Diabetes in pregnancy – Type 1 and 2

This guidance does not override the individual responsibility of health professionals to make appropriate decision according to the circumstances of the individual patient in consultation with the patient and /or carer. Health care professionals must be prepared to justify any deviation from this guidance.

Introduction

This guideline covers the management of type 1 and 2 diabetes in pregnancy. It covers antenatal, intrapartum and postnatal care and is designed to be used alongside other guidelines applicable to the clinical situation.

Continuous Variable Rate Intravenous Infusion (CVRIII), Glucose monitoring, Steroid management and care planning are all included within this guideline.

This guideline is for use by the following staff groups:

All staff caring for women with pre-existing diabetes during pregnancy.

Lead Clinician(s)

Catherine Hillman-Cooper	Consultant Obstetrician – Maternal Medicine
Athen Warren	Midwife – special interest in diabetes
Daisy Bradley	Audit and Guideline Lead Midwife
Approved by *Maternity Governance Meeting* on:	4th September 2023
Approved by Medicines Safety Committee on: *Where medicines included in guideline*	2020 – (Prescription Charts – Delayed Launch)
Review Date: This is the most current document and should be used until a revised version is in place	4th September 2027

Key amendments to this guideline

Date	Amendment	Approved by:
August 2023	Full Guideline Review	MGM
August 2024	Addition of DKA Pathway	MGM

Definitions

isCGM – intermittently scanned continuous glucose monitoring

rtCGM – real time continuous glucose monitoring

CBG – capillary blood glucose

CVRIII - Continuous variable rate intravenous insulin infusion

DKA – Diabetic Ketoacidosis

IUGR – Intra-uterine Growth Restriction

EFW – estimated fetal weight

HbA1C – Blood test to monitor average blood glucose levels for the past 2-3 months.

U&Es – Urea and electrolytes

MSU – Midstream specimen of urine

PCR – Protein Creatinine ratio

ACR – Albumin Creatinine Ratio

DSN – Diabetes Specialist Nurse

LSCS – Lower segment caesarean section

IOL – Induction of Labour

Introduction

Women with Type 1 and Type 2 diabetes have persistently high perinatal mortality with no improvement over the past 5 years. The recent Ockenden report has highlighted the need for continuity of experienced staff within Diabetes in Pregnancy teams to reduce poor outcomes in women with diabetes.

Diabetes is element 6 of Saving Babies Lives Care Bundle Version 3 (SBLCBV3) 'Providing multidisciplinary care in a joined-up way for women with type 1 and type 2 diabetes during pregnancy and harnessing technology (e.g. continuous glucose monitoring) to reduce maternal complications of diabetes, including perinatal morbidity and mortality.'

This guideline works towards offering effective, safe care to improve perinatal outcomes for women with pre-existing diabetes. Outcomes will be measured against the standards outlaid in this guideline to be able to meet the compliance framework outlined within SBLCBV3

Specific Risks for diabetes in pregnancy:
Maternal:

- Worsening retinopathy
- Worsening renal function
- Worsening or new onset hypertension
- Pre-eclampsia
- Increased risk of infection
- Reduced awareness of hypoglycaemic episodes
- Ketoacidosis
- Polyhydramnios
- Increased rates of induction /obstructed labour/instrumental/operative delivery

Fetal:

- Congenital malformation (5-7% which is 3-5 x higher than in the non-diabetic population)
- Miscarriage
- Prematurity
- IUGR
- Macrosomia
- Birth trauma
- Late intrauterine death
- Fetal distress

Neonatal

- Hypoglycaemia
- Respiratory distress
- Jaundice
- Prematurity
- Birth injury
- Polycythaemia
- Increased risks of obesity and diabetes in later life

Antenatal Management

The risks to both mother and baby are increased in the presence of poor glycaemic control in women with type 1 and 2 diabetes. Management is led by a multidisciplinary team approach involving obstetricians, endocrinologists, specialist diabetes nurses, midwives and dieticians.

Follow antenatal schedule below in conjunction with routine antenatal care schedule in the Antenatal guideline

Some Key points throughout pregnancy:

- Measure BP and perform urinalysis at **every** contact
  - If **any** proteinuria develops send MSU/PCR
  - Check for the presence of ketones
- Consider referral to nephrology if:
  - Serum creatinine is ≥120 mcmol/L **or**
  - ACR ≥30 mg/mmol **or**
  - Proteinuria >0.5g/day

- Offer thromboprophylaxis for pregnant with nephrotic range proteinuria i.e. >5g/day (ACR >220 mg/mmol).
- Decreasing insulin requirements can be a sign of decreased placental function and women should be advised to inform maternity services (triage or antenatal diabetes team) urgently if this occurs. Ongoing management should be individualised and discussed with the consultant obstetrician.
- For women with an ultrasound diagnosis of macrosomia (EFW >90th centile/abdominal circumference >95th centile), counsel regarding risks and benefits of vaginal birth, induction of labour and caesarean. Women should be counselled regarding the higher risk of shoulder dystocia.

Women are at an increased risk of stillbirth and therefore should be counselled regularly around the monitoring of fetal movements; and prompt presentation to maternity services if there are any concerns regarding fetal movements.

Care planning

There should be a partnership between women and health professionals in decision making throughout pregnancy. Care is individualised based on clinical situation and maternal preferences; this will be documented in the woman's badgernet record.

Discussions should take place in regards to:

- Pregnant women with type 1/2 diabetes with no other complications are advised to deliver between 37-38^{+6}
- Consider delivery <37 weeks' gestation for women with metabolic or fetal complications e.g. fetal growth restriction, sudden acceleration in fetal growth, polyhydramnios, hypertension, pre-eclampsia, worsening diabetic complications (e.g. nephropathy), or a progressive unexplained reduction in insulin requirements
- Antenatal management and fetal wellbeing assessments
- Women may choose their mode of birth (which includes: Induction of labour, Caesarean section and spontaneous labour)

Women with diabetes and retinopathy requiring treatment during pregnancy and/or kidney impairment (CKD 2 with significant proteinuria (PCR >30; or CKD 3 or more) should be referred to a regional maternal medicine centre, where care can be delivered in a single MDT clinic. In circumstances where regular travel to a tertiary clinic is not possible, ongoing care should be planned via regular (4-6 weekly) MDT discussion with the MMC centre throughout the pregnancy. (Saving Babies Lives Version 3, 2023).

Antenatal Care Schedule

	Maternal	**Fetal**
First **ANC** appointment (joint diabetes and antenatal clinic)	• Immediate contact following confirmation of pregnancy • Offer information, advice and support in relation to optimising glycaemic control. • Take a clinical history to establish the extent of diabetes-related complications. • Review medications for diabetes and its complications. • Commence Folic Acid 5mg per day until 16 weeks' gestation, if already commenced continue. • Offer renal assessment (U&Es) if this has not been undertaken in the past 3 months. • Consider referral to dietician. • Explain care plan and schedule **(should have contact from diabetes/obstetric team every 1-2 weeks)** • Offer retinopathy referral for screening in each trimester* • Offer screening for other associated disorders i.e. thyroid disease • Consider anaesthetic referral if there are other comorbidities	Confirm Viability of pregnancy **7-9 weeks'** gestation.
Booking appointment (ideally by 10 weeks)	• Confirm viability and gestational age. • Discuss information, education and advice about how diabetes will affect the pregnancy, birth and early parenting (such as breastfeeding and initial care of the baby).	
12 weeks	Commence Aspirin 150mg a day in the absence of contraindications continue throughout pregnancy.	Perform dating scan and offer 1st trimester screening.
16 weeks	Retinopathy screening appointment HBA1C Continue DSN/obstetric contacts	Counsel around importance of monitoring fetal movements throughout pregnancy and early presentation to triage – signpost to leaflet in badgernet and give contact numbers.
20 weeks	Continue DSN/obstetric contacts	Offer anomaly scan including four-chamber view of the fetal heart and outflow tracts. **If unable to visualise outflow tracts at anomaly USS refer to fetal medicine for review.**
28 weeks	Retinopathy screening appointment HBA1C Continue DSN/obstetric contacts	Reiterate importance of monitoring fetal movements and early presentation to triage. Commence 4 weekly ultrasound monitoring of fetal growth and amniotic fluid volume.

32 weeks	Continue DSN/obstetric contacts	Offer ultrasound monitoring of fetal growth and amniotic fluid volume.
36 weeks	Offer information and advice about: • timing, mode and management of birth • analgesia and anaesthesia • changes to hypoglycaemic therapy during and after birth • management of the baby after birth • initiation of breastfeeding and the effect of breastfeeding on glycaemic control • contraception and follow-up.	Offer ultrasound monitoring of fetal growth and amniotic fluid volume.
37-38+6	**Aim for Delivery** Offer induction of labour, or caesarean section if indicated	Start regular tests of fetal well-being for women with diabetes who are declining delivery by 38+6. This should be an individualised plan made in partnership with the woman.
38 weeks	Continue DSN/obstetric contacts	
39 weeks+	Re-offer induction of labour if previously declined, or caesarean section if indicated.	

* Retinopathy is not a contraindication to vaginal birth. However, early delivery is recommended in the presence of sight threatening macular oedema.

Indications for admission:

Women with diabetes are at an increased risk of requiring admission to hospital. There should be a low threshold for inviting women with diabetes in for assessment.

- Any suspicion of DKA (i.e. Ketonuria >/= ++ in association with raised blood glucose levels and an unwell patient.)
- Deteriorating renal function
- Dehydration
- Unstable blood glucose
- Development of severe hypertension or pre-eclampsia
- Concern re fetal well being
- Persistent vomiting or hyperemesis
- Decreasing insulin requirements - discuss with a senior clinician.

If a woman on insulin requires admission, please complete self-management of insulin form (appendix 4) if she is planning to continue self-testing and administer insulin.

Blood glucose monitoring and ketones:

Aim for blood glucose targets of:

- Fasting <5.3mmol/l **and**
- Either <7.8mmol/l one hour post meals or 6.4 mmol/litre 2 hours after meals

Advise pregnant women on insulin to maintain their capillary plasma glucose levels >4 mmol/litre.

Measure HbA1c levels at booking for all women with pre-existing diabetes. Aim for HbA1c of **48mmol/mol (HbA1c of 6.5%)** or as close to it without significant hypoglycaemia. HbA1c levels should also be checked in second and third trimesters of pregnancy. Be aware that level of risk for the pregnancy correlates with an HbA1c >48 mmol/litre.

Real-time continuous glucose monitoring (rtCGM e.g. Dexcom) should be offered to all pregnant women with type 1 diabetes to optimise maternal and neonatal outcomes. Intermittently scanned continuous glucose monitoring (isCGM e.g. Libre) can be offered to pregnant women unable to use rtCGM or for those who express a preference.

Consider rtCGM for pregnant women who are on insulin therapy but do not have type 1 diabetes if:

- They have problematic severe hypoglycaemia **or**
- They have unstable blood glucose levels that are causing concern despite efforts to optimise control

Advise pregnant women **not** using rtCGM or isCGM with diabetes to test blood glucose daily at the following times:

- Fasting
- Pre-meal,
- 1-hour post-meal
- Bedtime

Warn women that tight diabetic control is likely to increase the frequency of mild hypoglycaemia. (blood glucose of <4.0mmol/l) This may be accompanied by a loss of warning for hypoglycaemia and hence an increased risk of severe hypoglycaemia.

If a severe hypoglycaemic attack occurs (severe hypoglycaemia defined as one requiring 3rd party intervention or blood glucose less than 3.0mmol/l) the patient must contact a member of the team to discuss this. (Provide patient with contact details) See trust guidelines on the management of hypoglycaemia.

The woman's partner or relative must be provided with Glucogel and a Glucagon kit and be instructed how to use them.

Staff and patients should be aware that insulin requirements increase during the course of pregnancy.

Ketone testing

Offer ketone testing strips and meter to pregnant women with type 1 diabetes. Advise them to test for ketonaemia and seek urgent advice if they become hyperglycaemic or unwell.

Advise pregnant women with Type 2 diabetes to seek urgent advice if they become hyperglycaemic or unwell.

Test for ketonaemia if pregnant woman with any form of diabetes presents with hyperglycaemia or is unwell.

Women with suspected diabetic ketoacidosis (DKA) should be urgently admitted for level 2 critical care with support from both medical and obstetric teams.

Diabetic Ketoacidosis (DKA) – Please see Appendix 6 (DKA Pathway)

DKA is a medical emergency requiring prompt treatment and may arise with only a modest increase in blood glucose in pregnancy. It is associated with significant fetal mortality since ketones are toxic to the fetus.

DKA may present as abdominal pain and should form part of the differential diagnosis for women with suspected preterm/term labour.

The Trust policy on DKA should be followed (flowchart for reference below)

Women suspected of having DKA should be admitted to the Delivery Suite/High Dependency Care Unit where they should be cared for both the medical and obstetric team. See Appendix 6 for DKA Flowchart

Signs and symptoms include:

- Nausea and vomiting
- Abdominal pain
- Polyuria
- Polydipsia
- Leg cramps
- Dehydration
- Blurred eyesight
- Tachypnoea
- Rapid pulse
- Distinct smell on breath akin to "pear drops"
- Coma

Worcestershire Acute Hospitals NHS Trust

Management of DKA

1 DIAGNOSIS

Presence of diabetes mellitus
AND
Ketosis: urinary ketones >++ or blood ketones >3.0 mmol/L
AND
Acidosis: blood gas Ph <7.3 and/or bicarbonate <15 mmolL (use venous blood gas)

Encourage women to contact the obstetric team if unwell or vomiting

Always ask when they last ate and when they had last insulin. If they have omitted their last insulin, advise immediate admission.

2 TREATMENT

In women using a pump, discontinue the pump and establish intravenous insulin infusion at a fixed rate

Involve the medical team urgently

Manage in HDU/ITU setting

Start IV fluids immediately whilst waiting for medical team

3 START IV INSULIN INFUSION AND MONITOR BLOOD GLUCOSE

Set up insulin infusion of 50 units of soluble insulin/Actrapid in 49.5mls 0.9% NaCl via syringe driver

Deliver insulin at fixed rate 0.1 unit/kg/hour

Maximum dose limit of 14 units per hour should be adhered to unless specifically overridden by a medical SpR/Consultant

The fixed rate might have to be increased by 1 unit/hour if there is an inadequate response (i.e. <3 mmol/L drop in CBG per hour or <0.5 mmol/L drop in blood ketone or < 3mmol/L rise in venous bicarbonate per hour. Check the lines and involve the medical team.

Measure CBGs hourly

Glucose level is not an accurate indicator of resolution of acidosis in euglycaemic ketoacidosis, so the acidosis resolution should be verified by venous gas analysis.

Continue with basal insulin but discontinue short acting insulin.

4 ADMINISTER FLUIDS AND POTASSIUM

Start with 1L 0.9% NaCl over 60 minutes and continue with the hydration fluids as per clinical need. Often patients with severe dehydration and typical DKA would need 1 litre of normal saline each in subsequent 2, 2, 3, 3, and 6 hours after the first bag.

Add 10% dextrose to run alongside 0.9% NaCl when capillary glucose <14 mmol/L. Initially this should be administered at a rate of 125 ml/hr but rate of infusion may need to be adjusted to prevent hypoglycaemia and avoid fluid overload or hyponatraemia.

Potassium may not be needed in the first bag. Aim for keeping K+ between 4.0-5.5 mmol/L. Add 40 mmol/L of normal saline from the 2nd litre of fluids onward. Use the pre-prepared 3% KCl with 0.9 NaCl.

Insulin may be infused in the same line as the intravenous replacement fluid provided that a Y connector with a one way, anti-siphon valve is used and a large-bore cannula has been placed.

5 MONITOR GLUCOSE, POTASSIUM, PH AND FETUS

Monitor:

CBG and capillary ketones (if available) hourly

Venous bicarbonate and potassium at 1 hour, 2 hours and 4 hours

Plasma electrolytes 4 hourly

Monitor fluid status as needed

The fetus should be continually monitored but abnormalities of the fetal heart may improve with improvement of the maternal condition.

Dietary advice

In most cases the patient is given dietary advice by the specialist diabetes nurse, midwife or an obstetrician. Women may be referred to the dietician on an individualised basis.

Provide advice as to coping with more frequent hypoglycaemic episodes especially in the presence of nausea and vomiting.

Aim for a regular intake of low glycaemic index carbohydrates, low in fat and sugar. Reduce saturated fat intake.

If BMI is >35 then advise to reduce calorie intake with the aim of minimising weight gain during pregnancy.

Diabetic medication in pregnancy

Pre-pregnancy insulin doses should be documented clearly at booking.

Type 1 women are usually managed on one of the following regimens:

- Basal bolus regimen
- Twice daily mixture of short and intermediate acting insulin
- Insulin pump

Type 2 women are commonly managed with metformin and often continue this alongside insulin if required. Other oral hypoglycaemic agents are not suitable for pregnancy and therefore should be replaced with insulin therapy following discussion with the diabetic team.

Women using insulin pump therapy may be able to safely maintain glycaemic control through use of correction boluses and temporary basal rate increases in cases where CVRIII may be indicated. However, if glycaemic control cannot be maintained (e.g. 2 consecutive blood glucose readings >7.0 mmol/L 1 hour apart) then insulin pump should be switched off and CVRIII commenced. Pump therapy may be recommenced when CVRIII is successfully discontinued.

Continuous variable rate Intravenous insulin infusion (CVRIII)

Check U&Es prior to starting CVRIII to monitor fluid balance and electrolyte abnormalities and repeat 24hourly.

An insulin syringe should always be used when drawing up insulin.

CVRIII should always be drawn up by two qualified midwives, one of which is experienced in the management of CVRIII.

CVRIII should be considered in the following circumstances:

- Vomiting/intercurrent illness/unable to eat
- Awaiting surgery or procedure where CVRIII is indicated
- During Labour/Delivery (with blood glucose >7.0mmol/L on 2 consecutive occasions)
- Receiving steroids of fetal lung maturation (with blood glucose >7.0mmol/L on 2 consecutive occasions)
- Any occasion where blood glucose is unable to be maintained by usual management.

If CBG <4.0 mmol/L stop CVRIII and treat hypoglycaemia by following hypoglycaemia management flowchart (available on back page of all insulin prescription paperwork)

Women using isCGM/rtCGM should be reminded that capillary glucose tests are more accurate and therefore recommended whilst CRVIII is in progress.

Steroids for fetal lung maturation

All women with Diabetes requiring steroids should be admitted to the antenatal ward for monitoring.

Corticosteroids should be offered to women with Diabetes to aid fetal lung maturation if:

- Spontaneous delivery is likely to occur prior to 34+6 weeks' gestation

Corticosteroids should be considered for women with Diabetes to aid fetal lung maturation:

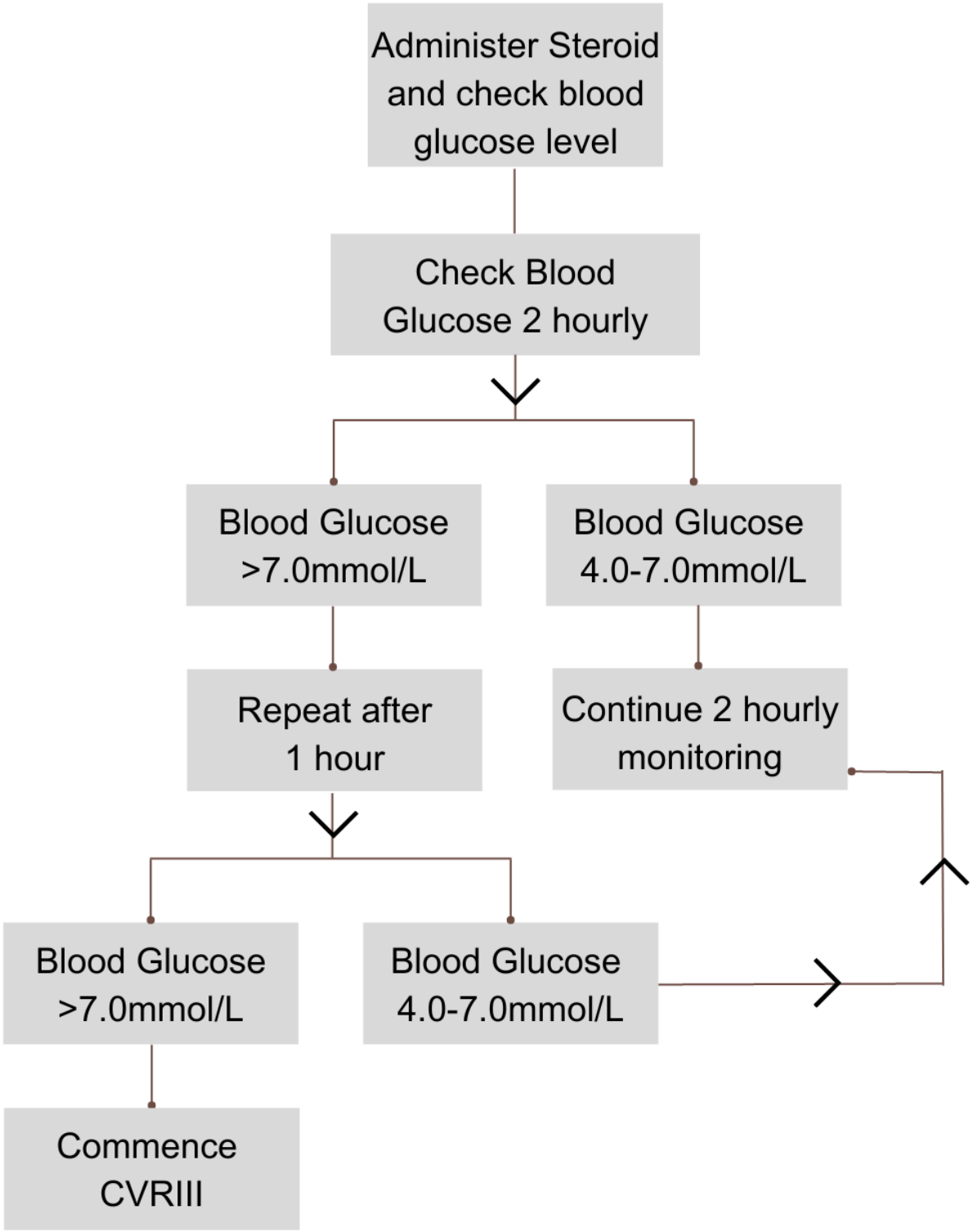
- Prior to elective section performed earlier than 39 weeks gestation
- Or if patients have co-existent IUGR up to 35+6 weeks gestation

Women should be counselled that although antenatal corticosteroids may reduce admission to the neonatal unit for respiratory morbidity, it is uncertain if there is any reduction in respiratory distress syndrome, transient tachypnoea of the newborn or neonatal unit admission overall. Antenatal corticosteroids may result in harm to the neonate which includes hypoglycaemia and potential developmental delay.

Dexamethasone phosphate is the steroid of choice (12mg/24 hours apart, but can be given between 12 and 24 hours if circumstances dictate this to be more practical). Total dose 24mg.

Administration of steroids may result in a deterioration of glycaemic control for 2-3 days which should be anticipated and actively managed using a CVRIII if indicated. (see appendix 1)

Flowchart for blood glucose monitoring following administration of steroids



Management of preterm labour in diabetes

Diabetes should not act as a contraindication to tocolysis or antenatal steroids for fetal lung maturation

Women with insulin-treated diabetes who are taking steroids for fetal lung maturation should receive additional insulin. See appendix.

Do not use betamimetic medicine (terbutaline) routinely for tocolysis in women with diabetes. If tocolysis is required, individual assessment by a consultant or senior obstetrician should take place.

Labour and Delivery

Management as outlined in tables below.

Additional points:

- All women should have a clearly documented plan for the management of their diabetes whilst in labour, including CVRIII.
- If CBG <4.0 mmol/L stop CVRIII (if commenced) and treat hypoglycaemia by following hypoglycaemia management flowchart (available on back page of all insulin prescription paperwork)
- Women using is CGM/rtCGM should be reminded that capillary glucose tests are more accurate and therefore recommended during labour and delivery and on sliding scale.
- Check U&Es daily during labour to monitor potassium and bicarbonate.
- Following delivery of placenta reduce the insulin infusion rate by 50%.

When a woman on insulin is admitted in labour:

- Review antenatal notes carefully and inform the labour ward coordinator.
- Inform the obstetric registrar.
- Inform the diabetes team if any additional concerns.
- Inform the neonatal unit if any additional concerns.

Table 1: Management of glycaemic control in labour for women with type 1/2 diabetes on multiple daily insulin injections

Labour Event	Diet and Medication	Care Plan
Induction of labour	Normal diet Continue usual insulin/metformin regime	7x daily capillary blood glucose monitoring - fasting, pre meal, 1 hour post meal and bedtime.
Early labour (Spontaneous onset/ IOL)	Normal diet Continue usual Insulin/metformin regime	7x daily capillary blood glucose monitoring - fasting, pre meal, 1 hour post meal and bedtime.
Established labour / ARM in IOL	Avoid solid diet, encourage oral fluid intake + / - IV fluids If CVRIII is commenced, stop mealtime/fast acting insulin & meal time metformin, but continue with long acting basal insulin alongside CVRIII.	Commence continuous fetal monitoring Hourly capillary blood glucose levels (CBG) should be performed. Aim to maintain CBG levels between 4-7 mmol/L. If a CBG is >7 mmol/L, recheck after 30 minutes. A CVRIII and glucose regime is needed if capillary blood glucose levels >7.0mmol/L on 2 consecutive occasions 30 minutes apart.
Immediate post-partum	Continue CVRIII following the delivery of the placenta until able to eat and drink normally. Ensure women reduce their insulin according to their postnatal plan once CVRIII is discontinued.	Continue hourly CBG until CVRIII is discontinued. Monitor CBG every 2 hours for 24 hours after discontinuing CVRIII. This baby may be at risk so follow neonatal hypoglycaemia guideline.
Discharge	Follow postnatal plan for insulin doses.	DSN review prior to discharge. Remind woman they may need more frequent CBG monitoring at home due to postnatal adaptations. Discuss contraception and offer preconception counselling. **Do not** discharge babies until they are at least 24 hours old and maintaining blood glucose levels and feeding well.

Table 2: Management of glycaemic control in labour for women with type 1/2 diabetes on insulin pump therapy

Labour Event	Diet and Medication	Care Plan
Induction of labour	Normal diet Continue usual insulin/metformin regime	7x daily capillary blood glucose monitoring - fasting, pre meal, 1 hour post meal and bedtime or continue continuous blood glucose monitoring (CGM).
Early labour (Spontaneous onset/ IOL)	Normal diet Continue usual Insulin/metformin regime	7x daily capillary blood glucose monitoring - fasting, pre meal, 1 hour post meal and bedtime or continue continuous blood glucose monitoring (CGM).
Established labour/ ARM in IOL	Avoid solid diet, encourage oral fluid intake + / - IV fluids If CVRIII is commenced, stop insulin pump **ONLY** when IV Insulin infusion is started. Woman may decide to continue to use insulin pump in labour as alternative to CVRIII through correction boluses and/or temporary basal rate changes. If she becomes unable to manage her own insulin needs or becomes unstable I.e. blood glucose >7.0mmol/l on 2 occasions, ++ Ketones in urine or capillary blood ketones >1.5mmol/L then CVRIII should be commenced and the pump switched off.	Continuous Fetal Monitoring Hourly capillary blood glucose levels (CBG) should be performed. Do not take glucose readings from CGM during established labour. Aim to maintain CBG levels between 4-7 mmol/L. If a CBG is >7 mmol/L, recheck after 30 minutes. A CVRIII and glucose regime is needed if capillary blood glucose levels >7.0mmol/L on 2 consecutive occasions 30 minutes apart.
Immediate post-partum	Continue CVRIII following the delivery of the placenta until able to eat and drink normally. Recommence pump therapy. **DO NOT** discontinue the CVRIII until the pump is inserted and fully functional. Ensure women reduce their insulin according to their postnatal plan once CVRIII is discontinued.	Continue hourly CBG until CVRIII is discontinued. Monitor CBG/CGM every 2 hours for 24 hours after discontinuing CVRIII. This baby may be at risk so follow neonatal hypoglycaemia guideline.
Discharge	Follow postnatal plan for insulin doses.	DSN review prior to discharge. Remind woman they may need more frequent CBG monitoring at home due to postnatal adaptations. Discuss contraception and offer preconception counselling. **Do not** discharge babies until they are at least 24 hours old and maintaining blood glucose levels and feeding well.

Caesarean section in the context of diabetes

Caesarean Stage	Diet and Medication	Care Plan
Night before	Normal diet and fluids including evening snack. Continue usual insulin/metformin regime Nil by Mouth (no food) from midnight, drink clear fluids to thirst up until transfer to theatre	Admit the night prior to caesarean section to ensure appropriate treatment in the event of hypoglycaemia during the period of preoperative fasting. The timing of admission should be arranged in conjunction with the woman i.e. after dinner if this is the woman's choice. Review notes to see if diabetes team have given specific instructions about insulin dosage. Women with diabetes should be first on theatre list. 7x daily capillary blood glucose monitoring - fasting, pre meal, 1 hour post meal and bedtime.
Morning	Drink clear fluids to thirst up until transfer to theatre	Commence hourly capillary blood glucose levels (CBG) from 6am. A CVRIII and glucose regime is needed if capillary blood glucose levels >7.0mmol/L on 2 consecutive occasions 30 minutes apart.
In Theatre	Nil by Mouth If commenced, CRVIII should continue throughout surgery and recovery until the woman is eating and drinking normally and has restarted her usual insulin regime.	Hourly capillary blood glucose levels (CBG) should be performed. Aim to maintain CBG levels between 4-7 mmol/L. If a CBG is >7 mmol/L, recheck after 30 minutes. A CVRIII and glucose regime is needed if capillary blood glucose levels >7.0mmol/L on 2 consecutive occasions 30 minutes apart. If general anaesthetic is required, increase CBG monitoring to 30 minutes.
Woman's own insulin pump	If glucose control is stable women can continue to use their insulin pump. The insulin pump settings can be set to post-partum doses by the woman just before the start of surgery. If she becomes unable to manage her own insulin needs or becomes unstable I.e. blood glucose >7.0mmol/l on 2 occasions, ++ Ketones in urine or capillary blood ketones >1.5mmol/L then CVRIII should be commenced and the pump switched off.	
Immediate post-partum	Woman should remain on delivery suite until CVRIII has been discontinued successfully and CBG is stable. Ensure women reduce their insulin according to their postnatal plan once CVRIII is discontinued.	Continue hourly CBG until CVRIII is discontinued. Monitor CBG every 2 hours for 24 hours after discontinuing CVRIII. This baby may be at risk so follow neonatal hypoglycaemia guideline.
Discharge	Follow postnatal plan for insulin doses.	DSN review prior to discharge. Remind woman they may need more frequent CBG monitoring at home due to postnatal adaptations. Discuss contraception and offer preconception counselling. **Do not** discharge babies until they are at least 24 hours old and maintaining blood glucose levels and feeding well.

Postpartum Management

Mother:
Follow the postnatal medication plan made in the woman's notes. If this is not available, contact the DSN team.

Advise women with insulin-treated pre-existing diabetes that they are at increased risk of hypoglycaemia in the postnatal period. Advise them to have a meal/snack available before or during a feed.

Metformin is safe to take whilst breastfeeding so can be resumed immediately after birth. However, all other oral blood glucose lowering therapy should be avoided while breastfeeding.

Refer women back to their routine diabetes care arrangements.

Baby:

Follow neonatal guideline on monitoring babies at risk of hypoglycaemia:
Hypoglycaemia – Network Guideline with amendments 2022-24

Remember:

- Use Red Blanket
- Babies of women with diabetes should feed as soon as possible after birth (within 30 minutes) and then at frequent intervals no longer than 3 hours
- If not fed, then maternal hand expression should be encouraged if mother's choice is to breast feed.

Breastfeeding and Diabetes:

- Infants of women with diabetes in pregnancy are at increased risk of hypoglycaemia, admission to a neonatal intensive care unit (NICU) and not being exclusively breastfed
- Early feeds are recommended and Colostrum can stabilise infant glucose concentrations more effectively than infant formula milk
- Mothers with diabetes should have a discussion with a midwife about infant feeding and the importance of giving breast milk
- Cows' milk (the main ingredient of formula milk) can trigger diabetes in some babies; therefore, it is very important that mothers who are diabetic avoid giving their baby formula milk if at all possible, until the baby is at least 6 months' old
- Worcestershire acute trust encourages exclusive breast milk for these babies
- A midwife in the antenatal period should discuss the importance of the hand expression of colostrum **after 36 weeks'** or before if the mother is being induced
- Mothers with diabetes should receive a copy of 'Diabetes and feeding your baby' (Xerox code WR1940) and given an expression pack. The mother will be shown by a staff member how to hand express and store her colostrum

Considerations:

The antenatal expression of colostrum may be **contraindicated** in the following circumstances and should be considered on an individual basis:

- History of threatened premature labour
- Cervical incompetence
- Multiple pregnancies
- Cervical suture in situ

Follow up:

- Inform Diabetes Specialist Nurse of delivery and arrange inpatient review and postnatal follow up.
- Discuss contraception and where appropriate, sterilisation or Mirena.
- **Offer pre-conception counselling – Appendix 3**

Appendix 1: CVRIII Chart

Affix Patient Label here or record
NAME: . . . . . .
NHS NO:
HOSP NO:
D.O.B: D D / M M / Y Y Y Y MALE FEMALE

Ward:..... Cons.....

MATERNITY ADULT PRESCRIPTION AND MONITORING CHART FOR CONTINUOUS VARIABLE RATE INTRAVENOUS INSULIN INFUSION (CVRIII)

NHS Worcestershire Acute Hospitals NHS Trust

ALLERGIES/ADVERSE DRUG REACTIONS

NONE KNOWN ☐ Signature:

DATE	DRUG/FOOD/OTHER	REACTION DETAILS

PRE-ADMISSION DIABETES REGIMEN:

Approved Drug Name	Form/Insulin Device	Dose	Frequency	Pharmacy Supply

REASON FOR INITIATING CVRIII (please tick)

- ☐ Type 1 or 2 or Gestational diabetes and vomiting/intercurrent illness/unable to eat
- ☐ Type 1 or 2 or Gestational diabetes awaiting surgery or a procedure where CVRIII is indicated
- ☐ Type 1 or 2 or Gestational diabetes during labour/delivery with blood glucose >7.0mmol/l on two consecutive occasions
- ☐ Diabetes in pregnancy receiving steroids for fetal lung maturation with blood glucose >7.0mmol/l on two consecutive occasions

(Please use the appropriate Care Pathway for Diabetic Ketoacidosis and Hyperosmolar Non-Ketotic State)

HYPERGLYCAEMIA MANAGEMENT

- Refer to WAHT-END-0011(Guidelines for the use of Continuous Variable Rate Intravenous Insulin Infusion)

HYPOGLYCAEMIA MANAGEMENT:

- Refer to WAHT-END-0011 & WAHT-END-004 (Treatment of Hypoglycaemia Flow Chart)
- Record Management of Hypoglycaemia on page 6 of this document

GUIDANCE POINTS FOR PRESCRIBING CVRIII

- Prescribe 'insulin as per chart' on the main inpatient prescription chart
- Prescribe the variable rate regimen, insulin infusion and accompanying intravenous fluids on page 2 & 3 of this prescription
- Prescribe continued basal insulin on the subcutaneous insulin prescription for pregnant women (WR5552)
- If indicated, prescribe additional fluids on the Prescription Chart for Intravenous Infusions (WR0992)
- Cross through all sections of this prescription not in use
- Cross off and re-write the prescription if changes are required

GUIDANCE POINTS FOR THE ADMINISTRATION OF CVRIII:

- Document insulin syringe preparation and each infusion rate change on page 2
- Connect the insulin syringe pump to an intravenous access separate from the accompanying intravenous fluids. If venous access is difficult, use a 2 or 3 tailed device with **Non Return Valves**
- Refer to WAHT-TP-094 for Guidance on (1) Frequency of capillary blood glucose monitoring (2) Changing between the three variable rate regimens (3) Discontinuing CVRIII and re-initiating the usual diabetes regimen

Affix Patient Label here or record
NAME: . . . . . .
NHS NO:
HOSP NO:
D.O.B: D D / M M / Y Y Y Y MALE FEMALE

Ward:..... Cons.....

All women commence on Regimen 1. If 4 consecutive CBG readings above 7.0mmol/l, move to Regimen 2. If 4 further CBG readings above 7.0mmol/l, move to Regimen 3.

PRESCRIPTION FOR VARIABLE RATE REGIMENS OF INTRAVENOUS INSULIN:

Capillary Blood Glucose mmol/l	Insulin Infusion (units/hour - 1 unit = 1ml)		
	Regimen 1	Regimen 2	Regimen 3
<4	STOP INSULIN FOR 20 MINUTES Treat hypo as per guideline (re-check CBG in 10 minutes)		
4.0 - 5.5	0.2	0.5	1.0
5.6 - 7.0	0.5	1.0	2.0
7.1 - 8.5	1.0	1.5	3.0
8.6 - 11.0	1.5	2.0	4.0
11.1 - 14.0	2.0	2.5	5.0
14.1 - 17.0	2.5	3.0	6.0
17.1 - 20.0	3.0	4.0	7.0
>20.1	4.0	6.0	8.0
Doctors Signature			
	Start: Date: Stop: Date:	Start: Date: Stop: Date:	Start: Date: Stop: Date:

PRESCRIPTION FOR INTRAVENOUS INSULIN INFUSION:

Actrapid 50 units made up to 50mls with sodium chloride 0.9% to be given by intravenous infusion via a syringe pump. Check capillary blood glucose (CBG) 1 hour after commencing the infusion.

Prescribed by: Date: Time:

DOCUMENTATION OF SYRINGE RATE CHANGES:

SYRINGE MUST BE CHANGED EVERY 24 HOURS REGARDLESS OF DOSE

Date	Time (00:00)	CBG Reading Requiring Rate Change	Infusion Rate ml/hr	Regimen 1 / 2 / 3	Syringe Prepared By	Syringe Checked By	Rate Set By	Rate Checked By

Affix Patient Label here or record

NAME: . . . . . .

NHS NO:

HOSP NO:

D.O.B: / / MALE FEMALE

Ward:..... Cons.....

PRESCRIPTION FOR CONTINUING BASAL (LONG ACTING) INSULIN:

- Continue the patients basal insulin **and** metformin, if patient is NBM or not eating, omit metformin.
- Basal insulins are: Humalin I, Insulatard, Levemir (Detemir), Lantus, Toujeou (Glargine), Tresiba (Degludec)
- Continued basal insulin should be prescribed on the Maternity prescription and monitoring chart for subcutaneous insulin injections (WR5552)

PRESCIPTION FOR CVRIII ACCOMPANYING FLUIDS:

- Prescribe 500 ml 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L (0.15%) at 50 ml/hr
- Prescribe additional rehydration/resuscitation fluids (to be given via a separate cannula), if indicted on the Prescription for Intravenous Infusions chart (WR0992)

Date	Approved Drug Name	Route	Rate	Doctor's Signature	Prepared by Signature	Checked by Signature	Date & Time (00:00)
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				
		IV	ml/hr				

DOCUMENTATION OF CAPILLARY BLOOD GLUCOSE READINGS

Blood Glucose <4.0mmol/l needs action and treatment for hypoglycaemia, record 1st blood glucose readings below and further readings and treatment on Page 6.

- Record the capillary blood glucose (CBG) reading and time in the correct section of the chart.
- Review the variable rate regimen being used (1/2/3) if 4 consecutive CBG readings are above 7.0mmol/l
- Monitor CBG every hour.
- Monitor CBG every 2 hours for the first 24 hours after stopping CVRIII and commencing the patient's usual diabetes regimen. This may be continued by the woman at home if clinically appropriate.

DATE: / /

Affix Patient Label here or record

NAME: . . . . . .

NHS NO:

HOSP NO:

D.O.B: / / MALE FEMALE

Ward:..... Cons.....

Time: (00:00) →												
CBG mmol/l →	>11.1	10.0–11.0	9.0–9.9	8.0–8.9	7.0–7.9	6.0–6.9	5.0–5.9	4.1–4.9	<4.0	Midwife Signature		

Worcestershire Acute Hospitals NHS Trust

Appendix 2: Insulin Prescription Chart

Attach Patient Sticker here or record

NAME: . . . . . .

NHS NO:

HOSP NO:

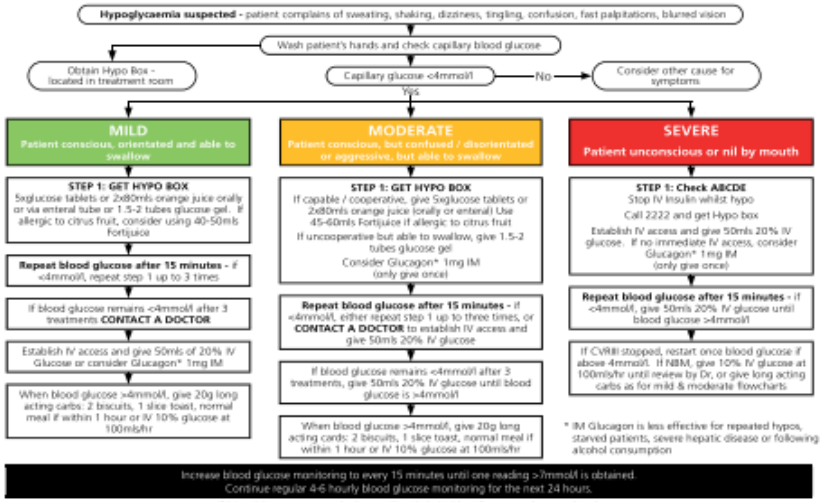
D.O.B: D D M M Y Y Y Y Female ☐

Consultant:..... Ward:.....

HYPOGLYCAEMIA MANAGEMENT

- Record the initial capillary blood glucose reading in the correct section for capillary blood glucose recording on page 2 or 3. If less than 4mmol/l refer to WAHT-END-004 for the Treatment of Hypoglycaemia Flow Chart below for further guidance.
- Treatment for hypoglycaemia should be given under PGD and recorded in the appropriate section below. Alternatively this can be prescribed by a Doctor.
- **For Paediatric patients (1 up to 16yrs of age) use half the recommended dose in the flow diagram below.**

TREATMENT OF HYPOGLYCAEMIA - Hypoglycaemia defined as blood glucose less than 4mmol/l



* IM Glucagon is less effective for repeated hypos, starved patients, severe hepatic disease or following alcohol consumption

If IV or IM treatment required, an online datix incident form must be completed.
Patient Group Directions for glucose tablets, glucose gel, 10% and 20% IV glucose and Glucagon can be found on the Trust Intranet.

MEDICINES GIVEN BY STAFF TO MANAGE HYPOGLYCAEMIA (under PGD) AS PER FLOW CHART

Date	Time	DRUG	Dose	Route	Signature	Print Name	Time

DOCUMENTATION OF CAPILLARY BLOOD GLUCOSE MONITORING

- After the hypoglycaemic episode has been treated record further capillary blood glucose readings in the table below.
- Repeat and record capillary blood glucose again 15 minutes after hypoglycaemia treatment is given.
- Continue to check and record capillary blood glucose readings every 15 minutes until 3 consecutive readings of 4.1mmol/l or greater are obtained. Once blood glucose is above 4 mmol/L increase blood glucose monitoring to 1 hourly until blood glucose is above 7 mmol/L. Then continue regular monitoring before meals and before bedtime.
- For recurrent hypoglycaemia refer the patient to the Diabetes Specialist Nurses for review.

DATE	TIME (00:00)	INITIALS	CAPILLARY BLOOD GLUCOSE READING MMOL/L	DATE	TIME (00:00)	INITIALS	CAPILLARY BLOOD GLUCOSE READING MMOL/L

MATERNITY PRESCRIPTION AND MONITORING CHART FOR SUBCUTANEOUS INSULIN INJECTIONS

Worcestershire Acute Hospitals NHS Trust

Attach Patient Sticker here or record

NAME: . . . . . .

NHS NO:

HOSP NO:

D.O.B: D D M M Y Y Y Y Female ☐

Consultant:..... Ward:.....

ALLERGIES/ADVERSE DRUG REACTIONS

NONE KNOWN ☐ Signature: Date:

DATE	DRUG/FOOD/OTHER	REACTION DETAILS

PRE-ADMISSION DIABETES REGIMEN:

Approved drug name	Form / insulin device	Dose	Frequency

Diabetic Kit required: YES / NO Print Name_____ Signature_____ Date_____

Supplied by Pharmacy: Print Name_____ Signature_____ Date:_____

INSULIN ADMINISTRATION:

☐ Midwife Administration (Ref: MedPolSOP09) Start_____ Stop_____

☐ Self Administration (Ref: MedPolSOP09) Start_____ Stop_____

☐ Self Management Scheme (Ref: WAHT-CG-447) Start_____ Stop_____

ONCE ONLY SUBCUTANEOUS INSULIN DOSES

DATE	TIME	INSULIN	DOSE	ROUTE	PRESCRIBER'S SIGNATURE	ADMINISTERED BY (TWO SIGNATURES)	DATE & TIME
				SC			
				SC			
				SC			

HYPERGLYCAEMIA MANAGEMENT:

- Reference to WAHT-END-001 (Guidelines for the Treatment of Diabetic Ketoacidosis) & WAHT-END-006 (Management of the Initiation of Insulin in Adults.)
- Please test urine or blood ketones if a patient has a blood glucose reading of 12mmol/L or above

HYPOGLYCAEMIA MANAGEMENT:

- Record Management of Hypoglycaemia on page 4 of this document.
- Refer to WAHT-END-004 (Treatment of Hypoglycaemia Flow Chart on back page)

SAFE PRESCRIBING, ADMINISTRATION, TRANSFER AND STORAGE OF INSULIN

- When prescribing insulin, the word 'units' must never be abbreviated.
- Ensure TWO Midwives sign for administration of insulin for patients who cannot self-administer their insulin.
- Never use an IV syringe to administer insulin. Always use an insulin pen device with a BD autoshield safety needle in patients who cannot self-administer.
- Insulin doses must never be omitted or delayed unless clearly outlined on the prescription and documented in the medical notes by the prescriber.
- Prescribe insulin doses to include all the doses required that day plus the morning dose of the following day.
- Cross through all insulin prescription boxes not required that day.
- An insulin dosage range should only be prescribed if a patient is on the 'Self Management Scheme' (see above) and the necessary forms have been signed and filed in the patients notes.
- Seek further advice and supplies from Pharmacy.

Worcestershire Acute Hospitals NHS Trust

PRESCRIPTION FOR SUBCUTANEOUS INSULIN INJECTIONS AND MONITORING CHART FOR MANAGEMENT OF DIABETES

Attach Patient Sticker here or record

NAME: ....

NHS NO: ☐☐☐☐☐☐☐☐☐☐

HOSP NO: ☐☐☐☐☐☐☐☐☐☐

D.O.B: D D M M Y Y Y Y Female ☐

Consultant:.......................... Ward:..........................

Target CBG **4.0 - 7.8mmol/L** unless otherwise indicated

Specify target range: . . . . . mmol/L to . . . . mmol/L

Signature: Date:

GUIDANCE ON CAPILLARY BLOOD GLUCOSE

MONITORING: - Monitor blood glucose a **minimum** of 4 times daily (Pre-breakfast and 1 hour past meals)

If pre-bedtime CBG is 5.0mmol/l or below check CBG at 03:00

Specify insulin form and device(s):		
1.	2.	3.
PHARMACY SUPPLY		

PRESCRIBED INSULIN MUST NEVER BE OMITTED WITHOUT PRESCRIBER'S DOCUMENTED AUTHORISATION IN MEDICAL NOTES

INSULIN DOSE IN UNITS — **CAPILLARY BLOOD GLUCOSE (MMOL/L)**
Blood glucose <4mmol/L needs action and treatment. Record 1st low blood glucose here and further blood glucose readings on page 4.

Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						
Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						
Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						

PF WR5552 Maternity Prescription And Monitoring Chart For Subcutaneous Insulin Injections Version 2 Page 2 of 4

NEVER WITHDRAW INSULIN USING A SYRINGE FROM AN INSULIN PEN DEVICE OR CARTRIDGE

INSULIN DOSE IN UNITS — **CAPILLARY BLOOD GLUCOSE (MMOL/L)**
Blood glucose <4mmol/L needs action and treatment. Record 1st low blood glucose here and further blood glucose readings on page 4.

Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						
Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						
Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						
Pharmacy Check	DATE	INSULIN TYPE	Breakfast	Lunch	Tea	Bedtime		03:00	Pre-breakfast	Pre-Lunch	Pre-Tea	Bedtime	Other Please specify
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
									Post-breakfast	Post-Lunch	Post-Tea		
		Prescriber Signature/Bleep	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	UNITS Midwife Signatures Time given	Reading mmol/L						
							Time						
							Signature						

PF WR5552 Maternity Prescription And Monitoring Chart For Subcutaneous Insulin Injections Version 2 Page 3 of 4

Appendix 3: Pre-pregnancy counselling

All women with either type 1 or 2 diabetes considering pregnancy should be referred to a consultant Obstetrician specialising in the care of diabetes in pregnancy.

The aim should be to avoid unplanned pregnancy in these women. All women with diabetes of childbearing age should be provided with appropriate contraceptive and pregnancy advice.

The aims of pre-pregnancy care are:

- Establish good blood glucose control for at least three cycles prior to conception and in the early weeks of pregnancy during organogenesis (first 42 days of pregnancy) to reduce the risk of congenital malformation.
- **Advise women to avoid pregnancy if HbA1c is >86mmol/mol**

IFCC-HbA1c mmol/mol	**Risk of Congenital malformation**
48-61	4%
62-86	6%
>86	25%
Non-diabetic	2%

- Aim for fasting blood glucose 5-7 mmol/litre
- Aim for pre-meal blood glucose 4-7mmol/l.
- Target HBA1c of <48mmol/mol (or as close to it) without significant hypoglycaemia.
- Advise women who are planning a pregnancy that good glucose control prior to conception and throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death.
- Advise women that risks can be reduced but not entirely eliminated.
- Advise women who are planning a pregnancy that the risks associated with diabetes in pregnancy will increase the longer they have had their diabetes.
- Advise women who are planning a pregnancy of the increased risk of having a baby who is large for gestational age which increases the chance of birth trauma, induction of labour, instrumental and caesarean delivery.
- Advise women that there is an increased possibility that baby may have health problems in the first 28 days following birth, requiring admission to NICU
- Advise women of the risk of the baby developing obesity, diabetes and other health problems later in life.
- Advise women of the risk of hypoglycaemia and impaired awareness of hypoglycaemia in pregnancy

- Optimise lifestyle: reduce smoking, encourage exercise
- Review diet and where appropriate consider weight reduction. Women with a BMI >27 kg/m^2 should consider losing weight prior to pregnancy.
- Advise women that nausea and vomiting in pregnancy can affect blood glucose control
- Commence folic acid 5mg ideally 3 months prior to conception
- Screen for medical complications:
    - Hypertension
        - Check blood pressure
    - Retinopathy
        - Check retinopathy screen at least once in the preceding 6 month period
    - Nephropathy
        - U+E, uric acid, PCR
        - Refer to nephrology if serum creatinine ≥120 micromol/litre, PCR >30 mg/mmol, eGFR <45ml/minute/1.73m^2
    - Send MSU
    - TSH, free T3, T4, thyroid antibodies if symptomatic or family history
    - Review co-existing medical problems
    - Record height and weight.
    - Calculate BMI
- Review medication:
    - Convert patients on oral hypoglycaemics to insulin
    - Metformin can be continued prior to and throughout pregnancy
    - ACE inhibitors should be stopped or replaced.
    - Stop statins
- Warn about potential for hypoglycaemic episodes and loss of awareness
- The patient's partner or relative must be provided with Glucogel and a Glucagon kit and be instructed how to use them.
- Consider contraception whilst optimizing pre-pregnancy health status. Women with diabetes can use the oral contraceptive pill. Contraception should be continued until they have good blood glucose control.
- Identification of any possible contraindications to pregnancy should be sought and the patient advised accordingly. These may include significant ischaemic heart disease, untreated proliferative retinopathy, severe autonomic neuropathy, advanced nephropathy.
- Advise to access medical care as soon as pregnancy has been confirmed.

Appendix 4

Agreement to self-manage diabetes during hospital admission in Maternity

I wish to take responsibility for managing my diabetes (Blood Glucose monitoring and insulin adjustment) during my admission to Worcestershire Acute Hospitals NHS Trust.

I agree that:

☐ I will keep my medication safe an inaccessible to other patients

☐ I will check my blood glucose regularly and record the results

☐ I will record the dose of insulin taken and make the information available to staff

☐ If I am unable, for any reason to make decisions about my management, medical or nursing/midwifery staff should make decisions on my behalf until I am able to resume self-management.

Signed: PRINT name: Date:

Witnessed by Healthcare Professional (Signature)

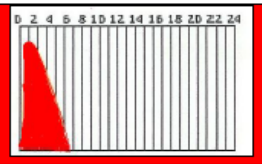
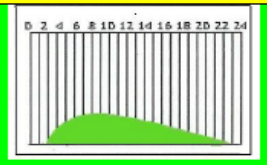
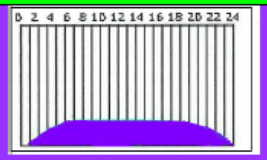
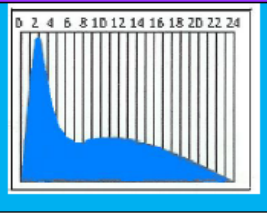
PRINT name: Date: Position:

Any change in circumstances affecting this agreement should be documented in the notes.

(Taken from 'JBDS: Self-management of diabetes in hospital guideline')

Appendix 5

INJECTABLE INSULIN CHART

BRAND NAME	APPROVED NAME	SOURCE	TIME-ACTION PROFILE	TYPICAL DOSING SCHEDULE	AVAILABLE DEVICES V = 10ml vial C = 3ml cartridge P = disposable pen
Apidra®	Glulisine	Human		Immediately before or within 15 minutes of a meal OR continuous SC infusion via insulin pump system	V, C, P
Humalog®	Lispro	Human		Immediately before or within 15 minutes of a meal OR continuous SC infusion via insulin pump system	V, C, P
Novorapid®	Aspart	Human		Immediately before or within 15 minutes of a meal OR continuous SC infusion via insulin pump system	V, C, P
Actrapid®	Soluble insulin	Human		Three times a day 30 minutes before meals OR continuous IV infusion as sliding scale	V
Humulin S®	Soluble insulin	Human		Three times a day 30 minutes before meals OR continuous IV infusion as sliding scale	V, C
Insuman® Rapid	Soluble insulin	Human		Three times a day 30 minutes before meals OR continuous IV infusion as sliding scale	C
Hypurin® Neutral	Soluble insulin	Beef, pork		Three times a day 30 minutes before meals OR continuous IV infusion as sliding scale	V, C
Insulatard®	Isophane	Human		Once or twice daily, 30 minutes before meals	V, C, P
Humulin I®	Isophane	Human		Once or twice daily, 30 minutes before meals	V, C, P
Insuman® Basal	Isophane	Human		Once or twice daily, 30 minutes before meals	V, C, P
Hypurin® Isophane	Isophane	Beef, Pork		Once or twice daily, 30 minutes before meals	V, C
Lantus®	Glargine	Human		Once Daily, usually at bedtime	V, C, P
Levemir®	Determir	Human		Once or twice daily	C, P
Hypurin® Lente	Insulin zinc	Beef		Once daily, usually at bedtime	V
Hypurin® Protamine Zinc	Protamine zinc	Beef		Once daily, usually at bedtime	V
Novomix®30	Biphasic-Aspart	Human		Twice daily, before or within 15 minutes of a meal	C, P
Humalog® Mix 25 Humalog® Mix 50	Biphasic-lispro	Human		Twice daily, before or within 15 minutes of a meal	V, C, P
Humulin M3®	Biphasic-Isophane	Human		Twice daily, 30 minutes before meals	V, C, P
Insuman® Comb 15 Insuman® Comb 25 Insuman® Comb 50	Biphasic-isophane	Human		Twice daily, 30 minutes before meals	V, C, P
Hypurin® 30/70 Mix	Biphasic - isophane	Pork		Twice daily, 30 minutes before meals	V, C

Rapid-acting Insulins **Short-acting Insulins** **Intermediate-acting** **Long-acting** **Biphasic**

Appendix 6 – DKA Pathway