

Diabetes in Pregnancy Guideline

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Brief Summary of Document:	Guidelines for management of Diabetes in pregnancy
Scope	

To be read in conjunction with:	
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Owning group	Obstetric Written Documentation Review Group
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Reviews and updates		
Version no:	Summary of Amendments:	Date Approved:
1	New guideline	14.9.17

Glossary of terms

Term	Definition
OGTT	oral glucose tolerance test

Keywords	management of Diabetes in pregnancy
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1. INTRODUCTION

Diabetes is a disorder of carbohydrate metabolism that requires immediate changes in lifestyle. In its chronic forms, diabetes is associated with long-term vascular complications, including retinopathy, nephropathy, neuropathy and vascular disease. Approximately 650,000 women give birth in England and Wales each year, and 2–5% of pregnancies involve women with diabetes. Approximately 87.5% of pregnancies complicated by diabetes are estimated to be due to gestational diabetes (which may or may not resolve after pregnancy), with 7.5% being due to type 1 diabetes and the remaining 5% being due to type 2 diabetes. The prevalence of type 1 and type 2 diabetes is increasing. In particular, type 2 diabetes is increasing in certain minority ethnic groups (including people of African, black Caribbean, South Asian, Middle Eastern and Chinese family origin).

2. PRE-CONCEPTION CARE

- Offer information, care and advice to women with diabetes who are planning to become pregnant before they discontinue contraception.
- The importance of avoiding unplanned pregnancy should be an essential component of diabetes education.
- Explain that fetal outcome is improved with tight control of blood sugar.
- Explain about the following risks of diabetes in pregnancy and how to reduce them with good glycaemic control-

- Fetal macrosomia
- Birth trauma to mother and baby
- Induction of labour or caesarean section
- Miscarriage
- Congenital malformation
- Stillbirth
- Transient neonatal morbidity
- Neonatal death
- Obesity and/or diabetes developing later in the baby's life

- Agree individualised blood glucose targets for self-monitoring.
- Advise women who need intensification of glycaemic control to increase the frequency of self-monitoring to include fasting and a mixture of pre and post-prandial levels.
- Offer monthly HbA1c and advise women to aim for an HbA1c below 6.1%, if safe.
- Advise women with HbA1c above 10% to avoid pregnancy.
- Do not offer rapid optimisation of glycaemic control until after retinal assessment and treatment are completed.
- Advise women regarding diet, body weight and exercise including weight loss for women with a BMI > 27.
- Advise women regarding 1) hypoglycaemia and hypoglycaemic unawareness 2) pregnancy related nausea/ vomiting and its impact on glycaemic control 3) retinal and renal assessment.
- Advise women regarding folic acid supplementation – 5mg/day from preconception until 12 weeks of gestation.
- Review current medications for diabetes. Before or as soon as pregnancy is confirmed 1) stop oral hypoglycaemic agents, apart from metformin (and glibenclamide) and commence insulin if required 2) stop ACE inhibitors and angiotensin 2 receptor antagonists and consider alternative antihypertensives 3) stop statins

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- Review complications of diabetes. Consider referral to a nephrologist if serum creatinine is 120 micromol/litre or more or the estimated glomerular filtration rate is less than 45ml/minute/1.73m². Organise retinal assessment preferably by digital imaging with mydriasis using tropicamide (unless carried out in previous 6 months), alternatively at ophthalmology clinic.

3. GESTATIONAL DIABETES

Screening and Diagnosis

Offer screening for gestational diabetes using the following risk factors at early pregnancy booking scan appointment-

- BMI 30 Kg/m² or above
- Previous macrosomic baby weighing 4.5 Kg or above 90th centile
- Previous gestational diabetes
- First degree relative with diabetes
- Family origin with a high prevalence of diabetes (South Asian, black, Caribbean, and Middle Eastern)
- History of confirmed Polycystic Ovarian Disease

If the woman has any of the above risk factors, offer a 75g oral glucose tolerance test (OGTT) at 24-28 weeks

If the woman has had gestational diabetes in a previous pregnancy, offer an OGTT at 16-18 weeks followed by another OGTT at 24-28 weeks if the first test is normal.

Testing by way of GTT would also be indicated in the following instances:

- Where a fetus is shown to be plotting on or above the 90th centile on customised Symph/fundal height chart (on the first finding and up until 36 weeks gestation)
- Where a fetus is shown to demonstrate excessive/ exceledated fetal growth
- Where Polyhydramnios is identified

Antenatal Care

- Offer immediate referral to a joint diabetic and antenatal clinic
- Offer contact with diabetic care team every 1-4 weeks to assess glycaemic control
- Advise that the birth should take place in a hospital with advanced neonatal resuscitation skills available 24 hours a day.

Blood Glucose Targets and Monitoring

- Advise women to test fasting and 1-2 hour postprandial blood glucose levels after every meal during pregnancy
- Agree individualised targets for self-monitoring
- Suitable glycaemic targets: women to aim for a fasting blood glucose of between 3.5 and 5.5 mmol/litre and postprandial blood glucose below 7.8 mmol/litre (pre-established Type 1 or 2 Diabetes) or <7.0 (Gestational Diabetes)
- The presence of diabetic retinopathy should not prevent rapid optimisation of glycaemic control in women with a high HbA1c in early pregnancy
- For Gestational Diabetes do not check HbA1c routinely in the second and third trimesters.

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- For pre-established Type 1 or 2 Diabetes check monthly HbA1c

Additional Care for women taking Insulin

- Advise women to test their blood glucose before going to bed at night
- Explain about the risk of hypoglycaemia and hypoglycaemia unawareness, specially in the first trimester
- Advise women and their partners or family members on the use of concentrated oral glucose solutions and glucagon for hypoglycaemia
- Offer insulin pump therapy if glycaemic control using multiple injections is not adequate and woman experiences significant disabling hypoglycaemia
- Management of diabetic ketoacidosis (see appendix 6)
- If diabetic ketoacidosis is suspected during pregnancy, admit women immediately for level 2 critical care, where both medical and obstetric care are available
- For women with type 1 diabetes exclude diabetic ketoacidosis as a matter of urgency if they become unwell
- For women with type1 diabetes offer ketone testing strips and advise women to test their ketone levels if they are hyperglycaemic or unwell

Retinal Assessment

For women with pre-existing diabetes offer retinal assessment as soon as possible after the first contact in pregnancy if it has not been performed in the past 12 months or following the first antenatal clinic appointment

- If diabetic retinopathy is present, arrange a second retinal assessment at 16-20 weeks
- If there is no pre-existing retinopathy, arrange a second retinal assessment at 28 weeks
- It is preferable that all retinal assessment should be carried out by digital imaging with mydriasis using tropicamide

Renal Assessment

- Offer renal assessment at the first contact in pregnancy if it has not been performed in the past 12 months
- Consider referral to a nephrologist if serum creatinine is abnormal (120 micromol/litre or more) or total protein excretion exceeds 2g/day
- Offer thromboprophylaxis if protienuria is above 5g/day
- Do not offer GFR during pregnancy for renal assessment

Fetal Monitoring

- Offer antenatal examination of the four-chamber view of the fetal heart and outflow tracts at 18-20 weeks
- Arrange ultrasound monitoring of fetal growth and amniotic fluid volume every 4 weeks from 28 to 36 weeks
- Arrange individualised monitoring of fetal well being to women at risk of intrauterine growth restriction (those with hypertension or nephropathy)
- Do not offer tests for fetal well being before 38 weeks unless there is a risk of intrauterine growth restriction

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3.1 SPECIFIC ANTENATAL CARE FOR WOMEN WITH DIABETES (Type 1 and Type 2 Diabetes)

Refer to Appendix 8 for advice.

This advice is also applicable to women with Gestational Diabetes depending on the gestation when this is diagnosed.

Antenatal steroid administration

Inpatient supervision is essential to monitor glucose control whenever antenatal steroid administration is planned for anticipated preterm delivery i.e. before 36 weeks.

Monitor blood glucose hourly

Start sliding scale if blood glucose is 10 mmol/L or above (see Appendices 1-5 for specifics for sliding scales)

Whilst on sliding scale, basal insulin (eg Lantus) to be continued but prandial insulin (eg Novorapid) to be temporarily discontinued

Contact the diabetic team for review as indicated in the sliding scale

5% dextrose with 20 mmol KCL intravenous infusion to be commenced whilst on sliding scale (run at 1 Litre per 8 hours)

Once initiated sliding scale to continue until 24 hours after the last Betamethasone dose. Providing basal insulin has continued uninterrupted and BM is less than 8 mmol/L at 12 hours, the sliding scale can then be stopped immediately. Re-instate prandial insulins pre-meals as appropriate

Advise pre and 1-2 hours post meal BM testing (i.e. 8 tests per day) for at least next 48 hours. If targets not maintained (less than 5.5 fasting and less than 7.8 post meal) contact diabetes team for advice.

Specific advice for Type 1 Diabetes

Blood ketone testing (Optium Xceed meter) prior to each Betamethasone dose and at 2,4,6 and 8 hours (beware ketoacidosis with normal blood sugar). If blood ketone more than 1 manage as for potential ketoacidosis (**Appendix 6**)

4. INTRAPARTUM CARE

4.1 For women with Type 1 Diabetes

All sliding scales for Type 1 diabetic women to be individualised and written plan agreed prior to anticipated delivery or by 36 weeks gestation (Appendix 1)

All women should receive dextrose infusions and iv insulin by sliding scale (during labour or caesarean section)

To continue basal insulin (eg Lantus) whilst on insulin sliding scale, but see Appendix 1 regarding dose adjustments

To aim for normoglycaemia (bm 4-7) in labour to prevent neonatal hypoglycaemia

In the absence of individualised insulin plan see appendix 4 and 5 for sliding scales

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If BM more than 10 mmol/L, check blood ketones (Optium Xceed meter). Follow Diabetes potential ketoacidosis protocol if ketones more than 1 (**appendix 6**). Check blood ketones hourly until bm less than 10 mmol/L.

Once the placenta is delivered:

The insulin infusion rates are halved but the dextrose continues unchanged.

The regular basal insulin (eg Lantus) is continued as suggested in the delivery plan (see appendix 1 for further guidance)

Regular bm monitoring (at least 4 times a day pre-meal and bedtime) to continue whilst inpatient

Once eating and drinking prandial insulins (eg Novorapid) to be re-commenced at pre-pregnancy insulin doses. Basal insulin to be continued at pre-pregnancy levels

If basal insulin has been discontinued whilst on sliding scale Diabetes team review advised to oversee re-commencement of regular insulin regime

If breast feeding, insulin doses may need to be reduced further

To be followed up by the diabetes team 6 weeks following delivery in general diabetes clinic

4.2 For women with Type 2 Diabetes

- Where insulin treatment required pre-and/or during pregnancy, follow the above guidelines
- Where basal insulin (eg Lantus) required pre and during pregnancy, continue with concurrent iv insulin sliding scale but see **Appendix 2** regarding dose adjustments
- If insulin substituted for oral antidiabetic drugs, prior to or during pregnancy and intends breastfeeding, continue according to individualised care plan. If breast feeding not anticipated, stop basal insulin on confirming labour or on evening preceding morning caesarean section delivery
- Where neither insulin nor oral antidiabetic drugs previously required and breast feeding not anticipated, stop basal insulin on confirming labour or on evening preceding morning caesarean section delivery
- In the absence of individualised insulin plan see **Appendix 4 and 5** for sliding scales

Once the placenta is delivered

- Type 2 previously on insulin or on oral medication only, the insulin infusion rates are halved but the dextrose continues unchanged (see appendix 2 for further guidance)
- Type 2 previously on diet control only, any required sliding scale to be discontinued; dextrose to continue only if clinically indicated
- For Type2 previously on insulin, regular basal insulin (eg Lantus) to be given at pre-pregnancy doses according to individual plan (appendix 2)
- Once eating and drinking, prandial insulin (eg Novorapid) can be commenced at pre-pregnancy doses (**appendix 1 & 2**)
- For Type 2 previously on oral medication only, once eating re-established, and intends breast feeding, insulins to be continued as defined in individualised plans

4.3 Intrapartum care for women with Gestational Diabetes

- Glycaemic control including all sliding scales to be individualised and written plan agreed prior to anticipated delivery or by 36 weeks gestation

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- In the absence of individualised treatment plan see appendix 4 and 5 for sliding scales
- For gestational diabetes controlled on diet alone (or diet + metformin) : as a rule, no insulin is needed during labour but hourly blood glucose monitoring should be undertaken with sliding scale insulin and dextrose infusion if bm is more than 7 mmol/L (Appendix 3)
- For gestational diabetes treated with insulin: sliding scale insulin may be necessary (follow individualised care plan). Monitor bm hourly and start sliding scale if it goes above 7 mmol/L
- Basal insulin (eg Lantus) to be stopped as labour confirmed or previous night if morning elective caesarean section is planned (see appendix 3)
- Once placenta is delivered any required sliding scale must be discontinued. Dextrose to continue only if clinically indicated.

5. POSTPARTUM CARE

5.1 Women with Type 1 diabetes

- Continue regular blood sugar monitoring (at least 4 times a day pre-meal and bed time) whilst inpatient
- Commence breast feeding of the neonate within 1 hour to prevent hypoglycaemia
- Once normal diet has been resumed, insulins should be re-commenced at pre-pregnancy dose
- If breast feeding, the insulin dose may have to be reduced further
- Offer 6 weeks follow up appointment in general diabetic clinic

5.2 Women with Type 2 diabetes

- Metformin or Glibenclamide can be resumed or continued while breastfeeding
- Avoid all other oral hypoglycaemic drugs while breastfeeding
- Offer 6 weeks follow up appointment in general diabetic clinic

5.3 Women with gestational diabetes

- Discontinue all hypoglycaemic medication immediately after birth
- Advise women on weight control, diet and exercise
- Advise women on the risk of gestational diabetes in subsequent pregnancies and screening for diabetes during subsequent pregnancies
- A follow-up appointment should be arranged in 6 weeks time with the GP to arrange fasting plasma glucose

6. NEONATAL CARE

- The baby should stay with the mother unless extra neonatal care is required
- Do not transfer babies in to community care until they are at least 24 hours old, maintaining their blood glucose levels and feeding well
- Test the neonate for polycythaemia, hyperbilirubinaemia, hypocalcaemia and hypomagnesaemia if the neonate has clinical signs
- Test the neonate for heart abnormalities using echocardiogram if the baby has clinical signs associated with congenital heart disease or cardiomyopathy

6.1 Indications for admission to neonatal unit

- Hypoglycaemia with abnormal signs
- Respiratory distress or jaundice that requires monitoring or treatment
- Signs of cardiac decompensation, neonatal encephalopathy or polycythaemia
- Needs intravenous fluids
- Needs tube feeding

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- Born before 34 weeks (or between 34 and 36 weeks if dictated clinically by initial assessment)

7. REFERENCES:

Clinical care of adults with diabetes (2001) : Department of Health, National Service Framework for Diabetes (standard 4)

Diabetes in pregnancy : caring for the baby after birth; findings of a national enquiry (2007) Confidential enquiries into maternal and child health (CEMACH)

Diabetes in pregnancy (2008) :Management of diabetes and its complications from pre-conception to the postnatal period NICE Clinical guideline 63

Robinson S, Dornhorst DM : ABCD Position statement on screening for gestational diabetes mellitus (2007) Practical Diabetes International 24, 192-195

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8. APPENDIX 1: TYPE I DIABETES – INSULIN REGIME PERI-DELIVERY

Basal insulin (eg Lantus) to continue.

- Any doses due during established labour or evening prior to morning elective caesarean section delivery to be at pre-delivery dose (written agreed plan to be established pre-anticipated delivery or by 36 weeks gestation)
- Once labour established or prior to elective caesarean section delivery IV sliding scale insulin and IV infusion one litre 5% Dextrose (+20mmol KCL per litre) per 8 hrs to be commenced
- Mealtime prandial insulin (eg novorapid) dosing to be suspended whilst on sliding scale insulin
- Monitor bm's hourly
- Pre-agreed personalised plan should state personalised sliding scale rates or will indicate use of standard sliding scales (2) or (3), **NOT (1)**, as defined later
- Where no pre-specified plan start with sliding scale (2)
- Personalised sliding scale rates calculated according to pre-delivery total prandial insulin (eg novorapid) dosing requirements. Total prandial insulin requirement in any 24hr period is divided by 24 and **rounded down** to next whole number to give insulin requirement where bm 4.1 – 7.0 mmol/L. Other points on the sliding scale then extrapolated – **see table for guidance**; except bm 0 – 4 always has sliding scale off as continued basal insulin will meet this need.
- On delivery of placenta any sliding scale rates are halved (includes standard sliding scales), **but see table for minimum infusion rates**.
- Pre-meal subcutaneous prandial insulin (eg novorapid) doses are thereafter re-established according to pre – pregnancy requirements
- These same sliding scales can be applied for glycaemic control after betamethasone injections

Table: Personalised IV insulin sliding scales:

Bm reading (mmol/L)	Initial Insulin infusion rates (units/hr)	Insulin infusion rates post delivery placenta (units/hr)
0 – 4.0	0	0
4.1 – 7.0	b (min 1)	0.5b (min 0.5)
7.1 – 11.0	1.5b (min 2)	0.75b (min 1)
11.1 – 14.0	2b (min 3)	b (min 2)
14.1 – 17.0	3b (min 4) (call Diabetes team)	1.5b (min 3) (call Diabetes team)
>17.0	4b (min 6) (call Diabetes team)	2b (min 6) (call Diabetes team)

Where b = total daily prandial insulin (eg novorapid) dose divided by 24 and rounded down to next whole number

Worked example:

Type 1 Diabetic previously on 16 units Lantus at bedtime and 6 units novorapid with each of 3 meals. Morning ECSD planned at 38 weeks. At 36 weeks requiring 44 units Lantus at bedtime and 16 units

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novorapid with each meal (ie 48 units per 24 hrs). Advised to reduce Lantus to 16 units night before ECSD. Morning of ECSD starved therefore no novorapid dose. Commenced sliding scale and IV dextrose infusion. Sliding scale bm 0 – 4: no additional insulin, 4.1 – 7.0: 2 units/h ($48/24 = 2$), 7.1 – 11.0: 3 units/h, 11.1 – 14.0: 4 units/h, 14.1 – 17.0: 6 units/h, >17: 8 units/h. On delivery of placenta insulin infusion rates are halved. In this case sliding scale bm 0 – 4: no additional insulin, 4.1 – 7.0: 1 units/h ($48/24 = 2$), 7.1 – 11.0: 1.5 units/h, 11.1 – 14.0: 2 units/h, 14.1 – 17.0: 3 units/h, >17: 6 units/h (minimum applied). On resuming eating novorapid restarted at 6 units with each meal. Sliding scale stopped. Lantus continued at 16 units.

IF DIABETIC CONTROL NOT MAINTAINED (bm's > 14) THE DIABETIC TEAM SHOULD BE CONTACTED FOR ADVICE (on-call medicine middle grade if out of hours)

REMEMBER these sliding scale rates are dependant on **CONTINUING BASAL INSULIN (eg LANTUS)** throughout

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9. APPENDIX 2: TYPE II DIABETES – INSULIN REGIME PERI-DELIVERY

Where insulin was required prior to pregnancy (or previously on sulphonylurea and intending breastfeeding) basal insulin (eg lantus) to continue.

Any doses due during established labour or evening prior to morning elective caesarean section delivery to be at pre-pregnancy level (written agreed plan to be established pre- anticipated delivery or by 36 weeks gestation)

Once labour established or prior to elective caesarean section delivery IV sliding scale insulin and IV infusion one litre 5% Dextrose (+20mmol KCL per litre) per 8 hrs to be commenced
Any mealtime prandial insulin (eg novorapid) dosing to be suspended whilst on sliding scale insulin
Monitor BM's hourly

Pre-agreed personalised plan should state personalised sliding scale rates or will indicate use of standard sliding scales (1), (2) or (3) as defined later

Where no pre-specified plan start with sliding scale (2)

Personalised sliding scale rates calculated according to pre-delivery total novorapid dosing requirements. Total prandial insulin (eg novorapid) requirement in any 24hr period is divided by 24 and **rounded down** to next whole number to give insulin requirement where bm 4.1 – 7.0 mmol/L. Other points on the sliding scale then extrapolated – **see table for guidance**

On delivery of placenta any sliding scale rates are halved (includes standard sliding scales), **but see table for minimum infusion rates**. Where prior to pregnancy diabetes managed by diet and exercise alone sliding scale can be stopped on delivery of placenta

Where appropriate, pre-meal subcutaneous prandial insulin (eg novorapid) doses are thereafter re-established according to pre – pregnancy requirements

These same sliding scales can be applied for glycaemic control after **Betamethasone** injections. If managed with insulin, basal insulin (eg Lantus) is continued whilst on sliding scale, but any prandial insulin (eg novorapid) suspended.

Table: Modified / Personalised IV insulin sliding scales:

Bm reading (mmol/L)	Initial Insulin infusion rates (units/hr)	Insulin infusion rates post delivery placenta (units/hr)
0 – 4.0	0	0
4.1 – 7.0	b (min 1)	0.5b (min 0.5)
7.1 – 11.0	1.5b (min 2)	0.75b (min 1)
11.1 – 14.0	2b (min 3)	b (min 2)
14.1 – 17.0	3b (min 4) (call Diabetes team)	1.5b (min 3) (call Diabetes team)
>17.0	4b (min 6) (call Diabetes team)	2b (min 6) (call Diabetes team)

Where b = total daily prandial insulin (eg novorapid) dose divided by 24 and rounded down to next whole number

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Worked example:

Type II Diabetic previously on Gliclazide 160 mg bd and metformin 1g bd. Converted to lantus and novorapid as soon as aware of pregnancy – metformin was continued, Gliclazide stopped. At 36 weeks requiring 28 units Lantus at bedtime and 10 units novorapid with each meal (ie 30 units per 24 hrs). Planning to breastfeed. Advised to reduce Lantus to 8 units as soon as established labour. Admitted at 39 weeks, established labour confirmed at 8 pm. Sliding scale insulin according to standard scale(2) and IV dextrose commenced. 10pm Lantus dose of 8 units given. On delivery of placenta insulin infusion rates halved according to standard scale(2) regime. On resuming eating novorapid restarted at 4 units with each meal. Sliding scale stopped as soon as novorapid administered. Lantus continued at 8 units. Diabetes Specialist Nurse review on daily basis to ensure no problems with transition.

IF DIABETIC CONTROL NOT MAINTAINED (bm's > 14) THE DIABETIC TEAM SHOULD BE CONTACTED FOR ADVICE (on-call medicine middle grade if out of hours)

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10. APPENDIX 3: GESTATIONAL DIABETES – INSULIN REGIME PERI-DELIVERY

All regular diabetes treatments (Lantus, Novorapid and oral agents to stop as soon as established labour or evening prior to morning elective caesarean section delivery (unless otherwise specified in delivery plan)

Monitor BM's hourly during labour / peri-operatively (from morning of elective CSD). Commence 5% dextrose 8 hrly with 20mmol KCl added per litre if BM's consistently < 5.0 mmol/L

If BM's > 7 mmol/L IV insulin according to standard sliding scale and 5% Dextrose (+20mmol KCL) 1 litre per 8 hrs to be commenced.

Any required deviations from standard sliding scales, (1) (2) or (3) see later, to have been pre-agreed in written delivery plan (preferably prior to 36 weeks gestation) where insulin requirements during latter pregnancy may have indicated need for modified personalised sliding scale
Where no pre-specified plan start with sliding scale (1)

On delivery of placenta any sliding scale is stopped (unless otherwise specified in delivery plan).
Dextrose infusion may be continued according to clinical need

These same sliding scales can be applied for glycaemic control after Betamethasone injections. In this context, however, any basal insulin (eg Lantus) is continued and prandial insulin (eg novorapid) doses temporarily suspended.

Worked example:

Gestational Diabetic at 36 weeks requiring 20 units Lantus at bedtime and 6 units novorapid with each meal (ie 18 units per 24 hrs). Labour confirmed at 6 pm (38 weeks gestation). No further sc insulin doses to be given. BM maintained < 7 mmol/L therefore no sliding scale insulin required; However BM's 4.5 then 3.8 on consecutive tests 1 hour apart necessitating 1 litre 5% dextrose with 20mmol KCL set to run over 8 hours to prevent hypoglycaemia. Baby delivered at 2am. Dextrose infusion discontinued at 3am as BM's stable.

IF DIABETIC CONTROL NOT MAINTAINED (bm's > 14) THE DIABETIC TEAM SHOULD BE CONTACTED FOR ADVICE (on-call medicine middle grade if out of hours)

REMEMBER although basal insulins (eg Lantus) are stopped they have long half lives and sliding scales need to take this into account. Furthermore need to remain vigilant for post-delivery hypoglycaemia for up to 48 hrs.

11. APPENDIX 4: INSULIN SLIDING SCALES WHERE NO INDIVIDUALISED PLAN AVAILABLE

Attempt to contact Diabetes team for review of any long-acting insulin usage

If pre-existing Diabetes and no specialist review available switch to sliding scale insulin as Labour diagnosed or prior to Caesarean section delivery. Stop subcutaneous insulins as sliding scales initiated. DO NOT stop sliding scale without specialist review

If Gestational Diabetes and no specialist review stop Diabetes specific treatments including subcutaneous insulins as Labour diagnosed or night before elective caesarean section delivery.

Hourly BM testing during labour

The aim is normoglycaemia in labour to prevent neonatal hypoglycaemia

Any BM > 7.0 mmol/L to prompt initiation sliding scale insulin

5% Dextrose with 20mmol KCL IVI to be commenced whilst on sliding scale (run at 1 litre per 8 hours)

SEE APPENDIX 5 – SLIDING SCALES FOR DEFAULT CHOICES

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12. APPENDIX 5: STANDARD IV INSULIN SLIDING SCALES

(1) Where GDM or type 2 diabetic previously diet controlled **AND** total daily insulin < 20 units. **NOT** established Type 1 Diabetes or other Type 2

BM reading (mmol/L)	Initial Insulin infusion rates (units/hr)	Insulin infusion rates post delivery placenta (units/hr)
0 – 4.0	0	0
4.1 – 7.0	0.5	0
7.1 – 11.0	1	0
11.1 – 14.0	2	0 (call Diabetes team)
14.1 – 17.0	4 Move to scale (2)	0 (call Diabetes team)
>17.0	6 Move to scale (2)	0 (call Diabetes team)

(2) Where GDM and total daily insulin dose > 20 units **OR** established Type 1 or 2 Diabetes with total daily insulin dose < 60 units **OR** where not controlled with (1) above (Default minimum for any established diabetic where not pre-specified)

BM reading (mmol/L)	Initial Insulin infusion rates (units/hr)	Insulin infusion rates post delivery placenta (units/hr) NB stop where GDM only
0 – 4.0	0 (call Diabetes team)	0 (call Diabetes team)
4.1 – 7.0	1	0.5
7.1 – 11.0	2	1
11.1 – 14.0	3	2
14.1 – 17.0	4 * (call Diabetes team)	4 (call Diabetes team)
>17.0	6 * (call Diabetes team)	6 (call Diabetes team)

if persists for >1 hour move to (3)

(3) Where established Type 1 or 2 Diabetes **AND** total daily insulin dose > 60 units **OR** where not controlled with (2) above

BM reading (mmol/L)	Initial Insulin infusion rates (units/hr)	Insulin infusion rates post delivery placenta (units/hr)
0 – 4.0	0 (call Diabetes team)	0 (call Diabetes team)
4.1 – 7.0	2	1
7.1 – 11.0	4	2
11.1 – 14.0	6	3
14.1 – 17.0	8 (call Diabetes team)	4 (call Diabetes team)
>17.0	12 (call Diabetes team)	6 (call Diabetes team)

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13. APPENDIX 6 - DIABETIC KETOACIDOSIS (DKA) AND PREGNANCY

Diabetic Ketoacidosis (DKA) is a complication of Type 1 Diabetes. It is extremely rare (therefore extremely unlikely) in Type 2 Diabetes and Gestational Diabetes Ketosis, however, is a normal response to starvation which may lead to confusion especially on urine ketone testing
Ketoacidosis implies acidosis – distinguishable by measuring blood pH or bicarbonate levels in difficult cases

Ketoacidosis developing during pregnancy is associated with very high rate of foetal death and should therefore be actively guarded against. Any Type 1 Diabetic should already be well informed of the risks of DKA and avoidance measures. Blood ketone testing kits (Optium Xceed, Abbott) are available for patient use and will have been provided in the combined Diabetes / Antenatal clinic as a patient empowering tool to assist in DKA avoidance. A blood ketone level >3.0 on this meter indicates a very high risk of current DKA and warrants immediate hospital admission and medical management with IV insulin and IV fluids (preferably in a high dependency unit). A reading less than 0.6 is taken as normal. Any reading greater than 1.0 needs action in preventing worsening ketosis – the following protocols relate to readings between 1.0 and 2.9:

contact your diabetes care team or emergency doctor service.	
Blood Ketone level	Advice
Below 0.6mmol/l	Normal carry on with your usual blood sugar testing
Between 0.6 and 1.5mmols	Test your blood sugar after 1 hour. Continue regular insulin regime. Consider increasing insulin after 1 hour. If blood glucose and ketones are falling retest hourly till ketones below 1.1mmols
Between 1.5mmols and 3mmols	Take additional short or rapid acting insulin. If you do not have this type of insulin use your usual premix insulin. Take amount shown below, but if not completed take 1/5 of YOUR total daily dose. If this is above 10 units only take 10units. <ul style="list-style-type: none"> Insulin type: Amount:..... Drink 1 cup of sugar free clear liquid every 15 minutes (i.e. 500mls per hour) Retest ketones and blood sugar in 1 hour. If blood ketones not falling contact professional advice.
Above 3mmols	Take additional short or rapid acting insulin. If you do not have this type of insulin use your usual premix insulin. Take amount shown below, but if not completed take 1/5 of YOUR total daily dose. If this is above 10 units only take 10units. <ul style="list-style-type: none"> Insulin type: Amount:..... Drink 1 cup of sugar free clear liquid every 15 minutes (i.e. 500mls per hour) SEEK SPECIALST ADVICE IMMEDIATELY

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14. APPENDIX 7 - MULTIDISCIPLINARY DIABETIC/OBSTETRIC TEAM

Contact Details

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15. APPENDIX 8 – SPECIFIC ANTENATAL CARE FOR WOMEN WITH DIABETES

(Type 1 and Type 2 Diabetes)

This advice is also applicable to women with Gestational Diabetes depending on the gestation when this is diagnosed.

- First Appointment (joint diabetes and antenatal clinic at the earliest opportunity after the pregnancy is confirmed)
- Take a detailed clinical history
- Offer information, advice and support on glycaemic control
- Review medication
- Offer retinal and renal assessment if these have not been performed in the previous 12 months



Booking appointment (ideally by 10 weeks)

- Confirm viability of pregnancy and gestational age
- Discuss information, education and advice about how diabetes will affect pregnancy birth and early parenting such as breast feeding, and initial care of the baby
- Perform the routine booking tests



16 weeks

Offer retinal assessment to women with pre-existing diabetes who had signs of diabetic retinopathy at the first antenatal appointment



20 weeks

Offer four-chamber view of the fetal heart and outflow tracts in addition to the routine anatomy scan



24 weeks

- Offer routine care only (appointment for nulliparous women)
- Offer serial ultrasound monitoring of fetal growth and amniotic fluid volume and organise the above to be started from 28 weeks

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28 weeks

- Review the result of fetal growth scan and amniotic fluid volume
- Offer retinal assessment to women with pre-existing diabetes who did not have diabetic retinopathy at their first antenatal clinic visit



32 weeks

- Offer ultrasound monitoring of fetal growth and amniotic fluid volume.
- Offer routine antenatal investigations



36 weeks

- Offer ultrasound monitoring of fetal growth and amniotic fluid volume
- There must be a documented delivery plan by 36 weeks
- Offer information and advice about the following-
 - Timing, mode and management of birth
 - Analgesia and anaesthesia (including anaesthetic assessment of women with comorbidities, such as obesity and autonomic neuropathy)
 - Changes to antidiabetic medication during and after birth
 - Initial care of the baby
 - Initiation of breast feeding and the effect of breast feeding on glycaemic control
 - Contraception and follow-up



38 weeks

- Offer induction of labour or caesarean section if indicated
- Women with Gestational Diabetes who achieve a good glycaemic control with dietary measures alone and have a normal fetal growth and normal liquor volume, may be offered induction of labour at 39 or 40 weeks
- Offer tests of fetal well being for women waiting for spontaneous labour



39-40-41 weeks

Offer tests of fetal wellbeing for women waiting for spontaneous labour

