Diabetes mellitus management during peripartum period and administration of steroids for fetal reasons

Target audience	NHS Lanarkshire maternity services.
Patient group	Women with pre-existing diabetes and those who develop gestational diabetes during pregnancy. The term 'women/birthing people' is used within this document to include women, girls, trans men, and non-binary and intersex people, who are pregnant or have recently been pregnant.

Summary

- Please review the diabetes intrapartum and postnatal management plans on Badger or seek senior advice if unsure as to the optimal diabetes management plan for a women being admitted to hospital, either during the peripartum period or for administration of corticosteroids for fetal maturity
- For those taking insulin in pregnancy, or needing insulin for the first time during peripartum period (due to a blood glucose consistently > 8.0 mmol/L), careful management of diabetes is required
- The target blood glucose in the peripartum period is **5-8 mmol/L**, based on Joint British Diabetes Societies for Inpatient Care (JBDS-IP) guidance
- Women with type 1 diabetes may require a variable rate intravenous insulin infusion (VRIII) during the peripartum period however most women using a hybrid closed loop (HCL) insulin pump system during pregnancy can continue this during the peripartum period, meaning a VRIII is not always required
- During labour or after steroids, this will likely require the use of correction boluses and/or temporary basal rate changes/'boost' mode to maintain optimal glycaemic control
- Provided optimal glycaemic control can be achieved, women on closed loop insulin pumps should continue current pregnancy insulin pump settings during labour or an elective caesarean section and switch to post-partum insulin settings immediately after delivery
- Bipolar diathermy rather than monopolar diathermy is recommended to be used intra-operatively for women continuing to use a closed loop insulin pump
- Women with type 2 diabetes or gestational diabetes on insulin during pregnancy may not all require a VRIII during the peripartum period
- Following delivery of the placenta, aim for target CBGs of 6-10 mmol/L. Review the postnatal diabetes management plan for advice
- If metformin therapy was commenced for GDM, this should be stopped after birth of baby. CBG should be checked pre and post meals for 24hrs to detect new or pre-existing diabetes
- For those with GDM with satisfactory blood glucose readings after delivery, CBG monitoring can discontinue. A formal fasting glucose should be undertaken at the GP surgery 6-13 weeks after birth of baby
- If on metformin pre-pregnancy, re-commence once eating and drinking normally
- The risks with administration of antenatal steroids in patients with diabetes are hyperglycaemia and DKA. DKA is potentially extremely dangerous in pregnancy
- The decision for antenatal steroids in patients with diabetes should always be consultant led.
- Admission to hospital for close monitoring of glycaemic control will be indicated for the majority of women receiving corticosteroids for fetal maturity

This guideline is not intended for guidance on management of diabetic ketoacidosis or hyperemesis in the patient with diabetes. It is imperative management of DKA in pregnancy is treated using NHS Lanarkshire DKA protocol (on the Right Decisions (RDS) application).

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Abbreviations

ARM	artificial rupture of membranes
CBG	capillary blood glucose
CGM	continuous glucose monitoring
CSII	continuous subcutaneous insulin infusion (insulin pump)
CTG	cardiotocograph
DKA	diabetic ketoacidosis
FBC	full blood count
FRIII	fixed rate intravenous insulin infusion
GDM	gestational diabetes mellitus
GI	glycaemic index
G&S	group and screen
HbA1c	glycated haemoglobin
HCL	hybrid closed loop
LUSCS	lower uterine segment caesarean section
PPH	post-partum haemorrhage
U&Es	urea and electrolytes
VRIII	variable rate intravenous insulin infusion
VTE	venous thromboembolism
NaCl	sodium chloride
KCl	potassium chloride
RDS	Right Decisions Service

Section 1 – labour & delivery management for women with diabetes

For those taking insulin in pregnancy, or needing insulin for the first time during labour (due to a blood glucose consistently > 8.0 mmol/L), careful management of diabetes is required. Hyperglycaemia in labour has been shown to lead to an increased incidence of fetal acidosis and neonatal hypoglycaemia.

There is strong evidence associating poor blood glucose control with adverse obstetric outcomes, both for women with pre-existing and gestational diabetes. Neonatal hypoglycaemia is common (occurring in around 30% of babies born to mothers with type 1 diabetes) and increases risk of impaired neurological development of the child.

The target blood glucose in labour is **5-8 mmol/L**, based on Joint British Diabetes Societies for Inpatient Care (JBDS-IP) guidance (1). The CBG should be monitored at the following intervals:

- Hourly in established labour for all women with diabetes
- Prior to LUSCS and half hourly under general anaesthesia

Women using CGM should be reminded that CBG tests are more accurate and are required during labour and delivery. In NHS Lanarkshire, CGM systems used in pregnancy are the Dexcom G6 CGM and the Freestyle Libre 2 flash/3 CGM. These can be continued during labour and delivery but it is also required that capillary blood glucose tests are measured to guide VRIII doses, as per the guidelines.

Increasingly, women with type 1 diabetes are offered an HCL insulin pump system, whereby a CGM system is integrated with an insulin pump and a smartphone app with an adaptive algorithm to digitally automate insulin delivery. These systems have been shown to improve outcomes in pregnancy and are increasingly being used in the peripartum period, meaning that most women can avoid commencing a VRIII during delivery. The HCL insulin pump recommended in pregnancy currently in NHSL is the Ypsomed/CamAPS insulin pump. Further detail regarding care for women using an HCL insulin pump system is included throughout the guideline, particularly in Section 1.3 and Section 2.2.

Please review the diabetes intrapartum and postnatal management plans on Badger or seek senior advice if unsure as to the optimal diabetes management plan for a women being admitted to hospital, either during the peripartum period or for administration of corticosteroids for fetal maturity.

Section 1.1 Variable rate intravenous insulin infusion (VRIII)

A VRIII (formerly called an insulin sliding scale) is used to titrate the required insulin dose against the measured blood glucose with an IV dextrose infusion running at a constant rate.

Appendix A details the doses of the VRIII for ranges of blood glucose measurements for women in labour and delivery. The starting rate is based on the capillary blood sugar at the point of the VRIII being commenced.

Appendix B details the doses of the VRIII for ranges of blood glucose measurements for women receiving antenatal steroids. However, not all women on insulin receiving antenatal steroids will require a VRIII and the decision to commence this should involve the on-call Obstetric Consultant.

Section 1.1.1 When to start the VRIII

Please review the diabetes intrapartum and postnatal management plans on Badger for each women's individualised management plan.

- For women with type 1 diabetes, commence VRIII at time established labour is confirmed (either spontaneous or induced) or at 7am on day of elective LUSCS.
- For women with type 2 diabetes and GDM who require a large doses of insulin, commence VRIII at time labour is established or at 7am on the day of elective LUSCS.
- VRIII should be commenced if two consecutive CBGs are > 8 mmol/l (with the second within an hour of the first CBG > 8 mmol/l to prevent any delays)

Section 1.1.2 administration of the VRIII

Commence VRIII at appropriate rate (see Appendix A for details) via syringe driver:

- In a 50ml syringe prepare 50 units soluble insulin (Actrapid® or Humulin S®) in 49.5ml 0.9% NaCl (1 unit = 1ml). **Use an insulin syringe to measure out the insulin dose.**
- Prime the giving set with 5ml of insulin infusion fluid (containing diluted insulin) prior to commencing the infusion.
- Alongside the VRIII, run a substrate IV fluid of 500ml NaCl 0.9% + 5% glucose + 0.15% KCl (10mmol) in a pre-mixed bag. This should generally run at a rate of 50 mls / hour
- Check U&Es 4-6 hourly when using a VRIII. Use blood ketones and if ketoacidosis is suspected also check a venous bicarbonate.

While on a VRIII, if CBG < 5 mmol/L stop the insulin for 20 minutes. Treat hypoglyacemia (CBG <4) as per local NHS Lanarkshire hypoglycaemia guidelines. Re-check CBG in 10 minutes. Also remember to perform a CTG.

The rate of IV fluid will have to be considered in relation to individual patient factors (e.g. fluid status, electrolyte imbalances and fluid restriction such as in severe pre-eclampsia).

Where syntocinon is being concurrently infused, ensure that oxytocin is diluted in 0.9% NaCl. Avoid Hartmann's solution.

Section 1.2 Induction of Labour or LUSCS for women with diabetes

Women who have type 1 diabetes will all be on insulin therapy. For those not using an insulin pump system, all will require a VRIII in labour or during a LUSCS. For those with an insulin pump, please see Section 1.3.

Women with type 2 diabetes may be on insulin. Women with gestational diabetes may be managed by diet control, metformin or insulin therapy. The management that the woman is receiving will determine timing of admission to hospital and method of blood glucose control during labour and delivery.

Please review the diabetes intrapartum and postnatal management plans on Badger or seek senior advice if unsure.

Section 1.2.1 Admission for Elective LUSCS for women with diabetes on insulin *(who are not using an insulin pump during the peripartum period)*

For women with type 1 or type 2 diabetes on insulin, admit at 2pm the day before their elective LUSCS. Some women with Type 2 diabetes or GDM on insulin may not require admission the day before if they are not requiring large doses of insulin. Please review the intrapartum and postnatal management plans on Badger or seek senior advice if unsure. See appendix C for admission checklist.

- Give usual evening meals and insulin and then fast from midnight for women having an elective LUSCS (however oral intake of clear fluids should be encouraged).
- At 7am commence VRIII, or earlier if blood glucose levels are unstable overnight
- Omit breakfast and short acting insulin on morning of LUSCS
- Continue long acting basal insulin while on VRIII

Section 1.2.2 Admission for Elective LUSCS for women with diabetes on metformin or diet control

For women with diabetes (type 2 or GDM) on metformin only admit at 7am on the day of elective LUSCS. See appendix C for admission checklist.
Omit their morning metformin.
CBG should be monitored hourly.

Section 1.2.3 Admission for induction of labour for women with diabetes on insulin.

For women with type 1 or type 2 diabetes on insulin admit at 2pm (irrespective of parity), the day before anticipated labour (i.e. when suitable for ARM). Please review the intrapartum and postnatal management plans on Badger or seek senior advice if unsure.

If on multiple daily injections (MDI) of insulin or metformin, continue usual therapy and usual schedule of CBG testing on the day prior to induction and during cervical ripening.

For women with type 1 diabetes (who are not using insulin pump during the peripartum period) or type 2 diabetes, commence VRIII at time established labour is confirmed or ARM is performed. Short acting insulin and metformin should be stopped if VRIII is started. Long acting insulin should be continued.

Section 1.2.4 Admission for induction of labour for women with diabetes on metformin only or diet controlled

For women with diabetes (type 2 or GDM) on metformin only, admit as per usual protocol (i.e. according to parity and any other obstetric factors).

Metformin should be continued during cervical ripening along with usual schedule of CBG testing.
CBG should be monitored hourly and metformin stopped when in established labour.

Section 1.3 Management of labour and delivery for women on insulin pump therapy

All women on an insulin pump have type 1 diabetes. Women on an insulin pump may choose to continue their insulin pump during labour or during a caesarean section. This should have been discussed in advance with their treating diabetes physician. Further detail on benefits and risks can be found in the JBDS guidance.

If patient has well controlled diabetes on an insulin pump, and there is a plan to continue insulin pump during an elective caesarean section, it will likely be suitable to admit at 7am on the day of caesarean section rather than the day before. This decision should be included in the antenatal management plan on Badger completed at the medical obstetric diabetes clinic.

Woman are advised to continue current pregnancy insulin pump settings during labour, and switch to post-partum insulin pump settings, immediately after delivery. During labour or after steroids, this will likely require the use of correction boluses and/or temporary basal rate changes/'boost' mode to maintain optimal glycaemic control.

If the woman is unable to manage her own insulin requirements or if blood glucose levels become unstable (CBG > 8 mmol/l on two consecutive occasions, urinary ketones 2+ or more, or blood ketones > 1.5 mmol/l) then then switch off the pump and commence a VRIII (see appendix A) or a FRIII in event of DKA.

Obstetricians should be aware that the manufacturers of insulin pumps state that these pumps should not be used near unipolar diathermy, due to potential risk of thermal injury and pump malfunction. However, these are increasingly used (with a teflon cannula rather than steel infusion set) during caesarean section. We recommend that bipolar rather than monopolar diathermy is used for women continuing to use an insulin pump during caesarean section.

We would recommend the woman, prior to c-section, site the insulin pump cannula 15 cm above the umbilicus, away from caesarean section site, and 10-15 minutes before caesarean section should input her post-partum pump settings into the insulin pump. During caesarean section, the insulin pump should be placed away from the operative site and diathermy pad(s). Patient will still need CBG monitoring as per usual for type 1 diabetes patients during c-section.

An insulin pump plan should have been discussed with the woman, prior to delivery, by treating diabetes physician, and documented in Badger pregnancy summary as part of diabetes management plan. This pump plan should have been discussed and available to the patient from 32 weeks. If labour occurs or birth of baby is indicated prior to this time, seek urgent advice from the diabetes team. If this is not feasible out of hours, the pump should be stopped and a VRIII commenced prior to diabetes team advice being obtained.

Section 2 – postnatal management of women on insulin

Following delivery of the placenta, insulin requirements fall dramatically and hypoglycaemia is extremely common. For this reason, women should be encouraged to relax their glycaemic control, aiming initially for target CBGs of **6-10 mmol/L** for hospitalised patients on glucose lowering medication.

Due to the abrupt change in insulin requirements, doses should be reviewed each day by the obstetric on-call team and when required receive input from the diabetes team. *Review the postnatal diabetes management plan for advice.* Options include reverting to the pre-pregnancy dose, 25% reduction from first trimester dose (approx 12 weeks) or 50% reduction in late pregnancy dose (approx. 36 weeks). Postnatal follow up should be discussed prior to discharge.

In breast-feeding patients, hypoglycaemia is more common and therefore they should be encouraged to drink and have a carbohydrate-based snack (10-15g of carbohydrate) prior to feeding or expressing. Consider a further reduction in insulin based on calorie and carbohydrate intake if required.

Ensure that contraception/plans for future pregnancy and lifestyle advice are discussed with women prior to discharge from maternity services for all patients with diabetes during pregnancy. Women with pre-existing diabetes should have a plan for ongoing diabetes care and follow up.

Section 2.1 Postnatal management for women on a VRIII

- Half the VRIII rate for women with type 1 and type 2 diabetes
- For women with GDM, stop VRIII
- Aim to stop the VRIII 30-60 minutes after the first subcutaneous pre-meal insulin injection (pre-meal insulin may not be required for those using an insulin pump with the first light meal after delivery).
- Continue hourly CBG monitoring until the first meal or until the VRIII has been discontinued (whichever is later).
- Subsequently monitor CBGs as per pre-pregnancy regime (or pre-meals or pre-bedtime), aiming for CBG 6-10mmol/l.

Resume post-partum insulin as per the patient's individual care plan by the diabetes team.
If this is not available, reduce the lowest dose in pregnancy (at about 12 weeks' gestation) by 25%, or reduce to at least 50% of the late pregnancy dose.

If the blood glucose is unstable and the woman is vomiting or unwell due to other complications, then refer to the obstetric or diabetic team. Continue the VRIII until the patient is permitted and able to tolerate oral intake.

A woman should not be left unsupervised to self-administer subcutaneous insulin if she has recently received diamorphine or other opiate-based analgesia or has had a recent general anaesthetic.

Section 2.2 Postnatal management for women on an insulin pump

Women must change their pump to post-natal settings as agreed in their individualised care plan and diabetes management plan on Badger.

If the insulin pump has been discontinued and a VRIII commenced, the insulin pump should be re-connected for an hour prior to stopping the VRIII. Only re-start insulin pump once the women feels she is able to manage her own pump settings.

If an individualised care plan is not available, refer to the diabetes specialist team as soon as possible.

Typical post partum insulin pump setting guidance:

- Basal rates should be changed to pre-pregnancy settings
- Insulin to carbohydrate ratios should be changed to 1 unit of insulin per 12g of carbohydrate 1:12 (or 1:15 if breastfeeding)
- Insulin sensitivity factor (ISF) should be increased to 4mmol/l
- Active insulin time changed to 4 hours
- Personal blood glucose targets should be increased to 6 mmol/l
- Patient should use ‘ease off’ and ‘boost’ modes on insulin pump

Section 3 – postnatal management of patients on oral glucose lowering drugs

- If metformin therapy was commenced for GDM this should be stopped. CBG should be checked pre and post meals for 24hrs to detect new or pre-existing diabetes (fasting CBG >7mmol/L or post-meal >11.1mmol/L).
- If on metformin pre-pregnancy, re-commence once eating and drinking normally (discuss other oral glucose lowering drugs with diabetes team prior to re-commencing).
- Monitor CBG 4 hourly until the first meal
- Subsequently, monitor CBG pre-meals and pre-bed aiming for blood glucose 6-10mmol/l (or 4-10mmol/L for those on metformin)
- Encourage low GI, healthy diet and weight management support as required

Please note metformin does not cause hypoglycaemia and can be safely taken while breastfeeding

Occasionally, a woman with GDM may be suspected of having underlying type 1 or type 2 diabetes pre-dating the pregnancy. These women will need careful postnatal blood glucose monitoring on the ward to assess their diabetic status.

Section 4 – post-natal follow up of women with GDM

For those with satisfactory blood glucose readings after delivery, CBG monitoring can discontinue. A formal fasting glucose should be undertaken at the GP surgery in 6-13 weeks' time.

Women with GDM have a ten times increased risk of developing type 2 diabetes within 5 years. If this initial test is normal, an HbA1c should be offered annually (as per NICE guidance). For those who do not have testing within the first 13 weeks after birth, an HbA1c is an alternative.

When indicated, women will also have been referred to the Healthy Lifestyle in Pregnancy service during pregnancy by their lead midwife. *An anticipatory care plan with postnatal monitoring instructions and management plan should be available in the antenatal notes.*

Section 5 – antenatal steroid administration for women with diabetes

The risks with administration of antenatal steroids in patients with diabetes are hyperglycaemia and DKA. DKA is potentially extremely dangerous in pregnancy. It is widely acknowledged that the administration of antenatal steroids can lead to considerable challenges in maintaining euglycaemia in pregnant women with diabetes. This effect may last for 2 or 3 days and should be actively managed.

The decision for antenatal steroids in patients with diabetes should always be consultant led. An initial point of reference should be one of the obstetric consultants involved in the medical obstetric diabetes clinic, although it is likely to be more appropriate to initially discuss with the on-call consultant out of hours).

When the decision is made to administer steroids an anticipatory care plan for insulin doses should be available in the notes and should be reviewed by the attending on-call team. Once the decision for the administration of steroids has been reached by the obstetric team, the Wishaw diabetes team may be contacted for advice.

An individualised plan for changes to insulin requirement may need be developed for patients in specific circumstances (e.g. those with placental insufficiency in whom there is a risk of hypoglycaemia due to falling insulin requirements).

Insulin may need to be commenced in women who have gestational diabetes managed by diet or metformin. Insulin requirements increase by around 50% women who already require insulin.

Admission to hospital for close monitoring of glycaemic control will be indicated for the majority of women receiving corticosteroids for fetal maturity, even in the absence of other maternal or fetal concerns.

If CBG levels remain higher than target on two consecutive occasions (>8mmol/L), then a VRIII should be considered (see Appendix B):

- Check U&Es prior to starting the VRIII and repeat 24 hourly.
- Start the VRIII alongside the first dose of steroids. This may need to be continued until up to 12 hours after the second dose of steroids.
- Basal insulin needs to be continued as normal. The mealtime insulin should be continued if the women is eating and drinking and appropriate documentation and education are needed to prevent insulin errors. Target blood glucose range is 5-8 mmol/L pre- and post- meal.
- CBG should be measured each hour
- Prepare the VRIII (see section 1.1.2 and appendix B)
- Alongside the VRIII, run 500 mls NaCl 0.9% + 5% glucose + 0.15% KCL (10mmol) (in a pre-mixed bag) at 50mls/hr

Please note additional fluids may be required if the patient is dehydrated or is not able to eat and drink normally. Fluids may have to be restricted in some patients (including those with hyponatraemia) and senior guidance should be requested for an individualised plan in these cases.

Patients with diabetes using an insulin pump may be able to maintain satisfactory glycaemic control using 'boost' mode setting or temporary bolus rate increases. The input of the specialist diabetes team should be requested in these cases. In general, a 30-50% increase in insulin doses will be needed. If optimal glucose control is not achieved (e.g. two consecutive readings >8 mmol/L) then a VRIII should be commenced and the insulin pump switched off for future use.

References

1. Joint British Diabetes Societies for Inpatient Care. Managing diabetes and hyperglycaemia during labour and birth. 2023. Available at URL:

https://abcd.care/sites/default/files/site_uploads/JBDS_Guidelines_Current/JBDS_12_Managing_diabetes_and_hyperglycaemia_during_labour_and_birth_with_QR_code_February_2023

2. National Institute for Health and Care Excellence. Diabetes in pregnancy: management from pre-conception to the post-natal period. 2015. Available at URL:

https://www.nice.org.uk/guidance/ng3

Appendix A: VRIII for women with diabetes during labour and delivery

The below table outlines the VRIII which should be used for women with diabetes during labour. For indications for use of VRIII for women with diabetes during labour and delivery, see Section 1.1.1. Use fingerprick for CBG levels, not flash or CGM. *Most patients will start on Algorithm 1, however some will require to start on Algorithm 2. If unsure, please seek senior advice.*

	ALGORITHM 1 For most women	**ALGORITHM 2** For women with CBG not controlled on algorithm 1, or on >80units insulin/day, or on steroids	**ALGORTIHM 3** For women with CBG not controlled on algorithm 2 (do not start here without diabetes or obstetric review)
CBG level (mmol/l)	**Insulin rate (units/hr = ml/hr)**	**Insulin rate (units/hr = ml/hr)**	**Insulin rate (units/hr = ml/hr)**
<5	Stop insulin	Stop insulin	Stop insulin
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:

- Check CBG hourly while on VRIII and half hourly under general anaesthetic
- Target CBG 5-8 mmol/l
- If CBG <5, stop insulin for 20 minutes (and treat hypoglycaemia as per hospital guidance, re-checking CBG after 10 minutes).
- If CBG is <4mmol/l or falling too quickly, move to the lower step of algorithm
- If CBG is above target and not falling towards target range, move to the higher step of algorithm
- If CBG targets are not being achieved on the above algorithms, contact the diabetes team for advice
- Alongside the VRIII, run a substrate IV fluid of 500ml 0.9% NaCl + 5% glucose + 0.15% KCl (10mmol) in a pre-mixed bag. This should generally run at a rate of 50 mls / hour, however rate may need to be adjusted based on individual patient factors e.g. pre-elclampsia.

The insulin infusion should be delivered via a syringe driver and prepared as follows:

- In a 50ml syringe prepare 50 units soluble insulin (Actrapid® or Humulin S®) in 49.5ml 0.9% NaCl (1 unit = 1ml). **Use an insulin syringe to measure out the insulin dose.**
- Prime the giving set with 5ml of insulin infusion fluid (containing diluted insulin) prior to commencing the infusion

Appendix A. adapted from Joint British Diabetes Societies for Inpatient Care. Managing diabetes and hyperglycaemia during labour and birth. (2023).

Appendix B - VRIII for women with diabetes receiving antenatal steroids for fetal reasons

Most patients will start on Algorithm 1, however some will require to start on Algorithm 2. If unsure, please seek senior advice. The below table outlines the VRIII which should be used for women receiving antenatal steroids for fetal reasons. Use fingerprick for CBG levels, not flash or CGM. Start the VRIII and IV fluids with the first dose of steroids and continue for up to 12hrs after the last dose of steroids.

	ALGORITHM 1 For most women	**ALGORITHM 2** For women with CBG not controlled on algorithm 1 or on >80units insulin/day	**ALGORTIHM 3** For women with CBG not controlled on algorithm 2. Do not commence on algorithm 3 without diabetes or obstetric review)
CBG level (mmol/l)	**Insulin rate (units/hr = ml/hr)**	**Insulin rate (units/hr = ml/hr)**	**Insulin rate (units/hr = ml/hr)**
<5	Stop insulin	Stop insulin	Stop insulin
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:

- Check CBG hourly while on VRIII the management of steroid hyperglycaemia during pregnancy
- Target CBG 5-8 mmol/l
- If CBG <5, stop insulin for 20 minutes (and treat hypoglycaemia of as per hospital guidance, re-checking CBG after 10 minutes).
- If CBG is <5mmol/l or falling too quickly, move to the lower step of algorithm
- If CBG is above target and not falling towards target range, move to the higher step of algorithm
- If CBG targets are not being achieved on the above algorithms, contact the diabetes team for advice
- Alongside the VRIII, run a substrate IV fluid of 500 mls 0.9% NaCl + 5% glucose + 0.15% KCl (10mmol) in a pre-mixed bag. This should generally run at a rate of 50 mls / hour, however rate may need to be adjusted based on individual patient factors e.g. pre-elclampsia.

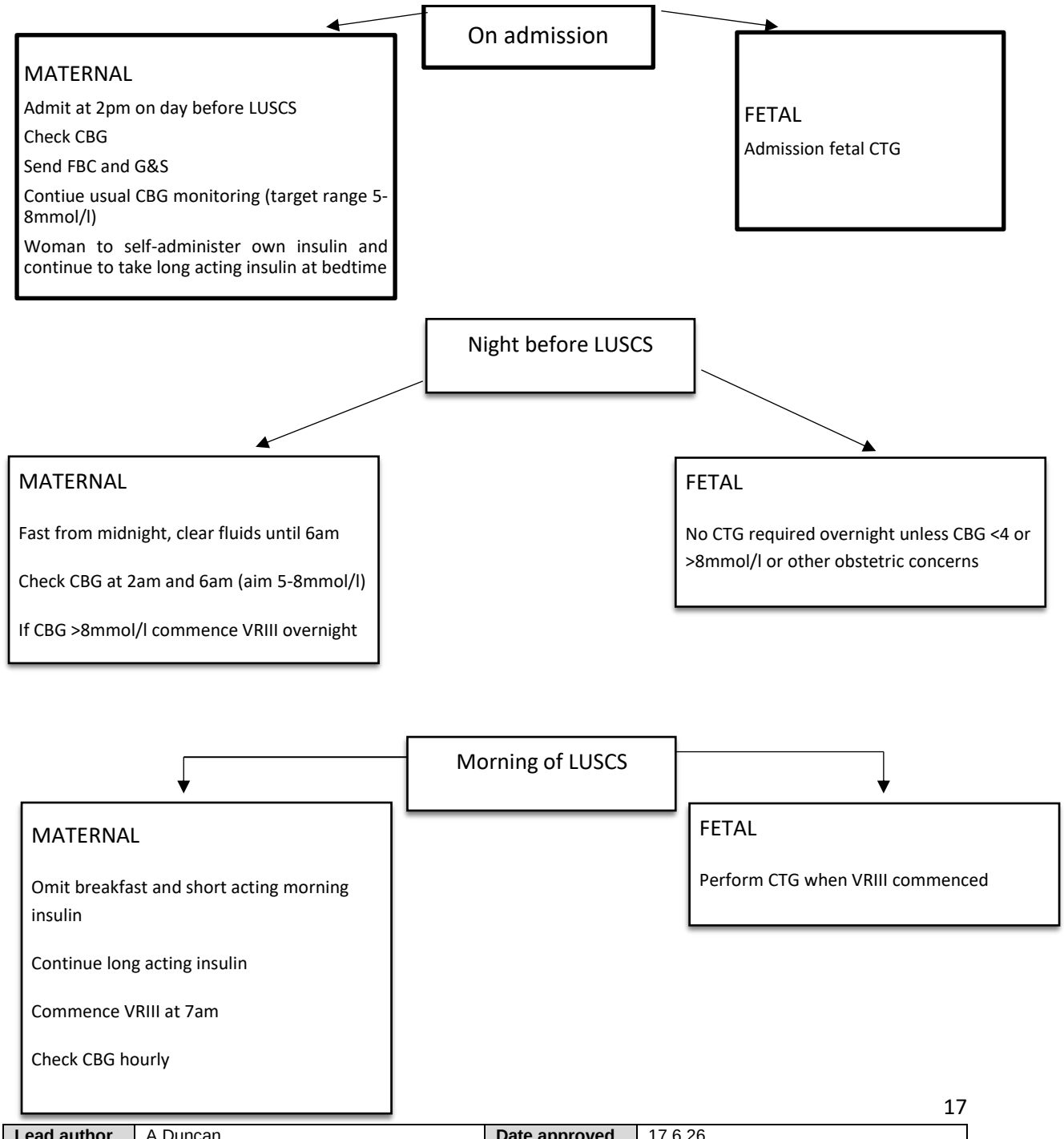
The insulin infusion should be delivered via a syringe driver and prepared as follows:

- In a 50ml syringe prepare 50 units soluble insulin (Actrapid® or Humulin S®) in 49.5ml 0.9% NaCl (1 unit = 1ml). **Use an insulin syringe to measure out the insulin dose.**
- Prime the giving set with 5ml of infusion fluid (containing diluted insulin) prior to commencing the infusion

Appendix B adapted from Joint British Diabetes Societies for Inpatient Care. Managing diabetes and hyperglycaemia during labour and birth (2023).

Appendix C - Flowchart for admission for patients with diabetes prior to elective LUSCS.

Women with pre-existing diabetes (type 1 and type 2 diabetes) and women who develop GDM may be treated with insulin during their pregnancies. Some of these women may need to be admitted the night before their LUSCS because of their insulin therapy. This flow chart is to guide staff in how to admit and manage these women in the pre-operative stage of their birth. Commencing a VRIII at an appropriate time for these women is imperative not only for maintaining the mother's blood sugar in a safe range but preventing neonatal hypoglycaemia and thus avoiding admission to the neonatal unit. Please see full guideline above on intrapartum and postnatal management and instruction on how to make up the VRIII (Section 1).



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Appendix D – Obstetric variable rate intravenous insulin infusion (VRIII) chart

Obstetric Variable Rate Intravenous Insulin Infusion (VRIII) Chart SAMPLE.pdf

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