies with diabetes are at an increased risk of birth complications including shoulder dystocia (increased 2-4 fold). This risk increases with increasing fetal weight at birth.

Based on RCOG guidance:

- Birthweights of 4000g – 4500g carry an increased risk of shoulder dystocia but the long term morbidity is not increased
- Birthweight >4500g carry an increased risk of shoulder dystocia with associated increase in morbidity (hypoxic injury and brachial plexus injury) and Caesarean section would be recommended.

The following factors also increase in the risk of shoulder dystocia and should be considered when planning mode of birth

- Pre-existing diabetes (vs GDM)
- Obesity
- Previous shoulder dystocia

In women with an ultrasound diagnosed macrosomic baby (over 4kg with diabetes) the risk of shoulder dystocia should be discussed with consideration given to earlier induction of labour or planned caesarean section as appropriate.

5.9 **Intrapartum blood glucose control**

- Monitor capillary plasma glucose every hour during labour and birth for women with diabetes, and maintain it between 5 mmol/litre and 8.0 mmol/litre (JBDS liberal target)
- Consider VRIII from the onset of established labour for women with type 1 diabetes who are not already well controlled.
- Up to 2 additional boluses of fast acting insulin (novorapid, humalog, fiasp or lyumjev) 2-4units may be considered before reverting immediately to VRIII for women who are normally well controlled.
- Use intravenous dextrose and insulin infusion during labour and birth for women with diabetes whose capillary plasma glucose is not maintained between 5.0 mmol/litre and 8.0 mmol/litre.
- If VRIII is used in someone who is NOT eating and drinking or is in labour, the default fluid to run alongside should be:
    - **5% dextrose to run at 100mls/hour or**
    - **0.18% saline with 4% dextrose and 20mmol KCL at 100ml/hr**
- Additional intravenous fluids may be required as per clinical need e.g. haemorrhage
- Reduce the rate of VRIII (if and when used) by 50% (or change to the lowest scale) once placenta is delivered

Women whose diabetes is managed with an insulin pump will have an individual management plan for labour. The plan will be made in the combined endocrine ANC prior to induction of labour and is the responsibility of the lead endocrinologist. When spontaneous labour occurs before the plan is made, women will usually be advised to disconnect the pump and commence VRIII for the duration of labour. See SaTH Management of Patients Using an Insulin Pump (CSII) in pregnancy guideline: Ref 1969

5.10 Elective caesarean section

5.9.1 Process and pre-op

Consideration should be given for women with poorly controlled diabetes to be admitted to the antenatal ward the evening prior to elective caesarean section and will fast from midnight. Long acting insulin dose the evening before the caesarean section will be reduced (usually halved) to account for decreased insulin requirements during the period of NBM and following the delivery of the placenta. The recommended dose will be documented on the MIS and advised to the woman. The revised insulin dosage will be planned in the combined endocrine ANC prior to elective CS and is the responsibility of the lead endocrinologist/DSM/DSN as appropriate. When admitted, hourly blood glucose will be measured from 06:00 with the aim of maintaining levels between 5.0 and 8.0mmol/l. When blood glucose cannot be maintained between 5.0 and 8.0 mmol/l, intravenous insulin will be commenced as variable rate insulin infusion (VRIII) together with IV fluids containing dextrose.

Women not admitted should be instructed to check their blood glucose on waking. If glucose is less than 4 they should take a source of liquid glucose (eg hypostop) to avoid further drop, and attend the maternity unit straight away rather than waiting for the planned admission time.

See SaTH guideline: Insulin Infusion in Hospital – Adult: ref 1431 and SaTH Adult Prescription and Administration Record.

5.9.2 Steroids and early term caesarean section

There is no clear evidence to support or refute the use of antenatal corticosteroids for women with pre-existing diabetes who are having an elective caesarean section between 36 and 38+6 weeks gestation (Thevathasan 2023). Women with diabetes are not specifically included in the NICE guideline on caesarean section or the RCOG guideline on steroids. Some studies have shown that steroids for early term caesarean section in women with any type of diabetes may cause harm whereby NICU admission rates for neonatal hypoglycemia were significantly higher (24.2% vs. 4.4%, P = 0.003) and RDS (Respiratory Distress)/TTN (Transient Tachypnea of the Newborn) rates were non-significantly higher (15.2% vs. 7.2%, P = 0.209) following corticosteroid administration (Gupta 2020). Therefore at SATH steroids should not be routinely offered to women with diabetes undergoing planned caesarean section from 37 weeks gestation. Prior to 37 weeks potential risk and benefits should be discussed and the decision documented clearly in the MIS.

Benefits

- Steroids may help with fetal lung maturation and reduce admission to the neonatal unit when given prior to an elective caesarean section I the general population. In women with diabetes however it is not clear whether corticosteroids reduce the NNU admission rate overall.

Risks

- Corticosteroids can cause unpredictable hyperglycemia in the mother, which can lead to hypoglycemia in the baby. Hypoglycemia in the newborn can lead to seizures and negatively impact childhood development.
- May reduce educational attainment at school age (increase in the proportion of children ranked by teachers as being in lower quartile of academic ability from 9 to 18%; and reduction in proportion of children obtaining English proficiency from 13 to 7%).

Monitoring

- Women with diabetes who are taking steroids need to be closely monitored for blood sugar levels. They may need to be admitted to the hospital for additional insulin treatment.

5.11 Postnatal care

5.11.1 Pre-existing diabetes

Timing and plan for review by DSM will be agreed as part of the management plan. Women will resume pre-pregnancy hypoglycaemic therapy. Individual requirements for hypoglycaemic therapy and follow up will have been agreed in the combined endocrine antenatal clinic at the time of planning delivery, recorded on the MIS. Any changes to this plan may be revised after delivery by the DSM or a member of the diabetes team.

Women who attended the hospital for diabetes care prior to pregnancy will require follow up with the appropriate endocrinologist after delivery. A letter requesting a follow up appointment will be dictated by the consultant endocrinologist at the final antenatal clinic appointment when delivery is planned.

Women with Type 1 diabetes will receive continued weekly contact from the DSN dependent on the individualized patient as to the length of time, this is provided for 4-8 weeks post-delivery.

The community Diabetes Nurse Specialist (DSN) will be informed of the woman's transfer back into the community. The community DSN can be contacted via referral form from the DSM.

Women whose diabetes is managed by their GP (most women with type 2 DM) do not require hospital follow up unless there are specific endocrine or obstetric issues.

5.11.2 Gestational diabetes

Women with gestational diabetes on treatment who post natal will be requested to test their blood glucose to exclude persisting hyperglycaemia before transfer to community care.

The post natal plan will be entered onto the maternity information system by the diabetes specialist midwife.

Remind women who were diagnosed with gestational diabetes of the symptoms of hyperglycaemia

Explain to women who were diagnosed with gestational diabetes about the risks of recurrence in future pregnancies, and offer them diabetes testing when planning future pregnancies.

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

- offer lifestyle advice (including weight control, diet and exercise)
- The GP will be asked to offer a HbA1c 13 weeks after birth.

All women who have had gestational diabetes should be offered the opportunity to enroll in the Diabetes Prevention– Pathway to Remission Program and will be given information on how to access it.

For women having an HbA1c test as the postnatal test:

Advise women with an HbA1c level below 39 mmol/mol (5.7%) that:

- they have a low probability of having diabetes at the moment
- they should continue to follow the lifestyle advice (including weight control, diet and exercise) given after the birth
- they will need an annual test to check that their blood glucose levels are normal

- they have a moderate risk of developing type 2 diabetes, and offer them advice and guidance in line with the NICE guideline on preventing type 2 diabetes (note that this guideline uses different risk thresholds, because it covers a different population).

Advise women with an HbA1c level between 39 mmol/mol and 47 mmol/mol (5.7% and 6.4%) that they are at high risk of developing type 2 diabetes, and offer them advice, guidance and interventions in line with the NICE guideline on preventing type 2 diabetes (note that this guideline uses different risk thresholds, because it covers a different population).

Advise women with an HbA1c level of 48 mmol/mol (6.5%) or above that they have type 2 diabetes, and refer them for further care.

Recommend an annual HbA1c test to women with gestational diabetes who have a negative postnatal test for diabetes.

Offer women with gestational diabetes early self monitoring of blood glucose or an OGTT in future pregnancies. Offer a subsequent OGTT if the first OGTT results in early pregnancy are normal.

5.12 **Neonatal care**

Refer to Transitional care guideline (170)

The woman will be offered assistance with feeding as per the Maternity Newborn Feeding guideline (013) taking into account her feeding preference and wishes to use any colostrum harvested in the antenatal period (see Antenatal Colostrum Collecting guideline, 028)

6.0 Training

All medical and midwifery staff will be informed of guidelines on intranet at induction.

- Training is provided to all staff on mandatory training Day 5
- All staff administering insulin are encouraged to complete the following e-learning
  - https://www.e-lfh.org.uk/programmes/safe-use-of-insulin/
  - https://www.ilearn.rcm.org.uk/enrol/index.php?id=1134

7.0 Monitoring

Compliance with this guideline / SOP will be audited as part of the Shrewsbury and Telford Hospital NHS Trust's five-year rolling programme of NICE and local guideline audits, unless circumstances require an earlier or more frequent audit. The audit will be carried out against the auditable standards and the results of the audit will be reported and acted on in accordance with the Trust Clinical Audit Policy (CG25).

8.0 References

ACOG Practice Bulletin No. 190: Gestational Diabetes Mellitus. Obstet Gynecol. 2018;131:e49–e64. doi: 10.1097/AOG.0000000000002501.

BNF Treatment summaries: Hypoglycaemia. Accessed at https://bnf.nice.org.uk/treatment-summaries/hypoglycaemia/ on 8/1/2025

Diabetes UK (2015) Available at: http://www.diabetes.org.uk/Guide-to-diabetes/What-is-diabetes/Other-types-of-diabetes/Gestational-diabetes/ Date accessed: 23/04/2015

Joint British Diabetes Societies (JBDS) for Inpatient Care Group:
Managing diabetes and hyperglycaemia during labour and birth (Feb 2023)

Katharine Gupta, Rohit Rajagopal, Felicia King, David Simmons; Complications of Antenatal Corticosteroids in Infants Born by Early Term Scheduled Cesarean Section. Diabetes Care 1 April 2020; 43 (4): 906–908. https://doi.org/10.2337/dc19-2126

NICE (2015) Diabetes in pregnancy: management of diabetes and its complications from preconception to the postnatal period. Available from https://www.nice.org.uk/guidance/ng3

The Diabetes Complications and Control Trial (D.C.C.T) Research Group,1993. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. New England Journal of Medicine, 1993. Sept. 30th ;329 (14): 977-86.

Thevathasan, I., Karahalios, A., Unterscheider, J., Leung, L., Walker, S. and Said, J.M. (2023), Neonatal outcomes following antenatal corticosteroid administration prior to elective caesarean delivery in women with pre-gestational diabetes: A retrospective cohort study. Aust N Z J Obstet Gynaecol, 63: 93-98. https://doi.org/10.1111/ajo.13586

Saving Babies' Lives Care Bundle version 3
NHS England » Saving babies' lives version three: a care bundle for reducing perinatal mortality

Appendix 1

Table 1: Advantages and disadvantages of tight vs pragmatic glycaemic targets during labour and birth and when using steroids for suspected preterm birth

Approach	Advantages	Potential Disadvantages
Traditional intrapartum capillary glucose target range of 4.0 - 7.0 mmol/L	Widely used Supported by NICE	• Increased risk of use of VRIII which is intrusive for women and resource intensive for delivery units • Increased risk of maternal hypoglycaemia • Reduced autonomy for diabetes self-management • May be too late to reverse the consequences of sustained fetal hyperinsulinism and/ or to prevent neonatal hypoglycaemia
Pragmatic intrapartum capillary glucose target range of 5.0 – 8.0 mmol/L	• Reduced use of VRIII which allows women more autonomy and mobility during/after birth • Lower risk of maternal hypoglycaemia • Reduced resource burden for delivery unit staff	• Limited evidence-base • Fear of potential increased risk of neonatal hypoglycaemia

Appendix 2

Table 2.
Potential complications associated with the use of the VRIII on maternity wards

Domain	Complication
VRIII initiation	• Delayed commencement leading to insufficient time to minimise neonatal hypoglycaemia and/or diabetic ketoacidosis (DKA) • Wrong connections • Lack of use of one-way anti-siphon valves • Incorrect programming
VRIII implementation	• Resource intensive and limits autonomy for diabetes self-management during birth • Insufficient blood glucose measurements resulting in either hypoglycaemia of hyperglycaemia • Titration scales that predispose to hypoglycaemia as there is no buffer zone between the lower capillary blood glucose target of 4.0 mmol/L and hypoglycaemia (<3.9 mmol/L) • Premature cessation of the substrate but with continuation of the intravenous insulin infusion leading to hypoglycaemia • Hyponatraemia due to inadequate sodium in the substrate fluid • Hypokalaemia due to inadequate potassium in the substrate fluid • Fluid overload • Erroneous blood glucose measurements caused by use of glucose in arterial flush lines
VRIII cessation	• Careful timing of pre-meal and basal subcutaneous insulin needed

Appendix 3

Diabetic Ketoacidosis (DKA)

Initial Care Pathway

DKA is a medical emergency and therefore the primary focus is early medical care. Regardless of the location of care, all women should have an urgent multi-disciplinary (MDT) review including:

- Medical Registrar or Consultant
- Obstetrician (Tier 3 (Consultant) +/- Tier 2 (Registrar))
- Obstetric Anaesthetist
- Nursing staff /Midwives trained to look after patients requiring level 2 care
- Diabetes Specialist Consultant and Diabetes Nurse (where possible)

The initial review should include an assessment of the severity of DKA, and an assessment of fetal viability, depending on the gestation. Assessment of fetal wellbeing would usually be considered from 26+0 weeks. Prior to this gestation, emergency delivery for fetal distress is unlikely to have a positive outcome for the baby and would significantly increase maternal risk. Therefore, maternal stabilisation is imperative before the consideration of delivery.

At all gestations, any adverse fetal heart changes are likely to improve as the maternal condition improves, and immediate delivery would rarely be indicated in the absence of other indications/causes (e.g.: suspected placental abruption). It is expected that a woman admitted to a medical care location with DKA should be reviewed by the Obstetric team (Tier 2 (Registrar) or above) within **one hour** to create a plan for fetal monitoring. Women with DKA admitted to an *obstetric location* should be seen by the medical registrar or above within **one hour**.

Women with severe DKA diagnosed in any location, as defined below, should be referred immediately for medical review (Medical Registrar or above), and escalated within **30 minutes** by the senior resident Obstetric team (Tier 2 or 3). Additionally, women with severe DKA should be immediately escalated to the critical care team to consider early admission to HDU/ICU.

Diagnosis and initial investigation

Symptoms include becoming sluggish or extremely tired, increasing thirst and urine output, hyperventilation, nausea and vomiting, agitation, aggressiveness and confusion and the onset of pain in the shoulders, neck or chest. The precipitating causes are infection, omission of insulin and vomiting.

Diagnosis

- Blood glucose >15mmols/litre (although DKA can occur with lower blood glucose levels than this in pregnancy)
- Blood pH <7.30 or bicarbonate <15mmols/litre
- Heavy ketonuria (ketones present in urine >++)
- Ketonaemia (blood ketone levels) > 3mmols/litre (High risk of DKA when >1.5mmols/l)

Initial investigations

- Capillary blood glucose and ketone testing
- Urinalysis +/- MSU
- Blood for FBC, U&E, (laboratory) glucose level
- Arterial blood gases
- Blood cultures (if sepsis considered)

Severe DKA is defined by the presence of any one of the following:

- blood ketones > 6mmol/L
- venous bicarbonate < 5mmol/L
- pH < 7.1
- K+ < 3.5mmol/L
- GCS < 12
- persistent maternal hypoxia
- persistent maternal brady/tachycardia
- anion gap > 16

Management will depend on degree of ketonaemia

Blood Ketones	Blood Glucose	Action
< 0.6mmol/l		Within normal limits **No action required**
0.6 – 1.5mmol/l	>12mmol/l	May be at risk of developing DKA **Recheck in 1hour**
1.5 – 3.0mmol/l	>12mmol/l	At risk of developing DKA **Consider additional subcutaneous insulin**
> 3.0mmol/l	>12mmol/l	**Likely DKA** **Initiate management to stabilise blood glucose with intravenous insulin infusion**

Recheck blood ketones at 3, 6 and 12 hourly intervals if the blood glucose remains above 12mmols.

Stabilisation of blood glucose
Insert 2 cannulae for intravenous (IV) access.

- 1st line for IV fluids Commence Normal Saline 0.9% until blood glucose < 12mmols, then change to Dextrose 5%. (See **SaTH DKA Management Chart** for further management of fluid type and infusion rates).
- 2nd line for intravenous insulin as variable rate insulin infusion (VRIII) according to **SaTH Adult Prescription and Administration Record**.

Blood glucose is measured hourly and the insulin rate adjusted accordingly. Continue subcutaneous basal insulin (Lantus, Levemir, Humulin I). If using Insulin pump (CSII) then disconnect/discontinue.

When blood glucose is controlled and ketonaemia has resolved, subcutaneous short-acting insulin (Novorapid, Humalog) can be resumed and the VRIII discontinued 1 hour after administration.

Potassium must **not** be given in the first litre of IV fluid. Add potassium according to serum levels as indicated on **SaTH DKA Management Chart**. Oral fluids can be continued if the woman is alert and not vomiting.

Assessment of fetal wellbeing
Initiate continuous EFM if ≥ 26weeks gestation and continue until normal blood glucose levels are achieved. Non reassuring CTG patterns should improve when the blood glucose and ketone levels are controlled.

After Care
The DSM will review prior to discharge to discuss precipitating factors especially insulin withdrawal and to reiterate sick day rules in an attempt to reduce the risk of recurrence of DKA. She will ensure that the woman has blood ketone testing strips, that she is aware of when these should be used and the subsequent action necessary. Follow up will be in the combined endocrine antenatal clinic.

Also refer to SaTH guideline for management of Diabetic Ketoacidosis

Appendix 4

Management of Diabetes with Antenatal Steroids

Women on diet control/ oral treatment and/or single or multiple dose insulin therapy

Administration of antenatal steroids for fetal lung maturity is recommended before 34+0 weeks and considered among women at risk for preterm birth between 34+0 and 35+6 weeks (25).

Administration of steroids may result in a deterioration of glucose levels for 2 to 3 days. This should be anticipated and actively managed. JBDS recommends regular monitoring of BG levels in these women. Insulin (s.c.) may need to be started in women managed by diet or metformin and an increase in s.c. insulin dose typically by 50% is needed in those who are already on insulin. If BG levels remain higher than target on two consecutive occasions then VRIII should be commenced. If VRIII is used in this context, the following approach is suggested:

- Check U+Es prior to starting VRIII to monitor fluid balance and electrolyte abnormalities. Repeat 24 hourly

- Start variable rate intravenous insulin infusion (VRIII) (50 units human soluble insulin [Humulin® S or Actrapid®] made up to 50 mL with 0.9% NaCl) to achieve the target blood glucose of 5.0 – 8.0 mmol/L. Use the scale in Tables 6 and 7 below.

- Continuous intravenous insulin may be needed until 12 hours after the administration of the second dose of steroids

- Commence substrate IV fluids – 0.9%NaCl with 5% glucose and 0.15% KCL (20mmol/L) to avoid maternal and neonatal hypoglycaemia, hyponatremia and hypokalaemia.

    - The rate of substrate infusion should take into account the volume status but generally 50 mL/h would be reasonable. Please see the prescription charts (Appendix 2 for NICE recommended targets and 4 for the more liberal targets) and Tables 6 and 7 for more details.
    - Additional i.v. fluids may be needed if the patient is not eating or drinking reliably. Fluids, particularly dextrose containing fluids, may have to be restricted in patients who are at risk of or already have hyponatraemia.
    - In some cases insulin without substrate fluids may have to be used (e.g. difficult i.v. access, fluid overload states like toxaemia, hyponatraemia or risk of hyponatraemia). Please consult senior medical/ obstetric and anaesthetic staff in this situation as a bespoke regime will be required.

- Basal insulin needs to be continued as usual. Meal time insulin should be continued if the woman is eating and drinking to achieve adequate management of glycaemic excursions after meal. Appropriate documentation and education are needed to prevent insulin errors

- When on VRIII, check capillary blood glucose level hourly aiming for blood glucose (BG) 5.0 – 8.0 mmol/L (JBDS liberal targets).

Women on CSII (Insulin pump therapy)

- The specialist diabetes team should be involved in the management of these patients. Contact diabetes specialist nurse and/or diabetes physician as soon as possible
- Women on insulin pump therapy may be able to safely maintain glucose levels following steroid administration by use of correction boluses and temporary basal rate increases. In general approximately 50% increase in insulin doses may be needed. This should only be done by the DSN.
- If optimal glycaemia cannot be achieved (e.g. 2 consecutive blood glucose (BG) readings >8.0 mmol/L), or if the DSN/specialist is not available, a variable rate intravenous insulin infusion (VRIII) should be considered. In this case the insulin pump should be disconnected, labelled and stored securely for future use. The woman should know how to disconnect the pump.

Appendix 5: Pre-conception advice for pre-existing diabetes

Information about outcomes and risks for mother and baby

Provide information, advice and support, to empower women to have a positive experience of pregnancy and to reduce the risks of adverse pregnancy outcomes for mother and baby.

Explain to women with diabetes who are planning a pregnancy that:

- if they have good blood glucose control before conception and throughout their pregnancy, this will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death but
- the risks can be reduced but not eliminated.

When women with diabetes are planning a pregnancy, provide them and their families with information about how diabetes affects pregnancy and how pregnancy affects diabetes. The information should cover:

- the role of diet, body weight and exercise
- the risks of hypoglycaemia and impaired awareness of hypoglycaemia during pregnancy
- how nausea and vomiting in pregnancy can affect blood glucose control
- the increased risk of having a baby who is large for gestational age, which increases the likelihood of birth trauma, induction of labour, and instrumental and caesarean section deliveries
- the need for diabetic retinopathy assessment before and during pregnancy
- the need for diabetic nephropathy assessment before pregnancy
- the importance of maternal blood glucose control during labour and birth, and the need for early feeding of the baby, in order to reduce the risk of neonatal hypoglycaemia
- the possibility of that the baby may have health problems in the first 28 days, and may need admitting to a neonatal unit
- the risk of the baby developing obesity, diabetes and/or other health problems in later life. [2008]
- Advise women of the increased risk of congenital anomalies such as spina bifida and cardiac anomalies. This risk is further increased if diabetes control is poor at the time of conception and in the first 12 weeks.

The importance of planning pregnancy and the role of contraception

- Emphasise the importance of planning for pregnancy, as part of diabetes education from adolescence for women with diabetes.
- Explain to women with diabetes that their choice of contraception should be based on their own preferences and any risk factors (covered in the Faculty of Sexual and Reproductive Healthcare UK medical eligibility criteria for contraceptive use).
- Advise women with diabetes that they can use oral contraceptives.

Advise women with diabetes who are planning to become pregnant:

- that the risks associated with diabetes in pregnancy will increase the longer they have had diabetes
- to use contraception until they have good blood glucose control (assessed by HbA1c levels)
- that blood glucose targets, glucose monitoring, medicines for treating diabetes (including insulin regimens) and medicines for complications of diabetes will need to be reviewed before and during pregnancy
- that extra time and effort is needed to manage diabetes during pregnancy, and that more frequent contact is needed with healthcare professionals.

For women with diabetes who are planning a pregnancy, provide information about the local arrangements for support, including emergency contact numbers.

Diet, dietary supplements and body weight

- Offer individualised dietary advice to women with diabetes who are planning a pregnancy.
- For women with diabetes who are planning a pregnancy and who have a body mass index (BMI)

above 27 kg/m2, offer advice on how to lose weight, in line with the NICE guideline on identifying, assessing and managing obesity. See the NICE guideline on BMI for guidance on using variations on the BMI cut-off, based on the risk for different ethnic groups.
- Advise women with diabetes who are planning a pregnancy to take folic acid (5 mg/day) until 12 weeks of gestation to reduce the risk of having a baby with a neural tube defect.

Monitoring blood glucose and ketones before pregnancy
- Offer up to monthly measurement of HbA1c levels for women with diabetes who are planning a pregnancy.
- Offer blood glucose meters for self-monitoring to women with diabetes who are planning a pregnancy.
- If a woman with diabetes who is planning a pregnancy needs to intensify blood glucose-lowering therapy, advise her to monitor her blood glucose more often, to include fasting levels and a mixture of pre-meal and post-meal levels.

- Offer blood ketone testing strips and a meter to women with type 1 diabetes who are planning a pregnancy, and advise them to test for ketonaemia if they become hyperglycaemic or unwell.

Target blood glucose and HbA1c levels before pregnancy
- Agree individualised targets for self-monitoring of blood glucose with women who have diabetes and are planning a pregnancy, taking into account the risk of hypoglycaemia.
- Advise women with type 1 diabetes who are planning a pregnancy to aim for the normal capillary plasma glucose target ranges:
    - a fasting plasma glucose level of 5 mmol/litre to 7 mmol/litre on waking and
    - a plasma glucose level of 4 mmol/litre to 7 mmol/litre before meals at other times of the day.

- For more information, see the section on blood glucose targets in the NICE guideline on type 1 diabetes in adults.
- Advise women with diabetes who are planning a pregnancy to aim to keep their HbA1c level below 48 mmol/mol (6.5%), if this is achievable without causing problematic hypoglycaemia.
- Reassure women that any reduction in HbA1c level towards the target is likely to reduce the risk of congenital malformations in the baby.
- Strongly advise women with diabetes whose HbA1c level is above 86 mmol/mol (10%) not to get pregnant until their HbA1c level is lower, because of the associated risks.

Safety of medicines for diabetes before and during pregnancy
- Women with diabetes may be advised to use metformin as an adjunct or alternative to insulin in the preconception period and during pregnancy, when the likely benefits from improved blood glucose control outweigh the potential for harm. Stop all other oral blood glucose-lowering agents before pregnancy, and use insulin instead.
- Be aware that the available evidence on rapid-acting insulin analogues (aspart and lispro) does not show an adverse effect on the pregnancy or the health of baby.
- 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.
- Note that this is an off-label use of long-acting insulin analogues. See NICE's information on prescribing medicines.

Safety of medicines for complications of diabetes before and during pregnancy
- Stop angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists before conception, or as soon as pregnancy is confirmed. Use alternative antihypertensive agents that are suitable for pregnant women.
- Stop statins before pregnancy, or as soon as pregnancy is confirmed.

Retinal assessment before pregnancy
- For women with diabetes who are seeking preconception care, offer a retinal assessment at their first

appointment (unless they have had a retinal assessment in the last 6 months). [2008, amended 2020]

- Advise women with diabetes who are planning a pregnancy to defer rapid optimisation of blood glucose control until after they have had retinal assessment and treatment.

Renal assessment before pregnancy

- Offer women with diabetes a renal assessment (including a measure of albuminuria) before stopping contraception.
- Consider referring women with diabetes to a nephrologist before stopping contraception if:
    - serum creatinine is 120 micromol/litre or more or
    - the urinary albumin:creatinine ratio is greater than 30 mg/mmol or
    - the estimated glomerular filtration rate (eGFR) is less than 45 ml/minute/1.73 m2.

Appendix 6 – Management of Hypoglycaemia

Severe hypoglycaemia is a medical emergency and prevention is better than cure. Treatments should be provided where the blood glucose is <3.5mmols, or <4mmols and patient feels unwell with symptoms of hypoglycaemia.

Step 1: Stop any immediate insulin treatment (eg VRIII or disconnect pump)

Step 2: Provide fast acting glucose:

By mouth (options include)

- 15–20 g (60–80 mL Lift® (previously Glucojuice®) oral glucose liquid
- 4–5 glucose tablets
- 1.5–2 tubes of glucose 40% oral gel
- 150–200 mL pure fruit juice
- 3–4 heaped teaspoonfuls of sugar dissolved in an appropriate volume of water) repeated after 15 minutes if necessary

Or buccal administration [in conscious but uncooperative patients]

- 15–20 g (1.5–2 tubes of glucose 40% oral gel), repeated after 15 minutes if necessary

Note Examples of glucose preparations which can be used to give oral doses are based on the use of oral liquid containing glucose 250 mg/mL and tablets containing glucose 4 g per tablet. Buccal dosing is based on tubes of 40% oral gel containing glucose 10 g per tube.

Step 3: If hypoglycaemia unresponsive or if oral route cannot be used

Glucagon injection (GlucaGen® 1 mg/mL) - **1 mg (1 mL) by intramuscular injection**

Step 4: If hypoglycaemia prolonged or unresponsive to glucagon after 10 minutes (or glucagon not immediately available)

Glucose **10%** intravenous infusion by IV injection into large vein - **150–200 mL** infused **over 15 minutes**

or

Glucose **20%** intravenous infusion by IV injection into large vein - **75–100mL** infused **over 15 minutes**