

## Diabetes in Pregnancy

<b>Classification:</b>	Guideline		
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<b>Departments/Group this Document applies to:</b>	Maternity Pregnant service users with diabetes		
<b>Approval Group:</b> Maternity guidelines review group Women's Health CIG	<b>Date of Approval:</b>	01/10/2020	
	<b>Last Review:</b>	01/05/2023	
	<b>Review Date:</b>	01/05/2026	
<b>Unique Identifier:</b> MIDW/GL/122	<b>Status:</b> Approved	<b>Version No:</b> 6.4	
<b>Guideline to be followed by (target staff):</b> All staff caring for diabetic service users in pregnancy			
<b>To be read in conjunction with the following documents:</b>			
<ul style="list-style-type: none"> <li>Diabetes in Pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period (NICE 2015)</li> <li>DESP 32 - Buckinghamshire Diabetic Eye Screening Programme (2019) – Pregnant Patients SOP</li> </ul>			
<b>Are there any eCARE implications? No</b>			
<b>CQC Fundamental standards:</b>			
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

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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 .....	4
Executive Summary .....	4
1.0 Roles and Responsibilities:.....	4
2.0 Implementation and dissemination of document .....	4
3.0 Processes and procedures .....	5
3.1 Abbreviations .....	5
3.2 Background.....	5
3.3 Gestational Diabetes.....	5
3.3.1 Screening for Gestational Diabetes .....	6
3.3.2 Service users with previous Gestational Diabetes .....	6
3.3.3 Service users with risk factors for Gestational Diabetes .....	6
3.3.4 Diagnosis of gestational diabetes .....	7
3.3.5 Management of gestational diabetes .....	7
3.4 Pre-Existing Type 1 and 2 Diabetes Mellitus .....	9
3.4.1 Antenatal care for service users with Pre-Existing Diabetes (Types 1 & 2) and service users who develop gestational diabetes .....	10
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) .....	15
3.4.3 Intrapartum Care .....	15
3.4.4 Elective Caesarean Section - See Appendix 2 .....	16
3.4.5 Neonatal care .....	17
3.4.6 Postnatal care (See Appendix 2).....	18
3.4.7 Care for service users with Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period .....	20
4.0 Statement of evidence/references .....	20
References: .....	20
5.0 Governance .....	21
5.1 Document review history .....	21
5.2 Consultation History .....	22
5.3 Audit and monitoring .....	22
5.4 Equality Impact Assessment .....	23
Appendix 2: Glycaemic management in labour and post delivery .....	27
Appendix 3: Treatment recommendations for gestational diabetes .....	31
Appendix 4: Pathway for management of accelerated fetal growth and/or polyhydramnios on scan, glycosuria and missed OGTT after 36 weeks .....	32
Appendix 5: Pathway for Service users with insulin-treated diabetes telephoning ADAU/Labour Ward .....	33
Appendix 6: Diabetes in pregnancy pathway for GP's and community Midwives .	34

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Appendix 7: Insulin Management Plan for Pregnant Service users Utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery, and post-natal period.....	36
Appendix 8: Consultant letter to GP on diagnosis of gestational diabetes.....	40
Appendix 9: Request for Retinal Screening During Pregnancy .....	41

## 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 service users 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 service users 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 service user and to the developing fetus
- While service users 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 service users 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 service users with diabetes in pregnancy are recommended and offered care including input from 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 Specialist Midwives (DSM) –antenatal, intrapartum and postnatal advice and support for service users and staff.
- Diabetes Specialist Nurses (DSNs) and Midwives – preconception, antenatal, intrapartum and postnatal advice and support with management of diabetes for service users and staff
- Dietician – dietary advice and support
- Retinal screening - retinal screening for service users with pre-existing diabetes

The service users are also cared for by:

- Midwives
- Nursery nurses and maternity care assistants

### 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
DSM	Diabetes Specialist 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 service user and to the developing fetus. Miscarriage, pre-eclampsia and preterm labour are more common in service users 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 service users 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  $\geq 30$
- Previous macrosomic baby ( $\geq 4.5$  kg)
- Family history of diabetes (1<sup>st</sup> 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
- Bariatric surgery (**Do not offer OGTT**, d/w maternal medicine consultant and refer to ANC for home blood glucose monitoring) (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)
- Service users on anti-psychotics: E.g., Olanzapine, Clozapine, Quetiapine. (Antipsychotics in pregnancy and breastfeeding. Royal College of Psychiatrists).

#### Additional risk factors

- Previous stillbirth
- AC > 95<sup>th</sup> centile at anomaly scan
- Acceleration in AC  $\geq 40\%$  compared to AC at anomaly scan
- Macrosomia and/or polyhydramnios  
(See Appendix 4 re action if macrosomia and/ or polyhydramnios is after 36 weeks.)

### 3.3.2 Service users 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 service users who have had gestational diabetes in a previous pregnancy:

- HbA1c at booking
- Early self-monitoring of blood glucose **or**
- A 75g 2 hour OGTT between 14-16 weeks and a further 75 g 2 hour OGTT at 24–28 weeks if the results of the first OGTT is normal. (NICE 2015)

### 3.3.3 Service users with risk factors for Gestational Diabetes

- Offer service users with any of the other risk factors for gestational diabetes, a 75 g 2 -hour OGTT at 24–28 weeks. (NICE 2015)
- For service users 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 service user 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)
- If HbA1c is used diagnosis should be made using the criteria defined by RCOG during the COVID-19 pandemic (RCOG 2020):
  1. HbA1c 41-47mmol/mol (5.9-6.5%) BEFORE 28 weeks
  2. HbA1c 39mmol/mol (5.7%) or above AT 28 weeks and above
  3. HbA1c 48mmol/mol (6.5%) or above should be managed as having type 2 diabetes
- NICE 2015 guideline recommends offering service users 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 service user is diagnosed with gestational diabetes (NICE 2015)

### 3.3.5 Management of gestational diabetes

On confirmation of diagnosis the following should be recommended and explained to service users:

- Referral to Diabetes Midwife for home blood glucose monitoring. (NICE 2015)
- Provision of patient information leaflet Gestational Diabetes Mellitus.
- Explain to service users 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 service users with gestational diabetes as for service users with pre-existing diabetes. (NICE 2015)
- Advise pregnant service users 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**

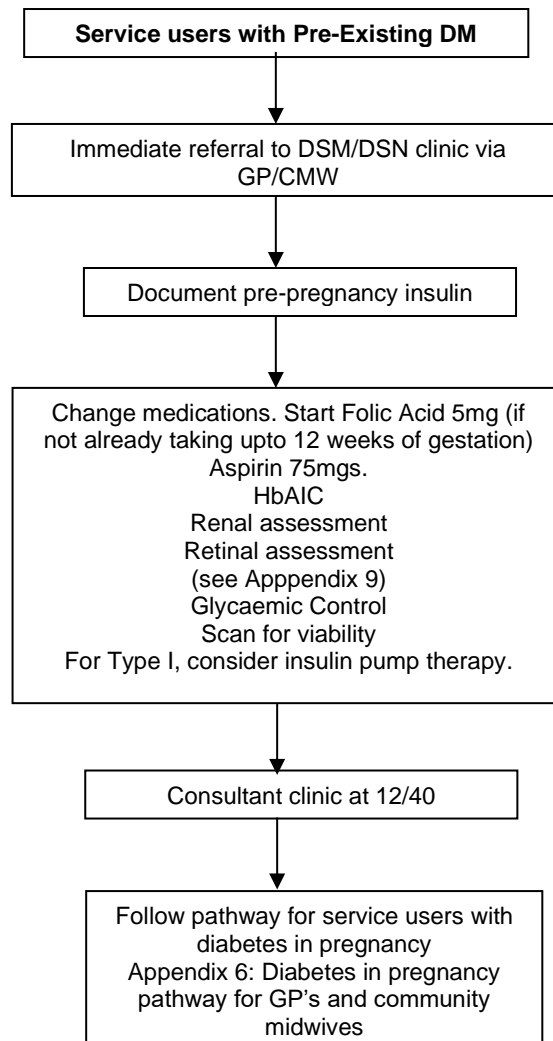
- 2 hours after meals: 6.4 mmol/litre. (NICE 2015)
  
- Test urgently for ketonaemia if a pregnant service user with any form of diabetes presents with hyperglycaemia or is unwell, to exclude diabetic ketoacidosis. [new 2015]
- Tailor blood glucose lowering therapy to the blood glucose profile and personal preferences of the service user with gestational diabetes. (NICE 2015)
- Offer service users advice about changes in diet and exercise at the time of diagnosis of gestational diabetes. (NICE 2015)
- Advise service users 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)
- Recommend and offer referral for all service users with gestational diabetes to a dietitian. (NICE 2015)
- Advise service users 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 service users with gestational diabetes who have a fasting plasma glucose level below 7 mmol/litre at diagnosis. (NICE 2015)
- Offer metformin to service users 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 service users with gestational diabetes if metformin is contraindicated or unacceptable to the service user. (NICE 2015)
- Offer addition of insulin to the treatments of changes in diet, exercise and metformin for service users 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 service users 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 service users 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 service users 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 Specialist 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 service users with pre-existing diabetes. Service users should still receive routine care with community midwife as appropriate in between consultant appointments.

### 3.4 Pre-Existing Type 1 and 2 Diabetes Mellitus

#### Initial pathway for service users with pre-existing Type 1 & 2 diabetes mellitus



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

#### **Monitoring blood glucose**

Advise pregnant service users with type 1 diabetes to test their fasting, premeal, 1 hour post meal and bedtime blood glucose levels daily during pregnancy. (NICE 2015)

Advise pregnant service users 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 service users 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 service users with diabetes in pregnancy, taking into account the risk of hypoglycaemia. (NICE 2008)

Advise pregnant service users 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 service users 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**

Advise measurement of HbA1c levels in all pregnant service users with preexisting diabetes at the booking appointment to determine the level of risk for the pregnancy. (NICE 2015)

Recommend measuring HbA1c levels in the second and third trimesters of pregnancy for service users 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 service users with pre-existing diabetes increases with an HbA1c level above 48 mmol/mol (6.5%). (NICE 2015)

Measure HbA1c levels in all service users 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 service user'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 service users 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 service users 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 service users with type 1 diabetes for use if needed. Instruct the service user and their partner or other family members in its use. **(2008, amended 2015)**

Offer service users 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 service users with diabetes. (NICE 2015)

Consider continuous glucose monitoring for pregnant service users 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 service users 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 service users 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 service users 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 service user with any form of diabetes presents with hyperglycaemia or is unwell, to exclude diabetic ketoacidosis. (NICE 2015)

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

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

#### **3.4.1.6 Retinal assessment during pregnancy**

Offer pregnant service users 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 service users who present with a high HbA1c in early pregnancy. (NICE 2008)

Ensure that service users 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 service users 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 service users 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 service users 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 service users 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 service users 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 service users 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 service users with diabetes who are pregnant. (NICE 2008)

Ensure that service users 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 service users with diabetes, in addition to the care provided routinely for healthy pregnant service users (see the NICE guideline on [antenatal care](#)). Table 1 describes how care for service users with diabetes differs from routine antenatal care. At each appointment, offer the service user ongoing opportunities for information and education. (NICE 2008, amended 2015)

**Table 1 Timetable of antenatal appointments**

Appointment	Care for service users with diabetes during pregnancy
Booking appointment (joint diabetes and antenatal care) – ideally by 10 weeks	<p>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).</p> <p>If the service user 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).</p> <p>If the service user 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.</p> <p>Offer retinal assessment for service users with pre-existing diabetes unless the service user has been assessed in the last 3 months.</p> <p>Offer renal assessment for service users with pre-existing diabetes if this has not been performed in the last 3 months.</p>

	<p>Arrange contact with the joint diabetes and antenatal clinic every 2-4 weeks throughout pregnancy for all service users with diabetes.</p> <p>Measure HbA1c levels for service users with pre-existing diabetes or previous GDM to determine the level of risk for the pregnancy.</p> <p>Confirm viability of pregnancy and gestational age at 7–9 weeks – arrange EPAU scan if necessary</p> <p>Offer self-monitoring of blood glucose or a 75g 2 hour OGTT between 14-16 weeks gestation for service users with a history of gestational diabetes who book in the first trimester.</p>
16 weeks	<p>Offer retinal assessment at 16–20 weeks to service users with pre-existing diabetes if diabetic retinopathy was present at their first antenatal clinic visit.</p> <p>Offer self-monitoring of blood glucose or a 75 g 2hour OGTT as soon as possible for service users with a history of gestational diabetes who book in the second trimester</p>
20 weeks	<p>Offer an ultrasound scan for detecting fetal structural abnormalities, including examination of the fetal heart (4 chambers, outflow tracts and 3 vessels).</p>
28 weeks	<p>Offer ultrasound monitoring of fetal growth and amniotic fluid volume.</p> <p>Offer retinal assessment to all service users with pre-existing diabetes.</p> <p>Service users diagnosed with gestational diabetes as a result of routine antenatal testing at 24–28 weeks enter the care pathway.</p>
32 weeks	<p>Offer ultrasound monitoring of fetal growth and amniotic fluid volume.</p> <p>Offer nulliparous service users all routine investigations normally scheduled for 31 weeks in routine antenatal care.</p>
34 weeks	<p>No additional or different care for service users with diabetes.</p>
36 weeks	<p>Offer ultrasound monitoring of fetal growth and amniotic fluid volume.</p> <p>Provide information and advice about:</p> <ul style="list-style-type: none"> <li>• timing, mode and management of birth</li> <li>• analgesia and anaesthesia</li> <li>• changes to blood glucose lowering therapy during and after birth</li> <li>• care of the baby after birth</li> </ul>

	<ul style="list-style-type: none"> <li>initiation of breastfeeding and the effect of breastfeeding on blood glucose control</li> <li>contraception and follow up.</li> </ul>
37 <sup>+0</sup> weeks to 38 <sup>+6</sup> weeks	Offer induction of labour, or caesarean section if indicated, to service users 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 service users with uncomplicated gestational diabetes to give birth no later than 40 <sup>+6</sup> weeks

Service users 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 service users) and 34 weeks, but with the exception of the appointment for nulliparous service users 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 service users 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 service users with diabetes. (NICE 2008)

- service users using insulin pump see Appendix 7: Insulin Management Plan for Pregnant Service users utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period
- Where service users are using either Continuous Glucose Management (CGM) or Flash meters:
  - blood glucose to be tested hourly (either by a review of CGM, Libre or CBG test reading)
  - If readings are <4.0mmols or >7.7mmols check capillary blood glucose (CBG) with a ward meter
  - If any concerns at any time check CBG with a ward meter

**NB: If a service user requires VRIII (Variable Rate Intravenous Insulin Infusion), they must receive care on the labour ward for the duration of the VRIII. This is to ensure that close observation can be achieved as per NICE (2008, 2015) recommendations.**

### 3.4.3 Intrapartum Care

#### Timing and mode of birth

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

Advise pregnant service users 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<sup>+0</sup> weeks and 38<sup>+6</sup> weeks of pregnancy. (NICE 2015)

Consider elective birth before 37<sup>+0</sup> weeks for service users with type 1 or type 2 diabetes if there are metabolic or any other maternal or fetal complications. (NICE 2015)

Advise service users with gestational diabetes to give birth no later than 40<sup>+6</sup> weeks, and offer elective birth (by induction of labour, or by caesarean section if indicated) to service users who have not given birth by this time. (NICE 2015)

Consider elective birth before 40<sup>+6</sup> weeks for service users 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 service users 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 service users 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 service users with diabetes, monitor blood glucose every 30 minutes from induction of general anaesthesia until after the baby is born and the service user is fully conscious. (NICE 2008)

### **Blood glucose control during labour, birth and immediately postpartum (See Appendix 2 & training video)**

**NB** Where service users are using either Continuous Glucose Management (CGM) or Flash meters:

- blood glucose to be tested hourly (either by a review of CGM, Libre or CBG test reading)
- If readings are <4.0mmols or >7.7mmols check capillary blood glucose (CBG) with a ward meter
- If any concerns at any time check CBG with a ward meter

**Remember that some service users labour and deliver rapidly and there may not be time to commence the intravenous insulin infusion – it is more important for these service users 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**



## Service users with pre-existing type 1 diabetes

- Service users 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 service user is fully conscious

## Service users with pre-existing type 2 diabetes or gestational diabetes (See Appendix 2)

**NB** Where service users are using either Continuous Glucose Management (CGM) or Flash meters:

- blood glucose to be tested hourly (either by a review of CGM, Libre or CBG test reading)
- If readings are <4.0mmols or >7.7mmols check capillary blood glucose (CBG) with a ward meter
- If any concerns at any time check CBG with a ward meter

### 3.4.5 Neonatal care

#### Initial assessment and criteria for admission to intensive or special care

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

Babies of service users 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)

Discuss with the parents and recommend routine blood glucose testing in babies of service users 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)

Discuss with the parents and recommend an echocardiogram for babies of service users 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 service users 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 service users 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 service users with diabetes. (NICE 2008)

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

Service users 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 service users 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**

Service users 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 service users 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)

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

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

Service users 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

#### Service users with pre-existing diabetes

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

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

#### Service users diagnosed with gestational diabetes

Test pre-meal blood glucose for up to 24 hours in service users who were diagnosed with gestational diabetes to exclude persisting hyperglycaemia (target <7.0mmol/l) before they are transferred to community care. (NICE 2008) (see Appendix 2)

Remind service users who were diagnosed with gestational diabetes of the symptoms of hyperglycaemia. (NICE 2008).

Explain to service users who were diagnosed with gestational diabetes about the risks of gestational diabetes in future pregnancies and offer them testing for diabetes<sup>[7]</sup> when planning future pregnancies. (NICE 2008), amended 2015)

For service users 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 service users having a fasting plasma glucose test as the postnatal test:

- Advise service users 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 service users 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 service users 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 service users having an HbA1c test as the postnatal test:

- Advise service users 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<sup>[8]</sup>.
- Advise service users 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<sup>[8]</sup>.
- Advise service users 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 service users who were diagnosed with gestational diabetes who have a negative postnatal test for diabetes. (NICE 2015)

Offer service users 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 service users with Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period**

See Insulin Management Plan for Pregnant Service users utilising Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour, delivery and postnatal period (Appendix 7).

NB Where service users 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](http://www.diabetologists-abcd.org.uk/JBDS/JBDS_Pregnancy_final_18082017.pdf)

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Joint British Diabetes Societies for Inpatient Care (2022) Managing diabetes and hyperglycaemia during labour and birth

[https://JBDS\\_12\\_Managing\\_diabetes\\_hyperglycaemia\\_during\\_labour\\_birth\\_April\\_2022.pdf](https://JBDS_12_Managing_diabetes_hyperglycaemia_during_labour_birth_April_2022.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>

RCOG (2020) Guidance for maternal medicine services in the coronavirus (COVID-19) pandemic: Information or healthcare professionals

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
6.2	04/2022	Jan Liddie Louise Allnatt Shanti Chandran Cornelia Libal Mohini Pankhania	Partial review and update  Powerplan update on ECARE
6.3	05/2023	Louise Allnatt Jan Liddie Anja Johansen-Bibby Faryal Nizami Ghaly Hanna Alex Godfrey Charlotte Auker	Updated GDM screening criteria, flowcharts in appendices improved
6.4	10/2023	Maternity Review group Chairman's action	Ensured that VRIII is to be completed only on labour ward is clear within the guideline.

## 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
Louise Allnatt & Jan Liddie	Diabetes Specialist Midwives	10/05/2022		Incorporated, made changes to the text/wording, amended the appendices to reflect the new 2022 JBDS guidance	
Melissa Davis	Head of Midwifery	11/05/2022		Suggested wording changes to support informed decision making and choice.	
Dr Joyce Elliot	Obstetric consultant	06/12/2022		No comment	
Louise Allnatt Jan Liddie  Anja Johansen-Bibby Faryal Nizami Ghaly Hanna Alex Godfrey  Charlotte Auker	Diabetes Specialist Midwives Consultant obstetricians  Superintendent sonographer ANC lead midwife	15/03/2023		Updated GDM screening criteria, flowcharts in appendices improved	
Dr Indranil Misra	Paediatric consultant	29/03/2023	30/03/2023	No comments to add	

## 5.3 Audit and monitoring

Audit/Monitoring Criteria	Tool	Audit Lead	Frequency of Audit	Responsible Committee/Board
a ) Numbers of service users who develop GDM, their related risk factors and birth outcomes  b) Numbers of service users with pre-existing	a-c) Audit/statistics	a-c) Diabetes Specialist midwives  a-c) Lead obstetrician for diabetes/DSNs	Annual	a-c) Diabetes Specialist midwives/DSNs a-c) Lead obstetrician for diabetes

diabetes and birth outcomes	NICE Baseline Assessment (April 2022)			
c) Adherence to the above guideline for all service users with pre-existing diabetes and gestational 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?		<i>All staff providing care for service users in pregnancy with diabetes</i>	
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?			

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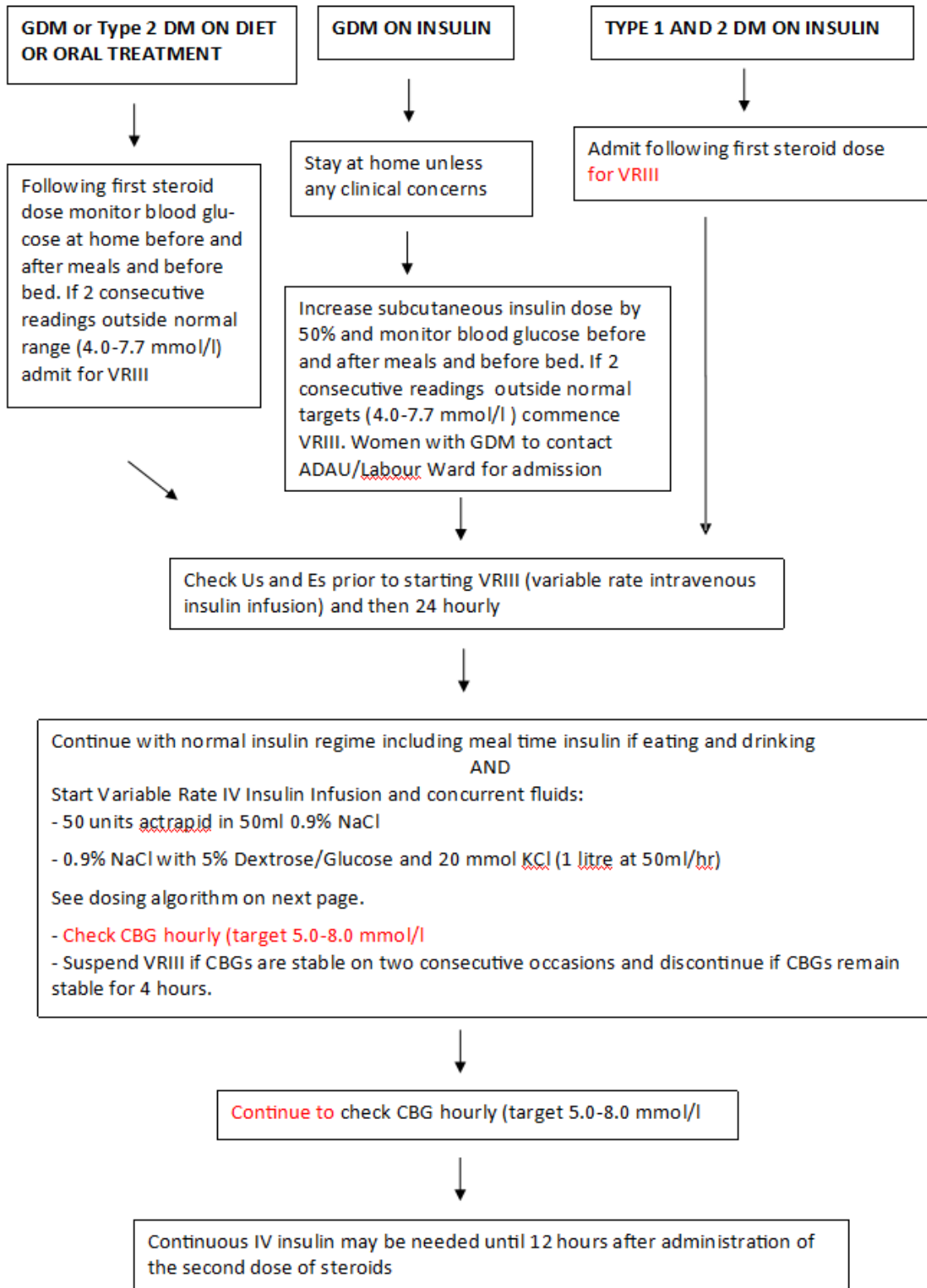
<i>Circulation via email and MS Teams. Discussed at the guidelines meeting and women's health CIG</i>			
How are the changes/amendments to the policies/services communicated?			
<i>Circulation via email and MS Teams. Discussed at the guidelines meeting and women's health CIG</i>			
What future actions 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

<https://www.youtube.com/watch?v=Pg6YG9ranQE>



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**For service users using Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy, labour and post delivery see Appendix 7**



Local Trust Logo

**Intravenous Insulin Prescription and Fluid Protocol  
FOR MANAGEMENT OF STEROID HYPERGLYCAEMIA DURING  
PREGNANCY (liberal targets)**

<p>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</p>					Ward	Consultant	Admission Date:			
							Discharge Date:			
					Surname		First Name			
					Hospital Number		Date of Birth / Age			
NHS Number										
Address										
<b>DOSING ALGORITHM</b> (Please see the guide below)										
Algorithm →	1	2	3	4						
Finger prick BG Levels (mmol/L) ↓	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)	Customised Scale						
	Infusion Rate (units/h = mL/h)									
<5	STOP INSULIN FOR 20 MINUTES Treat hypo as per guideline (re-check BG in 10 minutes)									
5.0 – 5.5	0.2	0.5	1.0							
5.6 – 7.0	0.5	1.0	2.0							
7.1 – 8.5	1.0	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										
<b>ALGORITHM GUIDE</b>										
<ul style="list-style-type: none"> <li>Start VRIII and Fluids if two consecutive BG/CGM &gt; target and continue for up to 12 hours after the last dose of steroid</li> <li>ALL women on VRIII should have Blood Glucose (BG) testing hourly for the management of steroid hyperglycaemia during pregnancy</li> </ul> <p><b>Algorithm 1</b> Most women will start here <b>Algorithm 2</b> Use this algorithm for women who are likely to require more insulin (on steroids; on &gt;80 units of insulin during pregnancy; or those not achieving target on algorithm 1) <b>Algorithm 3</b> Use this for women who are not achieving target on algorithm 2 (No patient starts here without diabetes or medical review)</p> <p>If the woman is not achieving targets with these algorithms, contact the diabetes team (out of hours: Medical SpR on call)</p>										
Target BG level = 5.0 – 8.0 mmol/L										
Check BG every hour whilst on VRIII										
Move to the higher algorithm if the BG is > target and is not dropping										
Move to the lower algorithm if BG falls below 5.0 mmol/L or is dropping too fast										
Drug (approved name) Please tick	Dose	Volume	Route	Prescriber's Signature	Prescriber Print name	Date	<b>SYRINGE PREPARATION</b>			
Human Actrapid <input type="checkbox"/> Humulin S <input type="checkbox"/>	50 UNITS	Made up to 50mL with NaCl 0.9% (1 UNIT per mL)	IV				Prepared and administered by	Date	Time started	Time stopped
<b>INTRAVENOUS SUBSTRATE FLUID PRESCRIPTION</b>										
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%) to run at 50 mL/h									
	500 mL 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L(0.15%) to run at 50 mL/h									
<b>PRESCRIPTION OF INTRAVENOUS MANAGEMENT OF HYPOGLYCAEMIA</b>										
Date	Time	Preparation	Volume	Route	Duration	Prescriber's Signature	Print Name	Given by:	Time given	
		20% Dextrose	100 mL	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										

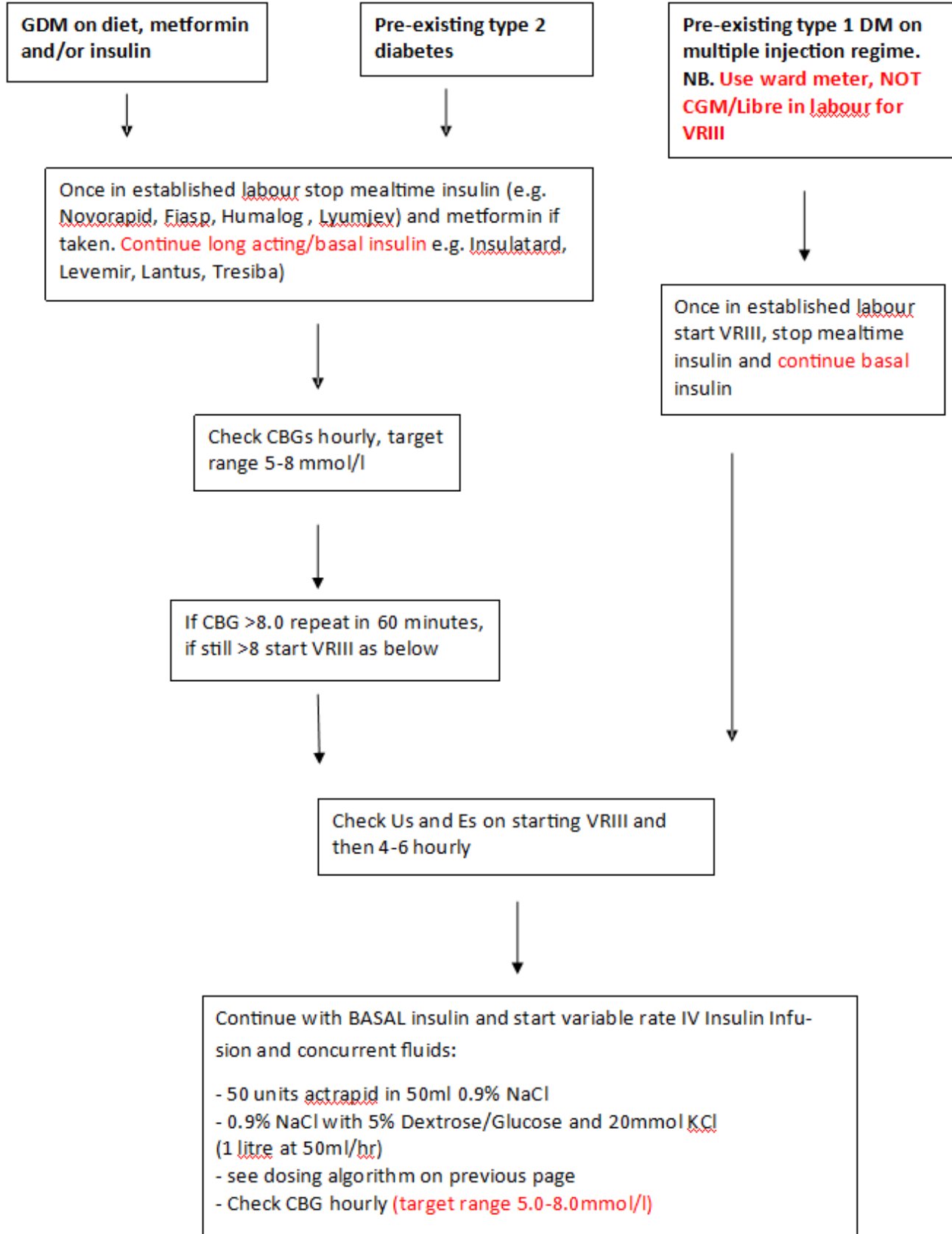
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**NB. Service users receiving VRIII must be cared for on Labour Ward.**

**Appendix 2: Glycaemic management in labour and post delivery**

See training video: VRIII PowerPlan for Maternity – YouTube

<https://www.youtube.com/watch?v=Pg6YG9ranQE>

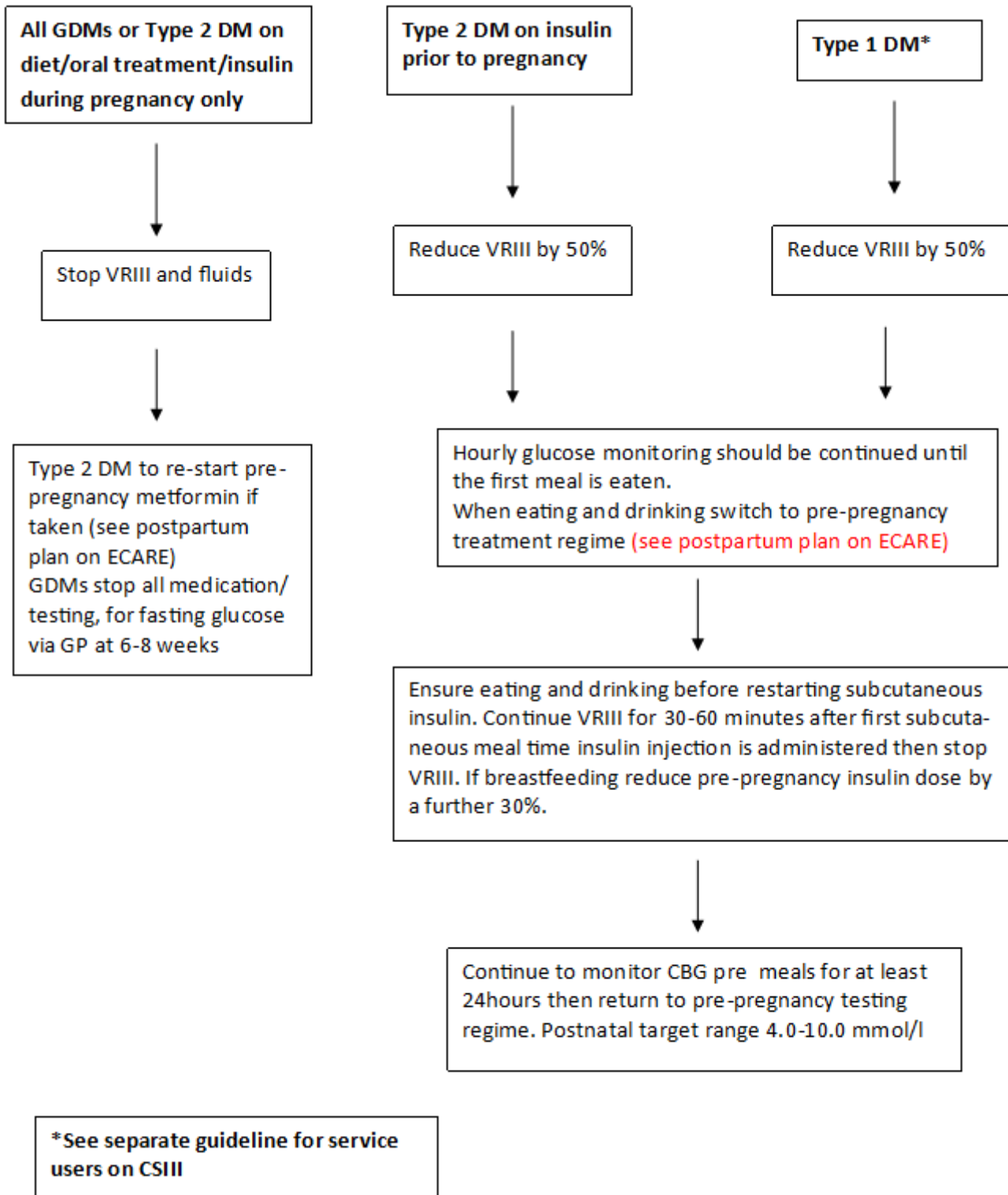


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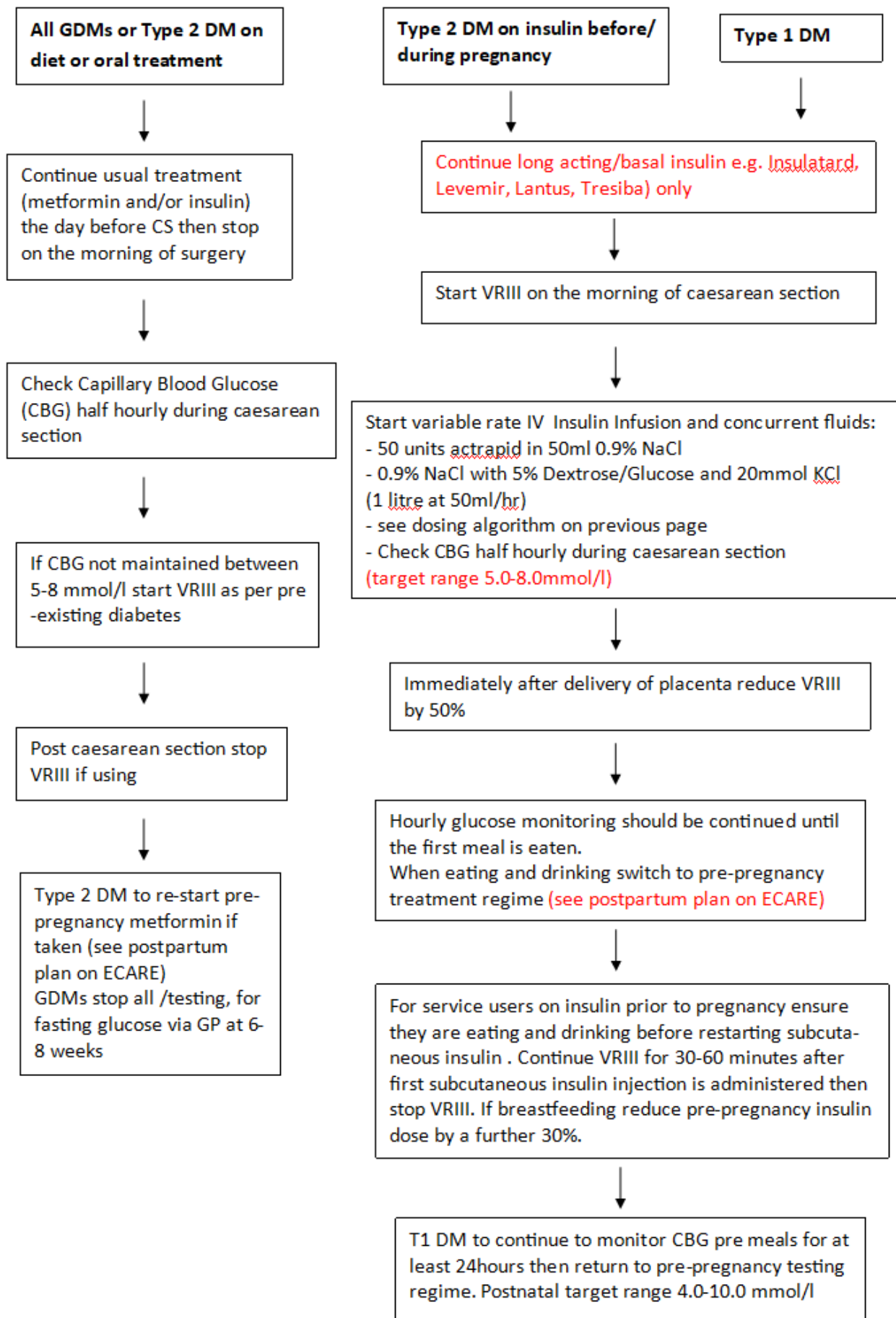
## Intravenous Insulin Prescription and Fluid Protocol FOR PREGNANCY AND LABOUR ONLY (liberal targets)

<p>For use during pregnancy and labour for ALL patients receiving Variable Rate Intravenous Insulin Infusion (VRIII)</p> <p>NEVER use an IV syringe to draw up insulin</p> <p>ALWAYS draw up insulin using an insulin syringe</p> <p>ALWAYS continue subcutaneous intermediate* or basal insulin**</p> <p>*Intermediate: Insulatard, Humulin I, Insuman basal</p> <p>**Basal: Lantus and Toujeo (Glargine), Levemir (Detemir)</p> <p>Doctor: All prescriptions for insulin and fluids must be signed</p> <p>Nurse: All entries must be signed</p>				Ward	Consultant	Admission Date:							
						Discharge Date:							
				Surname		First Name							
				Hospital Number		Date of Birth / Age							
				NHS Number									
Address													
<b>DOSING ALGORITHM</b> (Please see the guide below)				<b>ALGORITHM GUIDE</b>									
Algorithm →	1	2	3	4									
Finger prick BG Levels (mmol/L) ↓	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)	Customised Scale									
	Infusion Rate (units/h = mL/h)				<ul style="list-style-type: none"> <li>ALL women with diabetes should have Blood Glucose (BG) or intermittent or real time continuous glucose monitoring (CGM) testing hourly in established labour, after ARM or on admission for elective C-Section</li> <li>Start VRIII and Fluids if two consecutive BG/CGM &gt; target (see below)</li> </ul> <p><b>Algorithm 1</b> Most women will start here</p> <p><b>Algorithm 2</b> Use this algorithm for women who are likely to require more insulin (on steroids; on &gt;80 units of insulin during pregnancy; or those not achieving target on algorithm 1)</p> <p><b>Algorithm 3</b> Use this for women who are not achieving target on algorithm 2 (No patient starts here without diabetes or medical review)</p> <p>If the woman is not achieving targets with these algorithms, contact the diabetes team (out of hours: Medical SpR on call)</p> <p style="text-align: center;"><b>Target BG level = 5.0 – 8.0 mmol/L</b></p> <p>Check BG every hour whilst on VRIII and every half an hour if under anaesthesia</p> <p>Move to the higher algorithm if the BG is &gt; target and is not dropping</p> <p>Move to the lower algorithm if BG falls below 5.0 mmol/L or is dropping too fast</p>								
<5	STOP INSULIN FOR 20 MINUTES Treat hypo as per guideline (re-check BG in 10 minutes)												
5.0 – 5.5	0.2	0.5	1.0										
5.6 – 7.0	0.5	1.0	2.0										
7.1 – 8.5	1.0	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													
Drug (approved name) Please tick	Dose	Volume	Route	Prescriber's Signature	Prescriber Print name	Date	SYRINGE PREPARATION						
Human Actrapid <input type="checkbox"/> Humulin S <input type="checkbox"/>	50 UNITS	Made up to 50 mL with NaCl 0.9% (1 UNIT per mL)	IV				Prepared and administered by	Date	Time started	Time stopped			
<b>INTRAVENOUS SUBSTRATE FLUID PRESCRIPTION</b>													
Date	Intravenous Fluid and Rate			Alternative Rate	Prescriber's Signature	Nurse's Signature							
	500 mL 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L (0.15%) to run at 50 mL/h												
	500 mL 0.9% NaCl + 5% Dextrose with 20 mmol KCl/L(0.15%) to run at 50 mL/h												
<b>PRESCRIPTION OF INTRAVENOUS MANAGEMENT OF HYPOGLYCAEMIA</b>													
Date	Time	Preparation	Volume	Route	Duration	Prescriber's Signature	Print Name	Given by:	Time given				
		20% Dextrose	100 mL	IV	15 min								
<b>BLOOD GLUCOSE MONITORING</b>													
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	<b>GESTATIONAL DIABETES:</b> STOP VRIII and IV Substrate Fluid regime once placenta is delivered
BG													
Insulin rate													
Blood ketones													
Algorithm													<b>TYPE 1 DM and INSULIN TREATED TYPE 2 DM</b> Reduce the rate of VRIII by HALF once placenta is delivered. Contact diabetes team to review on-going insulin requirements
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	
BG													
Insulin rate													
Blood ketones													
Algorithm													
Initials													
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													

## Immediately after delivery of placenta



## Elective Caesarean Section



### Appendix 3: Treatment recommendations for gestational diabetes

Treating gestational diabetes has been shown to improve outcome for both service users 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 service users 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 service users with GDM if ultrasound suggests incipient fetal macrosomia (AD >70<sup>th</sup> centile) at diagnosis.

#### On diagnosis of GDM:

- Service users to start monitoring blood glucose and for review with the Diabetes Midwife within 1 week
- Give immediate dietary advice and offer next GDM group session with dietitian.
- If near-normal glycaemic control is not achieved during a period of 1-2 weeks or if the abdominal circumference on scan is >70<sup>th</sup> centile, consider hypoglycaemic therapy
  - Diabetes midwife may make the decision to initiate treatment and discuss with the service user 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
      - Service user to maintain contact with Diabetes Midwife until blood glucose stable, and to be reviewed in Joint Clinic/ANC 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 *A guide to starting insulin for women with Gestational Diabetes*), Novorapid™ (rapid acting) – with meals, dose as required, usually starting at 2-4units and increasing in increments of 1-2 units depending on glycaemic control
      - Insulatard™ (intermediate acting) – at bedtime, dose as required, usually starting at 2-4units 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
      - Service user to maintain contact with Diabetes Midwife or Diabetes Specialist Nurse and to be reviewed in Joint Clinic as per guideline
      - Discontinue postnatally

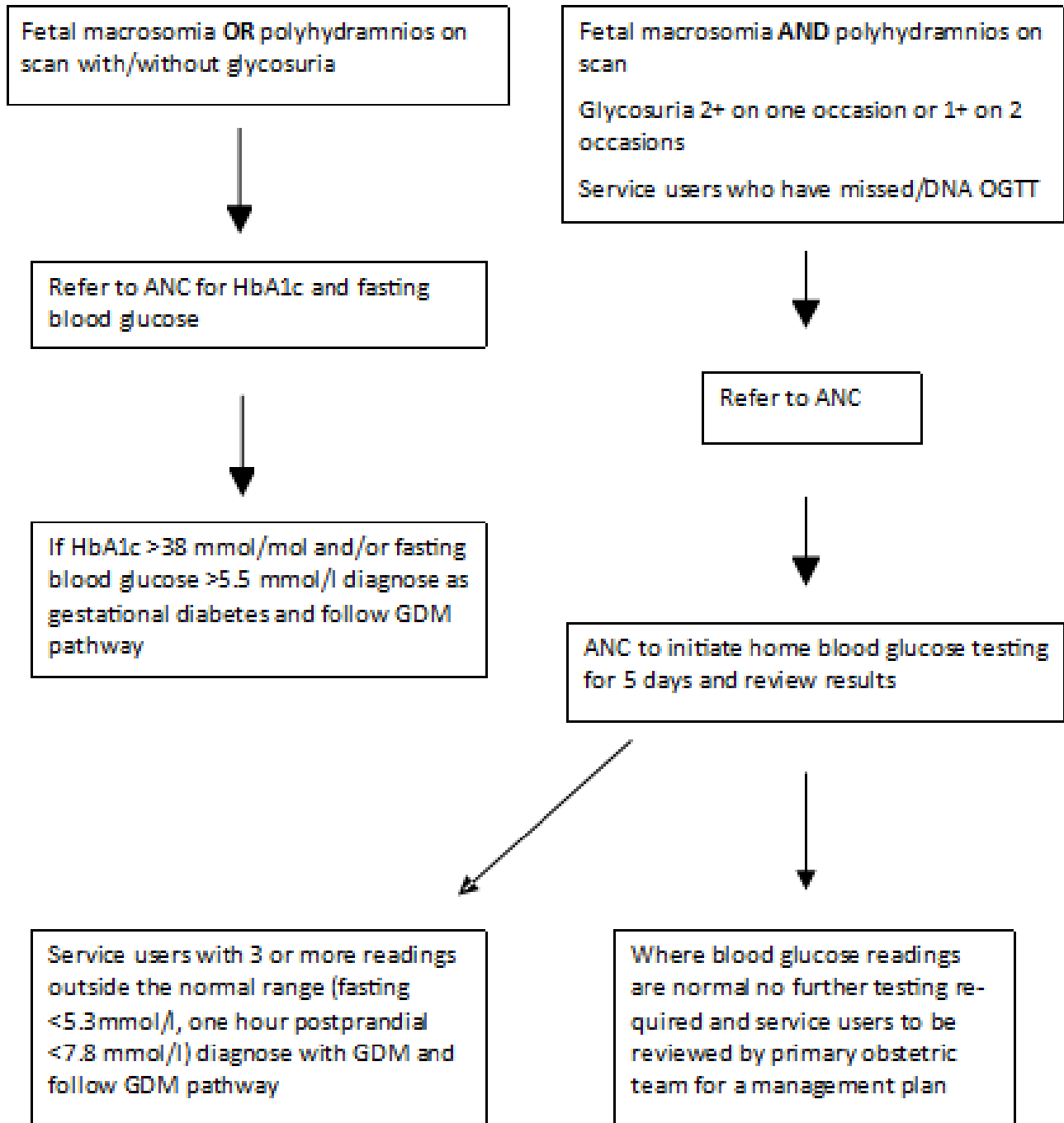
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#### Appendix 4: Pathway for management of accelerated fetal growth and/or polyhydramnios on scan, glycosuria and missed OGTT after 36 weeks

Macrosomia is defined as Estimated Fetal Weight (EFW) more than 90<sup>th</sup> centile.

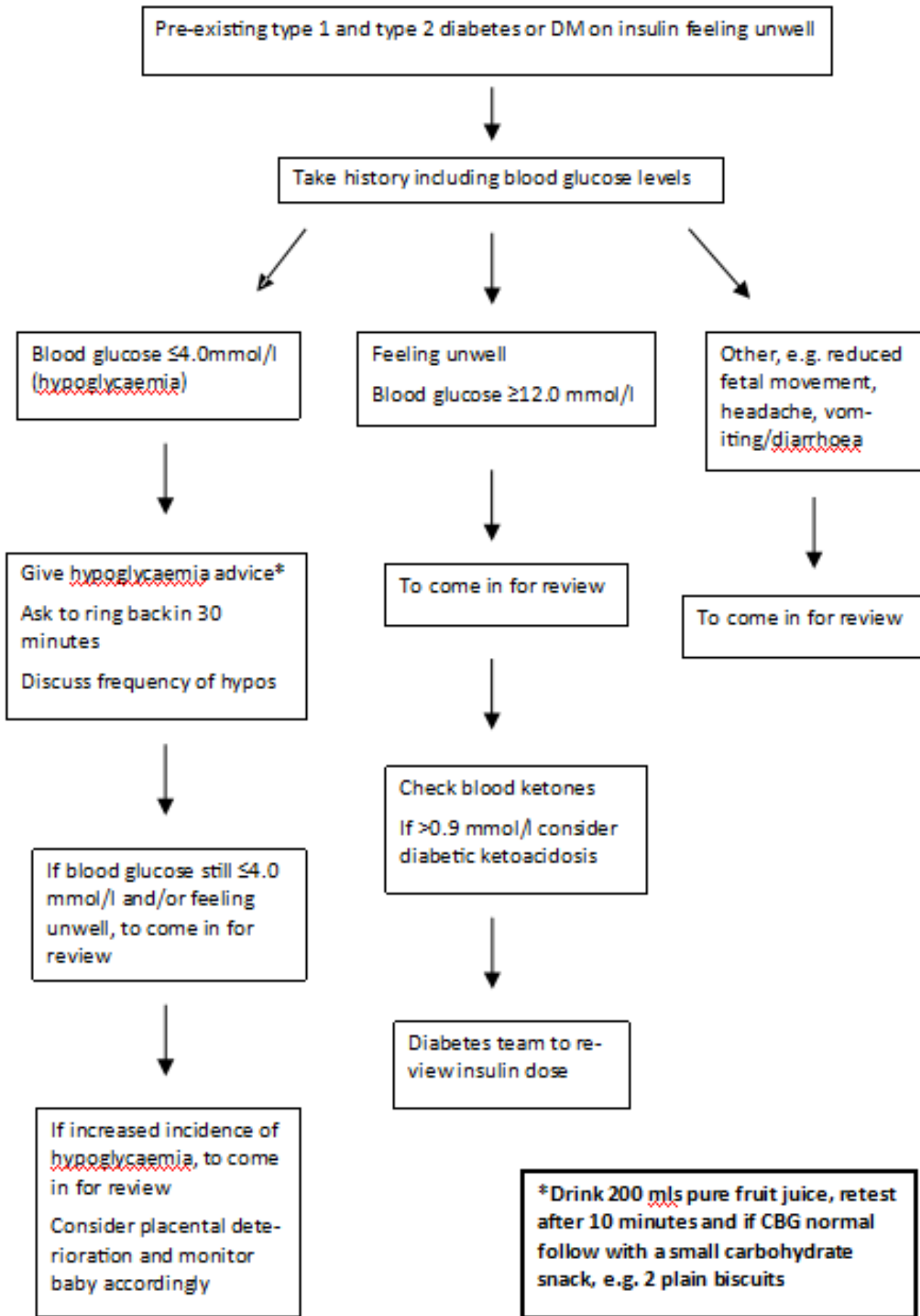
Polyhydramnios DVP >8cm and/or AFI 25cm and above





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## Appendix 5: Pathway for Service users with insulin-treated diabetes telephoning ADAU/Labour Ward



## 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 & Louise Allnatt - Diabetes Specialist Midwives

Tel 01908 995237 / 01908 995388

Email [DiabetesMidwife@mkuh.nhs.uk](mailto:DiabetesMidwife@mkuh.nhs.uk)

Diabetes Specialist Nurse

Email [TDSNT@mkuh.nhs.uk](mailto:TDSNT@mkuh.nhs.uk)

### SERVICE USERS 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

### SERVICE USERS WHO HAVE HAD GESTATIONAL DIABETES IN A PREVIOUS PREGNANCY

- Offer HbA1c and random blood glucose (venous) at booking to exclude pre-existing diabetes
- Document on antenatal booking risk assessment and request either OGTT or refer to Diabetes Midwife for home blood glucose monitoring between 14-16 weeks.
- The results will be followed up by the Diabetes Midwives
- Repeat OGTT or home blood glucose monitoring at 26-28 weeks if first trimester screening is normal

### SCREENING PROGRAMME FOR GESTATIONAL DIABETES

Service users 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

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- Minority ethnic family origin with a high prevalence of diabetes
- Age 40+ at booking
- PCOS (polycystic ovarian syndrome)
- Previous bariatric surgery (do not do OGTT, discuss with maternal medicine consultant and refer to ANC for home blood glucose monitoring)
- On anti-psychotic medication e.g. Olanzapine, Clozapine, Quetiapine
- Cystic fibrosis
- Glycosuria 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
- Previous stillbirth

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 <8.0 mmol/l for routine OGTT in Antenatal Clinic at 26/40 (to be booked by Antenatal Clinic on receipt of referral form)  
If ≥8.0 mmol inform service user and refer for urgent OGTT. 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

If HbA1c is used (RCOG 2020):

HbA1c 41mmol/mol (5.9%) or above <28 weeks  
HbA1c 39mmol/mol (5.7%) or above ≥28 weeks  
HbA1c 48mmol/mol (6.5%) or above should be managed as having type 2 diabetes

NB All positive results will be followed up by the Diabetes Midwives

## **Appendix 7: Insulin Management Plan for Pregnant Service users 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 hourly
- Levels of 5-8 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 5.0-8.0 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 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 hourly 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 5.0-8.0 mmol/L should be aimed for. **NB If any concerns about blood glucose levels confirm reading with ward meter**
- 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 or unable to manage own insulin needs
- Failure to achieve glycaemic targets
- Ketones present (++ urinary or >1.5 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)

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- Aim for blood glucose levels of 5.0-8.0mmol/L
- Check blood glucose levels 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, if glucose levels >10 mmol/L and/or if urinary ketones 2+ or more

### 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%)

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- Service users will need an extra 59 grams of carbohydrate per day
- Some service users 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 Specialist Nurse - Ext 86056, bleep 1198

Diabetologist- Dr Chandran, bleep 1062

## Appendix 8: Consultant letter to GP on diagnosis of gestational diabetes

Dear

This lady was diagnosed with Gestational Diabetes.

I have advised the patient of the possibility of developing type 2 diabetes in the future and would be grateful if you could arrange for a fasting blood glucose at 6-8 weeks postnatally and annual diabetes screening thereafter.

Also, please refer postnatally to the Diabetes Prevention Programme.

Please note that recent guidance from the Joint Committee on Vaccination and Immunisation (JCVI) requires us to inform the GPs of all women with gestational diabetes and/or BMI 40 and above, in order that they can be prioritised for a COVID vaccination.

Thank you

Yours sincerely

Dr Shanthi Chandran  
Consultant in Endocrinology and Diabetes



## 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 1<sup>st</sup> 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 1<sup>st</sup> 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](mailto:mkg-tr.Bucks-DESP@nhs.net)