

WOMEN'S HEALTH AND PAEDIATRICS
MATERNITY UNIT

Diabetes in Pregnancy

Amendments			
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1			Women's Health Guidelines Group
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1.0 Gestational diabetes (GDM)

1.1 Care pathway for women with GDM or previous GDM where indicated

Booking 10/40	<p>Discuss information, education and advice especially:</p> <ul style="list-style-type: none"> • Diet • Previous pregnancy • Screening • Plan for this pregnancy • FBC, U&Es, HBA1C <p>Book appointments as scheduled below including 12-16/40 OGTT for women with previous GDM</p>	CMW
11-13/40	<p>Screening USS</p> <p>Start Aspirin if indicated</p>	USS
12-16/40	OGTT (for women with previous GDM)	ANC
<p>If OGTT is normal revert to standard care pathway for that pregnancy but rebook OGTT for 24-28/40</p> <p>If OGTT confirms GDM refer to maternity diabetes MDT (which will include Obstetrics and dietitian) for appt within 7 days, commence CBG monitoring and follow schedule below:</p>		
20/40	Anomaly USS and Obs review	USS and Obs
24-28/40	OGTT (for women with risk factors or those with previous GDM who had a normal OGTT at 12-16/40)	ANC
<p>If OGTT is normal revert to standard care pathway for that pregnancy</p> <p>If OGTT confirms GDM refer to maternity diabetes MDT (which will include Obstetrics and dietitian) for appt within 7 days, commence CBG monitoring and follow schedule below:</p>		
28/40	<p>USS growth, liquor and dopplers</p> <p>BP, urine</p>	USS and Obs

	Take routine bloods and HbA1C assessment	
30/40 (para 0 only)	BP, Urine, and FH Obstetric review	Obs
32/40	USS growth, liquor and dopplers BP, urine	USS and Obs
36/40	USS growth, liquor and dopplers BP, urine Plan and book delivery (IOL or LSCS depending on the maternal and fetal situation)	USS and Obs
38/40 (if undelivered)	BP, Urine and FH	Obs
39/40 (If undelivered)	BP, Urine and FH	Obs

1.2 Risk Assessment

1.2.1 Risk factors at booking

All women should have a risk assessment for gestational diabetes undertaken at booking by the booking midwife. This should be recorded on BadgerNet as part of the booking summary.

Women with previous Gestational diabetes - Offer a formal OGTT at 10 - 16/40

***** for women with previous bariatric surgery, do not book an OGTT, they require capillary blood glucose monitoring*****

Offer a formal OGTT at 24-28/40 with women who have one of the following risk factors at booking:

- BMI above 30 kg/m²
- Previous macrosomic baby weighing (>4.5 kg)
- Previous gestational diabetes whose 16/40 OGTT was normal
- Family history of diabetes (first degree relative with diabetes)
- Minority ethnic family origin with a high prevalence of diabetes.
- Polycystic ovarian syndrome

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- Women taking antipsychotic medication
- Previous IUD / stillbirth

1.2.2 Risk factors arising during the pregnancy

- Glycosuria 2+ on one occasion or 1+ on 2 occasions
- Polyhydramnios (single deepest pool >8cm) diagnosed by Ultrasound scan
- EFW or fetal AC>97th centile

If < 36 weeks - Offer an OGTT and manage according to results

If 36-38/40 gestation:

- Give dietary advice as per GDM
- Offer USS for growth, liquor and dopplers (if not already done in the last two weeks)
- Book for delivery as per "Timing of delivery" section.
- Offer capillary blood glucose monitoring profile monitoring via diabetes midwives

If >38/40 Gestation

- Give dietary advice as per GDM
- Counsel fully re delivery options and document the discussion
- Book for delivery as per "Timing of delivery" section.
- **Do not** offer capillary blood glucose monitoring profile monitoring for diagnostic purposes unless they decline delivery or there is another indication.

NB: So that women can make an informed decision about risk assessment and testing for gestational diabetes, explain that:

- Gestational diabetes may respond to changes in diet and exercise, however, many women will need oral blood glucose lowering agents or insulin therapy if lifestyle changes in diet and exercise do not control blood sugar effectively
- If gestational diabetes is not detected and controlled, there is a small increased risk of serious adverse outcomes (including stillbirth, pre-eclampsia and macrosomia)
- A diagnosis of gestational diabetes will lead to increased monitoring, and may lead to increased interventions, during both pregnancy and labour

1.3 Testing

This is done by a 2 hour 75 g oral glucose tolerance test (OGTT)

Please note that women who have had bariatric surgery must not be booked for an OGTT but should have capillary blood glucose (CBG) profiling arranged instead.

Refer for an OGTT via BadgerNet, the OGTT will be arranged and conducted as per the SOP section 6

A diagnosis of GDM is made with one or both of the following results

- Fasting blood glucose = 5.6 mmol/litre or more
- 2 hour post 75g load glucose of 7.8 mmol/litre or more

The results of the test will be reviewed and actioned by the diabetes specialist midwives

- Normal results - they will be available on BadgerNet within 7 days.

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- Abnormal results - the woman will be telephoned and a treatment pathway commenced. This will be within 7 days of the test

1.4 New diagnosis of gestational diabetes

1.4.1 Initial advice

Explain and advise:

- The implications (both short and long term) for her and her baby
- 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
- Treatment includes changes in diet and exercise (e.g. 30 minute walk after a meal), and could involve medications
- Healthy diet and exercise should be maintained throughout the pregnancy
 - The necessity of avoiding high glycaemic index foods
 - How to monitor blood glucose
 - How to use the GDM app
 - How to seek help, whom to contact and when it is appropriate to do so

Offer women with a diagnosis of gestational diabetes a review with the joint diabetes and antenatal clinic within 1 week

1.5 Treatment of GDM

These women should be managed as part of the MDT with input from Endocrinologist, Dietitian, Specialist Midwife and Obstetrician

All women should be referred to a dietician

Fasting plasma glucose level between 5.5 – 7.0 mmol/litre at diagnosis

- Start with dietary and lifestyle changes.
- If diet and exercise measures are unsuccessful, then the first line treatment is metformin. If metformin is contraindicated or unacceptable then offer insulin.
- If metformin fails to control plasma glucose levels, then offer additional insulin as well as the metformin
- If there is macrosomia +/- polyhydramnios, with fasting plasma glucose level between 6.0 – 6.9 mmol/litre, then consider starting insulin +/- metformin

Fasting plasma glucose level above >7.0 mmol/litre at diagnosis

Offer immediate treatment with insulin, with or without metformin, as well as changes in diet and exercise.

Glibenclamide

This is rarely used and should only be started by an endocrinologist under very specific circumstances such as women with gestational diabetes who either:

- Do not achieve adequate control of blood glucose on metformin
- Who decline insulin therapy

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- Cannot tolerate metformin.

1.6 Antenatal care in GDM

1.6.1 Ante-natal appointments

The appointments will be at minimum at the four-weekly scans.

Appointment frequency can be increased in frequency if blood glucose levels are poorly controlled
If the woman has well controlled gestational diabetes on diet only, then she can be seen through the midwifery led ANC (When available – work in progress)

Women requiring medication or insulin must be reviewed through the diabetes ANC by an Obstetrician +/- Endocrinologist

1.6.2 Blood glucose monitoring:

- The capillary blood glucose (CBG) levels will be reviewed regularly by the Diabetes Specialist Midwives
- Women who are on diet control, a single oral hypo-glycaemic medication or a single dose of intermediate or long acting insulin need to check their fasting and post meal glucose levels.
- Women with gestational diabetes who are on a multiple daily insulin injection regimen to test their fasting, premeal, 1hour postmeal and bedtime blood glucose levels daily
- Target blood glucose levels should be above 4.0 mmol/litre but below:
 - Fasting – 5.3 mmol/litre
 - 1 hour post meal – 7.8 mmol/litre
- If a woman becomes hypoglycaemic (confirmed on CBG), she should be advised to eat some glucose containing foods (Jelly babies/glucose tablets), followed by some longer acting carbohydrate. If that doesn't increase the CBG or she feels unwell, the woman should contact the Surrey Heartlands pregnancy advice line and an urgent assessment arranged via the Maternity Assessment Centre (triage)

1.6.3 Fetal growth monitoring:

- All women with gestational diabetes should be offered serial scans at 28, 32 and 36 weeks gestation.
- These women must be reviewed after having had the scan by the Obstetrician in the joint Diabetes Antenatal Clinic
- At the 36 weeks appointment, a plan will be made for the mode and timing of delivery

1.7 Timing of delivery

Diet control only

1 – Well controlled – delivery should occur between 40 - 40⁺⁶/40

2 – Poorly controlled – delivery can be planned sooner, depending on maternal and fetal indications including (but not limited to) macrosomia, polyhydramnios, fetal growth restriction, hypertension.

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Oral hypo-glycaemics +/- insulin therapy

1 – Uncomplicated women – deliver electively by IOL or LSCS between 37⁺⁰/40 and 38⁺⁶/40

2 – Complicated women – consider delivery prior to 37⁺⁰/40 after MDT discussion

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1.8 Intrapartum care GDM

- Any IV fluids administered **must not** contain dextrose unless on VRIII
- Women with GDM **must not** be given glucose containing energy drinks in labour (unless treating a hypo-glycaemic episode)

	GDM diet	Metformin	Insulin +/- metformin
Spontaneous labour	<ul style="list-style-type: none"> No special precautions, manage as normal labour Blood glucose monitoring is not required Suitable for ABC if wished 	<u>Early labour</u> <ul style="list-style-type: none"> Eat and drink normally Take medication as normal <ul style="list-style-type: none"> Check and record pre and post meal CBG <u>Established labour</u> <ul style="list-style-type: none"> hourly CBG and ensure it is maintained between 4.0 – 7.0 mmol/l and start VRIII if CBG >7.0 mmol/litre 	<u>Early labour</u> <ul style="list-style-type: none"> Eat and drink normally Check pre and post meal CBG only <u>Established labour</u> <ul style="list-style-type: none"> Hourly CBG monitoring, ensure CBG remains between 4.0 – 7.0 mmol/l and start VRIII if CBG >7.0 mmol/litre (NICE) Use VRIII regardless if woman is using long acting insulin
Induction of labour	<ul style="list-style-type: none"> IOL to take place on Joan Booker Ward Can eat and drink during induction Pre and 1 hour post meal blood glucose levels (CBG) to be recorded on the diabetes chart once in established labour 	<ul style="list-style-type: none"> IOL to take place on JBW Can eat and drink during induction and labour Take medication as normal Pre and post meal CBG to be recorded on a diabetes chart Once in established labour as above. 	<ul style="list-style-type: none"> IOL to take place on JBW Can eat and drink during induction and labour Take medication as normal Pre and post meal CBG to be recorded on a diabetes chart Once in established labour – as above
Elective caesarean section Always first on LSCS list	<ul style="list-style-type: none"> As per normal elective LSCS pathway 	<ul style="list-style-type: none"> Fast for 6 hours pre delivery Can drink plain water until 2 hours pre delivery Omeprazole and metoclopramide as usual Omit metformin on the morning of surgery Hourly CBG until delivery to be documented on the diabetes chart VRIII only if CBG >7.0 mmol/l 	<ul style="list-style-type: none"> Fast for 6 hours pre delivery Can drink plain water until 2 hours pre delivery Omeprazole and metoclopramide as usual Avoid metformin and insulin on the morning of surgery Hourly CBG until delivery, ensure it is maintained between 4.0 – 7.0 mmol/litre, to be documented on the diabetes chart VRIII only if CBG >7.0 mmol/l or if woman is using long acting insulin

Emergency caesarean section	- As per labour pathway	- If VRIII has been started during labour or induction then continue throughout LSCS - If VRIII has not been started then continue without.
Post delivery	Routine care	Stop metformin +/- insulin Follow postnatal care section Stop VRIII once eating and drinking (follow VRIII chart) Monitor baby for signs hypoglycaemia as per neonatal guideline

1.9 Postnatal Care in GDM

- Normal diet
- Stop medication (metformin and/or insulin) and regular CBG testing immediately after delivery
- Monitor CBG for 24-48 hours prior to and one hour post meal
- Remind women of the symptoms of hyperglycaemia for long term health (thirst, excessive drinking and polyuria)
- Explain there is a recurrence risk in future pregnancies and an increased lifetime risk of diabetes. This risk can be reduced by a healthy lifestyle (weight control, diet and exercise)
- GP to arrange a fasting plasma glucose test and HBA1C 6–13 weeks after the birth to exclude diabetes (usually at the 6 week postnatal check) and annually.

• GDM diet only	Metformin	Insulin +/- metformin
<ul style="list-style-type: none"> • No special diet required • CBG prior to meals and one hour after meals the day after delivery • If CBG is > 11.0 mmol/l, repeat CBG again in one hour. If it is still > 11.0 mmol/litre, contact duty Medical SpR 	<ul style="list-style-type: none"> • No special diet • Stop metformin +/- insulin • Fasting CBG the day after delivery • If CBG >11 mmol/litre, repeat CBG again in one hour. If it is still > 11.0 mmol/litre, contact duty Medical SpR • If VRIII started during labour then continue VRIII until able to eat and drink (See chart in appendix) 	
Baby - Routine care	<ul style="list-style-type: none"> • Monitor for signs of hypoglycaemia as per guideline 	

2.0 Women with pre-existing Diabetes

2.1 Antenatal care in pre-existing diabetes

These women should be managed as part of the MDT with input from Endocrinologist, Dietitian, Specialist Midwife and Obstetrician.

Antenatal appointments and care should follow the care pathway section shown in 2.2

2.1.1 Pre-conception

Ideally women with pre-existing diabetes should plan pregnancy and optimise their diabetes control prior to conception. This should be in conjunction with their endocrinologist, obstetric consultant and GP and occur prior to discontinuing any contraception.

2.1.2 Education

- Use contraception (including OCP) until good blood glucose control assessed by HbA1c level (target < 48 mmol/mol or 6.5% NICE, 2015) has been established because establishing good blood glucose control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death (although it does not eliminate it)
- The role of diet, body weight and exercise
- The possibility of temporary health problems in the baby during the neonatal period, which may require admission to the neonatal unit
- The risk of the baby developing obesity and/or diabetes in later life.
- The risks associated with pregnancy in women with diabetes increase with how long the woman has had diabetes.
- Extra time and effort is needed to manage diabetes during pregnancy and that she will have frequent contact with healthcare professionals
- The increased risk of having a baby who is large for gestational age, which increases the likelihood of birth trauma, induction of labour and caesarean section
- The need for assessment of diabetic retinopathy and nephropathy before and during pregnancy

2.1.3 Blood glucose control:

- Targets, glucose monitoring, medicines for treating diabetes (including insulin regimens for insulin treated diabetes) and medicines for complications of diabetes will need to be reviewed before, during and after pregnancy. Agree individualised targets
- Aim for fasting and pre meal reading between 4.0 – 7.0 mmol/.
- Target HbA1C level to below 48 mmol/mol (6.5%) to reduce the risk of congenital malformations in the baby
- Strongly advise women with diabetes whose HbA1c level is above 86 mmol/mol (10%) not to get pregnant
- Advise re the risks of hypoglycaemia and impaired awareness of hypoglycaemia during pregnancy
- How nausea and vomiting in pregnancy can affect blood glucose control
- The importance of maternal blood glucose control during labour and birth and early feeding of the baby, in order to reduce the risk of neonatal hypoglycaemia

2.1.4 Diet, dietary supplements and body weight

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- Offer individualised dietary advice
- Advise and support those with a BMI >27 to lose weight
- Prescribe folic acid 5mgs daily from pre-conception to 12/40

2.1.5 Renal and retinal assessment

- Renal – if creatinine is >120 micromol/litre or urine PCR is greater than 30 mg/mmol or the eGFR <45 ml/minute/1.73 m² then referral to a nephrologist is advised prior to stopping contraception.
- Retinal – offer assessment unless they have had an annual retinal assessment in the last 6 months, this should continue annually if no diabetic retinopathy is found. This should be done prior to optimisation of blood glucose control.

2.1.6 Medication

- Women with diabetes may be advised to use metformin as an adjunct or alternative to insulin in the preconception period and during pregnancy, but all other oral blood glucose-lowering agents should be discontinued before pregnancy and insulin substituted.
- Use isophane insulin (also known as NPH insulin) as the first choice for long-acting insulin during pregnancy but insulin detemir, insulin degludec or insulin glargine can be continued in women with diabetes who have established good blood glucose control before pregnancy
- Angiotensin converting enzyme inhibitors and angiotensin II receptor antagonists should be discontinued before conception or as soon as pregnancy is confirmed. Alternative antihypertensive agents suitable for use during pregnancy should be substituted.
- Statins should be discontinued before pregnancy or as soon as pregnancy is confirmed.

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2.2 Care pathway – Type 1 or 2 diabetes

Pre-conception	Pre-pregnancy counselling is offered by the lead obstetrician in their outpatient clinic. Advised to start folic acid 5mg daily and to start aspirin 150mg from 12 weeks gestation onwards	GP
Pre-booking (7-9/40)	Viability USS	USS (to be arranged by DSM)
Booking	CMW	Community
10/40	<p>Discuss information, education and advice:</p> <ul style="list-style-type: none"> about how diabetes will affect the pregnancy, birth and early parenting (e.g. breastfeeding and risk of hypoglycaemia) in relation to achieving optimal blood glucose control (including dietary advice) <p>If the woman has not had preconception care and advice:</p> <ul style="list-style-type: none"> 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) review medicines for diabetes and its complications. <p>Offer retinal and renal assessment for women with pre-existing diabetes unless the woman has been assessed in the last 3 months.</p> <p>Arrange contact with the joint diabetes and antenatal clinic every 1–2 weeks throughout pregnancy.</p> <p>Measure HbA1C levels, renal function and TFTs in T1DM</p> <p>Book appointments as scheduled below</p>	Endo + Obs

11-13/40	Screening USS Start Aspirin 150mgs daily from 12-36/40 Discuss risks re fetal growth restriction, macrosomia, pre-eclampsia and congenital anomalies	USS and Obs
14/40	Endocrine review	Endo
16/40	Refer to retinal assessment, through diabetes retinal screening service (DRSS).	Endo and Obs
18/40	Endocrine review	Endo
20/40	Anomaly USS and Obs review (May be referred to SGH for echo if views are unclear)	USS and Obs
22/40	Endocrine review	Endo
24/40	Endocrine review	Endo
26/40	Endocrine review, BP, Urine, SFH and FH	Endo and obs
28/40	USS growth, liquor and dopplers BP, urine Retinal assessment Take routine bloods and HbA1C assessment	USS and Obs
30/40	BP, Urine, SFH and FH Assess 28/40 test results	Obs (+/- endo)
32/40	USS growth, liquor and dopplers BP, urine	USS and Obs
34/40	BP, Urine, SFH and FH	Obs and Endo

36/40	<p>USS growth, liquor and dopplers</p> <p>BP, urine</p> <p>Plan and book delivery (IOL or LSCS depending on the maternal and fetal situation)</p>	<p>USS and Obs and Endo</p> <p>Postnatal delivery plan to be made</p>
37+0/40 – 38+6/40	Date for delivery should be in this time frame	Obs
38/40 (if undelivered)	BP, Urine, SFH and FH	Obs
39/40 (If undelivered)	BP, Urine, SFH and FH	Obs

2.3 Timing and mode of birth

1 – Uncomplicated women – deliver electively by IOL or LSCS between 37⁺⁰/40 and 38⁺⁶/40

2 – Complicated women – consider delivery prior to 37⁺⁰/40 after MDT discussion

Notes

- Diabetes is not a contra-indication to VBAC
- Consider mode of delivery in light of the Montgomery ruling with regards to shoulder dystocia and fetal size.

2.4 Intrapartum care pre-existing diabetes

Advise birth on delivery suite with continuous CTG

All women with pre-existing diabetes who are currently on insulin should be managed with a VRIII during delivery and in the immediate postpartum period until they are eating and drinking.

2.4.1 Spontaneous labour:

- Early labour:- hourly CBG, to ensure CBG levels are maintained between 4.0 – 7.0 mmol/l. Start VRIII if >7.0 mmol/litre
- When in established labour, start VRIII as per protocol.
- Can eat and drink as per normal whilst on the VRIII unless other indication to fast is present.

2.4.2 Induction of labour:

- Propess induction can start on JBW as per normal IOL process.
- Can have breakfast and usual insulin at home, before admission

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- The woman should record pre and post meal blood glucose levels until in established labour.
- Whilst eating the woman should take her usual short acting insulin doses with meals.
- If not able to ARM after the Propess is removed, then continue with normal insulin and follow IOL protocol with Prostin gel
- If able to ARM then move to labour ward
- Start VRIII when in established labour or if an Oxytocin infusion is started.

2.4.3 Elective Caesarean section (pre-op)

- For women delivered between 38+0 and 38+6, elective steroid cover is not routinely required unless specifically requested by the diabetes team.
- No food from 6 hours prior to admission but can drink plain water until 6am.
- Omeprazole and Metoclopramide “premedication” (as per normal)
- **No** s/c insulin on the day of Caesarean section.
- Admit to labour ward at 7.30 a.m.
- VRIII regime to be commenced within 30 minutes of admission to the Labour Ward.
- Hourly blood glucose levels to be recorded on the relevant chart in Cerner by the midwife until the woman is transferred to theatre.

2.4.4 Emergency Caesarean section:

- If the VRIII has already been started this must be continued in theatre.
- If Caesarean section is required before the onset of labour, both the woman’s obstetric problems and her diabetes must be appropriately managed.
- Give usual Omeprazole and Metoclopramide
- The time interval between the decision to perform a Caesarean section and transfer to theatre, will inevitably depend upon the indication for Caesarean section. Where possible the woman should be nil by mouth for at least 6 hours.
- The VRIII is to be started within 30 minutes of a decision to perform a Caesarean section.
- If a category 1 Caesarean section is required then the VRIII can be started in theatre by the anaesthetic team
- Whilst on the VRIII, hourly blood glucose levels are to be recorded on the relevant chart in Cerner by the midwife and/or anaesthetist.

2.5 Postnatal Care pre-existing diabetes

2.5.1 Management of the VRIII post delivery (refer to protocol chart)

Women with type 1 diabetes or type 2 on medication +/- insulin should have an individual plan made for their postnatal medication by the Diabetes MDT. This will be recorded in the management box on BadgerNet.

Always Continue VRIII as per protocol until able to eat and drink and have taken their regular s/c insulin in line with the documented post-natal management plan

Oral antidiabetic tablets - Give oral antidiabetic agents with meals as usual. Stop VRIII 30 mins after first dose of tablets.

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Women on mixed insulins eg:Novomix 30/Humalog mix 25/Humalog mix 50 - Prescribe their regular insulin to be given with breakfast and evening meal and stop VRIII 30 mins after first dose or when meal time insulin given

Basal Bolus Short acting insulin with meals plus a long acting insulin 4 or more injections a day - Restart rapid acting insulin with next meal. Can stop VRIII at any time if long acting insulin has been continued.

Insulin pump users (CSII) (people who have their own insulin pump) - The patients' own insulin pump and the VRIII must run together for one hour before stopping VRIII. Stop VRIII once Patients own insulin pump has been running for 1 hour. See section 2.6 for further information.

Patients to resume pre-pregnancy insulin regime in pump.

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2.6 Women who are using an insulin pump

- Women who are using an insulin pump in pregnancy should have an individual plan for management of their pump and settings made by the Endocrinology team.
- This will be documented in the management box on BadgerNet.
- The following guidance does not replace the individual plan but provides a framework for managing these cases.

Labour

- Women with insulin pumps may prefer to use them whilst in labour. Most typically they will self-manage their pump with assistance from their partner as required. They will use correction boluses and/or temporary basal rate changes to maintain optimal glycaemic control.
- Women using continuous glucose monitoring (CGM) should also be reminded that capillary glucose tests are more accurate during labour and delivery.
- Her own insulin pump should remain in place on the basal settings; this will allow safe transition to her postnatal regimen.
- If the woman is unable to manage her own insulin needs, or becomes unstable, i.e. blood glucose >7.0 mmol/L on two consecutive occasions, or has urinary ketones ++ or more on urinary dipstick or high capillary blood ketones (> 1.5 mmol/L) then a VRIII should be commenced immediately and patient's own insulin pump switched off.

Caesarean section

- Women with stable glucose control may continue to use their own insulin pump. If the woman is unable to manage her own insulin needs, or becomes unstable, i.e. blood glucose >7.0 mmol/L on two consecutive occasions or has urinary ketones ++ or more on urinary dipstick or high capillary blood ketones (> 1.5 mmol/L) then a VRIII should be commenced.
- The insulin pump settings can be changed to post-partum doses by the woman or her partner just before the commencement of surgery.

Post delivery

If she hasn't already done so, the woman **must** change the pump settings of her own insulin pump to her postnatal settings (pre-pregnancy dose) as described on her individual care plan provided by the diabetes team. If the woman's pump has been discontinued it should be re-connected for one hour prior to discontinuing the VRIII. Only discontinue VRIII when the woman feels able to manage her own insulin pump.

In the absence of a documented individual care plan, ensure the woman changes her pump following the advice below:

- Basal rates should be reduced to 0.5 units per hour
- Insulin to carbohydrate ratios should be changed to 1 unit of insulin per 15g of carbohydrate
- Insulin sensitivity should be increased to 4 mmol/L
- Blood glucose targets should be relaxed to 6-10 mmol/L

Please note that an insulin bolus is usually not required for the first light meal taken post-delivery. The emphasis is now on avoidance of maternal hypoglycaemia so glycaemic targets are relaxed.

- Refer to specialist diabetes pump team as soon as possible

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3.0 Hypoglycaemia

Hypoglycaemia occurs when the blood glucose drops below 4.0mmol/litre and is a common occurrence in pregnancy. Symptoms of hypoglycaemia include (but are not limited to):

- Weakness
- Sweating
- Shaking/tremor
- Reduced consciousness

Recognition, diagnosis and treatment of hypoglycaemia is essential to avoid the hypoglycaemic episode worsening and resulting in loss of consciousness and in some cases death. There is a “Hypobox” available in all clinical areas.

Recognition

If the woman has symptoms of the above then check CBG and if <4.0mmol/litre then follow the below escalation and treatment

Treatment

- Fully conscious - give oral carbohydrate (eg 3-5 jelly babies/glucogel/1-4 glucose tablets)
- Reduced conscious level - give buccal fast acting dextrose gel (40% dextrose), ‘Glucogel’. This is well absorbed across the buccal mucosa and therefore less likely to be aspirated.
- Unconscious
 - Give a 100ml bolus of 20% glucose intra-venously
 - If the initial bolus fails to raise CBG after 15 minutes then give a repeat 25-50ml bolus of 10% glucose intra-venously
 - If CBG is still <4.0 then start an infusion of 10% dextrose
 - Once CBG >4.0 and the woman is able to eat and drink, give slow release carbohydrates such as toast, digestive biscuits or a meal
 - Monitor CBG hourly when the woman has recovered to pick up any overshoot and high CBG levels.

Escalation

- if fully conscious call the SHO
- if reduced conscious level then call the registrar or CoW (0900 – 1700)
- If unconscious, then call 2222 ‘Obstetric emergency and Adult Priority Call’

- **Give glucagon 1mg intramuscularly if iv access is unavailable or if the above measures are unsuccessful.**

If the hypoglycaemic episode was mild then the woman can stay where she is, however, if the woman is on JBW and has suffered either reduced consciousness or has been unconscious, then when she is stable, she should be transferred to Labour ward and monitored until she can be reviewed by the medical team.

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4.0 Diabetic Ketoacidosis in pregnancy

Please refer to the trust guideline on diabetic ketoacidosis; it can be accessed by clicking [here](#)

Antenatal monitoring

- Offer pregnant women with type 1 diabetes blood ketone testing strips and a meter, and advise them to test for ketonaemia and to seek urgent medical advice if blood ketones > 2 mmol/L as ketoacidosis can occur with normal blood glucose levels in pregnant women.
- Advise pregnant women with type 2 diabetes or gestational diabetes to seek urgent medical advice if they become hyperglycaemic (CBG>12) or unwell

Management of suspected or confirmed diabetic ketoacidosis

- Please be aware that small percentage of diabetic women in pregnancy can have euglycaemic (normal) ketoacidosis
- Test urgently for ketonaemia if a pregnant woman with any form of diabetes presents with hyperglycaemia or is unwell, to exclude diabetic ketoacidosis.
- During pregnancy, admit immediately women who are suspected of having diabetic ketoacidosis to labour ward where they can receive both medical and enhanced maternal care.
- Discuss woman with the on call medical team for advice
- Follow trust pathway for diabetic ketoacidosis
- Stabilise mother as first priority
- Monitor baby with a CTG at gestations >26/40
- Remember that maternal acidosis will cause changes in the CTG (Usually a fetal tachycardia with reduced variability) which will resolve as the acidosis rectifies.
- Senior input is required for any women presenting with DKA and especially with regards to emergency delivery for CTG abnormalities in the acute phase.

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5.0 Antenatal steroids

If a woman is in preterm labour or if she requires preterm delivery for fetal or maternal reasons then antenatal corticosteroids will frequently be required. The administration of corticosteroids is highly likely to adversely affect blood glucose levels and therefore for women with either gestational diabetes or pre-existing diabetes will require close monitoring and control of their blood glucose. In view of the associated morbidity and excess monitoring, the decision for administration must be made by a senior clinician.

Inpatient administration - All women will require inpatient administration of steroids because they are indicated for preterm labour/PPROM/APH etc. which in themselves are indications for admission and monitoring.

6.0 Care on Joan Booker Ward

The diabetes team midwives will be available for advice Monday to Friday 0900 - 1700

The admitting midwife must ensure that all;

- **Type 1 and 2 Diabetes Women**
- **GDM Women on Insulin therapy**
- **GDM Women on Metformin**

are to receive the following on admission to the ward:

- Colour Specific wrist Band
- CBG Monitoring Chart on Cerner if not able to access GDM Health App, to record CBG readings
- Diabetes Drug Chart with ALL and any medicines including GlucoGel and Glucagon prescribed by the obstetric team on arrival as per Cerner pathway.
- Sharps Bin

GDM inpatients who have been monitored during pregnancy and controlled by diet alone will only require;

- CBG Monitoring chart if not able to access the GDM Health app, to record CBG readings
- Sharps Bin

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7.0 VRIII appendix

VARIABLE RATE INTRAVENOUS INSULIN INFUSION (VRIII)

All information has been taken and adapted from “*Joint British Diabetes Societies: Management of pregnant women with diabetes on obstetric wards and delivery units*” May 2017.

Blood glucose targets are kept within a tight specific range throughout pregnancy (4.0 -7.8 mmol/L). Tight glycaemic target remains important during labour and delivery (4.0-7.0 mmol/L). It is commonly managed by an intravenous infusion of glucose and insulin that is adjusted according to hourly capillary blood glucose (CBG).

- CBG should be monitored hourly when mothers are administered steroids in pregnancy. The most effective way to control steroid-induced hyperglycaemia is by using VRIII
- All women with diabetes of any type should have hourly CBG monitoring in established labour. CBG should also be done on the morning of elective caesarean section. If general anaesthesia is used, monitoring should be every half an hour until the baby is born and the mother is fully conscious.
- Maintain CBG in labour in the target range according to the NICE guidelines (4.0 – 7.0 mmol/L).
- All patients with type 1 diabetes and some patients with type 2 diabetes or GDM may require VRIII in established labour to keep the CBGs in this range. An example pre-printed prescription chart and guidance is attached with this guideline
- Women who are on an insulin pump may choose to remain on CSII (in agreement with their treating physicians) unless they are not able or willing to continue pump therapy during labour.
- Reduce the rate of VRIII (if and when used) by 50% (or change to the lowest scale) once placenta is delivered. Contact the diabetes teams to review the on-going insulin requirement in insulin treated patients with type 1 and type 2 diabetes. The insulin dose may be 25% less than the doses needed at the end of first trimester

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7.1 Setting up VRIII

- Prescribe VRIII as '50 units (fifty units) ACTRAPID insulin in 50ml normal saline'
- If the patient usually takes a long acting insulin it must be continued. Prescribe on patient drug chart.
- Always use 0.45%NaCl with 5% glucose and 0.3%KCl (20mmol) 500mls bag to run at 125ml/hr unless told otherwise (ie severe PET)
- Target blood glucose:4.0 – 7.0 mmol/L

	Dosing Algorithm		
Algorithm	1	2	3
	For most women	For women not controlled on algorithm 1 or needing >80 units/day of insulin	For women not controlled on algorithm 2 (After specialist advice)
CBG levels (mmol/l)	Infusion rate (units/hr = mls/hr)		
Target CBG level	4.0 – 7.0 mmol/l		
<4	Stop insulin for 20 minutes and treat as hypoglycaemia protocol as per section 3.0 and re-check CBG in 10 minutes		
4.0 – 5.5	0.2	0.5	1.0
5.6 – 7.0	0.5	1.0	2.0
7.1 – 8.5	1.0	1.5	3.0
8.6 – 11.0	1.5	2.0	4.0
11.1 – 14.0	2.0	2.5	5.0
14.1 – 17.0	2.5	3.0	6.0
17.1 – 20.0	3.0	4.0	7.0
>20.0	4.0	6.0	8.0

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If the CBG falls below 4.0 mmol/l or drops too fast, then move to a lower algorithm

If the CBG exceeds target and is not dropping, then move to a higher algorithm

7.1.1 Algorithm guide

All women with diabetes should have CBG testing hourly whilst on VRIII for the management of steroid hyperglycaemia during pregnancy

Start VRIII and fluids with the first dose of steroids and continue for up to 24 hours after the last dose of steroids

Algorithm 1 – this will apply to the vast majority of women

Algorithm 2 – Use this algorithm for women who are likely to require more insulin (*eg on steroids or requiring >80 units of insulin per day during pregnancy or those who don't achieve targets using Algorithm 1*)

Algorithm 3 – For women who are not achieving target on Algorithm 2 (*Do not start anyone on Algorithm 3 without specialist diabetes or medical input*)

If the woman is not achieving targets on any of the above, contact either the endocrinology team in hours or the medical SpR out of hours.

7.2 VRIII Regime for Antenatal Steroid administration

In T1DM and T2DM women who require antenatal steroid injection for fetal lung maturity inpatient admission is needed and VRIII regime started.

Women can eat and drink during VRIII.

Check U&Es prior to starting VRIII to monitor fluid balance and electrolyte abnormality. Repeat 24 hourly.

Women will omit mealtime (short acting insulin) but continue their long acting insulin during the VRIII regime.

VRIII regime to be started as follows:

- Aim for CBG between 4.0 – 7.0 mmol/l.
- Check U&Es 24 hourly

7.3 VRIII regime for labour and delivery

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- The day prior to induction, and during cervical ripening, CBG testing, insulin and oral glucose lowering drugs should continue as usual.
- Once in established labour, check CBG hourly. Stop meal time insulin (and metformin if taken) but continue long acting basal insulin once VRIII is started (See below).
- If CBG is less than 4.0 mmol/L, then treat hypoglycaemia with appropriate food/drink or commence iv 5% Dextrose infusion if nil by mouth.
- Start VRIII in all women with type 1 diabetes using multiple daily injections at the time of established labour.
- CBG should also be done on the morning of elective caesarean section. If general anaesthesia is used, monitoring should be every half an hour until the baby is born and the mother is fully conscious.
- In women with type 2 diabetes or GDM, VRIII should be started if two consecutive blood glucose levels are above 7.0 mmol/L. The second CBG should be within half an hour of the first high reading to prevent any delay in starting VRIII. For VRIII, a syringe pump is set up with 50 units human soluble insulin Humulin® S or Actrapid® insulin in 50 ml of normal saline
- If elective caesarean section is planned in the morning, a VRIII can be set up at about 6 a.m., or earlier if blood glucose levels are unstable overnight. • Women using insulin Glargine (Lantus®, Toujeo®), Detemir (Levemir®), NPH insulin (Insulatard®), Insuman® Basal or Humulin® I as background insulin should continue their basal insulin during labour but discontinue the short-acting insulin when VRIII is started.
- For all women on hourly monitoring CBG should be maintained within target (4.0 – 7.0 mmol/L).
- Check U+Es 4–6 hourly during labour to maintain potassium and bicarbonate. Use blood ketones (if available) or urinary ketones if ketoacidosis is suspected (see the section of ketoacidosis).
- Following delivery of the placenta the insulin infusion rate should be reduced by 50% in women with type 1 and type 2 diabetes and stopped in women with GDM. In women with pre-existing diabetes, pre-pregnancy insulin regimen should be resumed once eating and drinking. The doses should be as pre-advised by diabetes team or 25% less than early pregnancy doses. CBG may need to be monitored before and 1 hour after meal for up to 24 hours in gestational diabetes to ensure euglycaemia and pick up new or pre-existing diabetes. Women with pre-existing diabetes should resume their usual pre-pregnancy monitoring regimen

8.0 References

1. NICE Guidance (NG 3): - Diabetes in pregnancy: management from preconception to the postnatal period 2015
2. Management of glycaemic control in pregnant women with diabetes on obstetric wards and delivery units May 2017 – JBDS 12

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