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Guideline for the Management of Diabetes in Pregnancy

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Disclaimer

When using this document please ensure that the version is the most up to date by checking the Obstetrics & Gynaecology Guidelines on the CTM Clinical Portal

PRINTED DOCUMENTS MUST NOT BE RELIED ON

Guidelines Definition

Clinical guidelines are systemically developed statements that assist clinicians and patients in making decisions about appropriate treatments for specific conditions.

However, they allow deviation from a prescribed pathway according to the individual circumstances and where reasons can be clearly demonstrated and documented.

Related Guidelines

- Management of Preterm Labour
- Antenatal Care
- Induction of Labour
- Caesarean Section
- Altered Fetal Movements in Pregnancy
- All Wales Neonatal Hypoglycaemia Pathway

Contents

Contents	Page
Introduction	5
Policy Statement	5
Rationale	5
Preconception Care	6
Antenatal Care	7
Gestational Diabetes Screening	8
Previous Gestational Diabetes Screening	10
Confirmation of Pregnancy in Women with Type 1 and Type 2 Diabetes	10
Target Blood Glucose Levels	11
Blood Glucose Monitoring whilst an Inpatient & in Community	11
Self-administration of Insulin for In-patients	12
Care of the Triage Woman with Diabetes	12
Diabetic Ketoacidosis	13
Unwell patients with normoglycaemia or uncontrolled hyperglycaemia/ketonemia not meeting DKA criteria	14
Indication for ketone monitoring	14
Antenatal corticosteroids	15
Guidance for use of insulin pumps (CSII) in the delivery suite for Labour, Delivery and Elective Caesarean Section	17
Colostrum harvesting and breastfeeding	18
Mode and Timing of Delivery	19
Induction of Labour diabetes management	20
Labour care and diabetes management	21
Elective Caesarean Section	22
Diabetes management immediate post delivery or surgery	24
Discharge Management	26
References	27
Appendix A: Patient Information Leaflet for Pre-existing Diabetes Mellitus	28
Appendix B: Timetable of Antenatal Appointments	31
Appendix C: Oral Glucose Tolerance Test for the diagnosis of gestational diabetes mellitus/ patient information leaflet	32
Appendix D: Variable rate intravenous insulin infusion (VRIII)	35
Appendix E: Diabetes care in Labour and Birth	37
Appendix F: Intramuscular Steroid administration	38
Appendix G: CTMHB Guideline for the treatment of hypoglycaemia	39
Appendix H: Intrapartum Individual Diabetes Care Plan	40
Appendix I: Previous Gestational Diabetes pathway	42

Appendix J: Guidance for use of insulin pumps (CSII) in the delivery suite for labour, delivery and elective caesarean section	43
Appendix K: Performance standards to measure compliance with All Wales Strategy for screening and managing gestational diabetes	47
Appendix L: Welsh government reportable incidents and DATIX report incidents	48
Appendix M: Joint British Diabetes Society for in- patient care VRIII algorithm (LIBERAL version)	49
Appendix N: Flow chart for the use of variable rate intravenous insulin infusion (VRIII) in pregnancy	52

Abbreviations

ACEi	Angiotensin-Converting Enzyme Inhibitors
ARM	Artificial Rupture of Membranes
BG	Blood Glucose
BMI	Body Mass Index
CBG	Capillary Blood Glucose
CGM	Continuous Glucose Monitors
CSII	Continuous Subcutaneous Insulin Infusion
CTG	Cardiotocography
CTMUHB	Cwm Taff Morgannwg University Health Board
DKA	Diabetic Ketoacidosis
DSN	Diabetic Specialist Nurse
EDD	Estimated Due Date
ELCS	Elective Caesarean Section
GDM	Gestational Diabetes Mellitus
HbA1c	Haemoglobin A1c (glycated haemoglobin)
HHS	Hyperosmolar Hyperglycaemic Syndrome
IOL	Induction of Labour
JBDS	Joint British Diabetes Societies
LSCS	Lower Segment Caesarean Section
MEOWS	Modified Early Obstetrics Warning System
MDI	Multiple Daily Insulin Injection
NICE	National Institute for Health and Care Excellence
OGTT	Oral Glucose Tolerance Test
PPROM	Preterm Premature Rupture of Membranes
RCOG	Royal College of Obstetricians and Gynaecologists
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
VBAC	Vaginal Birth After a previous Caesarean Section
VRII	Variable Rate Intravenous Insulin Infusion
VTEP	Venous Thromboembolism Prophylaxis

Introduction

This document is designed to support safe and effective practice whilst caring for women with T1DM, T2DM or GDM throughout pregnancy, birth and postnatal period at CTMUHB.

Policy Statement

Guideline is based on NICE (NG3) (2015 and 2020) Diabetes in Pregnancy: management from preconception to the postnatal period and Joint British Diabetes Societies for Inpatient Care (JBDS-IP) (2017 and 2022) Management of glycaemic control in pregnant women with diabetes on obstetric wards and delivery units.

Definition

Diabetes is a metabolic disorder characterised by abnormally raised blood glucose. It is caused by a failure of the physiological systems that control these glucose levels by either not producing insulin, making insufficient amounts or failing to utilise the insulin that is produced. Listed are the main categories, however there are rarer forms outside the scope of this document.

- Pre-existing insulin dependent diabetes, Type 1 always managed with insulin therapy.
- Pre-existing Type 2 diabetes, managed with diet or oral medication. As Type 2 diabetes progresses, insulin therapy may be required prior to or during pregnancy.
- Gestational diabetes, diagnosed during pregnancy, can be diet controlled, require metformin or may require insulin as pregnancy progresses.

Gestational diabetes is more common in the second or third trimester of pregnancy, not usually associated with symptoms, however women may experience thirst, frequent urination, tiredness and a dry mouth.

Rationale

Women with diabetes are at increased risk of complications during pregnancy, labour and birth, including;

- Miscarriage due to congenital anomaly
- Premature birth
- Hypertension (pre-eclampsia)
- Polyhydramnios
- Fetal macrosomia
- Shoulder dystocia

- Induction of labour/ caesarean section
- Instrumental birth
- Stillbirth
- Neonatal hypoglycaemia or jaundice

Preconception Care

Women with type 1 or type 2 diabetes (pre-existing) who are planning a pregnancy should be advised to seek advice from a health care professional, aiming to optimise glucose control (HbA1c) and have routine medication reviewed prior to conception.

Desirably, women would have had the opportunity to discuss safety and implications of certain medications in the preconception phase. Women with pre-existing diabetes take some medications which have a toxic effect on the fetus and increased risk of congenital abnormality.

Medications such as angiotensin-converting enzyme inhibitors (ACE inhibitors), angiotensin II receptor antagonists (blood pressure lowering agents) and statins (lipid management drugs) should ideally be discontinued prior to conception, or discontinued on confirmation of pregnancy (within 2 days) and safer alternatives prescribed (NICE, 2019).

Additionally, women will require further screening including every trimester retinal, renal and HbA1c assessment.

Advice should also include:

- Stop smoking and alcohol intake
 - Preconception folic acid 5mg daily, continued to at least 12 weeks gestation.
- (Please refer to **Appendix A**).

Princess of Wales Hospital - pre conception care obstetric clinic- slots on Wednesday afternoon with Ms Aditi Miskin

Royal Glamorgan Hospital - pre/post conception care endocrine clinic- Monday afternoon at diabetes centre with Dr Helen Lane.

Prince Charles Hospital - pre-conception counselling with Dr Helen Marx / Dr O Okosieme at the end of the Medical Antenatal Clinic on a Tuesday morning

Antenatal Care

All women with any form of diabetes will immediately have combined care of an Obstetrician and Endocrinologist (Diabetes Specialists). As soon as pregnancy is confirmed, an immediate referral to Antenatal clinic and Diabetes team should be made.

Care includes Obstetrician, Endocrinologist (Diabetes Specialist), Dietician, Diabetes Nurse Specialist and Diabetes Midwife Specialist.

Please refer to timetable of antenatal appointments (**Appendix B**).

Ysbyty Cwm Rhondda on Monday morning

Lead Obstetrician	Mr Jonathan Pembridge
Lead Physician	Dr Helen Lane

Prince Charles Hospital on Tuesday morning

Lead Obstetrician	Mrs Helen Marx
Lead Physician	Dr O Okosieme

Princess of Wales Hospital on Wednesday morning

Lead Obstetrician	Ms Aditi Miskin
Lead Obstetrician	Ms Sushama Hemmadi (Neath area)
Lead Physician	Dr Lawrence Cosmo

Gestational Diabetes Screening

NICE (NICE, 2015) recommend that women with risk factors (see table 1 below) at **booking** should be referred at 24 - 28 weeks for a routine **Oral Glucose Tolerance Test (OGTT) (75g glucose)** consisting of a fasting and 2 hour post venous blood sample.

It is important to discuss with women implications of the risk assessment and diagnosis of gestational diabetes to ensure women can make an informed decision as:

- Confirmation of gestational diabetes diagnosis results in monitoring and increased interventions throughout pregnancy and labour.
- Gestational diabetes may or may not respond to changes in diet and exercise.
- If not controlled with lifestyle changes, oral medications or insulin may be required.
- Undetected or uncontrolled gestational diabetes can result in a small risk of adverse birth complications, such as shoulder dystocia.

Table 1: Risk factors for gestational diabetes at booking.

- Body mass index more than 30 kg/m²
- Previous macrosomic baby weighing 4.5 kg or more or >97th centile
- Previous gestational diabetes
- Family history of diabetes (first-degree relative, sibling or parent)
- Family origin with a high prevalence of diabetes:
 - South Asian (specifically women whose country of family origin is India, Pakistan or Bangladesh)
 - Black Caribbean
 - Middle Eastern (specifically women whose country of family origin is Saudi Arabia, United Arab Emirates, Iraq, Jordan, Syria, Oman, Qatar, Kuwait, Lebanon or Egypt).
- Polycystic ovary disease
- Unexplained previous stillbirth

Incidental or serial investigative findings

An OGTT may be further indicated on confirmation or during pregnancy on clinical findings or history of:

- Polyhydramnios
- Large baby, on fundal height measurement, confirmed by scan, i.e. estimated fetal weight above the 97th centile; or significant accelerated growth on scan (as defined by Gap/GROW)

- Glycosuria ≥ 1.1 mmol/L (1+) on two subsequent antenatal visits or glycosuria 2.8 mmol/L (++) on one occasion on reagent strip urine sample.

Please Note:

After 28 weeks gestation, it would be reasonable to repeat an OGTT after a three to four week period if new findings develop after a normal OGTT (maximum of 3 OGTT).

Consider capillary blood glucose monitoring, after a normal OGTT if clinical symptoms of diabetes, such as thirst, polyuria, heavy glycosuria (2+), or large for gestational age fetus/polyhydramnios present.

Some at risk women may already have serial scans in place due to BMI $>35\text{kg/m}^2$ or are under Bump Start Care Pathway.

Diagnosis of GDM is confirmed by OGTT when results are either

- A **fasting** plasma glucose of 5.6mmol/L or above, or
- A **2-hour** plasma glucose of 7.8mmol/L or above.

Please note:

Metformin therapy should be stopped 7 days minimum before an OGTT is performed. Women should be informed taking metformin medication will prevent an accurate result. If women take oral **steroid therapy** (e.g. prednisolone) and require an OGTT please discuss with endocrinologist if steroid therapy should be withheld as steroid clinical indication will need assessment.

On confirmation of gestational diabetes diagnosis women will be referred for blood glucose monitoring within a week and attend combined Antenatal Clinic thereafter.

When diagnosed with gestational diabetes **measure HbA1c level to identify women who may have pre-existing type 2 diabetes.**

An **immediate same day referral to Diabetes team** would be indicated if ANY woman presented with:

- Fasting plasma glucose $\geq 7\text{mmol/L}$
- Random plasma glucose $\geq 11.1\text{mmol/L}$
- Ketones present capillary $\geq 0.6\text{mmol/L}$
- Any type 1 diabetes symptoms, such as unexplained weight loss, thirst, polyuria etc. (NICE, 2015 and NICE, 2020).

Previous Gestational Diabetes

NICE (NICE, 2015 and 2020) recommend women who have had a previous diagnosis of gestational diabetes, can be offered early self-monitoring of blood glucose at confirmation of pregnancy.

At CTMUHB the preferred screening method is 75g OGTT offered as soon as possible after pregnancy booking whether in 1st or 2nd trimester, consisting of:

- An early OGTT at 16 weeks, after viable dating scan
- If early OGTT is negative, a repeat OGTT at 24-28 weeks.

If positive, at any gestation, blood sugar monitoring and serial scans at 28, 32, 36 and 38-39 weeks' gestation with referral to combined Endocrine/Obstetric care should be arranged (please refer to **Appendix I**).

Confirmation of Pregnancy in Women with Type 1 or 2 Diabetes

Every woman with diabetes throughout pregnancy requires an individual risk assessment by a Consultant Obstetrician and Consultant Endocrinologist.

Women with pre-existing type 1 or 2 diabetes at booking should be offered **aspirin 75-150mg daily** from 12 weeks' gestation until the birth of the baby. This is to reduce the risk of hypertensive disease in pregnancy, and includes women with chronic hypertension with any form of diabetes (NICE, 2019).

Additionally, **HbA1c level** should be measured at the booking appointment to determine level of risk for the pregnancy.

Risk factor assessment and management of **obstetric thromboprophylaxis** (VTEP) needs to be considered in line with RCOG guidelines.

Retinal and renal assessment should be offered (if not already performed in last 3 months).

Advise women with insulin treated diabetes of the risks if hypoglycaemia and impaired awareness of hypoglycaemia in pregnancy, particularly in the first trimester. Ensure women have fast acting form of glucose available (dextrose tablets or glucose drinks).

Target Blood Glucose Levels

Agree individualised targets for self-monitoring of blood glucose, taking into account the risk of hypoglycaemia.

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

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

Blood Glucometer Monitoring whilst an Inpatient and in Community

All women admitted with diabetes must have **blood glucose monitoring on hospital glucometers**.

If women choose to use their own monitoring devices alongside, this is acceptable but it **SHOULD NOT REPLACE** hospital glucometer (Flash (Libre) or CGM (continuous glucose monitoring) glucose levels should **not** be used for insulin dosing during VRIII; hospital glucometer **MUST ONLY** to be used to guide VRIII doses).

Blood glucose monitoring recommendations:

- **Type 1 diabetes**
 - Women with type 1 diabetes to test blood glucose fasting, pre-meal, 1-hour post-meal and bedtime daily.
- **Type 2 diabetes or gestational diabetes**
 - Women with type 2 diabetes or gestational diabetes who are on a multiple daily insulin injection (MDI) regime to test fasting, pre-meal, 1-hour post-meal and bedtime blood glucose levels daily
 - Women with type 2 diabetes or gestational diabetes to test fasting and 1-hour post-meal blood glucose levels daily if they are:
 - Managing diabetes with diet & exercise changes alone, or
 - Taking oral therapy (with or without diet and exercise changes) or **single dose intermediate-acting or long-acting subcutaneous insulin**.

NICE (NICE, 2020) recommend that pregnant women who have type 1 diabetes should be offered **real time continuous glucose monitoring (CGM)** free of charge and educated in blood ketone testing. Pregnant women with other forms of diabetes such as type 2 diabetes or gestational diabetes, and experiencing severe hypoglycaemia regardless of awareness OR if have unstable blood glucose should also be offered CGM.

Self-administration of Insulin for In-patients

To promote independence, women should be encouraged to continue to self-administer subcutaneous insulin routinely.

Professional judgement and safety are the overriding factors when assessing a patient for their ability to self-inject during their hospital stay.

Please refer to the self-administration of insulin assessment in *Self-administration of Insulin for Adult In-patients Procedure* (MM172) on CTMUHB Sharepoint (<http://ctuhb-intranet/Policies/layouts/15/WopiFrame.aspx?sourcedoc=%7BA678AE5D-EACA-49CE-8B25-34A2C6BFED6A%7D&file=Self%20administration%20of%20insulin%20procedure.docx&action=default&DefaultItemOpen=1>).

Care of the Triage Woman with Diabetes

Many women present into triage during any trimester of pregnancy for varying reasons. When triaging a pregnant woman with diabetes it is important to ask what type of diabetes the woman has and how she is being treated; finding out about her eating pattern and whether she has taking insulin or oral treatment is important.

If a woman with type 1 diabetes woman omits insulin or is actively vomiting, it is important to seek advice from the diabetes team. Women could present with hyperemesis, infection of unknown origin or other illnesses which require further investigation of blood profile or radiological investigation.

A routine antenatal assessment should include:

1. Abdominal palpation.
2. CTG and fetal movement assessment.
3. Dipstick urinalysis observing for signs of infection, glucose, ketones, protein.
4. Vital observations, scoring on MEOWS chart as pre-eclampsia is an increased risk in diabetes.
5. Assessment of general compliance with diet and insulin administration.
6. Blood glucose monitoring.
7. Medication review.
8. Ask about injection sites; to ensure effective insulin absorption.
9. Venous blood assessment of urea & electrolytes, full blood count, glucose, lactate, C-Reactive Protein, group and save etc may be indicated.
10. Fluid balance.

Women suspected of pre-eclampsia need particular consideration, maximum fluid intake 84ml/h.

Diabetic Ketoacidosis (DKA): A Medical Emergency

If concerned about any clinical findings when caring for pregnant diabetic women, please refer to Diabetic Nurse Specialists (DSN) or Medical Registrar out of hours.

It is important to have an awareness of **Diabetic Ketoacidosis which mainly affects women with Type 1 diabetes.**

DKA is a medical emergency requiring immediate treatment and expertise from medical colleagues. It should be managed in a **high dependency unit/intensive care unit as requires escalation to the Diabetic Ketoacidosis Treatment Pathway** using a specific **DKA Adult Think Glucose chart** available at medical wards across CTMUHB sites.

DKA is associated with significant fetal mortality- ketones are toxic to the fetus.

DKA can present as abdominal pain, which should be considered as an alternative to preterm labour.

DKA can occur with only modest elevation of blood glucose in pregnant women.

Symptoms of DKA include;

- Nausea/ vomiting
- Abdominal pain (preterm labour origin considered also)
- Polyuria (increased urination)
- Polydipsia (increased thirst)
- Muscle cramps
- Hyperglycaemia and ketonuria
- Shortness of breath- rapid/ketotic breath (fruity smell of acetone on breath)
- Weakness/ fatigue
- Drowsy/ confusion/ coma
- Dehydration- headache/ dry skin /weak/ rapid heartbeat.

Think “cause”

- Infection?
- Changes to dietary intake?
- Insulin omission/ inadequate insulin amount?
- Inactivity?

Diabetic Ketoacidosis Diagnostic Criteria:

1. Is blood glucose >11.0 mmol/L **or** history of diabetes mellitus
2. Are blood ketones >3.0 mmol/L **or** urinary ketones $>2+$
3. Is serum bicarbonate <15.0 mmol/L **or** venous pH <7.3

If YES to all 3 diagnostic criteria, DKA guideline should be followed, requiring urgent medical referral.

Unwell Patients with Normoglycaemia or Uncontrolled Hyperglycaemia/Ketonemia not Meeting DKA Criteria.

Women who are unwell but not meeting DKA criteria will require a specialist diabetes consultant or 'out of hours' Specialist Medical Registrar review. With the aim to reduce risk of DKA.

If CBG <11.0 mmol/L OR ≥ 11.0 mmol/L AND capillary blood ketones ≥ 1.0 mmol treatment **will** be required with fluid hydration and VRIII.

Remember **DKA can occur with normal blood glucose.**

Indication for Ketone Monitoring.

If blood glucose ≥ 11.0 mmol/L **or** the patient is unwell check blood ketones.

If blood ketones >1.0 mmol/L consider DKA and call doctor.

Please refer to *CTMUHB Think Glucose Ketone Monitoring and DKA in Pregnancy* training package on Sharepoint.

Antenatal Corticosteroids

According to the Confidential Enquiry into Maternal and Child Health (CEMACH, 2007) 36% of women with type 1 and type 2 diabetes delivered before 37 weeks gestation, as a result, the increasing use of steroids to aid lung maturation is common practice.

NICE (2015) recommend the use of steroids in at risk preterm labour, but acknowledge a deterioration in maternal glycaemic control could occur. Therefore diabetic women managed with insulin should have closer blood glucose management and may require additional insulin during this phase, typically having effect after 12 hours and up to 72 hours.

Steroids are administered intramuscularly 12-24 hours apart.

As per CTMUHB Management of Preterm Labour guideline (CTMUHB, 2020)

Offer maternal corticosteroids to women between 24+0 and 33+6 weeks of pregnancy who are suspected, diagnosed or established preterm labour, are having a planned preterm birth or have PPRM.

Consider maternal corticosteroids for women between 34+0 and 35+6 weeks of pregnancy who are suspected, diagnosed or established preterm labour, are having a planned preterm birth or have PPRM.

Antenatal corticosteroids may be indicated when a caesarean section is indicated before the 39 weeks gestation (CTMUHB, 2020).

General advice:

- Women receiving steroids will require **hourly blood glucose monitoring** from the first dose of steroid administration.
- Perform urea & electrolyte at start of VRIII then repeat in 24 hours.
- Target blood glucose is **5.0 – 8.0 mmol/L**.
- Women are encouraged to **drink and maintain diet** as normal as possible.
- Women should be encouraged to **maintain independence** as much as possible and mobilise as normal, VTE assessment as necessary.
- Women receiving steroids should continue blood glucose monitoring minimum of 12 hours post last steroid dose (JBDS 2017).

All Women with any Form of Diabetes receiving Steroids.

- Commence hourly BG monitoring, with hospital glucometer.
- If **blood glucose >8mmol/L on 2 consecutive occasions** commence VRIII.
- Patients regular diabetic medication **should continue:**

- **Continue basal/ long-acting/ intermediate subcutaneous insulin at usual dose and time** (e.g. Levemir/ Lantus/ Humulin I insulin).
- **Administer fast acting subcutaneous insulin while VRIII is in progress** (e.g. Novorapid, Fiasp, Humalog) (JBDS, 2022) as patient should be taking normal oral diet.
- Continue oral treatment (e.g. metformin) as patient should be taking normal oral diet.
- **Standard intravenous fluid of choice** (to run alongside VRIII) is 0.9% sodium chloride with 5% glucose plus 0.15% (10mmol) potassium chloride (500mL premixed bag). Infuse at a rate of 50mL/h (as per VRIII chart recommendations). It is standard practice at CTMUHB to prescribe substrate fluids, even if eating and drinking (JBDS, 2022).
- **If blood glucose < 5.0 mmol/L** (as target range is 5.0-8.0mmol/L) stop intravenous insulin for 20 minutes, continue intravenous substrate fluid. Restart VRIII (insulin) when blood glucose > 8.0 mmol/L.
- **If blood glucose < 4.0 mmol/L** (as target range is 5.0-8.0mmol/L) stop intravenous insulin for 20 minutes, continue intravenous substrate fluid and refer to 'Treatment of Hypoglycaemia Chart'- Appendix G. Treat and record. Follow up with dietary intake as recommended on *Think Glucose* treatment of Hypoglycaemia Chart. Restart VRIII (insulin) when blood glucose > 8.0 mmol/L.
- **Continue VRIII minimum 12 hours following second dose** of steroids aiming for **target 5.0 - 8.0 mmol/L**. VRIII can be discontinued if blood glucose target of <8.0 mmol/L is achieved, *but* may be needed longer if target blood glucose not achieved.
- Following VRIII, women can **revert to usual blood glucose monitoring** regime, (use hospital glucometer while inpatient).
- On discharge women should be advised as a result of steroids use, a rise in blood glucose may occur, if they have **any concerns** with blood glucose measurement following steroids advise to contact Diabetes Centre (please see 'Discharge Management section' for contact numbers).
- If pump therapy is in situ (CSII), please seek advice from diabetes team before giving 1st dose of steroid (Appendix J).
- On discharge women should be advised as a result of steroids a rise in blood glucose may occur, if they have **any concerns** with blood glucose measurement following steroids advise to contact Diabetes Centre (contact numbers page 15).

Please also refer to Appendix F.

Guidance for Use of Insulin Pumps (CSII) in the Delivery Suite for Labour, Delivery and Elective Caesarean Section

Insulin pumps (CSII- Continuous subcutaneous insulin infusion) therapy is used in people with type 1 diabetes to improve glycaemic control and/or reduce risk of hypoglycaemia.

CSII involves a continuous “basal” insulin infusion (the rate usually varies over the 24 hour period), in combination with meal-time “bolus” insulin. Additional correction doses of insulin may be used to keep blood glucose (BG) levels in target. Patients can also use “temporary basal rates” (higher and lower percentage of usual basal rates] for several hours if the trend of their BG levels are high or low.

Both basal and bolus insulin are delivered by the insulin pump, which infuses short acting (Novorapid or Humalog) or ultra-short acting (Fiasp) insulin through a catheter attached to a fine bore subcutaneous cannula (typically sited in the abdomen). The basal infusion rates are pre-programmed and will continue to run until the insulin cartridge is empty whereas boluses are delivered by the patient themselves (as per carbohydrate counting and predetermined settings) to cover food intake and to correct for high glucose levels. Patients may use readings from capillary BG meters (CBG), Flash glucose monitors (Libre) or readings from continuous glucose monitors (CGM) for these purposes.

These pumps are sometimes used in conjunction with other technology known as *closed loop* and *open loop* systems, pumps should be only adjusted by its owner (who has received extensive training) or a member of the diabetes team (please refer to Appendix J).

Please note: CSII removal should not exceed 60 minutes.

Colostrum Harvesting and Breastfeeding

All diabetic women should have the opportunity to discuss and be educated regarding the benefits of colostrum harvesting (started at 36 weeks) and breastfeeding her newborn (1000 lives, 2017). Antenatal education and support should be available and continued throughout the induction process.

Women should be aware that human milk restores normoglycaemia more effectively than formula milk, and can be given to newborn at earliest opportunity within an hour of birth. With improved bonding, benefits to the newborn include, reduced rate of obesity, type 1 and type 2 diabetes in later life with reduced rates of infection and improved intelligence.

The All Wales Maternity Network estimate women with gestational diabetes have a 12% risk of developing type 2 diabetes within 2 years of birth, this risk can be reduced by 50% in comparison to mothers who formula feed their babies. Additional benefits include reducing breast and ovarian cancer risk and reverting to pre pregnancy weight, with greatest benefits to those breastfeeding exclusively and long term.

In the postnatal period women with type 1 diabetes are at more risk of hypoglycaemia especially when breastfeeding; additional carbohydrate snacks should be taken. Glucose levels over 6.0 mmol/L are advised before each breastfeed and before bed.

Mode and Timing of Delivery

Consultant Obstetrician to discuss the timing and mode of birth with women during antenatal appointments, around 34-36 weeks.

Contraception should also be discussed in the third trimester.

A **Diabetes Intrapartum Care plan** should be completed to inform core staff of diabetes care requirements by the Endocrinology team, held in the patient's handheld notes (A4 Green sheet) (Appendix H).

Women with **pre-existing diabetes (type 1 and type 2) and no other complications** should be offered 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).

Women with **pre-existing diabetes (type 1 and type 2) who develop metabolic or any other maternal or fetal complications** may need elective delivery before 37+0 weeks.

Women with **gestational diabetes treated and managed with diet, having normal growth on serial scans can continue** pregnancy until 40 weeks gestation. (Agreed locally at CTMUHB).

Consideration will be given for earlier delivery for women with **gestational diabetes who are treated and managed with metformin or insulin or any complications as for pre-existing type 1 and type 2 diabetes**.

Risks and benefits of steroids use needs to be discussed with women with any form of diabetes having an elective caesarean section before 39 weeks gestation (Appendix F) (CTMUHB 2020).

If **fetal macrosomia** is diagnosed by scan, the risk and benefits of vaginal birth, induction of labour and caesarean section, should be discussed with the woman in accordance with RCOG guidelines.

The **use of water** during birth with remote CTG monitoring can also be offered to women with **gestational diabetes** taking other risk factors into consideration, e.g raised BMI.

Diabetes is not in itself a contraindication for **VBAC**.

Induction of Labour Diabetes Management

Women having induction of labour, during prostaglandin induction and cervical ripening, should continue with usual insulin regime (long and short acting subcutaneous insulin) and oral medications (e.g. metformin), whilst eating and drinking as usual.

Blood glucose monitoring as usual to continue until active stage of labour achieved.

Harvesting colostrum can be encouraged during IOL.

Labour Care and Diabetes Management

Capillary blood glucose should be performed hourly in all women with diabetes:

- After artificial rupture of membranes (ARM)
- In established labour
- On oxytocin augmentation

Type 1 diabetes:

Start VRIII in established labour, after ARM or on admission for C-section.

Alongside the VRIII:

- Stop **fast/short acting subcutaneous insulin** and **oral agents**
- Continue **long-acting/intermediate subcutaneous insulin**

Type 2 diabetes or gestational diabetes:

Blood glucose target is 5.0 - 8.0mmol/L (JBDS, 2022). Please see Appendix M

VRIII to start when 2 consecutive blood glucose > 8.0 mmol/L, take second CBG reading within half hour of first reading to avoid delay in starting VRIII.

Alongside the VRIII:

- Stop **fast/short acting subcutaneous insulin** and **oral agents**
- Continue **long-acting/intermediate subcutaneous insulin**

Intravenous fluid choice is 0.9% sodium chloride with 5% glucose plus 0.15% (10mmol) potassium chloride, (500mL premixed bag) infused at 50mL/h.

Check U+E's 4-6 hourly during labour to assess potassium and bicarbonate.

Check capillary blood ketones if blood glucose is > 11.0 mmol/L or if ketoacidosis is suspected.

If capillary **blood glucose < 4.0 mmol/L**, treat as per *Think Glucose* Treatment of Hypoglycaemia recommends, can be oral or intravenous glucose. Please consider stage and progress of labour and nil by mouth status, recheck blood glucose 15 minutes following treatment. Restart VRIII (insulin) when blood glucose > 8.0 mmol/L.

Specific considerations should be noted and refer to individual plan for Obstetric Consultant's management of labour.

Consultant Obstetrician on call made aware of plan, an oxytocin infusion should not be commenced until senior obstetric review has taken place.

Consult **Individual Diabetes Intrapartum Care Plan**, if not available consult Diabetes Team. (If there are no specific instructions, use the generic birth plan please refer to **Appendices D, E and N**).

Anaesthetic team informed, ensuring review as necessary (BMI, anaesthetic indications/risks identified, CSII pump in situ). If diathermy is used do not place diathermy pad in close proximity to CSII pump (JBDS, 2022).

CTG monitoring (remote or abdominal) when labour established or commencement of oxytocin infusion.

Acknowledge macrosomia/labour dystocia and be aware of signs of shoulder dystocia, taking immediate action and informing senior clinicians if suspected

Clear oral fluids or an **isotonic drink** would be indicated in labour for diabetic women with stable blood glucose measurements.

Assess every **void of urine** for output, ketones, adjust fluid replacement as necessary.

For those women on **CSII pumps**, the woman would have been informed to reduce her insulin requirements and should be informed if required switching to VRIII during the procedure may be indicated due to unexpected clinical events to maintain safety (please refer to '*Guidance for Use of Insulin Pumps (CSII) in the Delivery Suite for Labour, Delivery and Elective Caesarean*' Section and **Appendix J**).

Elective Caesarean Section Care and Diabetes Management

Arrangements should be made to attend for pre-clerking in the Day Assessment Unit. This appointment should include;

- Admission and clerking
- Consent and general procedure information
- Bloods for Full Blood Count and Group + Save, urea & electrolytes
- Routine anaesthetic review
- Minimum 6 hour fasting period, drink of water early morning
- Enhanced Recovery Pathway started in MDAU or ward 21- PCH, ward 12 -POW if inpatient
- Woman admitted to labour ward on day of surgery with birth partner

WOMEN WITH TYPE 1 DIABETES SHOULD NEVER BE WITHOUT INSULIN- background/basal insulin (long acting/ intermediate subcutaneous insulin) should be administered as usual.

Please consider timing of elective procedure, to avoid prolonged fasting periods. Women with diabetes having a planned C-section should be first on theatre list. In the event of unexpected delay, or blood glucose management, refer to Anaesthetist's advice.

There should be a **specific plan** in the notes detailing the diabetes management and the insulin required for the woman. The Individual Diabetes Intrapartum Care Plan will cover any changes to the **usual dosage of subcutaneous insulin (long acting/intermediate insulin) to be given the night before the operation which is usually half of usual dose as per prior discussion with diabetic specialist team (Appendix H).**

Short acting **insulin taken with breakfast will be omitted.**

Oral hypoglycaemia agent (OHA) **metformin to be omitted.**
Hourly blood glucose monitoring should be started on arrival to ward.

Women with **type 1 diabetes require VRlll on admission on day of surgery.**

Women with **type 2 or GDM manage as in labour**

Intravenous fluid choice- **0.9% sodium chloride and 5% glucose plus 0.15% (10mmol) potassium chloride (500mL premixed bag) to absorb at 50mL/h.**

If **general anaesthetic** is indicated at any time during the procedure **half hourly blood glucose** monitoring should be performed.

For women who choose to remain on **CSII pumps**, the woman would have been informed to reduce her insulin requirements, and should be informed if required that switching to VRlll during the procedure may be indicated due to unexpected clinical events to maintain safety as CSII requires self-management which may not be achievable. Again this plan should be clearly documented in the Individual Diabetes Intrapartum Care Plan. Please refer to **Appendix H, i.e. in the event of diathermy use, diathermy pad should be placed clear of CSII pumps** (JBDS, 2022), Anaesthetist should be informed of woman's choice to use CSII on admission.

If CSII removed, duration of removal **should not exceed 60 minutes** (Appendix J). **The insulin in CSII is very short acting, therefore alternative insulin must be started immediately**, i.e. within an hour, to avoid the risk of ketoacidosis.

Paediatrician present at delivery.

On Anaesthetist discretion, prior to, in theatre or immediate post-operative phase, anaesthetist may chose not to administer VRlll, therefore diabetes management can be sought from anaesthetist.

Diabetes Management Immediate Post Delivery or Surgery.

Women with Pre-existing Type 1 or Insulin Treated Type 2 Diabetes.

Insulin infusion (VRIII)

Rate should be reduced by 50% on completion third stage of labour.

When regular meals can be taken, VRIII can be stopped 30-60 minutes after meal and pre pregnancy insulin regimen can be resumed, in the event of unknown pre pregnancy dose, dose can be half of dose (50%) that has been required in late pregnancy.

Blood glucose monitoring (until first meal)

Continue hourly monitoring, insulin not usually required with first light meal after delivery (tea & toast).

Subsequent blood glucose monitoring

Pre meals and pre bed time monitoring and 3am as a minimum, aim for 6.0 -10.0 mmol/L to avoid hypoglycaemia.

Insulin regime when eating normally

Insulin as pre advised by specialist diabetes team.

Diet

If feeding artificially- no additional calorific intake required

If breastfeeding – encourage healthy eating with increased carbohydrate to establish lactation. Up to 450 calories daily may be required when feeding established. Breastfeeding and expressing both predispose women to hypoglycaemia hence insulin doses should be reduced. A snack 10-15g carbohydrate should be encouraged at each breastfeed or express of milk (includes night feeds).

Women with Type 2 Diabetes on Oral Glucose Lowering Drugs before Pregnancy.

Insulin infusion (VRIII) and insulin injections

Stop when placenta is delivered.

Blood glucose monitoring (until first meal)

Continue 4 hourly monitoring.

Subsequent blood glucose monitoring

Pre meals and pre bed time, aiming for 6.0 -10.0 mmol/L to avoid hypoglycaemia.

Treatment regime when eating normally

As pre advised by specialist diabetes team. Metformin can be safely continued with breastfeeding and does not cause hypoglycaemia.

Diet

Encourage healthy choices with low GI diet and weight management as applicable.

Women with Gestational Diabetes.**Insulin infusion (VRIII), insulin injections or oral glucose lowering drugs**

Stop when placenta is delivered.

Blood glucose monitoring (until first meal):

Continue four hourly.

Blood glucose monitoring

Continue for up to 24 hours-monitor pre-meal and post meal. Target pre-meal <7.0 mmol/L and 1 hour post meal <11.1mmol/L. If these targets are not achieved contact specialist diabetes team

Diet

Encourage healthy choices with low GI diet and weight management as applicable

General Immediate Post Delivery Advice

Initiate **skin to skin** as early as possible, encourage and support suckling at breast.

Aim to **feed newborn 30-60mins** following birth, to reduce hypoglycaemia risk. All babies will need **All Wales Neonatal Hypoglycaemia Pathway** and remain as an inpatient for 24 hours.

Babies of women with diabetes should stay with their mothers, unless there are complications or abnormal clinical signs that mean baby needs to be admitted to neonatal unit.

Women with insulin treated **pre-existing diabetes** are more at risk of hypoglycaemia in the postnatal period especially when breastfeeding- advise to have a snack before or during feeds; aim for a blood sugar range of 6.0 -10.0 mmol/L with additional carbohydrate snacks before/during breastfeed and at bedtime.

Please refer to **Individual Diabetes Intrapartum Care Plan** for further postnatal management.

The usual post-operative care should be given including **thromboprophylaxis**.

Arrange **diabetes review if required** if plan not already in place

Ensure that women with pre-existing diabetes are assessed in their ability to manage their diabetes in the postnatal period.

Discharge Management

- Offer lifestyle modification advice which includes weight management, healthy diet choices and exercise), particularly T2DM and GDM.
- Women who were previously treated with metformin can safely continue to take these medications whilst breastfeeding.
- Women with diabetes who are breastfeeding should continue to avoid any medicines for their diabetes complications that were stopped for safety reasons when they started planning the pregnancy.
- Women with insulin treated pre-existing diabetes who are breastfeeding, should be reminded on discharge to consider additional carbohydrate requirements to avoid hypoglycaemia, a bedtime snack and during feeding.
- At CTMUHB women diagnosed with gestational diabetes, are advised to screen for T2DM with fasting plasma glucose 6-13 weeks postnatal OR HbA1c (glycated haemoglobin) in primary care at 13 weeks postnatal. If HbA1c is normal would need to be repeated on an annual basis. Woman are reminded by mail by Diabetes Midwife Specialist.
- Provide *myDesmond*TM 'Baby Steps post-natal information' to help prevent type 2 diabetes (<https://www.ndss.com.au/services/support-programs/mydesmond/>).
- Primary healthcare team will be informed of gestational diabetes diagnosis by Diabetes Specialist Midwife.
- Women should be reminded of the importance of immediate contraception and pre conception planning with regular postnatal and cervical screening.
- Advise women with pre-existing diabetes when considering a further pregnancy to contact a healthcare professional prior to conception.
- Routine diabetes out-patients appointments and contact should be resumed.

Women with pre-existing diabetes should have a diabetes review prior to discharge. Contact details are as follows:

- | | |
|-------|----------------------------------|
| - POW | 01656 752900- option 2 |
| - RGH | 26261 or 26896 |
| - PCH | 28490, 28575 or 28511, bleep 408 |

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Appendix A – Patient Information Leaflet for Pre-existing Diabetes Mellitus.

Patient Information Leaflet for Pre-existing Diabetes Mellitus

Diabetes - Planning a pregnancy? Advice for a healthy pregnancy

Planning a pregnancy with diabetes will help reduce risks and improve outcomes during pregnancy, labour and the postnatal period.

Women with diabetes have an increased risk of miscarriage, malformations of the baby's heart, limbs, spine or other vital organs. Baby's growth can also be affected, with increased risk of stillbirth and neonatal death in the early weeks of life.

Achieving a target HbA1c of 48mmol/mol (6.5%) at the outset of conception and maintaining target blood glucose;

- a fasting plasma glucose level 5.0mmol/L – 7.0mmol/L on waking, and
- a plasma glucose level of 4.0mmol/L – 7.0mmol/L before meals and at other times of the day.

This is important to minimise the risk of complications and ensure best outcomes for you and your baby.

HbA1c

HbA1c is your average blood glucose (sugar) levels over the last two to three months.

A high HbA1c means you have too much sugar in your blood. If the result is above 86mmol/L (10%) you will be strongly advised to avoid pregnancy, aiming for less than 48mmol/L (6.5%) before you conceive.

Blood glucose monitoring to achieve stability is very important, if you feel that you would benefit from additional diabetes advice, please contact the local hospital diabetes team.

Hypoglycaemia (low blood glucose)

The recognition and management of hypoglycaemia (blood sugar below 4.0 mmol/L) is particularly important during pregnancy.

Ensure you always have your blood glucose monitoring equipment to hand, and rapid acting glucose to treat the hypoglycaemia, such as orange juice or jelly babies. Remember to follow the rapid acting glucose with a carbohydrate snack to keep blood glucose stable.

Not Yet

- **Avoid pregnancy if HbA1c is above 86mmol/L (10%)**
- **Use effective contraception**
- **Start folic acid 5mg daily**
- **Aim for a healthy weight**
- **Arrange a medication review**
- **Stop smoking and alcohol intake**
- **Contact the diabetes team, the GP or the pre-conception clinic**

Nearly There

- HbA1c improving
- Continue folic acid 5mg daily
- Aim for Blood Glucose 4.0-7.8mmol/L
- Know how to treat hypoglycaemia
- Eye, blood pressure & kidney check
- Diabetes team review
- Ensure any medication changes have taken place

Your There

- HbA1c ideally less than 48mmol/L (6.5%), and avoiding severe hypoglycaemia
- Stop contraception
- Maintain stable blood glucose
- Continue folic acid 5mg daily
- Regular diabetic reviews

Confirmation of pregnancy

Once your pregnancy is confirmed, contact your Community Midwife (based at your GP health care centre) and your Diabetes team. If you need further advice, you can contact your local antenatal clinic.

Your joint antenatal care will be co-ordinated as much as possible throughout your pregnancy. It will consist of regular contact with the following healthcare professionals:

- Diabetes Consultant
- Obstetric Consultant
(Pregnancy Specialist)
- Diabetes Nurse Specialist / Diabetes Midwife Specialist
- Community Midwife
- Dietitian

Antenatal clinic appointments are held at the following times and location:

Day	Hospital
Monday	Ysbyty Cwm Rhondda
Tuesday	Prince Charles
Wednesday	Princess of Wales

Your care will include:

- more appointments such as regular scans from 28 weeks of pregnancy
- Folic acid 5mg daily up to 12 weeks of pregnancy then pregnancy multivitamins daily throughout pregnancy
- Advice on taking low dose aspirin 75-150mg daily from 12 weeks of pregnancy, to avoid complications such as high blood pressure which is a risk for women with pre-existing diabetes.

Appendix B – Timetable of Antenatal Appointments

<p>Early pregnancy visit</p> <p>Booking appointment (Joint diabetes and obstetric clinic) ideally by 10 weeks.</p>	<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 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).</p> <p>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.</p> <p>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.</p> <p>Arrange contact with the joint diabetes and antenatal clinic every 1–2 weeks throughout pregnancy for all women with diabetes.</p> <p>Measure HbA1c levels for women with pre-existing diabetes to determine the level of risk for the pregnancy.</p> <p>Offer self-monitoring of blood glucose or a 75 g 2-hour OGTT as soon as possible for women with a history of gestational diabetes who book in the first trimester.</p> <p>Confirm viability of pregnancy and gestational age at 7–9 weeks.</p> <p>Refer to fetal medicine UHW for fetal echocardiogram for women with pre-existing diabetes and on insulin, once viability ultrasound scan is confirmed.</p>
16/40	<p>Offer retinal assessment at 16–20 weeks to women 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 75g 2-hour OGTT as soon as possible for women with a history of gestational diabetes who book in the first trimester.</p>
20/40	Offer an ultrasound scan for detecting fetal structural abnormalities, including examination of the fetal heart (4 chambers, outflow tracts and 3 vessels).
28/40	<p>Offer ultrasound monitoring of fetal growth and amniotic fluid volume.</p> <p>Retinopathy screening for women with pre-existing diabetes Repeat HbA1c</p> <p>If OGTT negative at 16 weeks for women with a history of gestational diabetes, repeat OGTT at 28 weeks.</p>
Women diagnosed with gestational diabetes as a result of routine antenatal testing at 24–28 weeks enter the care pathway	
32/40	<p>Offer ultrasound monitoring of fetal growth and amniotic fluid volume.</p> <p>Offer nulliparous women all routine investigations normally scheduled for 31 weeks in routine antenatal care.</p>
34/40	No additional or different care for women with diabetes.
36/40	<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"> - 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 to 38+6	Offer induction of labour, or caesarean section if indicated, to women with type 1 or type 2 diabetes; otherwise await spontaneous labour.
38-39	<p>Offer IOL/CS as indicated.</p> <p>Serial growth scan and AFI.</p> <p>Offer tests of fetal wellbeing.</p>
40	Advise women with uncomplicated gestational diabetes to give birth no later than 40 weeks.

Appendix C - Oral Glucose Tolerance Test for the Diagnosis of Gestational Diabetes Mellitus

The carbohydrate source used for this test is POLYCAL®. A dose of 113 mL is used which gives a glucose load of 75g.

Start the test between 08:00h and 10:00h after a minimum of three days on an unrestricted diet and usual physical activity.

The woman must fast overnight (minimum 8 hours) before the test. Water may be drunk in very small amounts during the fast.

Collect a **fasting venous blood sample** into a fluoride-oxalate containing (grey-top) vacutainer. Label bottle clearly as 0 minute sample (pre sample).

Give the patient 113 mL POLYCAL® made up to 250-300mL with water. This should be drunk within a five minute period (once opened Polycal can be stored in fridge for maximum of 24 hours).

Woman should not smoke, chew gum or eat during the test. Water may be drunk if desired but only 15 minutes after the POLYCAL® has been given. During the test the patient should be inactive.

Collect a **venous blood sample** into fluoride-oxalate at two hours following administration of the glucose load. Label specimen bottle as 120 minutes (post sample).

Send both samples to the laboratory with one request form only. The investigation requested should be OGTT clearly labelled as pre (0 minute) and post sample (120mins) clinical indication- GDM screening in pregnancy.

Women with glucose results as below are regarded as having gestational diabetes mellitus N.B. These criteria are based on "Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications", (NICE, 2015).

Glucose Concentration (mmol/L)		
	Fasting	120 minutes
Normal	< 5.6	<7.8
Gestational Diabetes	≥5.6	≥ 7.8

Oral glucose tolerance test (OGTT) during Pregnancy

This leaflet explains why you have been asked to have an OGTT in your pregnancy, how to prepare for the test and what you can expect when you arrive at the hospital and what happens after the results.

What is an OGTT?

An OGTT is used to diagnose if a woman has diabetes in pregnancy called gestational diabetes (GDM). Gestational diabetes is usually a temporary form of diabetes which causes high blood glucose levels, especially after food is eaten. The test is usually carried out between 24 and 28 weeks pregnancy, but is sometimes done earlier, but this depends on your individual circumstances. Women who have gestational diabetes can make positive changes and reduce risks to themselves and their baby with the support of the diabetes and midwifery team.

Why should I have an OGTT?

You have been referred by your midwife for the test as you have been assessed as having at least 1 of the factors below that increases your risk of gestational diabetes:

- Previous diagnosis of gestational diabetes
- Previous large baby
- Family history of diabetes (parent, brother or sister)
- Body mass index (BMI) over 30
- Family origin i.e. Asian, African, Middle Eastern, Afro- Caribbean
- Polycystic Ovary syndrome
- Unexplained previous stillbirth

If in pregnancy you develop any of the following you may be offered a test to check if you have developed gestational diabetes:

- Glucose found in your urine- this depends on how much glucose is found and on how many occasions
- Extra fluid around the baby (polyhydramnios)
- The baby's growth is accelerated/excessive on scan

Women who have had previous diagnosis of gestational diabetes in pregnancy will be offered an earlier routine test at 16 weeks pregnancy, if normal, this will be repeated at 24-28 weeks pregnancy.

Important facts about an OGTT

- Confirmation of gestational diabetes diagnosis means increased monitoring and increased interventions throughout your pregnancy, labour and birth
- Gestational diabetes advice initially starts with changes in diet and increasing exercise – if blood glucose does not stabilise then treatment will be needed such as oral medication (metformin) or insulin.
- If a woman has gestational diabetes which isn't detected and controlled, there is an increased risk of problems such as baby growing too big, which can cause birth complications for the mother and the baby. Appropriate intervention will reduce these risks.

How to prepare for your OGTT

- You should continue to eat and drink as usual in the days leading up to the test
- Do not eat or drink anything other than small amounts of plain water the night before the test, for at least 10 hours.
- Do not eat any breakfast or drink on morning of test, this includes medicines, other than a small amount of plain water
- Do not smoke or use chewing gum until the test is finished
- When you arrive the first sample of blood from your vein is taken (fasting or pre sample)
- You will be asked to drink a glucose drink over a 5 minute period
- You will need to sit for 2 hours in the department, where you do not eat, drink, smoke or walk around during this 2 hour period
- After 2 hours the final sample of blood is taken and is now complete (post sample)
- You can go home, eat and drink as normal and will be contacted by the antenatal clinic (usually within 72 hours) if results are positive
- If your results are a positive diagnosis of gestational diabetes, this could be both blood samples (pre and post) or one sample (pre or post) you will be contacted by your antenatal clinic midwife and advice about further care explained

If the test is negative, it is still important to reduce your chances of developing diabetes, it is important to consider:

- Exercise- being physically active for 30 minutes a day, 5 days a week
Safe exercise, such as yoga, swimming, walking, is without risk to you or baby
- Eating healthy- consider food choice and portion sizes, increase fibre, fruits and vegetables, aiming for 5 portions daily, cut down on fatty or fried foods and those with high sugar content.

Contacts

If you have any concerns about the OGTT and need any further information please contact your midwife/ antenatal clinic /diabetes midwife.
PCH- 01685 728849/728846, Diabetes Midwife (Lisa) mobile-07919292155
YCR- 01443 430022 ext 72655
YCC-01443 430022 ext 25350
POW-01656 752752 ext 52475

Useful Information

www.rcog.org.uk/en/patients/patient-leaflet
www.diabetes.org.uk

Appendix D – Variable Rate Intravenous Insulin Infusion (VRIII)

A variable rate intravenous infusion of insulin is an infusion of intravenous insulin at a variable rate, according to regular capillary blood glucose measurements with the aim of controlling serum glucose levels within a specified target range.

The VRIII is accompanied by an infusion of fluid containing glucose (see below), to prevent insulin-induced hypoglycaemia.

Why use substrate intravenous fluids and insulin infusions?

- Labour and birth can last for over 24 hours. Diabetic patients may not be able to eat and/or manage their insulin treatment during this time.
- Failure to provide substrate (calories) and to match this with insulin can lead to serious metabolic disturbances.
- To avoid hypoglycaemia, hyponatraemia and hypokalaemia the substrate fluids should be
 - 0.9% sodium chloride and 5% glucose with 0.15% (10mmol) potassium chloride (premixed 500mL bag), OR
 - 0.9% sodium chloride and 5% glucose with 0.15% potassium chloride (20mmol) (premixed 1 litre bag)

Infusion rate = 50mL/h.

Why add Potassium?

- Patients may not eat during labour and may often vomit, which can lower potassium concentrations. Hypokalaemia is dangerous and can cause cardiac rhythm problems.
- The infusion of both glucose and insulin moves potassium from the extracellular fluid into cells, further reducing potassium concentrations. Any excess potassium is simply and safely excreted in the urine.

What insulin scale will be needed?

- Hourly capillary blood glucose measurements are performed and the amount of insulin required will be recommended on the Insulin Infusion Rate Table (see Appendix M).
- Women with type 1 diabetes are totally insulin deficient. They **always** need insulin otherwise they become keto-acidotic. **Never stop insulin in women with type 1 diabetes.**

Setting up of Variable Rate Intravenous Insulin Infusion (VRIII)

Two registered nurses/midwives must check/prepare the VRIII and every time the rate of infusion is changed.

Preparation

- **INSULIN MUST BE DRAWN UP USING AN INSULIN SYRINGE. NO OTHER SYRINGE TO BE USED.**
- Draw up 50 units (0.5mL) of Actrapid insulin (stored in fridge) and add to 49.5mL of 0.9% sodium chloride in a 50 mL luer lock syringe. Mix thoroughly. This will provide a concentration of 1 unit/ 1 mL.
(Please note: Actrapid insulin has 28 day expiry once opened).
- Complete the drug additive label in full; signed by two registered nurses/midwives and place on the syringe barrel; not obscuring the numerical scale.
- Prime through an appropriate giving set with a non-return valve.
- Set up an intravenous insulin syringe-driver pump.
- Set the concurrent intravenous fluid replacement rate to deliver the hourly fluid requirements of the individual patient, as prescribed, which must take into account their individual circumstances. Intravenous infusions are prescribed on the dedicated *CTMUHB Subcutaneous and Intravenous Insulin Administration and Monitoring in Pregnancy* chart.
- Delivery of the substrate solution and the VRIII must be via a single cannula or two lumens of a central line with appropriate one-way and antisiphon valves, via a volumetric infusion pump.
- Sign, date and time the VRIII *Think Glucose* chart on the Intravenous Insulin preparation section.

Ongoing use

- Discard any unused insulin solution after 24 hours; each insulin infusion must be timed and dated, and discarded after a 24 hour period.
(Please note: Actrapid insulin vial has a 28 day expiry once opened).
- Hourly blood glucose measurements throughout VRIII must be performed on hospital glucometer.
- If intravenous access is lost during VRIII continue hourly blood glucose monitoring and replace IV access immediately.
- Ensure patency of IV access and observe for inappropriate stopping of VRIII.
- Contact diabetes teams if hypoglycaemia or hyperglycaemia persists.
- There should always an overlap of 30 minutes before stopping VRIII and starting subcutaneous insulin.

Appendix E – Diabetes Care in Labour and Birth

Measure capillary glucose hourly, if general anaesthetic monitor every 30 minutes.

Aim for blood glucose 5.0 – 8.0 mmol/L

If woman has **Type 1 Diabetes** start VRIII for ARM, labour and caesarean section.

In all other women with diabetes if blood glucose > 8.0 mmol/L on 2 occasions start VRIII. Perform the second blood glucose within 30 minutes to prevent delay in starting VRIII.

Continue long acting/ intermediate subcutaneous insulin (some patient's may require half dose on the night before ELCS, as advised by specialist diabetes team).

Stop fast acting subcutaneous insulin.

Treat hypoglycaemia if blood glucose < 4.0 mmol/L. If hypoglycaemia, turn off IV insulin for 20 minutes but continue IV substrate fluids. Restart VRIII when blood sugar \geq 8.0 mmol/L.

Intravenous substrate fluid to be used with VRIII- **0.9% sodium chloride with 5% glucose plus 0.15% (10mmol) potassium chloride**, (500mL premixed bag) **infused at 50mL/h.**

NB- fluids, particularly glucose containing fluids, may have to be restricted in women who are at risk of, or already have hyponatraemia (women receiving oxytocin). Care with fluids in women with diabetes who may have pre-eclampsia, fluid restriction plus oxytocin, labetalol, magnesium or combination of these.

Can a diabetic woman eat during labour?

- Women with diabetes are high risk in labour. Therefore, please check from an obstetric or anaesthetic perspective. Clear regular oral fluids are acceptable.

What happens at birth?

- At birth (with separation of the placenta) insulin resistance falls. Insulin requirements go back to **pre-pregnancy** levels within a very short period of time.
- Insulin infusion rates are therefore halved following birth for type 1 and insulin treated type 2 diabetes. In the absence of an individualised plan, continue the VRIII but **halve the insulin rate.**
- Gestational diabetes and type 2 patients who were previously treated with diet and/or tablets can have their insulin stopped.

What happens when the woman with Type 1 diabetes is eating normally?

- Women are recommenced on their pre-pregnancy insulin regime. If woman cannot remember, or it is not specified in notes, halving the insulin requirements in late trimester of pregnancy is advised.
- When switching to subcutaneous insulin from VRIII, wait until mealtime and ensure a 30 minute overlap between giving fast acting subcutaneous insulin injection and stopping IV insulin infusion.

Appendix F – Intramuscular Steroid Administration

- Continue standard dietary measures; patient can eat and drink.
- Patient remains active as usual, encourage mobilisation –TEDS if indicated.
- Blood glucose monitored hourly at first steroid dose, and to continue for a minimum of 12 hours post second steroid dose.
- Aim for target blood glucose of 5.0 to 8.0 mmol/L for all diabetic women.
- All women should start VRIII if blood glucose > 8.0 mmol/L on **2 consecutive readings**.
- Use substrate fluids alongside VRIII, even if eating and drinking. **Use 5% glucose in 0.9% sodium chloride plus 0.15% (10mmol) potassium chloride** (500mL premixed bag). Infuse at a **rate of 50mL/h**.
- **Continue long acting/ intermediate subcutaneous insulin** whilst VRIII is in progress; give patients usual dosing regimen.
- **Continue fast acting subcutaneous insulin whilst VRIII is in progress if patient is eating and drinking**; giving usual dose of fast acting subcutaneous insulin may result in improved post meal blood glucose control.
- **Continue usual oral glucose lowering drug** regime, i.e. metformin, if eating.
- VRIII to continue 12 hours minimum post second steroid injection; when blood glucose < 8.0 mmol/L VRIII can be discontinued. VRIII may be required longer post second dose steroid if blood glucose < 8.0 mmol/L not achieved.

Appendix G – CTMUHB Guideline for the Treatment of Hypoglycaemia

TREATMENT OF HYPOGLYCAEMIA – BLOOD GLUCOSE ≤ 4.0 MMOL/L		
Wherever possible, check blood glucose level prior to treatment. If patient asymptomatic, repeat test.		
MILD	MODERATE	SEVERE
Patient conscious. Trembling, sweating, hungry, tingling, headache, anxiety, palpitations, nausea, forgetfulness.	Patient conscious but in need of assistance. Difficulty concentrating, confusion, weakness, giddiness, drowsiness, unsteady, headache, dizziness, difficulty focusing	...or <u>any</u> patient who is 'Nil By Mouth' Patient unconscious and unable to swallow. Unconscious, fitting
STEP 1		
STOP INSULIN INFUSION Continue the 5% glucose infusion Give 10g – 20g fast acting glucose: 3-5 x GlucoTabs (4g glucose per tablet) or 1 x 60mL bottle of GlucoJuice (15g glucose per bottle)	STOP INSULIN INFUSION Continue the 5% glucose infusion Give 1-2 tubes of GlucoGel (10g glucose per tube) Ensure gag reflex is present	STOP INSULIN INFUSION Continue the 5% glucose infusion CALL FOR EMERGENCY HELP Check ABC Place patient in recovery position Infuse 100mls of 20% glucose (or 200mls 10% glucose) over 15 minutes*
STEP 2		
Wait 15 minutes and recheck and record capillary blood glucose level If reading ≤ 4.0 mmol/L or if no physical improvement, repeat STEP 1 Repeat step 1 up to a maximum of 3 times If capillary glucose ≤ 4.0 mmol/L after 3 times or if clinically deteriorating despite treatments, treat as SEVERE hypoglycaemia		Once patient is conscious, if not 'Nil By Mouth' give sips of GlucoJuice • Recheck glucose level every 15 minutes to ensure increase > 4.0 mmol/L • If glucose ≤ 4.0 mmol/L, repeat x1 infusion of 100mls of 20% glucose (or 200mls of 10% glucose) over 15 mins
FOLLOW-UP		
<ol style="list-style-type: none"> Document hypoglycaemia in the patient's notes (using hypo sticker). Insulin should never be omitted following an episode of hypoglycaemia. Treat episode as above and restart insulin infusion when blood glucose > 8 mmol/L on a lower scale (from Increased Scale → Standard Scale or Individualized Scale → Standard Scale) Discuss with diabetes team if any doubts. If not 'Nil By Mouth': FOLLOW UP WITH STARCHY (LONG ACTING) CARBOHYDRATE ONCE capillary glucose > 4.0 mmol/L If on enteral feed: Give bolus down tube of $\frac{1}{2}$ carton Fortisip or enteral feed bolus as per the feed regimen. Always refer patients to the diabetes team, post treatment, if they have had a hypoglycaemic event resulting in unconsciousness. 		
* Administer intravenous 10% or 20% Glucose via a secure cannula into a large vein using infusion pump.		

Appendix H – Intrapartum Individual Diabetes Care Plan

EDD.....

Date of IOL.....

Date of C-Section.....

Individual Diabetes Intrapartum Care Plan

GDM on diet	<input type="checkbox"/>	Type 1 diabetes	<input type="checkbox"/>	CSII	<input type="checkbox"/>
GDM on metformin	<input type="checkbox"/>	Type 2 diabetes	metformin <input type="checkbox"/>	insulin	<input type="checkbox"/>
GDM on insulin	<input type="checkbox"/>	Other: MODY/Lada			<input type="checkbox"/>

For Labour

- Check blood glucose hourly, target range 5.0 – 8.0 mmol/L.
- Women with **T1DM** require VRIII for labour and ARM.
- **All other women** require VRIII if 2 consecutive blood glucose > 8.0 mmol/L.
- Basal (long acting and intermediate) subcutaneous insulin to continue but stop fast acting subcutaneous insulin and stop oral medication (metformin).
- CSII pump (to discuss with anaesthetist). Diathermy pad must be placed clear of CSII pump.
- All diabetic patients need continuous CTG monitoring in labour.

For Elective Caesarean Section

- Consider half dose long acting subcutaneous insulin on night prior to LSCS ☐
- Check blood glucose hourly, target range 5.0 – 8.0 mmol/L.
- Women with **T1DM** require VRIII on admission to labour ward, the morning of the ELCS.
- **All other women** require VRIII if 2 consecutive blood glucose > 8.0 mmol/L.
- Basal (long acting and intermediate) subcutaneous insulin to continue but stop fast acting subcutaneous insulin and stop oral medication (metformin).
- CSII pump (discuss with anaesthetist). Diathermy pad must be placed clear of CSII pump.
- If **General Anaesthesia is indicated** for delivery please perform capillary blood glucose every 30 minutes.

If any episode of hypoglycaemia, blood glucose \leq 4.0 mmol/L, please treat as per *Think Glucose Hypoglycaemia management* and discuss with Anaesthetist.

Immediate Post-Delivery Plan after Vaginal Delivery and LSCS

- GDM and Type 2 diabetes on diet or metformin should stop VRIII immediately.
- Pre-existing Type 1 or insulin treated Type 2 diabetes- should reduce VRIII rate by 50% immediately post-delivery and continue hourly monitoring.
- Stop VRIII when pre pregnancy subcutaneous insulin regimen can be resumed after first main meal, before discontinuing VRIII ensure 30 minute overlap of giving fast acting subcutaneous insulin and stopping VRIII.
- CSII pump- please seek advice from DNS before stopping VRIII- Appendix J
- Mothers and babies need to stay in hospital for 24 hours after delivery irrespective of mode of delivery
- Neonatal hypoglycaemia pathway for all babies born to mothers with any form of diabetes
- Support with colostrum collecting and breastfeeding

Post-Delivery Diabetes Medication Plan

Metformin	Stop	Continue	Dose.....
Basal (long acting) subcutaneous insulin	Stop	Continue	Dose.....
Rapid (short acting) subcutaneous insulin	Stop	Continue	Dose.....

Blood Glucose Monitoring Post Delivery

Type 1 diabetes and Type 2 diabetes treated with insulin in pregnancy- one hourly until first meal, then **pre meals, pre bedtime and 3am**, aiming for CBG 6.0 - 10.0 mmol/L, to avoid hypoglycaemia.

Type 2 diabetes treated with metformin- **4 hourly until first meal then pre meals and pre bedtime** aiming for CBG 6.0 -10.0 mmol/L, to avoid hypoglycaemia.

Women with Gestational Diabetes-**pre and post meal for up to 24 hours**. Target pre-meal <7.0mmol/L and 1 hour post meal <11.1mmol/L.

Women who are to continue insulin or metformin post-delivery need diabetes team review

Pre Discharge Plan after Vaginal Delivery and LSCS

- Women diagnosed with GDM in pregnancy need fasting blood sugar at 6-13 weeks or HbA1c at 13 weeks in primary care (GP) and annually thereafter.
- Discuss NHS BABY Steps initiative to Women with GDM (reduce T2DM risk) www.letspreventdiabetes.wales
- Discuss contraception; access primary care ☐ Depo injection offered ☐ agreed ☐
- Women to resume outpatient appointments for pre-existing diabetes.

Date.....

Sign.....

DSN contact numbers

POW-01656 752900- option 2.

PCH- 01685 728490 OR ext 28511 OR bleep 408.

RGH-01685 721721 ext 26261/26896

Appendix I – Previous Gestational Diabetes Pathway

PREVIOUS GESTATIONAL DIABETES

Community midwife booking appointment and risk assessment.
Diabetes acknowledged

Arrange dating scan

Arrange OGTT at 16 weeks gestation
(after viable dating scan)

Alternatively, women may choose to start blood glucose monitoring at earliest opportunity.

(if women choose this option refer to diabetes centre, advising at least 2-3 weekly contact with DSN, particularly in 2nd and 3rd trimester)

If 16/40 OGTT result is negative arrange repeat OGTT at 28 weeks

Positive results for gestational diabetes are either:

- A fasting plasma glucose of 5.6mmol/L or above, or
- A 2-hour plasma glucose of 7.8mmol/L or above.

If positive for gestation diabetes, patient is for pathway below:

- Diabetic Specialist Nurse referral for blood glucose monitoring
- Combined Obstetric/Endocrine clinic referral
- Arrange 28,32,36 and 38-39 week serial scans (NICE, 2015).

Appendix J – Guidance for Use of Insulin Pumps (CSII) in the Delivery Suite for Labour, Delivery and Elective Caesarean Section

Insulin pump therapy and use of antenatal steroids during pregnancy

Administration of antenatal steroids for fetal lung maturity is considered for all women at risk for preterm birth up to 35⁺⁶ weeks. This may result in deterioration in glycaemic control for 2-3 days and should be anticipated and managed actively.

The key recommendations are:

- Inform the diabetes team before steroids are started.
- Women should be allowed and encouraged to safely manage their BG levels following steroid administration by the use of correction boluses and temporary basal rate increases.
- The diabetes specialist nurse/team will instruct the patient regarding any change in CSII settings.
- Patients usually need a temporary increase in basal rate of 30% but more may be required. In general, an increase in total daily doses of approximately 40-50% is needed.
- Patients will be required to have their BG levels tested at hourly intervals and aim to achieve a BG target of 5.0-8.0 mmol/L.
- If optimal BG targets cannot be achieved (i.e. 2 consecutive BG readings are > 8.0 mmol/L a VRIII should be commenced (as per VRIII protocol). This should be prescribed in advance where possible. Once commenced on VRIII, the insulin pump should be disconnected and taken off.

Insulin pump therapy during labour or for elective caesarean section (ECS)

Optimal BG control prior to delivery (either normal delivery or elective caesarean section) is related to reduction in neonatal hypoglycaemia. Therefore, women should aim to maintain **BG levels between 5.0-8.0 mmol/L** throughout the labour and delivery by any route.

The key recommendations are:

- The decision regarding the patient's suitability to self-manage CSII through delivery should be made by the specialist diabetes team and documented in the notes.
- If patient +/- partner are happy to self-manage their insulin pumps they should be encouraged to do so and CSII should be continued on pre-existing settings.
- IV cannula should be inserted in case patient needs intravenous insulin infusion or fluids.
- Patients should use correction boluses and/or temporary basal rate changes to maintain optimal BG levels.
- Patients should have BG checked at hourly intervals and aim to achieve target BG levels between 5.0-8.0mmol/L (women using CGM)

should be reminded that capillary BG readings are more accurate during labour and delivery).

- For caesarean sections, when diathermy is not used, the insulin pump should remain in place on the basal settings. **If diathermy is being used, ensure diathermy pad is not placed in proximity to CSII** (JBDS, 2022); ensure Anaesthetist input.
- If the patient is unable to manage her own pump settings or her BG control becomes unstable or deteriorates, then VRIII should be commenced immediately and insulin pump should be disconnected and taken off.

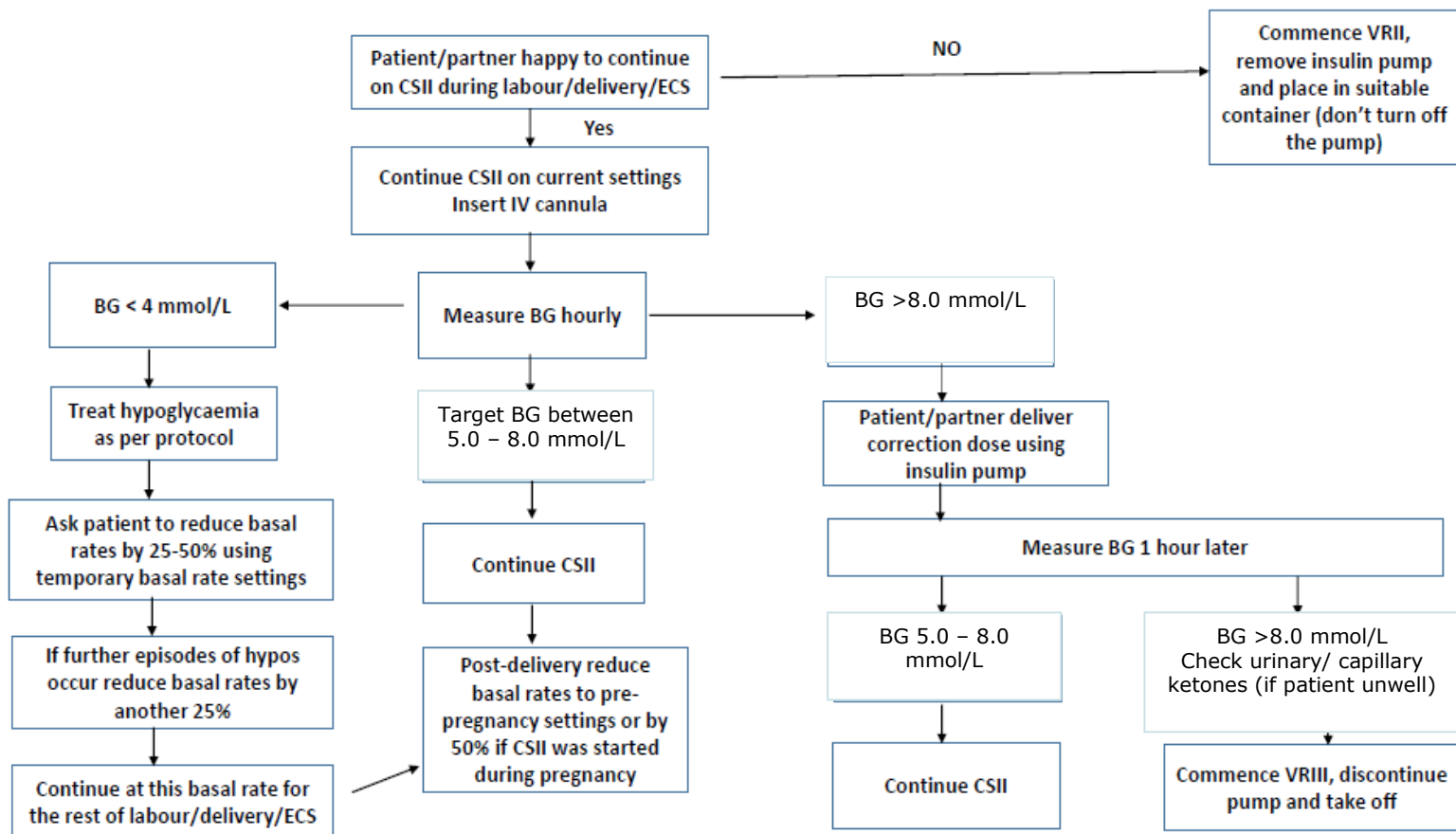
Hyperglycaemia during labour, normal delivery or ECS with pumps

- If BG >8.0 mmol/L patient/partner should be advised to use a correction bolus dose via pump, aiming for a BG of 5.0 mmol/L (patient should use their own correction dose as per “insulin sensitivity factor” (ISF)). BG should be checked after 1 hour. If BG 5.0 - 8.0 mmol/L CSII should be continued. If BG is still >8.0 mmol/L switch to VRIII, disconnect and take off insulin pump. *Remember to check urinary (++) ketones* [or capillary ketones (>1.5 mmol/L) if staff is trained to perform testing and interpret results]. If BG is > 8.0 mmol/L on two consecutive occasions despite using a correction dose, VRII is mandatory in these circumstances (Figure 1).
- Keep an open mind about diagnosing **Diabetic Ketoacidosis** (DKA) while managing patients on a pump during labour, normal delivery or ECS. DKA should be suspected if the patient is feeling unwell and have symptoms of nausea and vomiting.
- DKA can occur in pregnancy in a woman with normal BG. They will also have a) *Urinary ketones* > ++ (or capillary ketones > 3.0 mmol/L (high risk if > 1.5 mmol/L – if tested by staff in specialised areas)) AND venous blood gas shows pH < 7.3 and/or bicarbonate < 15 mmol/L (N.B. bicarbonate is reduced in pregnancy). If DKA is confirmed, insulin pump should be discontinued and taken off and fixed rate intravenous insulin infusion (FRIII) should be commenced as per DKA protocol. **DKA in pregnancy should be managed in HDU or ITU** with early involvement of the medical or diabetes team.

Hypoglycaemia during labour, normal delivery or ECS with pumps

- If BG is < 4 mmol/L treat hypoglycaemia as per *Think Glucose Hypoglycaemia management* (use rapid acting carbohydrates, e.g. dextrose tablets). Existing basal rates in the pump should be reduced by 25-50% using a temporary basal rate setting.
- BG should be checked after 15 minutes and then at hourly interval, if BG remains < 4 mmol/L, further corrections should be done and basal rates should be lowered by another 25%. Such lowered basal rates should be continued throughout the rest of the labour/delivery or ECS (Figure 1).
- Long acting carbohydrates are usually not needed routinely.

Figure 1: Guidance for Use of Insulin Pumps (CSII) During Labour, Delivery and ECS (Diabetes Technology Network UK, 2019).



Postnatal period and use of insulin pump

- Insulin requirements drop immediately after delivery. Post-delivery CSII settings should be planned in advance towards the end of pregnancy in discussion with the diabetes team and should be entered into the pump memory in advance. Please refer to patient's *Intrapartum Individual Diabetes Care Plan*, if available (Appendix H).
- If patient continued on CSII for whole period of labour/delivery or ECS, they should continue pre-pregnancy basal rates but with at least 10-30% reduction. If CSII was started during pregnancy, pre-delivery basal rates should be reduced by 50%.
- If post-partum dose were not entered earlier, then the basal rate can be set at 0.5 units/hour.
- Bolus insulin doses should be changed universally to 1:15g (insulin: carbohydrate ratio), ISF to 4.0 mmol/L and BG targets should be aimed for 6.0 – 8.0 mmol/L. Further adjustments can be done to each of them in discussion with the diabetes team. These settings should be in place before the first bolus dose.
- If patients were managed with VR during labour/delivery or ECS, transition to CSII should be made once the patient is eating and drinking (with main meal) and can self-manage the pump. CSII should be commenced with all

the post-delivery adjustments to settings mentioned above with an overlap of 60 minutes and then VRIII should be discontinued.

- Insulin bolus is usually not required for the first light meal taken post-delivery.
- Hourly BG monitoring should continue till the first meal and then every 4 hourly. BG targets can be relaxed to 6.0 – 10.0 mmol/L. Emphasis should be to avoid maternal hypoglycaemia.
- For women who would breastfeed their child, basal rates should be reduced by a further 10-20% (usually runs at 50% of pre-pregnancy basal rates- all rates are halved). Women should be advised to snack (10-15 g of carbohydrate) and drink each time they feed or express milk (including night feeds).
- Ongoing support and advice should be provided by the specialist diabetes team.

Stopping and restarting CSII in pregnant patients during and after delivery

Stopping

- The pump, tubing and cannula should be removed.
- The pump should be placed into a suitable container and should be kept switched on.
- Alternative insulin should be started immediately, i.e. within an hour to avoid risk of DKA.
- Keep a record of current basal and bolus settings.

Restarting

- The patient is the best person to restart the pump because of their training and experience.
- If pump was removed or suspended temporarily, the patient should use a new infusion set [tubing and cannula] and restart basal infusion as per programmed settings.
- If transferring from VRIII, patient should restart pump with a new infusion set [tubing and cannula]; VRIII to be discontinued with overlap of 60 minutes.

Appendix K – Performance Standards to Measure Compliance with All Wales Strategy for Screening and Managing Gestational Diabetes

1. Screening women with risk factors for gestational diabetes in accordance with the above strategy / NICE Guideline NG3 2015⁽¹⁾: Using:
 - BMI above 30 kg/m²
 - previous macrosomic baby weighing 4.5 kg or above
 - previous gestational diabetes
 - family history of diabetes (first degree relative with diabetes)
 - ethnic family origin with a high prevalence of diabetes
 - glycosuria of 2+ or above on 1 occasion or of 1+ or above on 2 or more detected by reagent strip testing during routine antenatal care

Compliant:

Variance:

Reason for variance:
2. Using the All Wales Strategy / NICE Guideline NG3⁽¹⁾ definition of gestational diabetes rather than other definitions:

“Diagnose gestational diabetes using a 75g OGTT if the woman has either:

 - a fasting plasma glucose level of 5.6 mmol/L or above **or**
 - a 2 hour plasma glucose level of 7.8 mmol/L or above.”

Compliant:

Variance:

Reason for variance:
3. Using the All Wales Strategy / NICE Guideline NG3⁽¹⁾ targets for capillary glucose when treating gestational diabetes:

fasting capillary glucose < 5.3mmol/L
 1 hour after food < 7.8mmol/L
 2 hours after food < 6.4mmol/L

Compliant:

Variance:

Reason for variance:
4. 100% women with a new diagnosis of gestational diabetes to be seen by the specialized team within a week (note: this is not the combined obstetric / diabetes clinic but a specialized service to explain the diagnosis, give appropriate dietary advice, teach capillary testing – see standard⁽²⁾)

Compliant:

Variance:

Reason for variance:
5. 100% communication with primary care of the diagnosis of gestational diabetes to facilitate READ coding and appropriate follow up with intervention to prevent diabetes.

Compliant:

Variance:

Reason for variance:

All Wales Strategy for screening and managing Gestational Diabetes (2017).

Appendix L – Welsh Government Reportable Incidents and DATIX Report Incidents

Welsh Government Reportable Incidents within Maternity:

- Diabetic Ketoacidosis (DKA) acquired hospital stay.
- Significant or severe hypoglycaemia during inpatient stay.
- New foot ulcer development during hospital stay.
- Hyperglycaemia Hyperosmolar Syndrome (HHS) during hospital stay (usually affects the older Type 2 diabetes population).

Incidents which Require DATIX Reporting:

- Insulin prescribing errors, dispensing errors, misadministration and inappropriate omission.
- Oral hypoglycaemic prescribing or dispensing errors.
- Failure to monitor blood sugars appropriately.
- Mismanagement of hypoglycaemia.
- Mismanagement of DKA (diabetic ketoacidosis).

Appendix M – Joint British Diabetes Society for In-patient Care VRIII Algorithm (LIBERAL version)

Management of glycaemic control in pregnant women with diabetes on obstetric wards and delivery units (JBDS, 2022).

VARIABLE RATE INTRAVENOUS INSULIN INFUSION (VRIII)- 50 units Actrapid in 49.5mL 0.9% sodium chloride via syringe driver and substrate fluid (please refer to Appendix D and Appendix O).

Blood glucose target: 5.0 -8.0 mmol/L.
--

Flash or CGM should not be used for insulin dosing during VRIII; **hospital glucometer MUST be used.**

	DOSING ALGORITHM		
Algorithm >	1	2	3
CBG 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)
	Infusion Rate (units/h = mL/h)		
< 5.0	STOP INSULIN FOR 20 MINUTES- TREAT HYPOGLYCAEMIA AS GUIDELINE (recheck 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

ALGORITHM GUIDE FOR ANTENATAL STEROIDS

- Start VRIII and fluids if BG levels are > 8.0 mmol/L on two consecutive readings and continue for up to 12 hours after the last dose, or until blood glucose stabilise to < 8.0 mmol/L.
- **ALL** women with diabetes should have Blood Glucose (BG) testing hourly whilst on VRIII for the management of steroid hyperglycaemia during pregnancy
N.B. at CTMUHB hospital glucometers must be used for blood glucose monitoring if VRIII is used.

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 = 5.0 – 8.0 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 4.0 mmol/L or is dropping too fast.

LIBERAL ALGORITHM GUIDE FOR USE IN LABOUR/C-SECTION **BLOOD GLUCOSE 5.0 – 8.0 mmol/L**

- **ALL** women with diabetes should have BG or intermittent or real time CGM testing hourly in established labour after ARM or on admission for C-section
N.B. at CTMUHB hospital glucometers must be used for blood glucose monitoring if VRIII is used.
- Start VRIII and fluids if CBG > 8.0 mmol/L on two consecutive readings.

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)

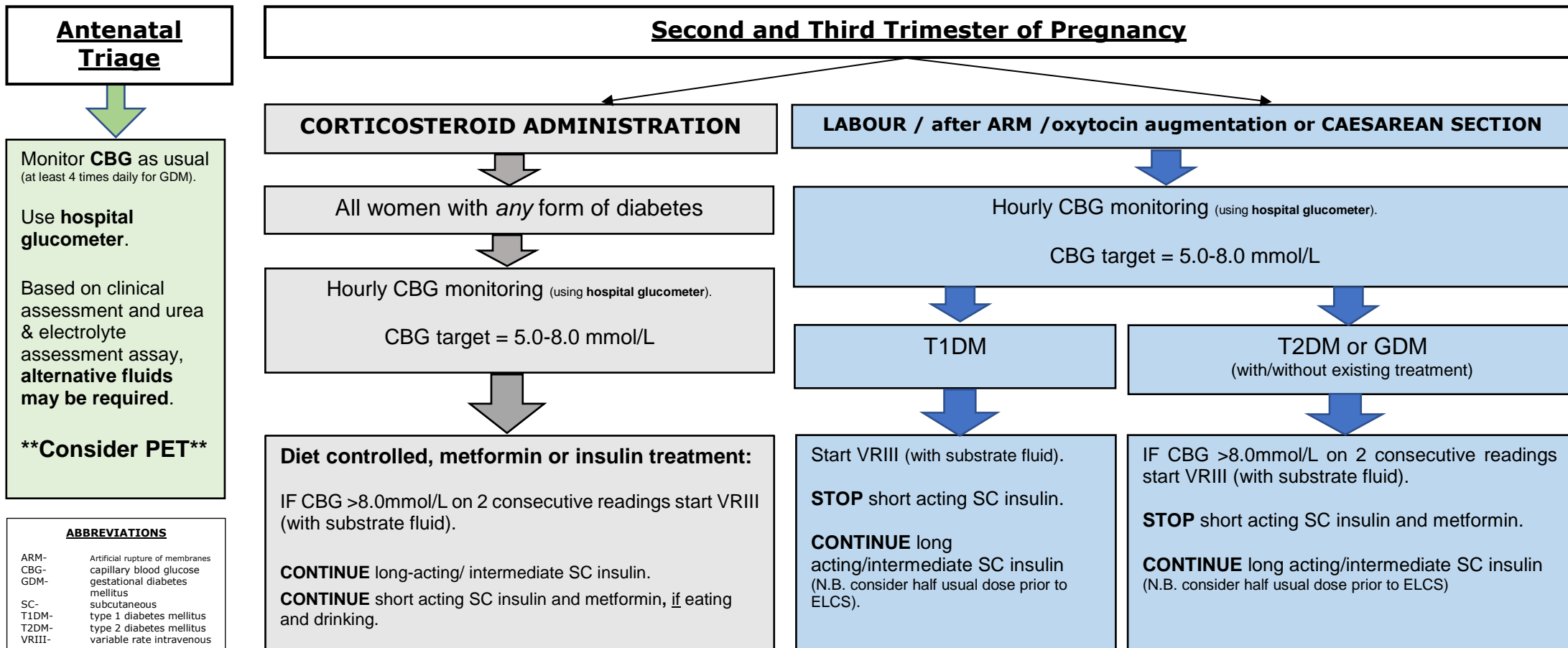
Target CBG level = 5.0 – 8.0 mmol/L

Check CBG every hour whilst on VRIII, and every half an hour if general anesthesia is required.

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

Move to the lower algorithm if CBG falls below 4.0 mmol/L or is dropping too fast.

Appendix N – Flow Chart for the Use of Variable Rate Intravenous Insulin Infusion (VRIII) In Pregnancy



- VRIII **substrate fluid** choice for 'CORTICOSTEROID ADMINISTRATION' and 'during LABOUR or CAESAREAN SECTION': **0.9% saline and 5% glucose with 0.15% potassium chloride (10mmol)** (500mL premixed bag). Rate = 50mL/h.
- VRIII substrate fluid for other antenatal triage women- rate depends on clinical assessment U+E assessment etc (rate can range between 50-125mL/h).
- Hospital glucometer **must** be used on ALL inpatient women with diabetes and those receiving VRIII.
- If **CBG <4.0 mmol/L treat as hypoglycaemia**-refer to *Think Glucose* Hypoglycaemia management.
- If on VRIII and blood glucose persistently out of range discuss with diabetes team.
- Continue VRIII 12 hours minimum post second dose of steroid- may be needed 24hours post second steroid dose until <8.0 mmol/L is achieved.