Diabetes in Pregnancy

Classification:	Guideline
Authors Name:	Miss Erum A Khan, Jan Liddie, Dr Shanti Chandran
Authors Job Title:	Consultant O & G, Lead Diabetic Midwife, Consultant Medicine
Authors Division:	Women and Children's Health
Departments/Group this Document applies to:	Maternity Pregnant women with diabetes

Approval Group: Maternity Guidelines Review Group, Women's Health CIG	**Date of Approval:**	07/10/2020
	Last Review:	06/2020
	Review Date:	01/10/2023

Unique Identifier: MIDW/GL/122	**Status:** Approved	**Version No:** 6.1

Guideline to be followed by (target staff): All staff caring for diabetic women in pregnancy

To be read in conjunction with the following documents:

- Diabetes in Pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period (NICE 2015)
- DESP 32 - Buckinghamshire Diabetic Eye Screening Programme (2019) – Pregnant Patients SOP

Are there any eCARE implications? No

CQC Fundamental standards:
Regulation 9 – person centred care
Regulation 10 – dignity and respect
Regulation 12 – Safe care and treatment
Regulation 14 – Meeting nutritional and hydration needs
Regulation 16 – Receiving and acting on complaints
Regulation 19 – Fit and proper

Disclaimer –

Since every patient's history is different, and even the most exhaustive sources of information cannot cover every possible eventuality, you should be aware that all information is provided in this document on the basis that the healthcare professionals responsible for patient care will retain full and sole responsibility for decisions relating to patient care; the document is intended to supplement, not substitute

for, the expertise and judgment of physicians, pharmacists or other healthcare professionals and should not be taken as an indication of suitability of a particular treatment for a particular individual.
The ultimate responsibility for the use of the guideline, dosage of drugs and correct following of instructions as well as the interpretation of the published material **lies solely with you** as the medical practitioner.

Index

Guideline Statement

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

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

Executive Summary

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

1.0 Roles and Responsibilities:

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

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

The women are also cared for by:

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

2.0 Implementation and dissemination of document

The information within this document will be disseminated throughout the maternity unit by being available on the hospital intranet.

3.0 Processes and procedures

3.1 Abbreviations

CBG	Capillary Blood glucose
CSII	Continuous Subcutaneous Insulin Infusion
DLM	Diabetes Lead Midwife
DM	Diabetes Mellitus
DSN	Diabetes Specialist Nurse
GDM	Gestational Diabetes Mellitus
OGTT	Oral Glucose Tolerance Test
PCOS	Polycystic Ovarian Syndrome
VRIII	Variable Rate Intravenous Insulin Infusion

3.2 Background

There are 3 types of diabetes:

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

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

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

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

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

3.3 Gestational Diabetes

3.3.1 Screening for Gestational Diabetes

NICE (2015) recommends screening for GDM using risk factors as follows:

- BMI ≥30
- Previous macrosomic baby (≥4.5 kg)
- Family history of diabetes (1st degree relative)
- Family origin as follows:
  - Minority ethnic family origin with a high prevalence of diabetes
- Be aware that glycosuria of 2+ or above on 1 occasion or of 1+ or above on 2 or more occasions detected by reagent strip testing during routine antenatal care may indicate undiagnosed gestational diabetes. If this is observed, consider further testing to exclude gestational diabetes. (NICE, 2015)
- Increased maternal age 40 years or above (Screening for gestational diabetes mellitus: U.S. Preventive Services Task Force recommendation statement, 2014).
- Polycystic Ovarian Syndrome (PCOS) (Diabetes Care, 2010 Jan; 33(Suppl1): S11-S61,doi: 10,2337/dc10-S011).
- Cystic Fibrosis
- Gastric sleeve surgery (d/w maternal medicine consultant) (Pregnancy after bariatric surgery: screening for gestational diabetes. BMJ 2017; 356 doi: https://doi.org/10.1136/bmj.j533 (Published 03 February 2017) Cite this as: BMJ 2017;356:j533)
- Women on anti-psychotics: Olanzapine, Clozapine, Quetiapine. (Antipsychotics in pregnancy and breastfeeding. Royal College of Psychiatrists).
- Macrosomia and/or polyhydramnios before 36 weeks. See **Appendix 4** re action if macrosomia and/ or polyhydramnios is after 36 weeks.

3.3.2 Women with previous Gestational Diabetes

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

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

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

3.3.3 Women with risk factors for Gestational Diabetes

- Offer women with any of the other risk factors for gestational diabetes, a 75 g 2 -hour OGTT at 24–28 weeks. (NICE 2015)
- For women with accelerated growth and/or polyhydramnios after 36 weeks see **Appendix 4**

3.3.4 Diagnosis of gestational diabetes

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

- Diagnose gestational diabetes if the woman has either:

1. a fasting plasma glucose level of 5.6 mmol/litre or above or
2. a 2 hour plasma glucose level of 7.8 mmol/litre or above (NICE, 2015)

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

3.3.5 Management of gestational diabetes

On diagnosis:

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

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

- Use the same capillary plasma glucose target levels for women with gestational diabetes as for women with pre-existing diabetes. (NICE 2015)
- Advise pregnant women with any form of diabetes to maintain their capillary plasma glucose below the following target levels, if these are achievable without causing problematic hypoglycaemia:

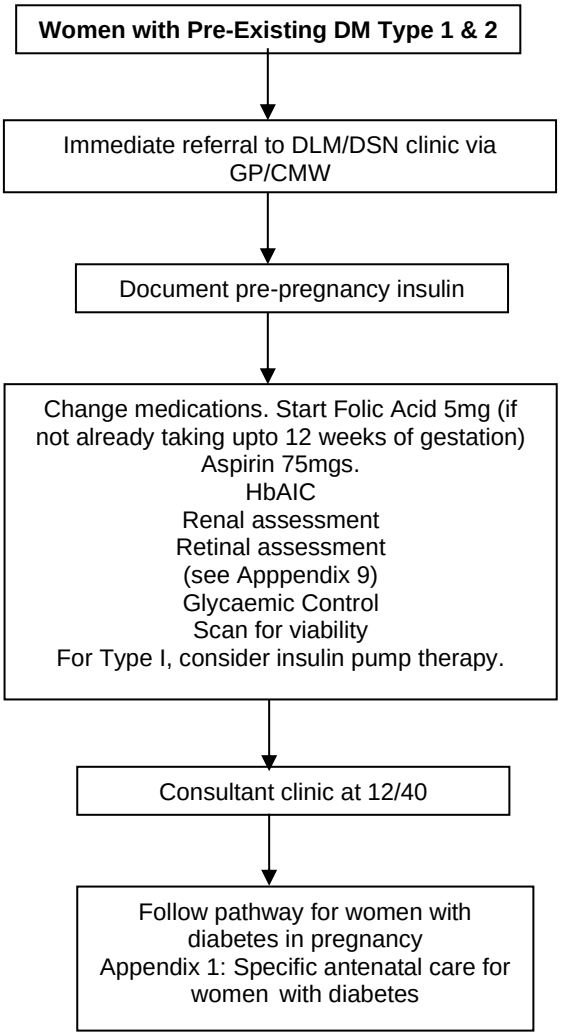
  - fasting: 5.3 mmol/litre
    and
  - 1 hour after meals: 7.8 mmol/litre **or**
  - 2 hours after meals: 6.4 mmol/litre. (NICE 2015)

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

- Advise women with gestational diabetes to take regular exercise (such as walking for 30 minutes after a meal) to improve blood glucose control. (NICE 2015)
- Offer a trial of changes in diet and exercise to women with gestational diabetes who have a fasting plasma glucose level below 7 mmol/litre at diagnosis. (NICE 2015)
- Offer metformin to women with gestational diabetes if blood glucose targets are not met using changes in diet and exercise within 1–2 weeks**.** (NICE 2015)
- Offer insulin instead of metformin to women with gestational diabetes if metformin is contraindicated or unacceptable to the woman**.** (NICE 2015)
- Offer addition of insulin to the treatments of changes in diet, exercise and metformin for women with gestational diabetes if blood glucose targets are not met. (NICE 2015)
- Offer immediate treatment with insulin, with or without metformin, as well as changes in diet and exercise, to women with gestational diabetes who have a fasting plasma glucose level of 7.0 mmol/litre or above at diagnosis. (NICE 2015)
- Consider immediate treatment with insulin, with or without metformin as well as changes in diet and exercise, for women with gestational diabetes who have a fasting plasma glucose level of between 6.0 and 6.9 mmol/litre if there are complications such as macrosomia or hydramnios. **(NICE 2015)**
- Consider glibenclamide for women with gestational diabetes:
    - in whom blood glucose targets are not achieved with metformin but who decline insulin therapy **or**
    - who cannot tolerate metformin. (NICE 2015)
- To remain in contact with Diabetes Lead Midwife on a 1-2 weekly basis
- Give patient information leaflet Expressing Colostrum Antenatally.
- Advise that the birth should take place in a hospital with advanced neonatal resuscitation skills available 24 hours a day.
- The rest of the antenatal, intrapartum and postnatal care should be managed as below for women with pre-existing diabetes. Women should still receive routine care with community midwife as appropriate in between appointments at the Joint Clinic

3.4 Pre-Existing Type 1 and 2 Diabetes Mellitus

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



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

Monitoring blood glucose

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

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

3.4.1.1 Target blood glucose levels

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

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

- fasting: 5.3 mmol/litre
  and
- 1 hour after meals: 7.8 mmol/litre **or**
- 2 hours after meals: 6.4 mmol/litre. (NICE 2015)

Advise pregnant women with diabetes who are on insulin or glibenclamide to maintain their capillary plasma glucose level above 4 mmol/litre. (NICE 2015)

3.4.1.2 Monitoring HbA1c

Measure HbA1c levels in all pregnant women with pre-existing diabetes at the booking appointment to determine the level of risk for the pregnancy. (NICE 2015)

Consider measuring HbA1c levels in the second and third trimesters of pregnancy for women with pre-existing diabetes to assess the level of risk for the pregnancy. (NICE 2015)

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

Measure HbA1c levels in all women with gestational diabetes at the time of diagnosis to identify those who may have pre-existing type 2 diabetes. (NICE 2015)

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

3.4.1.3 Managing diabetes during pregnancy

Insulin treatment and risks of hypoglycaemia

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

Advise women with insulin treated diabetes of the risks of hypoglycaemia and impaired awareness of hypoglycaemia in pregnancy, particularly in the first trimester. (NICE 2008)

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

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

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

3.4.1.4 Continuous glucose monitoring

Do not offer continuous glucose monitoring routinely to pregnant women with diabetes. (NICE 2015)

Consider continuous glucose monitoring for pregnant women on insulin therapy:

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

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

3.4.1.5 Ketone testing and diabetic ketoacidosis

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

Advise pregnant women with type 2 diabetes or gestational diabetes to seek urgent medical advice if they become hyperglycaemic or unwell. (NICE 2015)

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

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

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

3.4.1.6 Retinal assessment during pregnancy

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

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

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

Diabetic retinopathy should not be considered a contraindication to vaginal birth. (NICE 2008)

3.4.1.7 Renal assessment during pregnancy

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

3.4.1.8 Detecting congenital malformations

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

3.4.1.9 Monitoring fetal growth and wellbeing

Offer pregnant women with diabetes ultrasound monitoring of fetal growth and amniotic fluid volume every 4 weeks from 28 to 36 weeks. (NICE 2008)

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

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

3.4.1.10 Organisation of antenatal care

Offer immediate contact with a joint diabetes and antenatal service to women with diabetes who are pregnant. **(**NICE 2008**)**

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

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

Table 1 Timetable of antenatal appointments

Appointment	**Care for women with diabetes during pregnancy**
Booking appointment (joint diabetes and antenatal care) – ideally by 10 weeks	Discuss information, education and advice about how diabetes will affect the pregnancy, birth and early parenting (such as breastfeeding and initial care of the baby). If the woman has been attending for preconception care and advice, continue to provide information, education and advice in relation to achieving optimal blood glucose control (including dietary advice). If the woman has not attended for preconception care and advice, give information, education and advice for the first time, take a clinical history to establish the extent of diabetes related complications (including neuropathy and vascular disease), and review medicines for diabetes and its complications. Offer retinal assessment for women with pre-existing diabetes unless the woman has been assessed in the last 3 months. Offer renal assessment for women with pre-existing diabetes if this has not been performed in the last 3 months. Arrange contact with the joint diabetes and antenatal clinic every 1–2 weeks throughout pregnancy for all women with diabetes. Measure HbA1c levels for women with pre-existing diabetes to determine the level of risk for the pregnancy. Offer self-monitoring of blood glucose or a 75 g 2hour OGTT as soon as possible for women with a history of gestational diabetes who book in the first trimester. Confirm viability of pregnancy and

	gestational age at 7–9 weeks.
16 weeks	Offer retinal assessment at 16–20 weeks to women with pre-existing diabetes if diabetic retinopathy was present at their first antenatal clinic visit. Offer self-monitoring of blood glucose or a 75 g 2hour OGTT as soon as possible for women with a history of gestational diabetes who book in the second trimester
20 weeks	Offer an ultrasound scan for detecting fetal structural abnormalities, including examination of the fetal heart (4 chambers, outflow tracts and 3 vessels).
28 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Offer retinal assessment to all women with pre-existing diabetes. Women diagnosed with gestational diabetes as a result of routine antenatal testing at 24–28 weeks enter the care pathway.
32 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Offer nulliparous women all routine investigations normally scheduled for 31 weeks in routine antenatal care.
34 weeks	No additional or different care for women with diabetes.
36 weeks	Offer ultrasound monitoring of fetal growth and amniotic fluid volume. Provide information and advice about: • timing, mode and management of birth • analgesia and anaesthesia • changes to blood glucose lowering therapy during and after birth • care of the baby after birth • initiation of breastfeeding and the effect of breastfeeding on blood glucose control • contraception and follow up.
37^{+0} weeks to 38^{+6} weeks	Offer induction of labour, or caesarean section if indicated, to women with type 1 or type 2 diabetes; otherwise await spontaneous labour
38 weeks	Offer tests of fetal wellbeing
39 weeks	Offer tests of fetal wellbeing. Advise women with uncomplicated gestational diabetes to give birth no later than 40^{+6} weeks

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

3.4.2 Antenatal Corticosteroids - Management of glycaemia during steroid use in patients on oral treatment and/or insulin (see training video in Appendix 1 & 2)

Diabetes should not be considered a contraindication to antenatal steroids for fetal lung maturation or to tocolysis. (NICE 2008)

In women with insulin treated diabetes (GDM or pre-existing) who are receiving steroids for fetal lung maturation, give additional insulin according to an agreed protocol and monitor them closely. (NICE 2008, amended 2015) See **Appendix** 1 (Management of glycaemia during steroid use in patients on oral treatment and/or insulin)

Do not use betamimetic medicines for tocolysis in women with diabetes**.** (NICE 2008)

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

3.4.3 Intrapartum Care

Timing and mode of birth

Discuss the timing and mode of birth with pregnant women with diabetes during antenatal appointments, especially during the third trimester. (NICE 2015)

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

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

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

Consider elective birth before 40^{+6} weeks for women with gestational diabetes if there are maternal or fetal complications. (NICE 2015)

Diabetes should not in itself be considered a contraindication to attempting vaginal birth after a previous caesarean section. (NICE 2015)

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

Anaesthesia

Offer women with diabetes and comorbidities such as obesity or autonomic neuropathy an anaesthetic assessment in the third trimester of pregnancy. (NICE 2008)

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

Blood glucose control during labour and birth (See Appendix 2 & training video)

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

Intravenous dextrose and insulin infusion should be commenced for women with type 1 diabetes from the onset of established labour. (NICE 2008)

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

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

3.4.4 Elective Caesarean Section (See Appendix 2)

Women with pre-existing type 1 diabetes

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

Women with pre-existing type 2 diabetes or gestational diabetes (See Appendix 2)

- Women to take normal treatment the night before elective CS, to fast from midnight, and to attend Ward 9 at 0730.
- Monitor capillary blood glucose on an hourly basis and if more than two consecutive readings of ≥7.0 mmol/l commence intravenous insulin infusion
- If sliding scale commenced, continue as per regimen for management of labour in insulin-treated patients (and discontinue after delivery

3.4.5 Neonatal care

Initial assessment and criteria for admission to intensive or special care

Advise women with diabetes to give birth in hospitals where advanced neonatal resuscitation skills are available 24 hours a day. (NICE 2008)

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

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

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

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

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

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

Preventing and assessing neonatal hypoglycaemia

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

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

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

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

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

3.4.6 Postnatal care (See Appendix 2)

Postnatal plan of care should be recorded antenatally as a Diabetes progress note in eCare.

3.4.6.1 Blood glucose control, medicines and breastfeeding

Women with preexisting diabetes which was insulin-treated before pregnancy should reduce their insulin immediately after birth and monitor their blood glucose levels carefully to establish the appropriate dose**.** (NICE 2008). **Refer to personalised postnatal care plan in the maternal record on eCare.**

Ensure the mothers with insulin-treated preexisting diabetes are confident with commencing their postnatal insulin regime in the postnatal period.

Explain to women with insulin treated preexisting diabetes that they are at increased risk of hypoglycaemia in the postnatal period, especially when breastfeeding, and advise them to have a meal or snack available before or during feeds. (NICE 2008)

Women who have been diagnosed with gestational diabetes should discontinue blood glucose lowering therapy immediately after birth. (NICE 2008)

Women with preexisting type 2 diabetes who are breastfeeding can resume or continue to take metformin[2] and glibenclamide[4] immediately after birth but should avoid other oral blood glucose lowering agents while breastfeeding. (NICE 2008).

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

3.4.6.2 Information and follow-up after birth

Women with pre-existing diabetes

Refer women with pre-existing diabetes back to their routine diabetes care arrangements. **(**NICE 2008).

Remind women with diabetes of the importance of contraception and the need for preconception care when planning future pregnancies. (NICE 2008).

Women diagnosed with gestational diabetes

Test one pre-meal blood glucose in women who were diagnosed with gestational diabetes to exclude persisting hyperglycaemia before they are transferred to community care. (NICE 2008)

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

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

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

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

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

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

For women having an HbA1c test as the postnatal test:

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

Offer an annual HbA1c test to women who were diagnosed with gestational diabetes who have a negative postnatal test for diabetes. (NICE 2015)

Offer women who were diagnosed with gestational diabetes early self- monitoring of blood glucose or an OGTT in future pregnancies. Offer a subsequent OGTT if the first OGTT results in early pregnancy are normal. (NICE 2008, amended 2018)

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

See Insulin Management Plan for Pregnant Women utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period (**Appendix 8**).

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

4.0 Statement of evidence/references

References:

American Diabetes Association (2010) Standards of medical care in diabetes 2010 Diabetes Care, 2010 Jan; 33(Suppl1): S11-S61,doi: 10,2337/dc10-S011

Joint British Diabetes Societies for Inpatient Care (2017) Management of glycaemic control in pregnant women with diabetes on obstetric wards and delivery units http://www.diabetologists-abcd.org.uk/JBDS/JBDS_Pregnancy_final_18082017.pdf

NICE (2008 and 2015) Diabetes in pregnancy: management from preconception to the postnatal period https://www.nice.org.uk/guidance/ng3

NICE (2017) Type 2 diabetes: prevention in people at high risk Public health guideline [PH38] Published date: 12 July 2012 Last updated: 15 September 2017 https://www.nice.org.uk/guidance/ph38

US Preventive Services Task Force (2014) Gestational diabetes mellitus, screening, https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/gestational-diabetes-mellitus-screening

External weblink references: Please note that although Milton Keynes University Hospital NHS Foundation Trust may include links to external websites, the Trust is not responsible for the accuracy or content therein.

5.0 Governance

5.1 Document review history

Version number	Review date	Reviewed by	Changes made
6.0	06/2020	Erum A Khan Jan Liddie Shanti Chandran	Full review and update
6.1	28/04/2021	Erum A Khan Jan Liddie. Louise Allnatt Cornelia Libal Shanti Chandran	Power plan added. Updated VRIII Training video attached to powerplan

5.2 Consultation History

Stakeholders Name/Board	Area of Expertise	Date Sent	Date Received	Comments	Endorsed Yes/No
Julie Cooper	Head of Midwifery	14/07/2020	17/07/2020	Incorporated	Yes
Laura Jewell	Senior sister for antenatal and postnatal ward	14/07/2020	21/07/2020	Incorporated	Yes

5.3 Audit and monitoring

Audit/Monitoring Criteria	Tool	Audit Lead	Frequency of Audit	Responsible Committee/Board
a) Numbers of women who develop GDM, their related risk factors and birth outcomes b) Numbers of women with pre-existing diabetes and birth outcomes c) Adherence to the above guideline for all women with pre-existing diabetes and gestational diabetes.	a-c) Audit/ statistics	a-c) Diabetes lead midwife/DSNs a-c) Lead obstetrician for diabetes	Annual	a-c) Diabetes lead midwife/DSNs a-c) Lead obstetrician for diabetes

5.4 Equality Impact Assessment

As part of its development, this Guideline and its impact on equality has been reviewed. The purpose of the assessment is to minimise and if possible remove any disproportionate impact on the grounds of race, gender, disability, age, sexual orientation, religion or belief, pregnancy and maternity, gender reassignment or marriage and civil partnership. No detriment was identified. Equality Impact assessments will show any future actions required to overcome any identified barriers or discriminatory practice.

Equality Impact Assessment			
Division	Women's and Children's Health	Department	Maternity
Person completing the EqIA	Jan Liddie/ Erum Khan	Contact No.	
Others involved:		Date of assessment:	06/2020
Existing policy/service	Yes	New policy/service	No

Will patients, carers, the public or staff be affected by the policy/service?	Yes
If staff, how many/which groups will be affected?	*All staff providing care for women in pregnancy with diabetes*

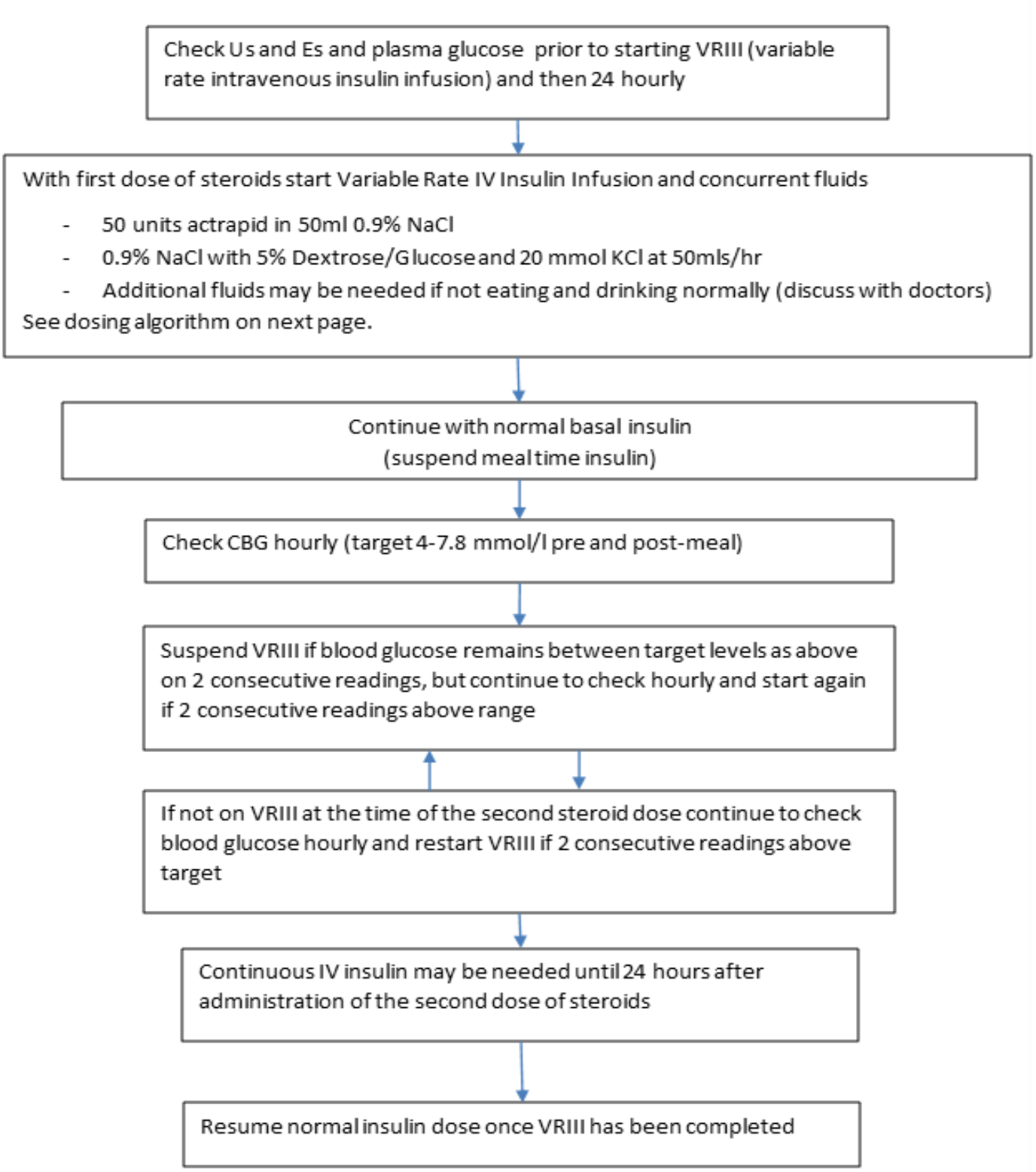
Protected characteristic	Any impact?	Comments
Age	NO	Positive impact as the policy aims to recognise diversity, promote inclusion and fair treatment for patients and staff
Disability	NO	
Gender reassignment	NO	
Marriage and civil partnership	NO	
Pregnancy and maternity	NO	
Race	NO	
Religion or belief	NO	
Sex	NO	
Sexual orientation	NO	

What consultation method(s) have you carried out?
Circulation via email and MS Teams. Discussed at the guidelines meeting and women's health CIG
How are the changes/amendments to the policies/services communicated?
Circulation via email and MS Teams. Discussed at the guidelines meeting and women's health CIG
What future actions need to be taken to overcome any barriers or discrimination?

What?	Who will lead this?	Date of completion	Resources needed
Review date of EqIA			

Appendix 1: Management of glycaemia during steroid use in patients on oral treatment and/or insulin

See training video:
[VRIII PowerPlan for Maternity - YouTube]



JBDS-IP Joint British Diabetes Societies for inpatient care

Local Trust Logo

Appendix 1 Intravenous Insulin Prescription and Fluid Protocol
FOR MANAGEMENT OF STEROID HYPERGLYCAEMIA DURING PREGNANCY

For use for ALL patients receiving Variable Rate Intravenous Insulin Infusion (VRIII) for the management of steroid hyperglycaemia during pregnancy
NEVER use an IV syringe to draw up insulin
ALWAYS draw up insulin using an insulin syringe
ALWAYS continue subcutaneous intermediate* or basal insulin**
*Intermediate: Insulatard, Humulin I, Insuman basal
**Basal: Lantus, Toujeo (Glargine), Levemir (Detemir)
Doctor: All prescriptions for insulin and fluids must be signed
Nurse: All entries must be signed

Ward	Consultant	Admission Date:
		Discharge Date:
Surname		First Name
Hospital Number		Date of Birth / Age
NHS Number		
Address		

	DOSING ALGORITHM (Please see the guide below)		
Algorithm >	**1**	**2**	**3**
	For most women	For women not controlled on algorithm 1 or needing >80 units/day of insulin	For women not controlled on algorithm 2 (after specialist advice)
CBG Levels (mmol/L)	Infusion Rate (units/hr = ml/hr)		
<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
Signed			
Print Name			
Date			

ALGORITHM GUIDE

- **ALL** women with diabetes should have Capillary Blood Glucose (CBG) testing hourly whilst on VRIII for the management of steroid hyperglycaemia during pregnancy
- Start VRIII and Fluids with the first dose of steroids and continue for up to 24 hours after the last dose

Algorithm 1 Most women will start here

Algorithm 2 Use this algorithm for women who are likely to require more insulin (on steroids; on >80 units of insulin during pregnancy; or those not achieving target on algorithm 1)

Algorithm 3 Use this for women who are not achieving target on algorithm 2 (No patient starts here without diabetes or medical review)

If the woman is not achieving targets with these algorithms, contact the diabetes team (out of hours: Medical SpR on call)

Target CBG level = 4 – 7.8 mmol/L

Check CBG every hour whilst on VRIII

Move to the higher algorithm
If the CBG is > target and is not dropping

Move to the lower algorithm
If CBG falls below 4 mmol/L or is dropping too fast

Drug (approved name) Please tick	Dose	Volume	Route	Prescriber's Signature	Prescriber Print name	Date
Human Actrapid ☐ Humulin S ☐	50 units	Made up to 50ml with NaCl 0.9% (1 unit per ml)	IV			

SYRINGE PREPARATION			
Prepared and administered by	**Date**	**Time started**	**Time stopped**

INTRAVENOUS SUBSTRATE FLUID PRESCRIPTION

Date	Intravenous Fluid and Rate	Alternative Rate	Prescriber's Signature	Nurse' Signature
	500 ml 0.9% NaCl + 5% Dextrose with 20 mmol/L KCl (0.15%) to run at 50 ml/hr			
	500 ml 0.9% NaCl + 5% Dextrose with 20 mmol/L KCl (0.15%) to run at 50 ml/hr			

PRESCRIPTION OF INTRAVENOUS MANAGEMENT OF HYPOGLYCAEMIA

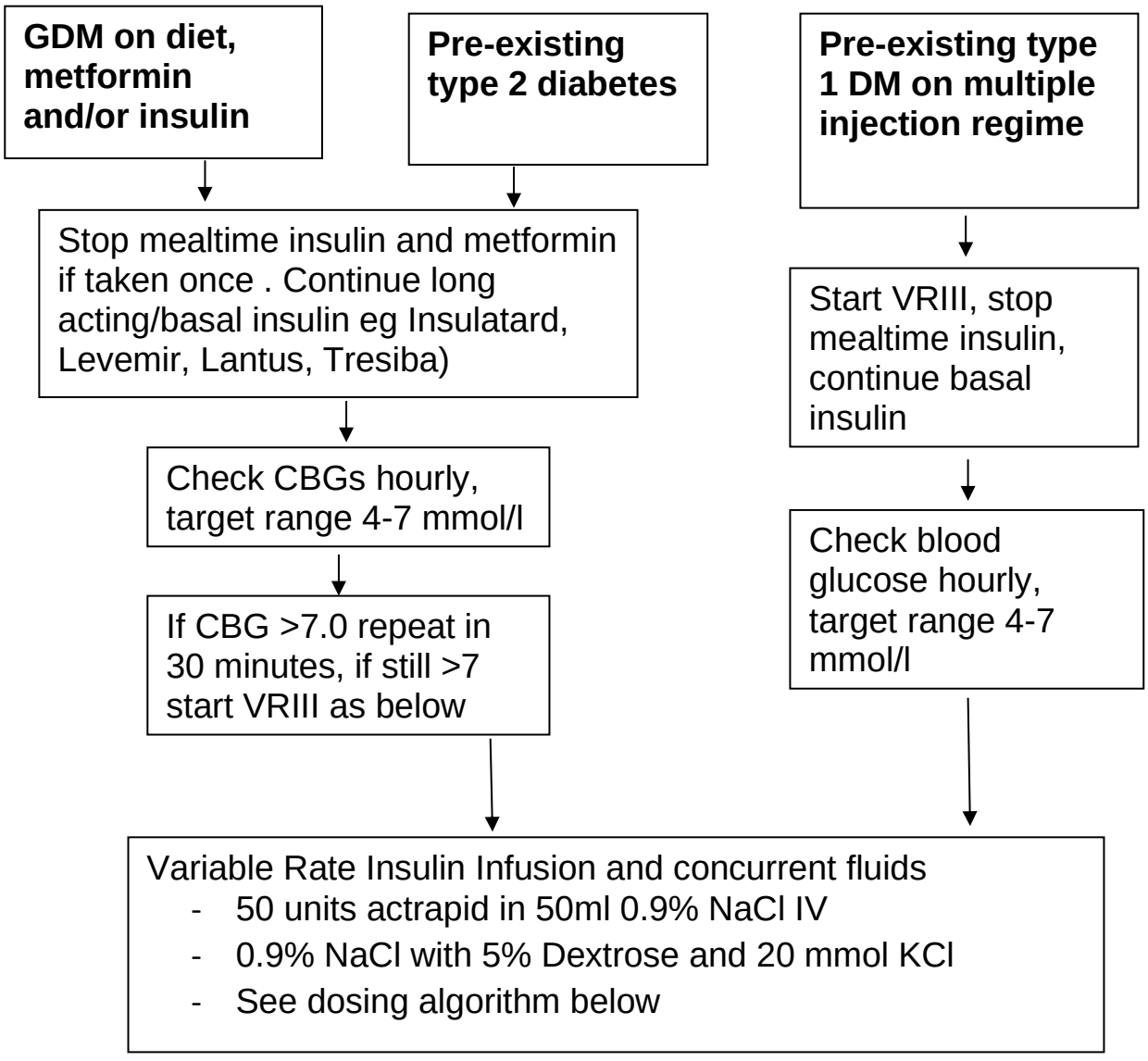
Date	Time	Preparation	Volume	Route	Duration	Prescriber's signature	Print name	Given by:	Time given:
		20% Dextrose	**100ml**	**IV**	**15 min**				

Patients with type 1 DM on insulin pumps should be referred to the Diabetes Specialist Team

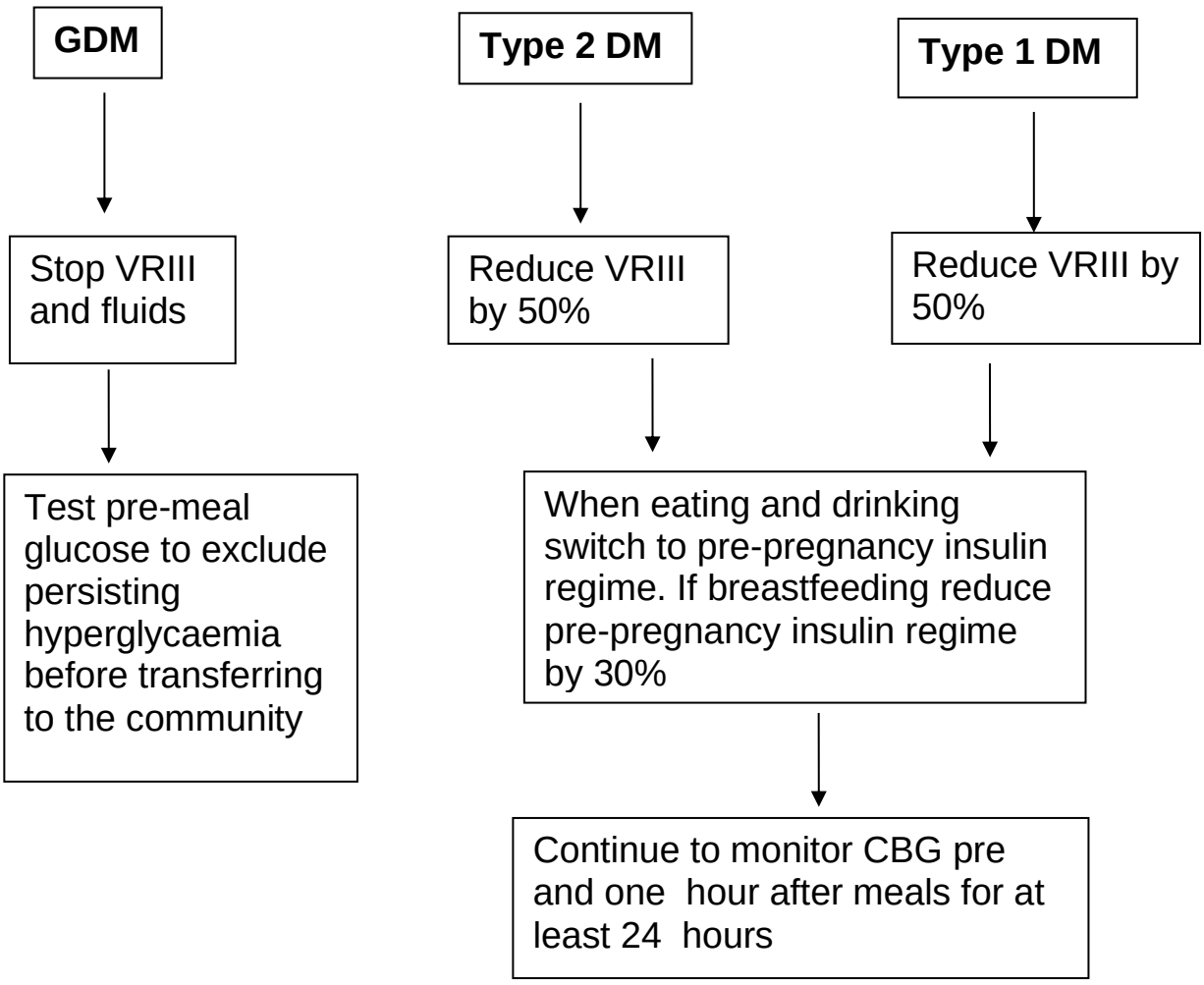
Maintain IV insulin infusion for 30 minutes after re-starting original insulin regime – IV insulin has a 5 minute half-life

Appendix 2: Glycaemic management in labour and post delivery

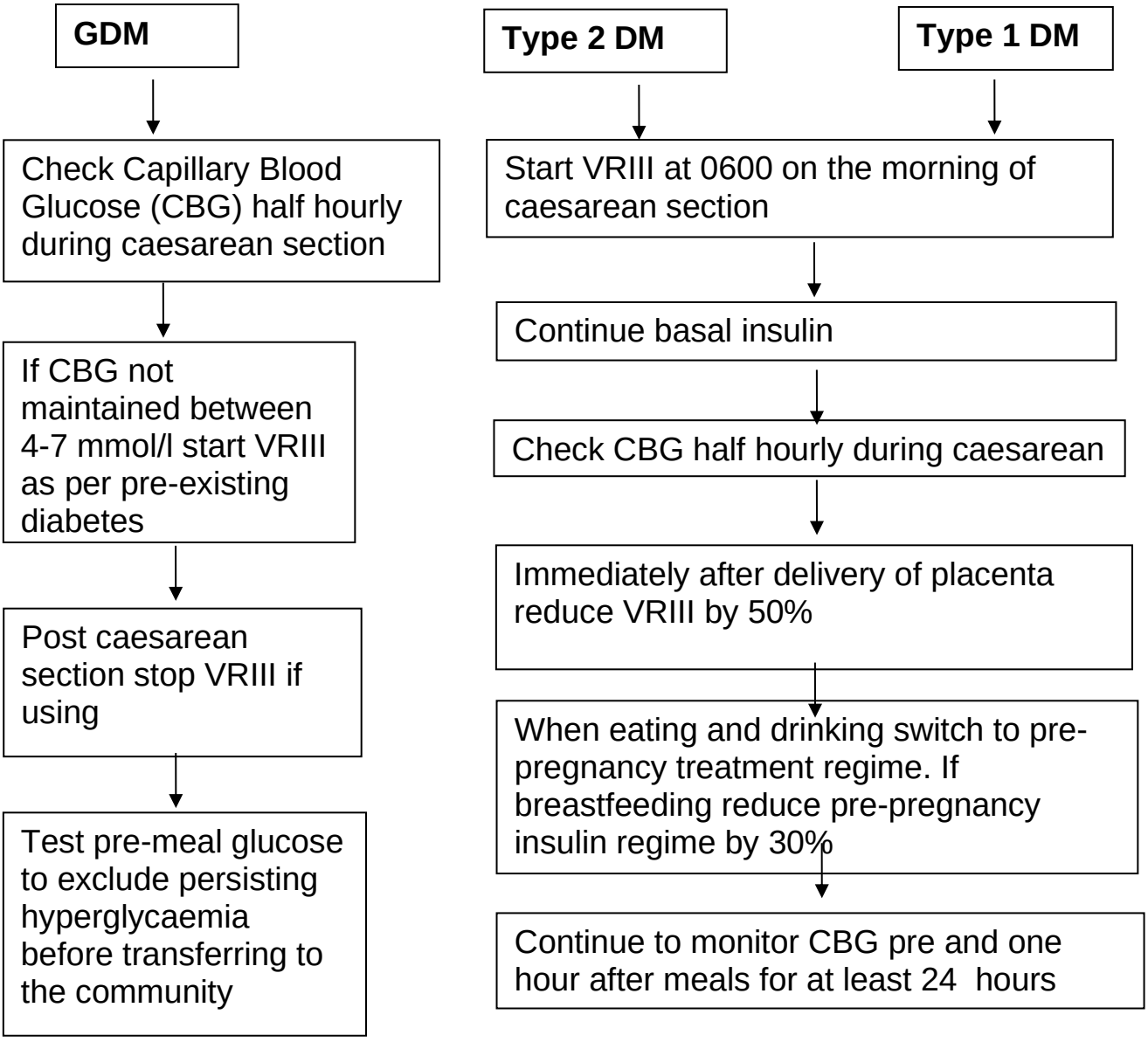
See training video:
[VRIII PowerPlan for Maternity - YouTube]



Immediately after delivery of placenta



Elective Caesarean Section



Appendix 2 Intravenous Insulin Prescription and Fluid Protocol
FOR PREGNANCY AND LABOUR ONLY

For use during pregnancy and labour for ALL patients receiving Variable Rate Intravenous Insulin Infusion (VRII)
NEVER use an IV syringe to draw up insulin
ALWAYS draw up insulin using an insulin syringe
ALWAYS continue subcutaneous intermediate* or basal insulin** *
*Intermediate: Insulatard, Humulin I, Insuman basal
**Basal: Lantus and Toujeo (Glargine), Levemir (Determir)
Doctor: All prescriptions for insulin and fluids must be signed
Nurse: All entries must be signed

Ward	Consultant	Admission Date:
		Discharge Date:
Surname		First Name
Hospital Number		Date of Birth / Age
NHS Number		
Address		

	DOSING ALGORITHM (Please see the guide below)		
Algorithm >	**1**	**2**	**3**
	For most women	For women not controlled on algorithm 1 or needing >80 units/day of insulin	For women not controlled on algorithm 2 (after specialist advice)
CBG Levels (mmol/L)	Infusion Rate (units/hr = ml/hr)		
<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
Signed			
Print Name			
Date			

ALGORITHM GUIDE

- **ALL** women with diabetes should have Capillary Blood Glucose (CBG) testing hourly in established labour and at least once on admission for induction of labour or elective C-section
- Start VRIII and Fluids if CBG > target (see below) or at the start of established labour if the woman has type 1 diabetes

Algorithm 1 Most women will start here
Algorithm 2 Use this algorithm for women who are likely to require more insulin (on steroids; on >80 units of insulin during pregnancy; or those not achieving target on algorithm 1)
Algorithm 3 Use this for women who are not achieving target on algorithm 2 (No patient starts here without diabetes or medical review)

If the woman is not achieving targets with these algorithms, contact the diabetes team (out of hours: Medical SpR on call)

Target CBG level = 4 – 7 mmol/L

Check CBG every hour whilst on VRIII and every half an hour if under anaesthesia

Move to the higher algorithm
If the CBG is > target and is not dropping

Move to the lower algorithm
If CBG falls below 4 mmol/L or is dropping too fast

Drug (approved name) Please tick	Dose	Volume	Route	Prescriber's Signature	Prescriber Print name	Date	SYRINGE PREPARATION: Prepared and administered by	Date	Time started	Time stopped
Human Actrapid ☐ Humulin S ☐	50 units	Made up to 50ml with NaCl 0.9% (1 unit per ml)	IV							

INTRAVENOUS SUBSTRATE FLUID PRESCRIPTION

Date	Intravenous Fluid and Rate	Alternative Rate	Prescriber's Signature	Nurse' Signature
	500 ml 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L (0.15%) at 50 ml/hr			
	500 ml 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L(0.15%) at 50 ml/hr			

PRESCRIPTION OF INTRAVENOUS MANAGEMENT OF HYPOGLYCAEMIA

Date	Time	Preparation	Volume	Route	Duration	Prescriber's signature	Print name	Given by:	Time given:
		20% Dextrose	**100ml**	**IV**	**15 min**				

CAPILLARY BLOOD GLUCOSE MONITORING

Date	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00
CBG												
Insulin rate												
Blood ketones												
Initials												
Date	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24:00
CBG												
Insulin rate												
Blood ketones												
Initials												

GESTATIONAL DIABETES:
STOP VRIII and IV Substrate Fluid regime once placenta is delivered

TYPE 1 DM and INSULIN TREATED TYPE 2 DM
Reduce the rate of VRIII by HALF once placenta is delivered.
Contact diabetes team to review on-going insulin requirements

Patients with type 1 DM on insulin pumps should be referred to the Diabetes Specialist Team

Maintain IV insulin infusion for 30 minutes after re-starting original insulin regime – IV insulin has a 5 minute half-life

Appendix 3: Treatment recommendations for gestational diabetes

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

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

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

On diagnosis of GDM:

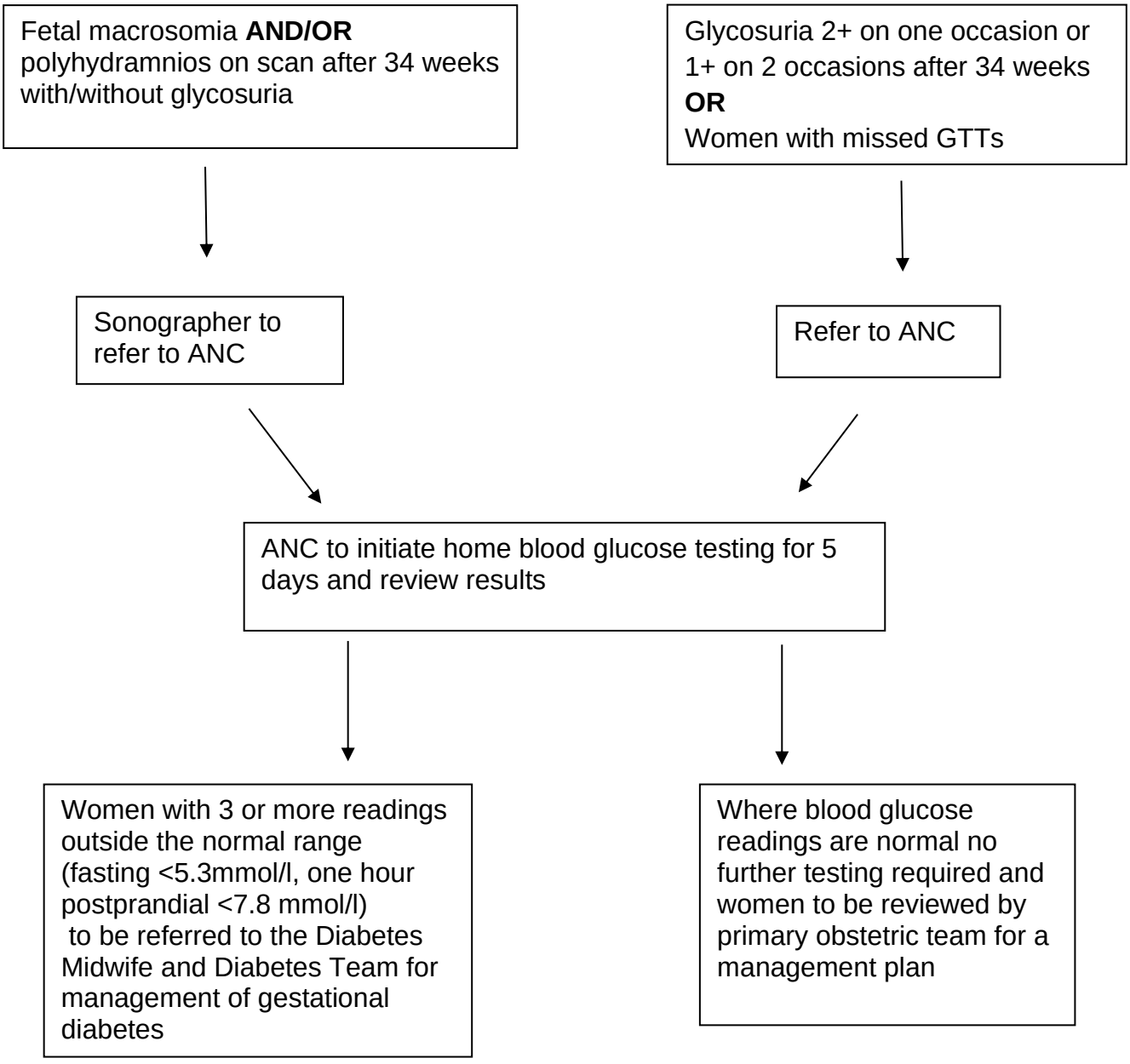
- Women to start monitoring blood glucose and liaise with the Diabetes Midwife within 1 week either by telephone or email with blood glucose readings
- Give immediate dietary advice, and offer next available dietitian appointment
- If near-normal glycaemic control is not achieved during a period of 1-2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

Appendix 4: Management of Women with Polyhydramnios and/or accelerated growth at 36 weeks

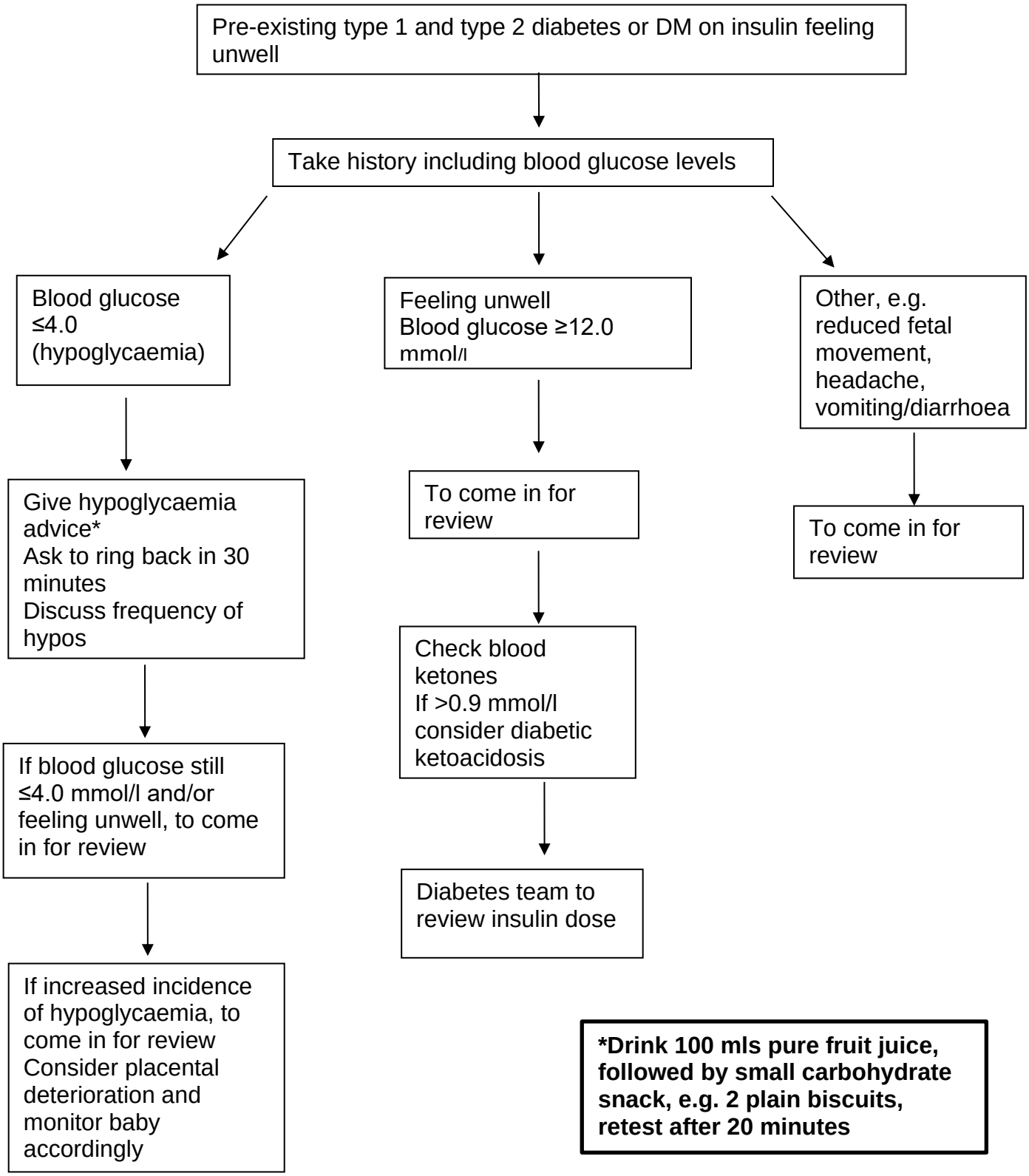
Macrosomia is defined as Estimated Fetal Weight (EFW) more than 90th centile. Oral Glucose Tolerance Test (OGTT) is not a validated test for third trimester. 5-10 days of Home Blood Glucose Monitoring (HBGM) is a better alternative as gives a wider picture of glycemic control. This is evidence level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

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

PATHWAY FOR MANAGEMENT OF ACCELERATED FETAL GROWTH AND/OR POLYHYDRAMNIOS ON SCAN, GLYCOSURIA AND MISSED OGTT AFTER 36 WEEKS



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



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

Appendix 6: Diabetes in pregnancy pathway for GP's and community Midwives

DIABETES IN PREGNANCY PATHWAY – INFORMATION FOR COMMUNITY MIDWIVES, GPs and PRACTICE NURSES

Jan Liddie – Diabetes Lead Midwife, Louise Allnatt - Diabetes Midwife
Tel 01908 995237
Email DiabetesMidwife@mkuh.nhs.uk
Diabetes Specialist Nurse
Email TDSNT@mkuh.nhs.uk

WOMEN WITH PRE-EXISTING TYPE 1 OR 2 DIABETES – PRECONCEPTION AND WHEN PREGNANCY CONFIRMED

- Preconception: give health promotion advice **at every contact** re contraception, weight loss and smoking cessation as appropriate
- Optimise blood glucose control, aiming for HbA1C less than 48 mmol/mol. Advise against pregnancy if HbA1C is above 86 mmol/mol
- Prescribe folic acid 5mg from preconception to 12 weeks pregnant
- Check safety of current medication:- metformin is suitable for use in pregnancy, all other oral blood glucose-lowering agents should be discontinued before pregnancy and metformin and/or insulin substituted; statins, angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists should be discontinued before conception or as soon as pregnancy confirmed and antihypertensive agents suitable for pregnancy substituted
- Arrange for retinal screening if not undertaken in the preceding 3 months
- Immediate telephone or email referral to Diabetes Midwife (see contact details above) or Diabetes Specialist Nurse (see contact details above) by GP/Practice Nurse/CMW **as soon as pregnancy is reported**
- Request bloods for renal function, HbA1C, thyroid function and microalbuminuria
- The community midwives will complete an antenatal booking risk assessment at the first appointment

WOMEN WHO HAVE HAD GESTATIONAL DIABETES IN A PREVIOUS PREGNANCY

- Do HbA1c and arrange OGTT as soon as possible after booking
- The result of the OGTT will be followed up by the Diabetes Midwife
- Copy antenatal booking risk assessment form to Diabetes Midwife who will organise repeat OGTT if required at 26 weeks

SCREENING PROGRAMME FOR GESTATIONAL DIABETES

Women with the following risk factors to be identified by community midwife when completing antenatal booking risk assessment:

- BMI 30 and above
- Previous macrosomic baby **4.5kg** and above
- Family history of diabetes in **first-degree relative**, ie parent, sibling, child
- Minority ethnic family origin with a high prevalence of diabetes
- Age 40+ at booking
- PCOS (polycystic ovarian syndrome)

- Previous gastric surgery (do not do OGTT, discuss with maternal medicine consultant)
- On anti-psychotic medication
- Cystic fibrosis

Discuss increased risk of GDM with reference to their specific risk factor. Discuss Weight Management in Pregnancy leaflet re lifestyle changes (available on the intranet) .

Do random blood glucose (venous) to exclude pre-existing diabetes

- If <7.8 mmol/l for routine OGTT in Antenatal Clinic at 26/40 (to be booked by Antenatal Clinic on receipt of referral form)
- If ≥7.8 mmol inform woman and request fasting glucose and HbA1C. Discuss results with Diabetes Midwife

Diagnostic Criteria for Gestational Diabetes (NICE 2015)

Fasting glucose 5.6 mmol/l or above
2 hour plasma glucose 7.8mmol/l or above

NB All positive OGTTs will be followed up by the Diabetes Midwife

Appendix 7: GDM Postnatal letter

Standing Way
Eaglestone
Milton Keynes
MK6 5LD
01908 660033
www.mkuh.nhs.uk

Date

Dear

Congratulations on the birth of your baby. I hope you're both well.

In order to confirm that your blood glucose has returned to normal we would advise you to have a fasting blood glucose test within the first 12 weeks after your baby is born. This test can be arranged with your own GP surgery and they will also follow up the results. If you have missed the opportunity to have this test, your GP can arrange another test called an HbA1c test (not fasting).

Since women who have gestational diabetes are at increased risk of developing gestational diabetes in future pregnancies and also type 2 diabetes later in life, we recommend that you have an annual diabetes screen and continue to maintain the healthy lifestyle changes which were recommended during pregnancy. If you become pregnant again your midwife will refer you for an early glucose test.
Please see your GP if you have any symptoms of high blood glucose (thirst, passing urine frequently, tiredness, persistent infections) in the future.
I have included my contact details below if you have any queries.

Yours sincerely

JAN LIDDIE
Diabetes Lead Midwife
01908 995237

Appendix 8: Insulin Management Plan for Pregnant Women Utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery, and post-natal period

Introduction

The goal of insulin therapy in diabetes management during pregnancy is to maintain blood glucose levels as close to normal as possible to improve the outcome of pregnancy and reduce the risk to both mother and fetus. Continuous subcutaneous insulin infusion (CSII) often referred to as pump therapy, is a physiological method for intensifying insulin therapy to achieve this level of control.

Antenatal Care

During the antenatal period obstetric care will follow established protocols for patients with diabetes. The diabetes team are responsible for CSII management including glycaemic control and addressing any educational needs regarding pump therapy and diabetes.

Anaesthetic, Obstetric and Midwifery involvement

Apart from the named individuals, anaesthetic, obstetric and midwifery staff are **NOT** permitted to alter the insulin pump regimen without the advice from the DSN or Diabetologist.
If glycaemic targets are not achieved or there are ++ urinary ketones or >0.9 blood ketones anaesthetist, obstetric or midwifery staff must contact a DSN or a Diabetologist for further advice.
If staff are unable to contact the diabetes team for advice, and there is evidence of glycaemic deterioration or ketosis, CSII treatment must be discontinued and intravenous insulin and dextrose commenced according to established protocols.

Inpatient admission- Use of CSII

Pump therapy may continue providing the patient or partner is able to self-manage the pump and perform the required blood monitoring.

Contacts

Diabetes Nurse Specialist - Ext 86056, bleep 1198
Diabetologist- Dr Chandran, bleep 1062

Steroid administration

Inpatient use of steroids during pregnancy

- CSII may continue, the Diabetologist or DSN will instruct the patient regarding any change in the pump settings
- Patients will be responsible for the management of the pump and blood testing
- Patients will be required to test their blood glucose levels 2-hourly
- Levels of 4.0 - 7.0 mmol/L should be aimed for

If glycaemic targets are not achieved Midwifery or Obstetric staff should contact a DSN or Diabetologist (Dr Chandran)

Use of steroids – Pre-Labour

- When the first dose of steroids is administered increase the temporary basal rate to 150%
- Aim for blood glucose values of 4.0-7.0 mmol/L
- Check for ketones if blood glucose level is >10mmol/L
- The temporary basal rate can be used to further increase or decrease the new basal rate as required in increments of 10-20%
- Blood glucose levels should be measured 2-hourly

- The patient can administer correction bolus doses at 1.5 - 2-hour intervals. As a starting point use the usual correction ratio (ISF) but consider that in some cases this ratio may need to be increased, particularly after the administration of the second dose of steroids
- Following the second dose of steroids increase the temporary basal rate to 150%
- If glycaemic targets are not achieved and or ketones are present, then discontinue CSII and convert to IV insulin

Labour and Delivery

- Patients suitability for self-managing CSII during labour, delivery and surgery under spinal anaesthetic is the decision of the Diabetes team and documented in the patient's records.
- The Diabetes team will discuss with the patient situations where CSII treatment may need to be discontinued and traditional management instigated

Position of cannula for labour or surgery

- Patient will be advised regarding the need to position their insulin pump cannula in the upper abdominal/lateral areas, loin regions or upper thighs
- The patient or their partner will be responsible for any repositioning of the cannula

Hypoglycaemia during labour, delivery, or periods of Nil by Mouth

- During periods of fasting, prior to surgery under a spinal anaesthetic or during labour, patients are permitted to use Dextrose tablets for correction of hypoglycaemia

Labour and Delivery

- The pump should continue to be used during labour and delivery
- The patient and her partner will be responsible for the management of the pump
- Prior to the intrapartum period the DSN or Diabetologist will instruct the patient regarding the proposed pump settings and other management issues required for labour and delivery
- Blood glucose levels should be performed every 2 hours by patient or partner
- Monitoring from a CGM or libre device can be used if the patient is not on IV insulin
- Blood glucose levels of 4.0 – 7.0 mmol/L should be aimed for
- All urine samples must be checked for ketones and patients should have access to a blood ketone meter

Situations which will require CSII/Pump therapy to be discontinued will include:

- Patient choice
- Failure to achieve glycaemic targets
- Ketones present (++ urinary or >0.9 mmol/L in blood)
- Need for a general anaesthetic
- Pump Failure

Stages of labour

Until established labour

- Continue usual basal rate and carbohydrate to insulin ratio

Established labour (4-10cm dilated)

- Aim for blood glucose levels of 4-7mmol/L
- Check blood glucose levels 1-2 hourly
- Reduce basal rate by 20%
- Thereafter increase or decrease in 10% increments by using temporary basal rate

Second stage Labour (Fully dilated)

- Decrease basal rate by further 20-30%
- Boluses- in established labour reduce insulin to carbohydrate ratio by 30%
- **Avoid extended boluses**
- If calculated bolus dose >2.5 units, split the dose- administer one half immediately before eating and the other half after finishing food
- Correction bolus may be given 1.5 – 2-hourly with a ratio of approximately 1 unit: 2.5mmol/L
- If glycaemic targets are not achieved and, or ketones present, or pump ineffective discontinue CSII and convert to IV insulin as per established protocol
- If labour prolonged may need IV fluids given as per non-diabetic patient. 5% dextrose is acceptable if indicated
- Check blood ketones (on patient's own meter) if unwell or if glucose levels >10 mmol/L

Surgical intervention

- Emergency surgery- Continue on the basal rate which has been used during labour
- Surgery requiring general anaesthetic, CSII to discontinue and IV insulin commenced

Planned Surgery (Caesarean section)

- **Reposition cannula to top of thigh to avoid interference with the incisional site**
- Decrease basal rate by 10% once nil by mouth
- Decrease basal rate by a further 20% prior to spinal or epidural procedure
- If necessary, reduce by a further 10-20% before entering the theatre
- Take glucose and ketone meter into the anaesthetic room and theatre

Post Delivery/Caesarean section

- Switch to pre-programmed basal rate at 50% of pre-labour rate
- Insulin to carbohydrate ratio will need to be returned to pre-pregnancy ratios
- Correction bolus (ISF) will also need to be returned to pre-pregnancy ratio (If unknown set to 1: 2.5mmol/L)
- The patient should continue with CSII providing they are able to self-care
- The DSN or diabetologist will advise the patient regarding the appropriate insulin doses for their pump

Following the use of Intravenous Insulin

- Once the patient is well enough to manage the pump, CSII can be restarted utilising the settings as detailed above in the post-delivery/caesarean section guidelines
- **When the patient converts from IV insulin onto the CSII, the insulin pump and IV insulin must run in tandem for 1 hour before the intravenous infusion is discontinued**

Breast feeding

- Breast feeding requires a further basal reduction
- The pre-delivery basal rate should be reduced to 70% (-30%)
- Women will need an extra 59 grams of carbohydrate per day
- Some women will need to consume carbohydrate whilst breastfeeding to prevent hypoglycaemia, use a reduced insulin to carbohydrate ratio

Conversion from CSII onto a basal/bolus insulin

Take the average 24-hour insulin requirement and add on 20%, then divide into 4 equal parts

Example:

- Average 24-hour insulin total= 40 units
- Add on 20% = 48 units
- Try 12/12/12 unit's rapid analogue insulin (Bolus) and 12 units long acting background insulin (Basal)
- Adjust as needed depending on CBG's.

Patient checklist prior to admission

- Decide site for cannula- Bring spare cannulas, lines, syringes, and a vial of insulin (can be stored in fridge on the ward)
- Blood testing meter strips and Lancets
- Ketone meter and strips
- Bringing your diary may be useful
- New set of batteries and battery cap for pump
- Dextrose tablets to treat hypoglycaemia
- Copy of CSII protocol
- Insulin pens (both short and long acting) and needles, in case you wish to convert to basal bolus
- Pump case/waist band (what you secure your pump with normally, remember your body will be a slightly different shape and you may want to rethink your pump placement post delivery
- Have a profile programmed for post-delivery with pre-pregnancy rates

Your partner will need to be taught the following prior to admission:

- How to work temporary basal rates
- How to deliver a bolus
- How to change basal rate if required
- How to perform blood glucose monitoring including ketone testing using separate meter
- To switch profiles to pre-pregnancy rates post-delivery, breast feeding etc.

Wishing you a safe and happy delivery

Contacts

Diabetes Nurse Specialist - Ext 86056, bleep 1198
Diabetologist- Dr Chandran, bleep 1062

Appendix 9: Request for Retinal Screening During Pregnancy

Affix patient sticker or details here

Request for retinal screening during pregnancy

On receipt of this referral the Diabetic Eye Screening Programme will offer the patient digital photography to national standards at the following intervals –

- During 1st trimester – i.e. within first 12 weeks of pregnancy or as soon as pregnancy confirmed (appointment within 6 weeks of referral receipt)
- If background diabetic retinopathy is found to be present at the 1st screen, an additional screen will be offered at 16-20 weeks of pregnancy.
- at 28 weeks of pregnancy

If referable disease is found at any of the above the patient will be referred urgently to Hospital Eye Services

If at 28 weeks the patient has no or non-referable retinopathy the patient will be returned to annual screening

1. Date of referral ___ / ___ / ___
2. The best contact number for the patient is_____
3. You may leave a message with anyone else ***Yes*** ***No*** (Please indicate)
4. Estimated date of delivery is _____/_____/_____
5. She has ***Type 1 / Type 2 / Type uncertain*** Diabetes (Please indicate)
6. Please send results to XXXXXX

Print name and sign here please: _____

Please scan and email referral form via an NHS.net account to: mkg-tr.Bucks-DESP@nhs.net