Clinical Practice Guideline Diabetes in Pregnancy
Department Women's Health

Purpose

To provide guidance on the appropriate screening and management of diabetes in pregnancy, including pre-existing type 1 and 2 diabetes requiring insulin or oral hypoglycaemics (OHG)

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Introduction

Diabetes can have immediate, short term and long-term health implications for women and their babies. Evidence shows that early screening and intervention can improve outcomes.

Abbreviations

BGL	Blood glucose level
CS	Caesarean section
GDM	Gestational diabetes
OGTT	Oral glucose tolerance test – a fasting 75g glucose load with BGL tests at 0, 1 and 2hrs.
T1DM	Type 1 diabetes mellitus
LV	Liquor volume
NNU	Neonatal Unit
SC	subcutaneous
OHG	Oral hypoglycaemic medication (eg Metformin)

Pre-Conception

Women with pre-existing diabetes should be advised of the importance of pre-conception counselling with diabetes and health optimisation before embarking on a pregnancy. This includes regular monitoring of HbA1c, adjustment of medication, optimisation of BMI, high dose folate (5mg daily) supplementation pre-conception and assessment of complications of diabetes

Women should be made aware of the impact that diabetes can have on a pregnancy and the need for careful blood glucose control both pre-conception and in the pregnancy. Women should be given appropriate contraceptive advice to avoid an unplanned pregnancy.

Further details are outlined in the NICE Guidelines and ADIPS guidelines

Antenatal Care

Much of this guideline is based on the Better Safer Care Victoria Maternity eHandbook: Gestational Diabetes, the 2015 NICE Guidelines: Diabetes in pregnancy: management from preconception to the postnatal period and the ADIPS guidelines

Risks of Gestational Diabetes

Maternal short term	Maternal long term	Newborn/fetal short term	Newborn long term
Pre-eclampsia Polyhydramnios Induced labour Operative birth Postpartum haemorrhage Infection	Recurrent GDM Progression to type 2 diabetes About 5% develop type 2 diabetes within 6 months of birth About 60% develop type 2 diabetes within 10 years Development of cardiovascular disease	Congenital abnormalities Respiratory distress syndrome Jaundice Hypoglycaemia Premature birth Hypocalcaemia Polycythaemia Increased newborn weight and adiposity Macrosomia Shoulder dystocia - risk increases as fetal weight increases Bone fracture Nerve palsy Caesarean section birth Hypoxic-ischaemic encephalopathy (HIE) Death	Impaired glucose tolerance Development of type 2 diabetes Obesity

Screening (see SCV eHandbook flowchart)

Screen all women at the diagnosis of pregnancy and booking for risk factors for gestational diabetes:

Booking BMI >30	Previous GDM
Age ≥40 years	Previous elevated BGL
Ethnicity (Asian, Indian subcontinent, Aboriginal, Torres Strait Islander, Pacific Islander, Maori, Middle Eastern, non-white African)	Family history of diabetes (first degree relative, or sister with GDM)
Previous macrosomic baby (birth weight >4500 g or >90th centile)	Previous perinatal loss
Polycystic ovarian syndrome (PCOS)	Medications (corticosteroids, antipsychotics)
Multiple pregnancy	

Risk Factors for GDM

- Women with risk factors are advised to have an early glucose tolerance test
- Women with no risk factors are advised to have a random glucose test at the time of their booking blood tests. A full OGTT and HbA1c is advised if the level is >11.0mmol/L, followed by an urgent referral to endocrinology.
- All women are advised to have a 2hr OGTT at 24-28/40 even if earlier testing was negative.

Diagnosis and Referral

Time	GDM glucose	Pre-existing Diabetes
Fasting	5.1-6.9 mmol/L	≥7.0 mmol/L
1 Hour	≥10.0 mmol/L	-
2 hours	8.5-11.0	≥11.1 mmol/L

Diagnostic Criteria following OGTT

- Women should be informed of their diagnosis as soon as is feasible and a referral made to the diabetes and antenatal clinic to discuss the care plan.
- Women with a diagnosis should be informed of the implications of diabetes in pregnancy, the need for careful monitoring and accurate control of blood glucose levels. Optimal control will reduce the risk of macrosomia, trauma during the birth (to mother or baby), induction of labour, neonatal hypoglycaemia and admission, and perinatal death. Women should be directed to on line resources such as the Diabetes Australia website.
- As well as careful monitoring of blood glucose and dietary advice (from the dietician), encourage women to exercise regularly (150mins per week) to assist in optimising glucose control (see Routine Pregnancy Care)

Management of Diabetes in Pregnancy

The decision about the indication and type of hypoglycaemic is made by the endocrinology team with input from the diabetes educators. Alterations of treatment and dose should be documented in DMR and the women's handheld record (VMR).

	GDM Diet	GDM on Rx	Type 1 or 2
Antenatal Care	Group B. Obstetric Plan Shared care with GP/MW	Group C Obstetric care	Group C Obstetric Care
Investigations			HbA1c each trimester Retinal assessment at booking and 28/40 (Additional retinal assessment if pre-existing retinal disease) Renal function (UEC) Urine Alb:Creat ratio
Pre-eclampsia Prevention			Commence 100mg Aspirin daily from 12/40
Diabetes Educator	Refer at diagnosis Review 1-4 weekly as required	Refer at diagnosis Review 1-4 weekly as required	Refer at diagnosis Review 1-4 weekly
Dietician	Refer at diagnosis and as required	Refer at diagnosis and as required	Refer at booking and as required
Endocrinologist	If suboptimal glycaemic control	At commencement of treatment then 1-4 weekly	At commencement of treatment then 1-4 weekly
BGL Monitoring	Fasting, 2hr post meals	Fasting, 2hr post meals	Type 1 & 2 on insulin: Fasting, pre-meal, 2hr post meals Type II on diet/OHG: Fasting, 2hr post meals
Ultrasound Surveillance	32/40 (+36/40 if suboptimal control or macrosomia)	32/40 and 36/40	28/40, 32/40, 36/40
Fetal Monitoring	Weekly CTG, AFI & Dopplers from 38/40	Weekly CTG, AFI & Dopplers from 38/40. Earlier if co-morbidities	Weekly CTG, AFI & Dopplers from 38/40. Earlier if co-morbidities
If requiring steroids	Liaise with endocrinologist Consider admission Consider insulin for 48hrs if BGLs rising	Liaise with endocrinologist Admit Adjust insulin	Liaise with endocrinologist Admit Adjust insulin
Anaesthetic Review	Only if other sig morbidities	Only if other sig morbidities	Only if other sig morbidities
Lactation support	Consider expressing from 36/40	Consider expressing from 36/40	Consider expressing from 36/40
Timing of birth	41wks if normal control 38-39wks if macrosomia	>20u/day 38/40 ≤20u/day 39/40	37/40 if poor control, macrosomia 37-38/40 if well controlled

Intrapartum care	See below		
Postpartum Care	Monitor BGL for 24 hours post delivery 6 – 12 week OGTT with GP	Cease treatment after birth QID BGL for 48 hours If BGL >7.0 after 48 hours or concerned liaise with endocrinology 6 – 12 week OGTT with GP	Endocrinology management Type 1: Reduce insulin to 20% or pregnancy rate Type 2: Cease insulin. Return to pre-pregnancy treatment if appropriate Endocrinology follow up as advised.
Neonatal Care	Support early breastfeeding Use expressed colostrum if available Care on WHU unless risk factors See CPG		Support early breastfeeding Use expressed colostrum if available Admission to SCN See CPG

Routine care of diabetics in pregnancy

Control of Blood Glucose Levels

Optimal glycaemic control is supervised by the diabetes educators and endocrinologists. The obstetric and midwifery staff should encourage women to maintain compliance with blood glucose testing, be aware of any issues with regard to suboptimal glucose control and any changes in treatment.

Glucose Monitoring

- See table above for recommended frequency of monitoring.
- Consider continuous monitoring for women who have severe hypoglycaemia, unstable glucose, or to verify uncertain glucose control.

Optimal glycaemic control (ADIPS Guidelines)

- Target fasting BGL ≤ 5.0mmol/L
- 1hr post meal ≤ 7.4mmol/L
- 2hrs post meal ≤ 6.7mmol/L

Suboptimal control (eHandbook)

- Three or more fasting BGLs > 5.0mmol/L in preceding week
- Three or more 2 hour BGLs > 6.7mmol/L
- Suboptimal control more likely with inconsistent monitoring, inconsistent attendance

Refer back to diabetes clinic or encourage the woman to make contact with the diabetes educators.

Management of Hypoglycaemia

- Advise women on insulin of the risks of hypoglycaemia and the impaired awareness of hypoglycaemia in pregnancy (especially in 1st trimester).
- Ensure that women with diabetes on treatment always have access to fast acting glucose
- Consider providing women with type 1 diabetes with glucagon and teaching the woman and her family how to use it
- BGL <4.0 mmol/L
- Symptoms of hypoglycaemia

Hunger	Tingling lips and/or fingers
Palpitations	Blurred vision
Dizziness	Confusion
Sweating	Lack of concentration
Headache	Behaviour changes
Irritability	Lack of consciousness

Symptoms of hypoglycaemia

If hypoglycaemic, follow Peninsula Health Adult Hypoglycaemia CPG

If Conscious:

- Call for help - Inform obstetric registrar and ANUM
- If on insulin infusion – halve insulin infusion, double dextrose rate
- Obstetric team to call endocrinology
- Give 15g fast acting carbohydrate ie 100mL of Lucozade
- Recheck BGL in 15mins, if BGL <4.0mmol/L give further 15g of fast acting carbohydrate
- Continue 15 minutely BGL until >4.0 mmol/L
- Then give 15g slow acting carbohydrate
- Repeat BGL in 1hr
- Discuss with endocrinology and arrange follow up with diabetes clinic.

If Unconscious or Reduced Consciousness

- If reduced consciousness – call MET call
- If on insulin infusion – halve insulin infusion, double dextrose rate
- Give 25mls IV glucose 50% as a slow push
- Recheck BGL every 5mins, until BGL >5.0mmol/L
- Obstetric team to call endocrinology
- Give 10% glucose IV infusion over the next 8 hours (amount to be discussed with endocrinology)
- Repeat BGL hourly

- When conscious give slow acting carbohydrate.
- Review by and follow up plan by endocrinology

Fast-acting carbohydrate – 15 g	Slow-acting carbohydrate – 15 g
100ml Lucozade	1 slice of bread or ½ sandwich
½ can regular soft drink (not diet)	Next meal (if served within 30 minutes)
Glucose tablets equivalent to 15gms	

Carbohydrates for management of hypoglycaemia

Ketone Testing

- Women with type 1 diabetes should be offered ketone testing strips and a meter to test for ketones if they become hyperglycaemic or unwell.
- Ketonaemia should be tested for urgently in any woman with diabetes in pregnancy if they become unwell or hyperglycaemic
- Women with suspected ketoacidosis must be admitted and receive consultant led care from the endocrinology and obstetric team with consideration of HDU/ICU care.

Retinal Assessment

- Women with pre-existing diabetes should have retinal assessment at the beginning of their pregnancy unless it has been performed less than 3 months prior.
- Diabetic retinopathy is not a contraindication to a vaginal birth.
- Women with retinopathy should have ophthalmological follow up after pregnancy.

Falling Insulin Requirements

- Insulin requirements sometimes fall in the third trimester.
- This is more likely to occur in women with pre-existing diabetes (around 20% of this group) [3]
- There is an association between FGR pre-eclampsia and falling insulin requirements in some pregnancies, although perinatal outcomes have not been shown to differ. In a prospective study the falling insulin requirements preceded the diagnosis of pre-eclampsia by three weeks [3]
- The reduced need for insulin may also be related to increased fetal demand for maternal glucose, increased maternal sensitivity to insulin in the fasting state, and/or a decrease in human chorionic somatomammotropin, which has been observed in women with GDM [4]
- Falling insulin requirements should prompt an assessment of fetal growth and placental function and a review to exclude pre-eclampsia. Increased surveillance is recommended.
- Early delivery on the basis of falling insulin requirements alone is not advised [3,4]

Inpatient Management of Diabetics in Pregnancy

- Aim for BGL between 4.0 and 7.0
- Review clinical circumstances (oral intake, recent treatment)
- Inform obstetric registrar of admission?
- If BGL >7.0 mmol/L repeat BGL in 1hr
- If BGL still >7.0 mmol/L, obstetric registrar to discuss with endocrinology team
- Consider SC insulin if suboptimal control
- If persistently above 7.0 consider IV insulin and dextrose infusion

Intrapartum Management

- A peripartum plan should be documented for all women with diabetes
- Monitor blood glucose – see table below
- Target BGL is 4.0-7.0 mmol/L
- Consider an insulin and dextrose infusion for women whose blood glucose is outside the above range and for all women with type 1 diabetes
- If a GA caesarean required monitor BGL every 30mins whilst anaesthetised
- Obstetric registrar must be informed if a woman with diabetes is in labour
- Tocolysis with betamimetics (eg terbutaline) should be used with caution, especially in women with pre-existing diabetes or those requiring insulin. Women with diabetes may at greater risk of hyperglycaemia after terbutaline and should have their blood glucose monitored hourly for the next 4-6 hours.

	GDM Diet Controlled	GDM Requiring treatment	Type 1 or 2
Intrapartum Care	Standard Care	Cease insulin or OHG when labour established. Morning IOL/early labour: Eat breakfast + give usual rapid acting insulin Omit long acting insulin Afternoon IOL/early labour: Give usual mealtime insulin Give usual bedtime insulin	Type 1: Insulin & dextrose infusion Type 2: Cease insulin. Consider insulin & dextrose if BGLs outside of range
BGL testing	4 hourly	1-2 hourly	Hourly
CTG	Continuous CTG if poor control or macrosomia	Continuous CTG	Continuous CTG

Intrapartum care for diabetics in labour

Elective Caesarean Section

- A peripartum plan should be documented for all women with diabetes
- Elective caesarean should be considered and should have the benefits and risks over vaginal birth discussed if a diabetic woman has an estimated fetal weight over 4500gm (Induction of Labour, Indications and Booking Process CPG)
- Identify on the caesarean booking form that the woman has diabetes
- Theatre bookings to identify diabetes status on the theatre list
- It is preferable for women with diabetes, especially those requiring treatment to be first on an AM list
- If a GA caesarean required monitor BGL every 30 minutes whilst anaesthetised

	GDM Diet Controlled	GDM Requiring treatment	Type I & II
Perioperative Care	Standard Care	Give usual insulin the night prior Withhold OHG for 24hrs prior to CS Fast as per usual regimen	Type 1: Commence insulin and dextrose infusion as per endo plan Need to check with endo
BGL testing	None during the CS	Check fasting BGL before attending hospital 2 hourly whilst awaiting CS	Check hourly whilst awaiting CS

Perioperative care for caesarean section

Postpartum Management

- If gestational diabetes - cease all insulin
- Monitor BGL (see below)
- Recommend and support breastfeeding
- Send the placenta for pathological examination and follow up results.

	GDM on Diet	GDM on Rx	Type 1 & 2
BGL Monitoring	Cease monitoring	BGL QID for 48 hours	Return to routine pre-pregnancy monitoring
Insulin		Cease following birth	Type 1: Reduce to 20% of pregnancy dose Type 2: Cease following birth
Intervention	OGTT at 6 – 12 weeks	If BGL is >7.0 after 48 hours, or concerned, obstetric registrar to liaise with endocrinology OGTT at 6 - 12 weeks	Endocrinology to review as inpatient where possible

Follow Up for GDM

- Recommend OGTT at 6 week review to be performed from 6-12 weeks post-partum.
- Offer dietician follow up
- Discuss the diagnosis of GDM, reasons for follow up OGTT, HbA1c and future risk of type 2 diabetes.
- Advise weight loss and exercise to minimise this risk of type 2 diabetes and the future risk of GDM
- Annual OGTT if contemplating another pregnancy, otherwise fasting BGL, OGTT or HbA1c depending on risk every 1 to 3 years
- OGTT in 1st trimester and (if negative) at 28/40 in future pregnancy
- Ophthalmological follow up if diabetic retinopathy
- Inform GP (and VMO) of diabetes in pregnancy and follow up recommendations in discharge summary.

Neonatal Care

- Babies of diabetic women are at risk of neonatal hypoglycaemia
- Babies of women with well controlled GDM with or without insulin can be cared for on the Women's Health Unit
- Babies of women with GDM and additional risk factors or type 1 or type 2 diabetes will require admission to the special care nursery
- See Care of Neonates at Risk of Hypoglycaemia CPG for assessment of risk factors and neonatal care.

Advice for GP Shared Care Practitioners

- GPs should provide information and advice to diabetic women who are considering a pregnancy with regard to optimisation of BMI and diabetes control. Women should commence 5mg folic acid daily pre-conception. Endocrinology and obstetric input should be obtained where complications of diabetes exist pre-conception.
- GPs should screen women for risk factors for diabetes and initiate early OGTT for women at risk.
- Women without risk factors should have a random glucose included in their booking blood tests. If this is elevated, a full OGTT and HbA1c should be arranged, followed by an endocrinology referral if abnormal.
- Women with diabetes should have an early referral to the antenatal clinic for booking and an obstetric planning visit.
- All women without diabetes should have a 2hr OGTT at 24-28 weeks, even if early pregnancy screening is negative.
- All results of screening should be documented in the woman's Victorian Medical Records (VMR) and forwarded to the antenatal clinic.

- Women with a positive screen should be referred immediately to the antenatal clinic, where a diabetes clinic review will be arranged.
- Diabetes education will be provided by the diabetes clinic, but the GP should advise the women of the potential risks of diabetes in clinic, the need for careful diet control, exercise and BGL monitoring.
- After obstetric and diabetes clinic review, women with diet controlled gestational diabetes without complications may be suitable for ongoing shared care. The visit schedule is outlined in appendix 1 (below). Women with poor control require review in the diabetes clinic and may require treatment. If treatment is required, they should continue their care in the obstetric clinic. Shared care will also require additional ultrasound assessment as outlined.
- Shared care women will require hospital visits at 32 and 36 weeks.
- GPs will be asked to see women at six weeks postpartum. Women with GDM require an OGTT at 6-12 weeks postpartum to exclude pre-existing diabetes. Postpartum care should include dietary and exercise advice to optimise BMI prior to future pregnancies and to minimise future health outcomes.

See below for appendices.

Appendix 1: Usual Antenatal Care for Diabetics in Pregnancy
(note this care in in addition to Routine Pregnancy Care)

Gestn	GDM	Type 1 or 2
Model Of Care	**Group B Model of Care if GDM on diet with no other risk factors** **Group C Model of care if GDM requiring treatment or other risk factors**	**Group C Model of Care if type 2 diabetes** **Complex Pregnancy Clinic (CPC) if type 1 diabetes**
10-12	Screen for risk factors	Booking visit. Diabetes clinic (endocrinology, educator, dietician) Retinal assessment (if not in last 3/12) Renal assessment, HbA1c
14-16	Obstetric planning visit Early GTT for women at risk Initiate diabetes clinic review and monitoring if OGTT positive	Obstetric planning visit Repeat retinal assessment if abnormal at 10-12/40
20	Detailed morphology scan	Detailed morphology scan COGU scan if type 1 with suboptimal control Request 28 week US
20-28	GDM controlled on diet – review at 24/40 with MW, VMO or GP GDM on medication – review 2 weekly in obstetric clinic	2 weekly obstetric clinic appointments 28 week US for growth LV and dopplers for Type 1 diabetes
28	Refer to diabetic clinic if OGTT positive	US growth, LV and dopplers Retinal assessment
30	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic request 32 week ultrasound	Obstetric clinic review Request 32 week US
32	Review with obstetric clinic after US for growth, LV and dopplers	Obstetric clinic review after US for growth, LV and dopplers
34	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic, midwife discussion for birth planning.	HbA1c Obstetric clinic review Discuss further surveillance, mode and timing of birth, peripartum plan, arrange IOL/CS booking Request 36 week US
36	Obstetric clinic US growth, LV and dopplers if on treatment or suspected macrosomia Discuss further surveillance, mode and timing of birth, peripartum plan, arrange IOL/CS booking BFSS antenatal appointment	Obstetric clinic review after US for growth, LV and dopplers Confirm mode and timing of birth, peripartum plan.

37	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic	Obstetric clinic Offer induction/CS* if poor control, macrosomia.
38	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic Offer induction/CS* if >20iu insulin, poor control, macrosomia Weekly CTG, LV & dopplers if ongoing pregnancy	Obstetric clinic Offer induction/CS* if well controlled Weekly CTG, LV & dopplers if ongoing pregnancy
39	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic Offer induction/CS* if on treatment with ≤20u insulin CTG, LV & dopplers if ongoing pregnancy	
40	GDM controlled on diet – MW, VMO or GP GDM on medication – obstetric clinic LV and dopplers Offer induction/CS* no later than 40+6/40 if otherwise low risk	

*Diabetes is not considered an independent indication for caesarean section

Appendix 2: Example Insulin infusion

IV Insulin infusion – Novorapid in 0.9% NaCl (1 unit/ml)
Dextrose infusion – see below

BGL mmol/L	Infusion rate
Starting rate	1–2 ml/hr, depending on initial BGL
<4.0	Halve infusion rate and double dextrose rate Contact Endocrinology
4.0–7.0	Maintain at current rate
>7.0	Increase rate by 1 ml/hr

See protocol for insulin & dextrose preparation below:

Preparation of Insulin & Dextrose Infusion (see insulin infusion CPG)

- Insulin and dextrose infusions to be started at the same time.
- Prepare Dextrose infusion first
  - 1L 10% dextrose should be commenced at a 12 hourly rate when BGL less than 15 mmol/l
- Insulin is a sticky protein and will adhere to plastic coating until it is fully coated, so it is essential to make up a priming solution of 10 units of Actrapid insulin in 10mls of normal saline and to prime the infusion line with with all of this solution, prior to the commencement of the actual insulin infusion of 50units/50mls
- To prepare insulin infusion draw up 50 mls of normal saline solution and add 50 units of Actrapid insulin to this. This will create a solution of 1unit/ml
- Connect both the insulin infusion and the dextrose infusion to the same cannula via a Y-lumen connector. This ensure the woman receives both infusions and not one alone, in cases of extravasation of intravenous site
- The insulin infusion rate will be determined by the endocrinologist dependent on the patients BGL

Key Aligned Documents

Peninsula Health Clinical Practice Guidelines:
Antenatal expressing for Women with Diabetes During Pregnancy
Routine Pregnancy Care
Risk Assessment for Model of Pregnancy Care
Care of Neonates at Risk of Hypoglycaemia
Neonatal Blood Glucose Monitoring
Induction of Labour, Indications and Booking Process
Insulin Infusion

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