Clinical Guideline

NSW GOVERNMENT Health
Hunter New England Local Health District

Maternity – Diabetes in Pregnancy, Labour, Birth and the Postnatal Period

Sites where Clinical Guideline applies	HNELHD for sections 1 – 5 & 9 **Sections 6 – 8 inclusive are for John Hunter Hospital**
This Clinical Guideline applies to:	
1. Adults	Yes
2. Children up to 16 years	Yes – Potential for all maternity care guidelines to apply to girls under 16 years.
3. Neonates – less than 29 days	No
Target audience	All maternity care providers: includes midwives, obstetricians, endocrinologists and medical officers
Description	This clinical guideline identifies care concerns and makes recommendations for the management of pregnant, birthing and postnatal women with type 1 & 2 diabetes & gestational diabetes. **This guideline has been written for care of patients at John Hunter Hospital. Individual sites will need to determine the appropriateness of recommendations for their clinical circumstances**.

Go to Guideline

Keywords	Maternity, diabetes, labour, birth, postnatal, hypoglycaemia, hyperglycaemia, gestational, type 1, type 2, blood glucose level, BGL, insulin, PARU, pre-admission, perioperative, JHH, RNC
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Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:

Diabetes in pregnancy: management from pre-conception to the postnatal period. NICE guidelines [NG3] February 2015

JHH_BH_0019: Maternity: Management of Antenatal Unstable Diabetes and Diabetes in Labour, Birth and Immediate Postnatal Period : 2013

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Note: Over time links in this document may cease working. Where this occurs please source the document in the PPG Directory at: http://ppg.hne.health.nsw.gov.au/

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GLOSSARY

Acronym or Term	Definition
ACR	albumin to creatinine ratio
ADIPS	Australasian Diabetes in Pregnancy Society

ANC	Antenatal clinic
Basal insulin	Background long acting insulin. Common preparations include Protaphane, Lantus, Levemir, Humulin NPH
BGA	Blood group & antibodies
BGL	Blood glucose level
BMI	Body mass index
Bolus insulin	Rapid acting insulin, usually administered with a meal. Common preparations include: NovoRapid, Humalog, Apidra, Actrapid, Humulin R.
Capillary BGL	Blood glucose measurement performed on a sample of capillary blood obtained following a lancet finger prick of the peripheral circulation, and measured on a bedside glucose meter. Also referred to as 'finger prick BGL'. Does NOT refer to glucose measurement from an implanted subcutaneous device (continuous glucose monitoring, CGM)
CGM	Continuous Glucose Monitor, obtaining estimates of capillary/plasma glucose readings from a sensor implanted in the subcutaneous (interstitial) space. Does NOT refer to capillary BGL monitoring
CNS	Central Nervous System
C/S	Caesarean section
CTG	Cardiotocography
DIP	Diabetes in pregnancy (includes gestational and pre-existing diabetes)
DKA	Diabetic ketoacidosis
EUC	electrolytes, urea, creatinine
ELUSCS	Elective lower uterine section caesarean section
FBC	full blood count
GCT	Glucose challenge test
GDM	Gestational diabetes mellitus
GP	General Practitioner
HAPO	Hyperglycaemia and Adverse Pregnancy Outcome Trial
HbA1c	Glycated haemoglobin (A1c), which identifies average plasma glucose concentration.
HNE	Hunter New England
IADPSG/WHO	International Association of Diabetes and Pregnancy Study Groups/World Health Organisation
Hypoglycaemia (hypo)	When a blood glucose is less than 3.8 mmol/L
LHD	Local Health District

IIMS	Incident Information Management System
IOL, IoL	induction of labour
IV	Intravenous
JHH	John Hunter Hospital
LFT	liver function test
MFMU	Maternal Fetal Medicine Unit
NICU	Neonatal Intensive Care Unit
NT	nuchal translucency
OGTT	Oral glucose tolerance test
SCII (“Insulin Pump”)	Subcutaneous insulin infusion pump. A personalised, mobile medical device worn by a patient and controlled by a patient to provide basal and bolus insulin delivery. NOT to be confused with an intravenous insulin infusion.
SMOC	Standard Maternity Observation Chart
TSH	thyroid stimulating hormone
U/A	urinalysis
VE	Vaginal examination

PURPOSE AND RISKS

This guideline has been developed to provide evidence based guidance to staff in order to minimize complications associated with undiagnosed and/or unmanaged diabetes in pregnancy & the postnatal period for both mother and baby/ies. The risks are minimised by:

1. Following the guideline, flowcharts
2. Escalating as appropriate for all maternity sites
3. Specific management for level 4 – 6 hospitals dependent on resources available
4. Women and babies’ care will occur in the facilities that are able to provide the required resources for this care

Sections 6–8 of this guideline have been written for management in a tertiary hospital. Individual sites should determine their own practices depending on resources available and write a local guideline reflecting this if required.

Any unplanned event resulting in, or with the potential for, injury, damage or other loss to patients, staff or visitors as a result of this procedure must be reported through the Incident Management System (ims+) and managed in accordance with the NSW Ministry of Health Incident Management Policy PD2020_047. This would include unintended injury that results in disability, death or prolonged hospital stay.

Risk Category: *Clinical Care & Patient Safety*

GUIDELINE

While not requiring mandatory compliance, staff must have sound reasons for not implementing standards or practices set out within guidelines issued by HNE Health, or for measuring consistent variance in practice.

Staff Preparation

It is mandatory for staff to follow relevant: “Five moments of hand hygiene”, infection control, moving safely/safe manual handling, documentation practices and to use HAIDET for patient/carer communication: Hand hygiene, Acknowledge, Introduce, Duration, Explanation, Thank you or closing comment.

1. INTRODUCTION

Gestational diabetes affects 5–10% of pregnancies, and is associated with increased maternal risks of pre-eclampsia and operative delivery, and fetal risks of macrosomia, polyhydramnios and subsequent metabolic complications. Treatment of gestational diabetes can reduce the risk of developing some maternal (e.g. pre-eclampsia) and fetal (e.g. macrosomia) complications, as well as reduce the long term metabolic risks overweight/obesity, dysglycaemia, and hypertension for the child.

Pregnancy in women with pre-existing diabetes is also associated with risks to the woman and the developing fetus. Miscarriage, pre-eclampsia and preterm births are more common in women with pre-existing diabetes. In addition, microvascular complications such as diabetic retinopathy and microalbuminuria can worsen rapidly during pregnancy. Women with pre-existing diabetes are at risk of developing diabetic ketoacidosis (DKA) even with moderate hyperglycaemia (≥ 10 mmol/L). Stillbirth, congenital malformations, macrosomia, birth injury, perinatal mortality and postnatal adaptation problems are more common in babies born to women with pre-existing diabetes.

Throughout this document there are glucose target and trigger levels for action.

- Glycaemic targets vary according to whether women have pre-existing or gestational diabetes, in keeping with the current best evidence at the time of ratification.
- Glycaemic targets listed in this document are a guide for most women and may be individualised for each woman in consultation with her specialists.

CAPILLARY GLUCOSE TARGETS FOR DIABETES IN PREGNANCY	
10mmol/L and greater	Critical hyperglycaemia
7mmol/L	2 hour post-meal upper target (pre-existing diabetes) Upper range target while on IV Insulin-Dextrose infusion
6.7mmol/L	2 hour post-meal upper target (gestational diabetes) Trigger to start IV Insulin-dextrose infusion (labour or betamethasone)
5.5mmol/L	Upper acceptable fasting target (pre-existing diabetes)
5.1mmol/L	Upper acceptable fasting target (gestational diabetes)
3.8mmol/L	Lower acceptable glucose range. Treat for hypoglycaemia below this level

2. PRE-EXISTING DIABETES – PRE-CONCEPTION MANAGEMENT

The importance of avoiding unplanned pregnancy should be an essential component of diabetes education from adolescence for all women with diabetes. Women with diabetes who are planning to become pregnant should be informed that establishing at-target glycaemic control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death. It is important to explain that risks can be reduced but not eliminated.

Women and their families should be offered information about how diabetes can affect pregnancy. Information should include:

- Role of diet, body weight and exercise

- The importance of controlling blood glucose optimally both prior to conception and during pregnancy to minimise risks to mother and fetus
- Risks of hyperglycaemia, hypoglycaemia and hypoglycaemia unawareness
- The effect of nausea and vomiting on glycaemic control
- The risks associated with a baby that is large for gestational age (LGA) and associated birth interventions – induction of labour and caesarean section
- The need for assessment of diabetic retinopathy before and during pregnancy
- The need for assessment of diabetic nephropathy before pregnancy
- The importance of blood pressure control before and during pregnancy
- The risk of worsening of renal function and progression to end-stage kidney disease in women with pre-existing renal impairment and proteinuria.
- The importance of glycaemic control during labour and birth and establishment of early breastfeeding to avoid neonatal hypoglycaemia
- The possibility of the baby needing admission to the nursery or NICU
- The risk of the baby developing diabetes and/or obesity in later life

Women with diabetes who are planning to become pregnant should be:

- **Referred to an endocrinologist for pre-pregnancy optimisation, on the basis that:**
    - Optimising glycaemic control before conception and in the first few weeks of pregnancy is of key importance. Suboptimal glycaemic control before pregnancy and in early pregnancy is associated with congenital malformations and miscarriage
    - Blood glucose targets, glucose monitoring, medicines for treating diabetes (including insulin regimens) and medicines for complications of diabetes will need to be reviewed before and during pregnancy
- Informed of the availability of continuous interstitial glucose monitoring systems (CGM) and their association with improved glycaemic control, and supported to apply for National Diabetes Services Scheme (NDSS) subsidised therapy (where eligible).
- Prescribed high-dose folic acid supplementation (5 mg daily), continued until 12 weeks gestation, to minimise risk of neural tube defects
- Informed of the extra time and effort needed to manage diabetes during pregnancy and that she will have frequent contact with healthcare professionals
- Advised that the risks associated with pregnancies complicated by diabetes increase with the duration of diabetes and with the level of blood glucose and HbA1c
- Offered individualised dietary advice
- Offered advice on how to optimise weight if BMI is above 27 kg/m^2, in line with Obesity: identification, assessment and management of overweight and obesity in children, young people and adults
- Advised to use metformin as an adjunct or alternative to insulin in the pre-conception period and during pregnancy if they have Type 2 diabetes. The likely benefits from improved blood glucose control outweigh theoretical potential for harm. All other oral blood glucose-lowering agents and GLP-1 analogues should be discontinued before pregnancy and insulin substituted
- Advised to cease statin, fibrate and agents used to treat neuropathy (e.g. gabapentin) prior to pregnancy. Antihypertensive therapy must be reviewed prior to conception. ACE inhibitor/angiotensin receptor blockers are contraindicated in pregnancy and alternative antihypertensive agents may be required (e.g. methyldopa, labetalol or calcium channel blockers). Obstetric specialist advice should be sought

Recommendations for glycaemic target levels pre-pregnancy:

- In general, women with pre-existing diabetes should be advised to aim for glycaemic targets as close to normoglycaemia as possible, without causing problematic hypoglycaemia. In most women, this will represent an HbA1c target between 42 and 53 mmol/mol (6–7%).

- Reassure women that any reduction in HbA1c level towards the target range of 42–53 mmol/mol (6–7%). is likely to reduce the risk of congenital malformations in the baby.
- Strongly advise women with diabetes whose HbA1c level is above 86 mmol/mol (10%) to defer pregnancy until glycaemic control is improved, on the basis of significant associated risks of conception with hyperglycaemia, namely fetal abnormalities and fetal loss.

3. PRE-EXISTING DIABETES – ROUTINE ANTENATAL CARE

Women with pre-existing diabetes who become pregnant should have an urgent referral by their GP to a High-Risk Pregnancy Clinic (with Endocrinologist input if available). High-risk clinics are available at Armidale, Tamworth, (Manning) Taree, Moree, Maitland and the John Hunter Hospital.

- Referral should be made immediately on confirmation of pregnancy to facilitate early specialist review to optimise glycaemic control in early pregnancy.
- Advise pregnant women who are treated with multiple daily insulin injections to test their fasting, pre-meal, 2-hour post-meal and bedtime blood glucose levels daily during pregnancy; consider overnight testing if warranted.
- Advise pregnant women with type 2 diabetes to test their fasting and 2-hour post-meal blood glucose levels daily during pregnancy if they are:
    - On diet and exercise therapy only, **OR**
    - Taking metformin monotherapy or a single dose of basal insulin.

Target blood glucose levels for women with pre-existing diabetes

Achieving glycaemic targets is more difficult in women with pre-existing diabetes when compared to women with GDM. These targets should be used as a guide, and should be individualised based on patient circumstances.

Fasting capillary glucose	**3.8–5.5 mmol/L**
2 hours after commencing a main meal	**3.8–7 mmol/L**

Women should be encouraged to achieve the best possible blood glucose control while maximising safety and avoiding hypoglycaemia.

Monitoring of HbA1c in women with pre-existing diabetes

- Measure HbA1c levels in all pregnant women with pre-existing diabetes at the booking appointment to inform the level of risk for the pregnancy.
- Measure HbA1c levels in the second and third trimesters of pregnancy for women with pre-existing diabetes to assess the level of risk for the pregnancy. This does not replace the need for daily self-monitoring of capillary glucose as above.
- Be aware that level of risk for the pregnancy for women with pre-existing diabetes increases with an HbA1c level above 48 mmol/mol (6.5%).

Continuous glucose monitoring

Recommend use of continuous glucose monitoring for pregnant women on insulin therapy if they have:

- **Type 1 diabetes**
- Problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) **or**
- Unstable blood glucose levels (to minimise variability) or to gain information about variability in blood glucose levels

Ensure that support is available for pregnant women who are using continuous glucose monitoring from a member of the joint diabetes and antenatal care team with expertise in its use.

Ensure that women are familiar with the HNELHD *Cloud Based Storage and Accessing of Glucose Data: Terms and Permission of Use* [HNE500120] and understand the terms and limitations of cloud-based data sharing **(Appendix 1).**

Ketone testing and diabetic ketoacidosis (DKA) for women with pre-existing diabetes

Type 1 diabetes:

- Advise pregnant women with Type 1 diabetes of the availability of meters for personal capillary blood ketone testing
- Advise that testing for ketones (blood or urinary) should be performed in the event of hyperglycaemia (BGL ≥ 10 mmol/L) or intercurrent illness
    - Individualised education regarding self-management of hyperglycaemia and ketonaemia should be provided
    - Capillary ketones > 0.6 mmol/L, urinary ketones > 1+ or persistent hyperglycaemia > 10 mmol/L should prompt urgent clinical review
- Advise women that diabetic ketoacidosis (DKA) in pregnancy can develop at lower levels of hyperglycaemia than outside pregnancy and that vigilant monitoring as above is required.

Type 2 diabetes:

- Fasting urinary ketone monitoring may be appropriate for women with Type 2 diabetes to detect carbohydrate restriction
- Advise pregnant women with Type 2 diabetes to seek medical advice if they become hyperglycaemic [BGL ≥ 10 mmol/L] or unwell, where ketone testing should be performed promptly by clinical staff

Retinal assessment during pregnancy for women with pre-existing diabetes

- Advise all pregnant women with pre-existing diabetes to attend retinal assessment by an optometrist or ophthalmologist following their first antenatal clinic appointment (unless they have had a retinal assessment in the last 3 months) and again at 28 weeks. If any diabetic retinopathy is present at booking, perform an additional retinal assessment at 16–20 weeks
- Ensure that women who have pre-proliferative diabetic retinopathy or any form of referable retinopathy diagnosed during pregnancy have ophthalmological review as soon as diagnosed
- Diabetic retinopathy should not be considered a contraindication to vaginal birth

Renal assessment during pregnancy for women with pre-existing diabetes

- If renal assessment has not been undertaken in the preceding 3 months in women with pre-existing diabetes, arrange electrolytes, creatinine and spot urine albumin:creatinine ratio at the first contact in pregnancy
- Referral to a nephrologist should be considered if any of the following:
    - Serum creatinine is abnormal (100 micromol/litre or more) (*N.B. eGFR is unreliable in pregnancy and should not be used*)
    - Spot urine albumin:creatinine ratio is greater than 30 mg/mmol or total protein excretion exceeds 0.5 g/day
    - Progressively rising creatinine or urinary albumin or protein excretion
- Optimal blood pressure control is important and targets should be identified and treated in consultation between Obstetrics and Nephrology
- Thromboprophylaxis should be considered for women with nephrotic range proteinuria above 2 g/day and serum albumin less than 20 g/L

Detecting congenital anomalies

<u>First trimester</u>

Offer all women combined first trimester assessment at 11+0 to 13+6 weeks

- Diabetes does not increase the risk of chromosomal abnormalities, therefore Non Invasive Prenatal Test (NIPT) or invasive testing is considered as per routine indications for the general obstetric population

<u>Morphology scan</u>

In line with the Australasian Diabetes in Pregnancy Society (ADIP) 2020 guidance, a fetal anomaly scan that includes a four-chamber cardiac view or outflow tracts (consistent with the Australasian Society for Ultrasound in Medicine [ASUM] guidelines) should be performed at 18–22 weeks in all women with diabetes. Cardiac structures should be reviewed on subsequent 24 week growth scan as this may increase detection particularly in women with increased BMI.

A tertiary-level cardiac assessment (JHH Maternal Fetal Medicine (MFM) or outreach clinics) is recommended for women at increased risk of congenital cardiac conditions:

- Periconceptual HbA1c ≥ 7.5% (3 months pre-conception or during 1st/early 2nd trimester)
- Incomplete cardiac views at morphology scan

There is a 2 to 3 fold increase in risk of major malformations in infants of mothers with diabetes, particularly cardiovascular, CNS, face and extremity defects. There appears to be a dose-response effect corresponding to periconceptual and early pregnancy glucose control.

Fetal echocardiography with a Paediatric Cardiologist is recommended if any structural cardiac anomalies are suspected on routine morphology scan. This can be arranged via a referral to JHH MFMU.

Monitoring fetal growth and wellbeing

- Offer pregnant women with pre-existing diabetes (Type 1 or 2) monitoring of fetal growth, Dopplers and liquor volume every 4 weeks from morphology scan until 36 weeks. Fetal cardiac views should be repeated at around 24 weeks gestation as this may increase detection rate for cardiac anomalies particularly women with increased BMI. Scan frequency may be increased if additional concerns arise, such as disorders of fetal growth or liquor volume.

  Tertiary level assessment should be considered (JHH MFM or outreach clinics) in the following circumstances:

- High risk for fetal growth disorders (e.g. diabetic microvascular and/or macrovascular complications, maternal hypertension, poor diabetic control, previous fetal growth disorder)
- Evidence of fetal growth disorder on imaging (i.e. AC/EFW >90th centile or AC/EFW <10th centile)
- Suspicion of structural anomaly on imaging

Gestational diabetes

Offer pregnant women with uncomplicated diet controlled GDM ultrasound monitoring for fetal growth, Doppler studies and liquor volume at 30 and 36 weeks unless there are additional obstetric risk factors requiring more frequent monitoring.

For women with GDM requiring therapy (oral or insulin), ultrasound monitoring should be performed monthly from initiation of therapy until 36 weeks.

Provide an individualised approach to monitoring fetal growth and wellbeing for women with diabetes and a risk of fetal growth restriction (macrovascular disease and/or nephropathy)

Organisation of antenatal care for women with pre-existing diabetes

Ensure antenatal care is provided:

- Within a joint Diabetes and Antenatal clinic for women with diabetes who are pregnant

  OR

- In conjunction with the high risk antenatal clinics available across the LHD

  OR

- In consultation with an obstetrician and endocrinologist as outlined in HNE Community Health Pathways Gestational Diabetes page

Assessment of blood glucose control should generally occur every 2 weeks or as deemed clinically appropriate.

The pathway for women with Type 1 or 2 diabetes is contained in **Appendix 2**.

4. GESTATIONAL DIABETES – SCREENING AND DIAGNOSIS

Women not known to have diabetes but considered at risk of pre-existing diabetes or at high risk for GDM should be tested early in pregnancy. All other women should be tested for GDM later in pregnancy at 24-28 weeks gestation.

There is no need for a 3-day high-carbohydrate diet before the Oral glucose tolerance test (OGTT); however women should not restrict carbohydrates from their diet

- All women should be tested as stratification by risk factors is unreliable
- The Glucose Challenge Test (GCT) lacks both sensitivity and specificity and is no longer part of the diagnostic algorithm

For women at a gestation of **16 weeks and beyond**, an OGTT is the gold standard and the IADPSG / ADIPS criteria are used for diagnosis. The diagnosis is based on any one of the following blood glucose values:

Fasting plasma glucose	**5.1 mmol/L** or greater
1 hour after 75 g oral glucose	**10.0 mmol/L** or greater
2 hours after 75 g oral glucose	**8.5 mmol/L** or greater

Requesting an OGTT is **NOT** appropriate for some women as it can be hazardous to the mother and fetus. For example:

- Women under 16 weeks gestation
- Women with a diagnosis of diabetes
- Women who have had metabolic / bariatric surgery (see *adapted* screening algorithm)
- In areas where the rate of undiagnosed Type 2 diabetes is thought to be high, or in remote areas where the performance of a 75 g OGTT may be logistically difficult, a measurement of HbA1c can be considered

The recommended **screening algorithm**, developed in HNELHD, is shown below:

Who to test	**Early testing <12 weeks** Consider for **high risk** women	**Early testing at 16-20 weeks** For **high risk** women	**Universal testing at 24-28 weeks** For **all** women	**Postnatal Testing** For **all** women with GDM
Standard test	**HbA1c and fasting glucose** Diagnose GDM: if HbA1c ≥5.9% or fasting glucose ≥5.6mmol/l But if fasting glucose 5.1-5.5mmol/l repeat at 12+ weeks and diagnose GDM if fasting glucose ≥5.1mmol/l	**75g OGTT** Diagnose GDM: if fasting glucose ≥5.1 or 1-hr glucose ≥10.0 or 2-hr glucose ≥8.5mmol/l	**75 g OGTT** Diagnose GDM: if fasting glucose ≥5.1 or 1-hr glucose ≥10.0 or 2-hr glucose ≥8.5mmol/l	**75g OGTT** 6-12mths Standard criteria
ALTERNATIVE If gold standard not achievable	To exclude **pre-existing diabetes** No alternative testing required as OGTT not recommended <12 weeks	HbA1c and fasting glucose Diagnose GDM: if HbA1c ≥5.7% or fasting glucose ≥5.1mmol/l But if fasting glucose 4.7-5.0mmol/l progress to OGTT	HbA1c and fasting glucose Diagnose GDM: if HbA1c ≥5.4% or fasting glucose ≥5.1mmol/l But if fasting glucose 4.7-5.0mmol/l progress to OGTT	Perform both:HbA1c and fasting glucose Standard criteria
Next step	Retest at 16-20 weeks if this test normal	Retest at 24-28 weeks if this test normal	No further testing unless indicated	Screen at least every 2 years

Early testing for GDM for high risk women:

Some women may warrant testing in the first trimester of pregnancy to identify undiagnosed **pre-existing diabetes**. The preferred test is HbA1c and a fasting glucose level. Women with HbA1c ≥6.5% or fasting glucose ≥7.0 mmol/l are likely to have pre-existing diabetes. Women with HbA1c ≥5.9% or fasting glucose ≥5.6 mmol/l should be diagnosed as GDM, although evidence is limited for this threshold. Testing in the first trimester may also identify women who exceed the diagnostic criteria for later pregnancy; these women with

'hyperglycaemia of early pregnancy' should be retested (refer to algorithm), as they are at increased risk of gestational diabetes.

Women at high risk for gestational diabetes should be tested at **16-20** weeks' gestation. Women should be defined as high risk if:

One of the following is present:	*OR*	*Two of the following are present:*
• History of impaired glucose tolerance or gestational diabetes • History of pancreatic disease e.g. acute pancreatitis, chronic pancreatitis, cystic fibrosis • Hyperglycaemia of early pregnancy • Polycystic Ovary Syndrome (PCOS)* (see below) • Previous unexplained stillbirth • Previous baby with macrosomia • Indigenous background • BMI > 35 kg/m^2 • Women on medication that may cause diabetes, e.g. steroids, antipsychotics, immunosuppressant • Previous metabolic / bariatric surgery** (see below)		• Immediate family history of diabetes • Age > 35 years • BMI > 30 kg/m^2 • Non-Caucasian background • Poor obstetric history (e.g. recurrent miscarriage, malformations etc.)

<u>Routine</u> testing of all women with 75 g OGTT at 24–28 weeks

All women **<u>NOT</u>** known to have GDM or diabetes should have a 75 g OGTT at 24–28 weeks gestation.

- All women should be tested as stratification by risk factors is unreliable
- There is no need for a 3-day high-carbohydrate diet before the OGTT; however, women should not restrict carbohydrates from their diet

Important notes:

- If at any time there is a **clinical concern** about an individual woman, who does not already have a diagnosis of GDM (e.g., accelerated fetal growth, polyhydramnios, fetal abdominal circumference >90th centile) glucose testing should be performed according to the algorithm.
- **Women with PCOS on metformin treatment*** Women with PCOS are at high risk of GDM and should receive early screening. For those on metformin at conception, ceasing medication may lead to significant hyperglycaemia. For women considered at lower risk of hyperglycaemia (e.g., no other risk factors), metformin can be ceased for 1-2 weeks prior to OGTT. For women considered at higher risk of hyperglycaemia (e.g., one or more other risk factors), metformin can be continued, and capillary glucose testing performed for 1 week; if >20-30% of capillary glucose levels (before and 2-hours after meals) are above threshold (or fewer if the clinical context is concerning) a diagnosis of **presumed GDM** can be made.
- **Metabolic / Bariatric surgery**** Women who have had previous metabolic / bariatric surgery are at increased risk of glucose variability (hyper- and hypo- glycaemia) and GDM. An OGTT should **<u>NOT</u>** be performed as it causes significant hypoglycaemia and is unreliable (particularly the 1-hour glucose level) as a screening tool. A suggested adapted algorithm is shown below. Women with symptomatic hypoglycaemia warrant further investigation using CGMS to identify glucose variability and should be referred to the Antenatal endocrine clinic.

  Women with repeated glucose excursions >7.8mmol/l should be considered for insulin treatment, as this threshold is associated with fetal overgrowth. Glucose targets should be adjusted for each individual to avoid hypoglycaemia, as this has been associated with growth restriction.

The ***adapted*** HNELHD **screening algorithm** for women who have had previous metabolic / bariatric surgery:

	Early testing <12 weeks	**Early testing at 16-20 weeks**	**Universal testing at 24-28 weeks**	**Postnatal Testing**

Standard test	**HbA1c and fasting glucose** Diagnose GDM: if HbA1c ≥5.9% or fasting glucose ≥5.6mmol/l	1 week of capillary glucose levels before and 2hr after meals Diagnose GDM: If more than one fasting glucose ≥5.1mmol/l or more than two 2hr glucose ≥6.7mmol/l	1 week of capillary glucose levels before and 2hr after meals Diagnose GDM: If more than one fasting glucose ≥5.1mmol/l or more than two 2hr glucose ≥6.7mmol/l	**HbA1c and fasting glucose** Standard criteria for diabetes
OGTT	**Not recommended**	**Not recommended** If OGTT performed inadvertently, only use threshold of fasting ≥5.1mmol/l or 2hr ≥8.5mmol/l	**Not recommended** If OGTT performed inadvertently, only use threshold of fasting ≥5.1mmol/l or 2hr ≥8.5mmol/l	**Not recommended**
Additional	If *symptomatic* hyper- or hypo- glycaemia, refer to Antenatal endocrine clinic	If *symptomatic* hyper- or hypo-glycaemia, refer to Antenatal endocrine clinic	If *symptomatic* hyper- or hypo- glycaemia, refer to Antenatal endocrine clinic	
Next step	Retest (1 week of capillary glucose levels) at 16-20 weeks if this test normal	Retest (1 week of capillary glucose levels) at 24-28 weeks if this test normal	No further testing unless indicated	Screen yearly

Diagnostic criteria for gestational diabetes

The diagnosis of GDM at any time during pregnancy should be based on any one of the following blood glucose values:

Fasting plasma glucose	**5.1 mmol/L** or greater
1 hour after 75 g oral glucose	**10.0 mmol/L** or greater
2 hours after 75 g oral glucose	**8.5 mmol/L** or greater

Note:

- Diabetes mellitus first diagnosed in pregnancy may not necessarily be confirmed as diabetes that persists in the postpartum period. Diabetes is more likely to be confirmed in the postpartum period when the hyperglycaemia in pregnancy is diagnosed early and/or the degree of hyperglycaemia is marked

5. GESTATIONAL DIABETES – ANTENATAL CARE

- All women with gestational diabetes should be referred promptly to a clinic or centre with experience in managing gestational diabetes
- A standard pathway of care for women with gestational diabetes is outlined in the Appendix 3

Suggested glycaemic treatment targets in GDM

Clinician judgement should guide practice in this area, both in the setting of overall glucose targets and the glucose thresholds which would lead to pharmacological treatment of individual women.

In general, the following glycaemic targets are recommended for women with **gestational** diabetes:

Fasting capillary glucose	**3.8–5.0 mmol/L**
2 hours after commencing a main meal	**3.8–6.7 mmol/L**

Note:

- It is not routine for women to measure a 1-hour post meal BGL unless instructed by a clinician. For most women, the 2-hour post meal target should be used.

Monitoring of HbA1c in women with gestational diabetes

- If GDM is diagnosed prior to 20 weeks, measure HbA1c at the time of diagnosis to identify those who may have pre-existing Type 2 diabetes.
    - A HbA1c > 48 mmol/mol (6.5%) is diagnostic of diabetes outside of pregnancy and strongly suggests pre-existing diabetes
- In women with GDM, HbA1c levels are not routinely used to assess a woman's blood glucose control in the second and third trimesters of pregnancy

Ketone testing in gestational diabetes

- Fasting urinary ketone monitoring is appropriate for women with GDM
    - Positive fasting urinary ketones suggests carbohydrate restriction and should prompt clinical review
    - Persistent and high urinary ketones (> 1+) should prompt capillary ketones testing and discussion with endocrinologist regarding the possibility of insulin deficiency and undiagnosed Type 1 diabetes
- Advise pregnant women with gestational diabetes to seek urgent medical advice if they become hyperglycaemic (BGL ≥ 10 mmol/L) or unwell
- Test urgently for ketones in urine or capillary blood if a pregnant woman with any form of diabetes presents with hyperglycaemia (BGL ≥ 10 mmol/L) or is unwell, to exclude diabetic ketoacidosis
- During pregnancy, admit immediately women who are suspected of having diabetic ketoacidosis for care in a high dependency area such as the birthing unit, where they can receive immediate medical and obstetric care

SECTIONS 6–8 HAVE BEEN WRITTEN FOR MANAGEMENT AT A TERTIARY HOSPITAL. INDIVIDUAL SITES SHOULD DETERMINE LOCAL PRACTICE & POLICY

6. UNSTABLE GLYCAEMIC CONTROL IN THE ANTENATAL PERIOD

Stable glycaemic control is important throughout pregnancy. Most women with DIP should achieve BGLs at target. BGLs outside target are an indication for clinical review and treatment escalation. Where glycaemic instability is contributed to by intercurrent illness or where intensive education, monitoring and stabilisation are required, women should be recommended hospital admission for stabilisation of diabetes at a centre experienced in the management of diabetes in pregnancy.

Women should be made aware of an increased risk of hypoglycaemia and decreased symptoms of hypoglycaemia (hypoglycaemia unawareness) during pregnancy. This includes information about prevention, recognition and treatment.

Diabetic ketoacidosis (DKA) can be accelerated in pregnancy and is associated with adverse maternal and fetal outcomes (including fetal death). Women with Type 1 and 2 diabetes should have DKA excluded by blood gas and capillary ketone measurement if presenting as unwell and may need admission and may require high dependency care. They will require obstetric and endocrine review with a plan for management made. The most common precipitants for DKA are:

- Omission or inadequate dosing of insulin
- Infection (e.g. pneumonia, urinary tract infection, gastroenteritis, viral)
- Hyperemesis
- Medical/surgical intercurrent illness such as pancreatitis
- Steroid induced hyperglycaemia after administration for fetal lung maturation

Principles of management of antenatal unstable glycaemia (not in labour) (see Appendix 4)

- Women should be admitted to a ward familiar with the management of diabetes in pregnancy
    - The woman should be admitted under the Obstetric team, with consultation from Endocrine and other medical teams

- Women with suspected unstable diabetes require prompt obstetric, medical and midwifery assessment, with a comprehensive management plan instituted
- Initially, BGL should be measured 30-minutely until a pattern is determined and treatment instituted.
- CTG should be applied (≥ 25 weeks gestation) if BGL ≥ 10 mmol/L
- A medical officer must be informed and review the woman promptly. In the first instance, the obstetric registrar should be notified to review. Once this review has occurred, the obstetric registrar will liaise with the endocrine registrar or consultant, unless other arrangements have been made with midwifery staff. If there is a delay in the initial review, a senior obstetric registrar or consultant obstetrician should be contacted to escalate review as this is a serious maternity clinical issue that can be harmful to mother and baby
- Women with BGL ≥ 10 mmol/L must have an assessment for ketones in urine or blood
    - If ketones are present (urine > 1+, capillary > 0.6 mmol/L), urgent venous blood gas to assess for ketoacidosis must be performed. If acidosis is present (pH <7.32), the Obstetric and Endocrine consultant must be informed.
- Unstable BGL not responding to treatment or suspected DKA should be managed in a high dependency area such as the Birthing Unit
- Intravenous insulin infusion with concurrent intravenous glucose may be required for initial control as per Pregnancy Insulin/Glucose Infusion Form **(see Appendix 5**). Endocrine consultation is advised.

Subcutaneous insulin infusion pump (SCII) use during admission for unstable glycaemic control (not labour)

- Continued inpatient use of SCII pump for a pregnant woman with unstable blood glucose requires clinician judgement based on individual patient circumstances. Factors to be considered include:
    - Medical comorbidities and reason for admission
    - Patient capacity for patient-controlled management of SCII pump functions, including whether or not this capacity is impacted by intercurrent illness. Capacity for independent glucose self-management may change over time and may need to be re-assessed.
    - Familiarity of medical and midwifery staff with insulin pump therapy
    - In some circumstances it may be safer to remove the subcutaneous insulin pump and manage a patient on subcutaneous insulin or intravenous insulin-glucose infusion
- Early discussion with Endocrinologist is required to formulate an individual management plan in **all** circumstances
- A SCII pump should **never** be removed until appropriate alternate insulin therapy has been given, either with the establishment of an intravenous insulin infusion or administration of appropriate subcutaneous insulin
- Medical officers remain responsible for documenting admission SCII pump settings in the medical record and documenting advice to patient and any subsequent setting changes
- Midwifery staff remain responsible for monitoring and documentation of BGLs in accordance with this guideline, documenting patient self-care behaviours whilst on pump therapy and escalating to Medical Officers any concerns with patient's self-management

Use of CGM sensors in hospitalised women

- Women who are wearing a CGM sensor as part of the ambulatory management of their glucose may continue to wear the sensor whilst hospitalised, provided that:
    - The sensor is not located at a site that may interfere with clinical management (such as on the abdomen in a woman being prepared for caesarean section)
    - The CGM glucose is not used as a substitute for regular capillary glucose monitoring.
    - Capillary glucose monitoring is still performed at regular intervals as determined by clinical care (usually pre meals, 2 hours post meals and nocte), with results documented in the medical record.
- The midwife caring for women wearing a CGM sensor is responsible for ensuring capillary BGL measures (finger pricks) are performed and documented in the medical record as would be required for the routine care of any patient with diabetes (e.g. pre-meals, 2 hours following meals and prior to

bed in women treated with subcut insulin, and every 30-60 minutes when treated with intravenous insulin)

- All clinical decisions (such as assessing and treating hypoglycaemia and hyperglycaemia) should be based on finger prick capillary glucose measures

7. ANTENATAL BETAMETHASONE IN WOMEN WITH DIABETES IN PREGNANCY

General comments:

- Use of antenatal corticosteroids is not contraindicated in women with DIP, although use significantly increases risk of maternal hyperglycaemia and postnatal fetal hypoglycaemia, and may possibly contribute to fetal acidosis
- Women with DIP who are receiving antenatal betamethasone should be admitted to hospital for glycaemic monitoring and management
- Both tocolysis and nifedipine may be used if clinically indicated
- In women with marked insulin resistance, or with refractory hyperglycaemia, the administration of betamethasone must be more carefully weighed against the risk of inducing decompensated glycaemic control.
- There is no evidence or benefit for women without diagnosed with diabetes of checking BGLs.

Administration of antenatal betamethasone (See Appendix 6)

The decision to administer betamethasone is made by the Obstetric Registrar or Consultant. Refer to Maternity – Antenatal Corticosteroids HNELHD CG 22_16 and Drug Prescribing Guideline (DPG) 18_17 Maternity Betamethasone injection

All women with DIP prescribed betamethasone should be admitted to a Maternity Ward with experience in the management of unstable diabetes.

The betamethasone prescriber must also prescribe:

- Patient's regular diabetic pharmacotherapy:
  - Pre-existing metformin therapy should be continued if no contraindication. Consideration should be given to withholding metformin in the setting of intercurrent illness, volume depletion or renal/hepatic impairment
  - It is usually appropriate to continue subcutaneous insulin concurrently with intravenous insulin in a stable antenatal patient
- Pre-existing subcutaneous basal insulin therapy should be continued at pre-admission doses
- Pre-existing mealtime insulin should be withheld if the patient is fasting
- An anticipatory order for intravenous insulin and intravenous glucose, in accordance with the Pregnancy Insulin/Glucose Infusion Form, to be commenced if any BGL reading is greater than 6.7 mmol/L in the 48 hours after betamethasone

  Women with Type 1 and Type 2 diabetes who are prescribed betamethasone should have an Endocrine consultation within 8 hours of betamethasone administration.

Monitoring whilst not on insulin infusion

- **All** women must have 2-hourly **capillary** BGL readings for 24 hours after the final planned dose of betamethasone (during waking hours this should correspond to pre-meal and 2 hours post meals)
- Target BGL is 3.8–6.7 mmol/L
  - The Medical Officer must be informed of:
- Any BGL ≥ 10 mmol/L
- Any reading below 3.8 mmol/L
  - Pregnancy Intravenous Insulin/Glucose Infusion should be commenced if ANY reading is above 6.7 mmol/L

Commencement of intravenous insulin with intravenous glucose following betamethasone

- Commence intravenous insulin and glucose immediately if any BGL is greater than 6.7 mmol/L

- Insulin and glucose infusion should be prescribed on the Pregnancy Insulin/Glucose Infusion Form, which contains detailed instructions about monitoring and rate variation **(see Appendix 5**). The 'Standard Adult Intravenous Insulin Infusion' should not be used
- Intravenous glucose with premixed potassium (usually glucose 4% + sodium chloride 0.18% + 30 mmol/L potassium chloride) should be commenced at 80 mL/h in non-fasting women and 125 mL/h in fasting women. Clinicians should use judgement in individual circumstances (e.g. renal impairment, pre-eclampsia, electrolyte disturbance)

- Insulin infusion **RATE** (units/h) is adjusted **each hour** based on **hourly** capillary BGL measurements
- Insulin infusion **PROTOCOL** (A–E) should be:
  - Increased if BGL > 7 mmol/L for three consecutive readings (for example, increased from Protocol B to Protocol C)
  - Decreased if ANY BGL < 3.8 mmol/L (for example, decreased from Protocol B to Protocol A)
- Medical Officer must be informed of any BGL < 3.8 mmol/L or any BGL ≥ 10 mmol/L
- Once commenced, the insulin-glucose infusion is routinely continued for 24 hours after the final dose of betamethasone, after which time it can usually be ceased

De-escalating and ceasing IV insulin after betamethasone

- If glucose levels are 3.9–5mmol/L for 2–3 consecutive readings, the midwife should request a medical officer review the prescribed protocol and consider reducing the protocol to avoid hypoglycaemic (e.g. D to C).
- Intravenous insulin should be ceased 24 hours after the final dose of betamethasone unless alternate arrangements have bene made. In women with Type 1 diabetes, it should be ensured that subcutaneous insulin has been continued prior to ceasing intravenous insulin.
- If IV insulin is required to be continued for any reason, the Protocol should be decreased to Protocol B exactly 24 hours after the final dose of Betamethasone, and then re-escalated as required. Medical officer review is mandatory to determine an ongoing management plan.

Customised protocol E and greater

- 20% of women with GDM and 50% of women with pre-existing diabetes require more IV insulin than contained in Protocol D. This is particularly prevalent following the second dose of betamethasone.
- Clinicians should use the following table as a guide to prescribing escalating protocols of IV insulin. Protocols should be escalated in an incremental manner (e.g. D to E, E to F, F to G etc)
- Midwives should ensure that a custom protocol has been charted prospectively for all women requiring Protocol D or receiving a second dose of betamethasone.
- Endocrine consultation is warranted for all women requiring protocol F or higher.
- Women with frequent glucose >7mmol/L in the 24 hours after the first dose of betamethasone and who are requiring protocol F or higher should have the indication for a second dose of betamethasone re-assessed by their Obstetrician, as insulin resistance is likely to increase following the second dose of betamethasone.

All intravenous infusion rates are in units/hour

Protocol	**E**	**F**	**G**	**H**	**I**
3.8-4.9 mmol/L	1 u/h	1 u/h	1.5 u/h	2 u/h	2 u/h
5-5.9 mmol/L	2.3 u/h	3 u/h	4 u/h	6 u/h	8 u/h
6.0-6.9 mmol/L	4 u/h	5 u/h	6 u/h	8 u/h	11 u/h
7.0-7.9 mmol/L	6 u/h	7 u/h	9 u/h	11 u/h	14 u/h
8.0-8.9 mmol/L	8 u/h	10 u/h	12 u/h	14 u/h	18 u/h
9.0-9.9 mmol/L	10 u/h	13 u/h	15 u/h	18 u/h	24 u/h

>10 mmol/L	13 u/h	16 u/h	19 u/h	24 u/h	30 u/h

8. BIRTH

Timing of Birth

Type of diabetes	*Routine timing of birth*
Type 1 diabetes	**37–39 weeks**
Type 2 diabetes	**38–39 weeks**
GDM, treated with insulin/metformin	**38–39 weeks**
GDM, treated with diet alone	**40–41 weeks**

Spontaneous labour or induction of labour

Diet and subcutaneous insulin

- Mealtime insulin
  - Women may eat breakfast as usual and administer any prescribed mealtime insulin
- Basal insulin
  - Women should have usual long acting (basal) insulin, even if fasting. Check with Medical Officer if any concerns prior to administration
  - For patients with Type 1 diabetes, basal insulin must NOT be withheld

Insulin pump (Continuous Subcutaneous insulin infusion[CSII]) in labour

- Specific advice **must** be sought from the treating Endocrinologist (this should occur antenatally and be documented in the antenatal record)
- Once the woman is contracting or labour has commenced, the woman should be in the Birthing Unit & an intravenous insulin/glucose infusion should be commenced
- The subcutaneous insulin-pump may remain attached to the patient (in addition to an intravenous insulin/glucose infusion) at the discretion of the treating Endocrinologist, providing that:
  - The subcutaneous basal rate is reduced according to a pre-partum plan or alternatively 50% of the late pregnancy rate
  - Subcutaneous bolus insulin is **only** administered through the pump to correspond with food intake
  - Correction boluses (not with food) are **not** to be administered via the subcutaneous pump
  - The woman demonstrates capacity for ongoing independent self-management of the pump

If any of the above conditions are not met, the subcutaneous insulin pump should be removed 30 minutes after the initiation of intravenous insulin-glucose

- Withhold metformin

Monitoring

- Complete admission
- For continuous CTG monitoring unless
  - Diet-controlled diabetes in spontaneous labour with no infusions OR
  - Other arrangement made in discussion with Obstetrician
- Blood glucose level (BGL) on admission, then hourly if not on IV insulin/glucose
  - Target BGL whilst not on IV insulin/glucose: 3.8–6.7 mmol/L

- Notify Obstetric Registrar and Neonatal Intensive Care (NICU)
- IV access 16 or 18G cannula (unless diet controlled diabetes in spontaneous labour with no infusions)
- Measure every urine specimen for ketones or at a minimum four hourly or blood for ketones every four hours

Treatment

- If BGL < 3.8 mmol/L, commence glucose 4% + sodium chloride 0.18% + 30 mmol/L potassium chloride premixed 1000 mL bag at 125 mL/h
- If BGL > 6.7 mmol/L, commence insulin and glucose infusions as per Pregnancy Insulin/Glucose Infusion Protocol*(If Approved for use at your site)
- Once insulin and/or glucose infusion commenced, BGL is to be monitored every 30 minutes with a target BGL of between 3.8 and 7 mmol/L. Refer to Pregnancy Intravenous Insulin/Glucose Infusion Form*(If Approved for use at your site) (**Appendix 5**) for changes to infusion
- Medical Officer must be notified of:
  - Any reading less than 3.8 mmol/L, OR
  - 3 consecutive readings > 7 mmol/L, OR
  - Any reading ≥ 10 mmol/L OR
  - If urinary ketones 1+ or greater or capillary ketones > 0.6 mmol/L
- Every 12 hours check venous blood potassium
- Notify Medical Officer if potassium is out of range

Elective caesarean section

Insulin-treated patients – Type 1 diabetes and Type 2 diabetes/GDM treated with insulin

- Continue long-acting and short-acting insulin or premixed insulin as usual the day before surgery
- If a long-acting insulin or premixed insulin is administered in the morning, advise patient to administer 50% of usual pregnancy dose on the day of surgery
- Do not administer short-acting insulin once patient is fasting
- For admitted patients with Type 1 diabetes, an insulin/glucose infusion should be commenced from time of fasting until post-partum
  - If the patient is treated with a subcutaneous insulin pump (SCII), this should be removed 30 minutes after an insulin/glucose infusion has been commenced
- For women on metformin therapy, this should be withheld on day of surgery
- Nil by mouth – see local procedure JHH_JHCH_BH_0057 Fasting prior to anaesthesia/sedation
- Admission should occur on the day of surgery if well controlled, otherwise the evening before surgery

Non-insulin treated patients (gestational diabetes, Type 2 diabetes on metformin monotherapy)

- Nil by mouth – see local procedure JHH_JHCH_BH_0057 Fasting prior to anaesthesia/sedation
- For women on metformin therapy, this should be withheld on day of surgery

For all patients:

- Conduct hourly BGL measurements whilst within target BGL of 3.8–6.7 mmol/L
- If BGL < 3.8 mmol/L, commence glucose 4% + sodium chloride 0.18% + 30 mmol/L potassium chloride premixed 1000 mL solution at 125 mL/h
- If BGL > 6.7 mmol/L, commence insulin and glucose infusions as per Pregnancy Intravenous Insulin Glucose Infusion Form*(If Approved for use at your site) **(Appendix 5)**
- Once insulin and/or glucose infusion commenced, BGL is to be monitored at least every 60 minutes with a target BGL of 3.8–7 mmol/L. Refer to Pregnancy Intravenous Insulin Glucose Infusion Form*(If Approved for use at your site) **(Appendix 5)** for changes to infusion
- Change calling criteria for review on SMOC chart to be:

- Any reading < 3.8 mmol/L
- Any reading ≥ 10 mmol/L

- Measure every urine specimen for ketones or at a minimum four hourly or monitor blood for ketones every four hours

9. POSTNATAL

Type 1 diabetes:

All women with Type 1 diabetes should have an individualised postnatal plan documented in their medical record (usually eMaternity) during the final weeks of their antenatal care to guide post-partum glycaemic management adjusted by regular consultation with the Endocrine team often documented in eMaternity.

In the absence of a prior documented plan, the following can be used as a guide:

- Post-partum, reduce Pregnancy Intravenous Insulin/Glucose Infusion to Protocol A unless otherwise advised
- Continue insulin and glucose infusions until diet is re-established AND 2 hours have elapsed since a dose of subcutaneous insulin (long acting AND mealtime insulin OR subcutaneous insulin infusion pump)
  - Subcutaneous insulin should be recommenced at a reduced dose compared to those used in late pregnancy (guide: 50% reduction), but similar to the patient's pre-pregnancy regimen
- BGL targets in the post-partum period of 5–10 mmol/L are appropriate
  - If BGL above 10 mmol/L on two consecutive occasions, notify Medical Officer, either obstetric or endocrine (or out of hours medical)
  - Alter calling criteria on SMOC chart to be < 4 mmol/L and > 10 mmol/L postnatally on 2 consecutive occasions
- Review by Endocrine Team (or medical team if out of hours) within 24 hours.
- Check capillary ketones if BGL >10mmol/L

See: Intrapartum and Postnatal Flowchart for all diabetes in pregnancy (Appendix 7)

Type 2 diabetes:

Women with Type 2 diabetes should have a post-partum glycaemic management plan documented in their antenatal record.

In the absence of a prior documented plan, the following can be used as a guide:

- Post-partum, reduce Pregnancy Intravenous Insulin Infusion to Protocol A unless otherwise advised
  - Continue insulin and glucose infusions until diet and appropriate regular diabetic management is re-established
- If treated with insulin prior to pregnancy, revert to the pre-pregnancy dosing regimen if known, or reduce the late pregnancy dosing regimen by at least 50%
- If not treated with insulin prior to pregnancy, **do not** recommence subcutaneous insulin therapy postnatally unless advised by medical team
- **Do not** restart oral hypoglycaemic agents unless instructed by medical team
  - Cease intravenous insulin infusion 2 hours after a meal
- BGL targets in the post-partum period of 5–10 mmol/L are appropriate
  - If BGL above 10 mmol/L on two consecutive occasions, notify Medical Officer, either obstetric or endocrine (or out of hours medical)
  - Alter calling criteria on SMOC chart to be < 4 mmol/L and > 10 mmol/L postnatally on 2 consecutive occasions
- Diet as tolerated
- Review by Endocrine team (or medical team if out of hours)
- See postnatal flow sheet

Note: Small amounts of metformin are secreted into breast milk, but adverse effects have not been observed in breastfed infants. Therefore, metformin is considered safe to use during breastfeeding.

Gestational diabetes:

- If treated with insulin/glucose infusion, both can be ceased after birth. Monitor BGL one hour after ceasing the infusion. Contact Medical Officer if BGL < 4 mmol/L or >10 mmol/L
- Routine monitoring of BGLs should occur twice daily for 48 hours post birth then should cease. Contact Medical Officer if BGL < 4 mmol/L or >10 mmol/L
- Advise women to attend for post-natal OGTT 6 weeks post-partum and to follow up this result with their General Practitioner
- See Intrapartum and Postnatal Flowchart (Appendix 7)

FOR BABY:

- Please refer to Maternity and Newborn - Recognition and Management of Infants at Risk for Hypoglycaemia HNELHD GandP 20_05

IMPLEMENTATION, MONITORING AND AUDIT

1. Notification to LHD Midwifery managers, educators, medical officers of the guideline release.
2. In-service sessions for maternity & medical staff about the guideline & its use in the clinical areas across HNELHD, including use of the new Pregnancy Insulin-Infusion Protocol.
3. Notification of Clerical Staff regarding need to change over ward stationary to reflect new Pregnancy Insulin Infusion Protocol.
4. Notification of Endocrinology medical staff of the release of the guideline & adherence to the guideline.

CONSULTATION WITH KEY STAKEHOLDERS (2017 and 2022)

- Dr Henry Murray (WHAM Coordinator)
- Dr Andrew Woods (Clinical Lead l WHAM Maternity Stream Leader HNELHD)
- Dr Ailsa Foster (Director of Obstetrics, JHH)
- Dr Shamasunder Acharya (Director of Diabetes, JHH)
- Dr Judy Luu (Clinical Lead, HNELHD Diabetes Stream)
- Dr Felicity Park (Director, MFMU JHH)
- Dr Katie Wynne (Endocrinologist, JHH)
- Dr Eswari Vilayur (Nephrologist, JHH)
- Dr Chris Rowe (Endocrinologist, JHH)
- Dr Nigel Roberts (Obstetrician, Manning)
- Dr Tom Walker (Anaesthetics, JHH)
- Jacqueline Allabyrne (CMC High Risk Pregnancies, JHH)
- Alison Gebuehr (Diabetes Educator)
- Sarah Whyte (CMC, Northern HNELHD Maternity Services)
- Tammy Burns (NUM, Operating Theatres, JHH)
- Terence Knight (NUM Operating Theatres JHH)
- Susan Johnson (NUM, Intervention Suite JHH)
- Dr John Bailey (Obstetrician, JHH)
- Managers & Obstetricians at Tamworth, Manning, Maitland & Armidale Hospitals

APPENDICES

1. Cloud Based Storage and Accessing of Data Terms and Permission of Use
2. Pre-existing Diabetes: Standard Pathway for Antenatal Care
3. Gestational Diabetes: Standard Pathway for Antenatal Care
4. Flowchart for Inpatient Management of Unstable Diabetes Mellitus in Pregnancy
5. Pregnancy Intravenous Insulin-Glucose Infusion Form [HNEMR268]
6. Glycaemic Management following antenatal betamethasone
7. Intrapartum and Postnatal Flowchart for all diabetes in pregnancy
8. Clinical Audit

REFERENCES

ADIPS Consensus Guidelines for the Testing and Diagnosis of Gestational Diabetes Mellitus in Australia. 2013

Diabetes in pregnancy: management from pre-conception to the postnatal period. NICE guidelines [NG3] February 2015 (updated Dec 2020)

JHH_BH_0019: Maternity: Management of Antenatal Unstable Diabetes and Diabetes in Labour, Birth and Immediate Postnatal Period : 2013

Women and Newborn Health Service King Edward Memorial Hospital. Diabetic Ketoacidosis (DKA) Management Clinical Guideline May 2021 V2

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Useful Links

HNE Community Health Pathways Gestational Diabetes

NDSS 'Pregnancy and type 1 diabetes' and 'Pregnancy and type 2 diabetes' (via Pregnancyanddiabetes.com.au.

Booklets available in ANC for women with Type 1 or Type 2 diabetes who are planning a pregnancy

Pre-existing diabetes & pregnancy planning – Diabetes Australia

Related Documents

- NSW Health PD2013_043 Medication Handling in NSW Public Health Facilities
- NSW Health Policy Directive PD2017_032 Clinical Procedure Safety
- NSW Health. Consent to Medical and Healthcare Treatment Manual (2020)

- NSW Health Policy Directive PD2017_013 Infection Prevention and Control Policy
- NSW Health Policy Directive PD2011_015 Care Coordination: Planning from Admission to Transfer of Care in NSW Public Hospitals
- NSW Health Policy PD2021_023 Pressure Injuries: Prediction, Prevention and Management
- NSW Health Policy Directive PD2019_020 Clinical Handover
- HNELHD CG 21_09 Maternity - Prevention of Venous Thromboembolism (VTE) in Pregnancy and the Puerperium
- https://intranet.hne.health.nsw.gov.au/__data/assets/pdf_file/0014/344210/HNELHD_CP_21_05_Blood_Glucose_Ketone_Monitoring_with_Optium_H_Device.pdf
- http://intranet.hne.health.nsw.gov.au/__data/assets/pdf_file/0008/339056/HNELHD_CG_21_04_Maternity_-_Obesity_Management_in_Pregnancy,_Labour,_Birth_and_Postnatal_Care.pdf
- HNELHD_CG 19_25 Management of Hypoglycaemia

https://intranet.hne.health.nsw.gov.au/__data/assets/pdf_file/0007/368782/HNELHD_CG_22_16_Maternity_-_Antenatal_Corticosteriods.pdf

FEEDBACK

Any feedback on this document should be sent to the Contact Officer listed on the front page.

Appendix 1: Cloud Based Storage and Accessing of Glucose Data [HNE500120]

HUNTER NEW ENGLAND LOCAL HEALTH DISTRICT

Facility: _____

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. ____/____/____	M.O.
ADDRESS	
LOCATION / WARD	
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE	

HNEMR334

HNE500120

BINDING MARGIN – DO NOT WRITE

CLOUD BASED STORAGE AND ACCESSING OF GLUCOSE DATA TERMS AND PERMISSION OF USE

Hunter New England Local Health Service has identified that the manufacturer of my glucose meter/glucose monitoring system/insulin pump offers a service that allows me to upload data from my home glucose monitor and/or insulin pump to an online server ('Service').

In accepting the Terms and Conditions required by the Service provider, I understand that:

- The server(s) is hosted by the manufacturer of my glucose meter/insulin pump and may involve the data being stored on servers overseas.
- The companies offering these services all have published privacy policies and that it is my responsibility to have read, understood and accept the terms of these policies if agreed.
- The service is being offered for data storage. I acknowledge that HNELHD clinicians have the ability to access my glucose readings and other data uploaded from my monitor/pump, this information will only be routinely reviewed immediately prior to, or at the time of, a face to face or telehealth clinical review with myself, or after I have contacted a Hunter New England Health clinician requesting review of my uploaded information.
- Outside the processes for review outlined above, there is no additional monitoring of my data. This means that abnormal and possibly significant blood results will not be identified in real time. HNELHD and any of its officers or employees take no responsibility for reviewing or responding to data contained in the service, at times other than at face-to-face or telehealth appointments.
- The data storage service is offered "as is" and HNELHD will use the data available to inform clinical decision making.
- I am able to revoke permission for others to access my data at any time. I also understand that access to my data will be revoked automatically upon HNELHD receiving written notice that I have ceased using HNELHD as a healthcare provider.

I accept that:

- In no event shall HNELHD, nor any of its officers, agents or employees be liable to me for:
  - anything arising out of or in any way connected with my use of the Service;
  - health advice given on the basis of incorrect data contained in the Service;
  - any injury and/or damages sustained from using the medical equipment used to collect the glucose data
- HNELHD is not responsible for any technical problems related to the collection, storage of or access to my blood glucose data.
- These terms constitute the entire agreement between HNELHD and me in relation to HNELHD's use of the data from the server.

I give my permission to:

- HNELHD staff and officers accessing data held by the Service for the purpose of my clinical care. This will involve me giving explicit consent for access to this information and enabling the access, usually in the form of an email.
- My data being used by HNELHD clinicians for quality improvement and health research purposes, providing that I cannot be identified. ☐ Yes ☐ No

Patient Name _____

Signed _____ Date ____/____/____

Witness Name _____ Designation: _____

Signed _____ Date ____/____/____

290420

CLOUD BASED STORAGE AND ACCESSING OF GLUCOSE DATA TERMS AND PERMISSION OF USE

Authority

Page 1 of 1

Appendix 2: Pre-existing Diabetes or Diabetes Diagnosed Prior to 20 weeks Gestation: Standard Pathway for Antenatal Care

Gestation	Type of Visit To be Determined By Each Site (Individualised Depending On Woman's Needs)
First Appointment; 5–14 weeks **Booking In Visit Completed as per Facility processes**	Midwife arrange: • Dating scan, • First Trimester Risk Screening including bloods 11-13+6 wks • Antenatal bloods, HbA1c, B12 • TSH (if Type 1 Diabetes, BMI > 40) • Urinary Albumin: Creatinine ratio • Offer Fluvax (in season) • Obstetrician Visit / GP obstetrician • VTE Assessment in Pregnancy • Smoking Assessment • Endocrinology Team review within 2 weeks including diabetic educator and dietician Discuss care of diabetes per Guideline.
14 -16 weeks **Completion of Booking in Information & Referrals as per Each Facility's Processes**	Document in considerations (e-maternity) diabetes type Book scans for 20, 24, 28, 32,36 weeks with MFMU at JHH or with high risk outreach clinic Urinalysis + urine ACR and weight Obstetrician visit/ GP obstetrician Endocrinology review Organise Ophthalmology review Referral to Get Healthy In Pregnancy (via e-maternity) QR code for Covid-19 Vaccination
16 weeks (JHH Telehealth) Regional Sites	Endocrinology review *** Every visit - review BGL's & U/A at face to face visits. (refer to targets and advice)** F2F – high risk outreach clinic
18 weeks (JHH Face to Face) Regional Facilities	Maternity/Endocrine review F2F or telehealth with maternity care provider If not already given Offer Fluvax (in season)

20 weeks	
(JHH Telehealth)	Maternity / Endocrine visit
Regional Facilities	F2F or telehealth with maternity care provider or high-risk outreach clinic Morphology scan review or ensure scan is scheduled Review Bloods; HbA1c
22 weeks	
(JHH Face to Face)	Endocrinology/Maternity review
Regional Facilities	F2F or telehealth with maternity care provider Review morphology if not already attended. Ensure next growth scan is scheduled Ophthalmology review Renal, thyroid & B12 bloods Pertussis may be offered after 20 wks Breastfeeding Part A
24 weeks	Maternity/Endocrine or high-risk outreach clinic
JHH Face to Face	Review growth scan. A tertiary-level cardiac assessment (JHH MFM or outreach clinics) for women with HbA1c ≥ 7.5% 1st/2nd trimester or suboptimal views at morphology Ensure next growth scan is scheduled Offer fluvax &/or pertussis vaccination if not already attended Breastfeeding Part B Form for - HbA1c (negative blood group – BGA, FBC, Iron Studies, VDRL for 28 wks)
26 weeks	
(JHH Telehealth)	Maternity/Endocrinology review
Regional Facilities	F2F or telehealth with maternity care provider
28 weeks	Maternity/Endocrine or high-risk outreach clinic
(All Facilities Face to Face)	(Negative blood group anti-D) / Offer to weigh, Offer fluvax &/or pertussis vaccination if not already attended Review HbA1C, BGA, FBC, Iron studies, VDRL results Review maternity care plan +/- any growth scans Ensure next growth scan scheduled Brochures for SBB on side sleeping & fetal movements for appropriate women.

30 weeks	
(JHH Telehealth) Regional Sites	Maternity/Endocrine visit F2F or telehealth with maternity care provider Review any growth scans attended ensure next scan is scheduled
32 weeks	
(All Facilities - Face to Face)	Maternity/Endocrinology visit or high-risk outreach clinic Review growth scan and ensure next growth scan scheduled Ophthalmology review Bloods: Renal, Hb, blood group antibodies, HbA1c Review blood results and treat as indicated Discuss preparation for labour and birth, breastfeeding or safe infant formula if artificially feeding QR code for virtual tour for babies likely to require admission to SCN/NICU (JHH) (Other facilities- ?? Review maternity care plan and plan birth (book C/S) Give woman RFA to complete for booked C/S (intrapartum and post-partum management plan documented)
34 weeks	
(JHH Telehealth) Regional Sites F2F or telehealth with maternity care provider	Maternity/Endocrine visit & review Midwife visit / Referral to lactation consultant if available due to increased risk of mastitis postnatally Review any bloods or other pathology (Negative blood group anti-D) Confirm booking of IOL or C/S as per facility Antenatal expressing video If not already given QR code for virtual tour for babies likely to require admission to NICU/SCN tour (JHH) Check eMaternity is up to date
36 weeks	
Face to Face)	Maternity/Endocrine visit or high-risk outreach clinic Consult with Obstetrician – finalise birth plan & book IOL (if not already attended) Complete C/S paperwork as indicated

	GBS brochure swab attended OK given for antenatal expressing from 36 weeks Give expressing equipment/education unless contraindicated. Offer to weigh Dietitian (where available) to review if planning to breastfeed
37 weeks (Face to Face)	Maternity visit GBS result /education regarding result Endocrinology team (intrapartum and post-partum treatment plan reviewed & documented) Offer vaginal assessment 1 week prior to IOL/Document Bishop Score / Book any cervical ripening required and admission
38 weeks (Face to Face)	(If still pregnant) Maternity/Endocrinology (if required) visit Offer vaginal assessment 1 week prior to IOL/Document Bishop Score / Book any cervical ripening required and admission Ensure postnatal appointment made (6–12 wk) with GP & endocrinologist

Appendix 3: Gestational Diabetes Diagnosed > 20 weeks: Standard Pathway for Antenatal Care

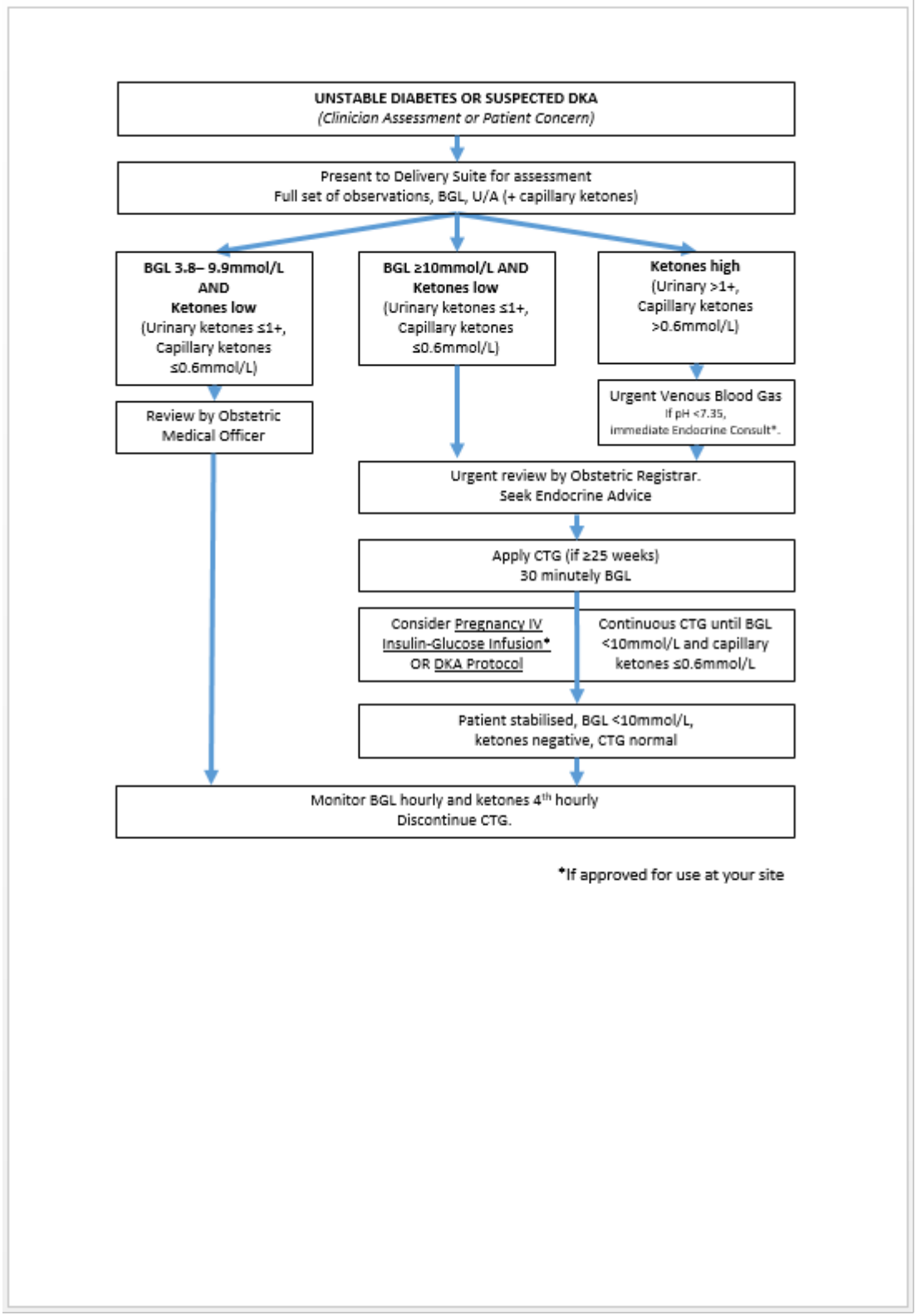
Stage	Provider	Type of Visit To be Determined By Each Site (Individualised Depending On Woman's Needs)
At referral (any gestation)	Diabetes Educator and Dietitian Group Session (at JHH: group Session every Tuesday and Thursday booked through ANC) Education session as per other facilities arrangements	Introduction to Diabetes in Pregnancy Clinic (DIP) team/Contact numbers Education on self-management and dietary requirements Given information package, including postnatal OGTT request form
1 week following group session (any gestation)	(JHH) Diabetes in Pregnancy (DIPC) Clinic or with GP / obstetrician as per facility Team should include Diabetes Educator, Dietitian, Obstetrician and Midwife IF/WHEN COMMENCING INSULIN MUST SEE DIABETIC EDUCATOR FOR EDUCATION ON INSULIN ADMINISTRATION	Diabetes summary, problem list and management plan Review BGL monitoring and decide if treatment required Bloods (if not done recently) – TSH If commencing insulin the woman will be dispensed an insulin pen and receive education on administration and adjustment doses of insulin doses
22 weeks (JHH Face to Face) (GP in GNS) (Regional Sites)	Maternity Visit F2F or telehealth with maternity care provider or high-risk outreach clinic IF/WHEN COMMENCING INSULIN MUST SEE DIABETIC EDUCATOR FOR EDUCATION ON INSULIN ADMINISTRATION	***Every visit - Review BGLs & U/A. (Refer to targets, advice and pathways regarding when to commence /adjust insulin. Advise on insulin increases as per Obstetrician's orders** Review morphology or ensure scan is scheduled. If not already attended offer Fluvax (in season)/Pertussis vaccination Review blood tests (if any) Ensure woman has enough test strips and is using her machine correctly QR code for Covid -19 Vaccination information (if not vaccinated)
24 weeks (JHH Telehealth)	Maternity Visit (JHH)	Review BGL monitoring

(GP in GNS) **<u>At any time in pregnancy</u>** Regional Sites **At any time in pregnancy**	F2F or telehealth with maternity care provider or high-risk outreach clinic <u>(JHH)</u> bring back to Dip C (Maternity) with pathway for monitoring BGLs. R**efer to endocrinology if BGL's consistently outside targets despite medication & corrections in consultation with the obstetric consultant at any time in pregnancy** **Refer to high risk outreach clinics for review with an ongoing plan at any time in pregnancy**	Review blood tests (if any) when to commence /adjust insulin. Advise on insulin increases as per Obstetrician's orders
26 weeks (JHH F2F) (GP in GNS) Regional Sites	Maternity Visit F2F or telehealth with maternity care provider or high risk outreach clinic	If not already attended offer Fluvax (in season) / Pertussis vaccination Review BGL monitoring (refer to targets and advice regarding when to commence /adjust insulin. Advise on insulin increases as per Obstetrician's orders) Review blood tests (if any) and any growth scans as per indications Ensure woman has enough test strips and is using her machine correctly
28 weeks (JHH F2F) (GP in GNS) Regional Sites	Maternity Visit F2F or telehealth with maternity care provider or high risk outreach clinic <u>Women GDM commenced on insulin</u> <u>Women with GDM diet</u>	Review BGL monitoring (refer to targets and advice regarding when to refer back to DIP team) Review blood tests (if any) Organise FBC and BGA (if neg blood group) Give anti-D (if neg blood group) Offer pertussis &/or fluvax vaccination Review growth scan and arrange for 32 week scan Arrange for 30/40 growth, liquor & Doppler scan
30 weeks (JHH Telehealth)	Maternity Visit	

(GP in GNS) Regional Sites	F2F or telehealth with maternity care provider or high risk outreach clinic	Review BGL monitoring (refer to targets and advice regarding when to refer back to DIP team) Review blood tests (if any) Review any scans performed
32 weeks (JHH F2F) (GP in GNS) Regional Sites	Maternity Visit F2F or telehealth with maternity care provider or high risk outreach clinic	Review BGL monitoring (refer to targets and advice regarding when to refer back to DIP team) Review 30 or 32 week growth scan Arrange for growth, liquor & Doppler scan at 36 weeks Review blood tests (if any) Referral to lactation consultant if available due to increased risk of mastitis postnatally Discussion regarding mode of birth planning. Book planned Elective CS. Give RFA for woman to complete & bring next visit
34 weeks (JHH Telehealth) GP in GNS) Regional Sites	Maternity Visit F2F or telehealth with maternity care provider or high risk outreach clinic May be referred back to usual care with pathway for monitoring BGL & referral back to higher level care if outside targets at any time in pregnancy	Review BGL monitoring (refer to targets and advice regarding when to refer back to DIP team) If not already attended review 32 week growth scan Review blood tests (if any) If F2F - Arrange for bloods, FBC (anti-D if neg) Complete indicated Elect C/S consent & paperwork Discussion of Vit K & Hep B vaccination for baby Further discussion regarding mode of birth Discuss antenatal expressing Ensure patient has growth scan scheduled for 36 weeks
36 weeks to birth (JHH Telehealth) Regional Sites	DIP team Maternity Visit F2F or telehealth with maternity care provider or high risk outreach clinic	Review: • BGL monitoring • Blood tests • Growth scan & review • GBS swab collect/review If not already attended - arrange for bloods, FBC and (anti-D if neg)

	Obstetrician / GP obstetrician to discuss birthing plan and book IOL or ELSCS & complete appropriate consent. Regional sites to confirm birth facility depending on resources available for insulin/dextrose infusions and monitoring neonatal resources Approve antenatal expressing Midwife, discuss feeding, antenatal expressing, and monitoring of baby's BGL's postnatally Midwife, 1 week prior to IOL, VE to attend Bishop Score for potential cervical ripening

Appendix 4: Flowchart for Inpatient Management of Unstable Diabetes Mellitus in Pregnancy



Appendix 5: Pregnancy Intravenous-Glucose Infusion Form [HNEMR268]

HUNTER NEW ENGLAND LOCAL HEALTH DISTRICT

Facility: _____

HNE025905

PREGNANCY INTRAVENOUS INSULIN – GLUCOSE INFUSION FORM

Attach ADR Sticker

ALLERGIES & ADVERSE REACTIONS (ADR) ☐ Nil known ☐ Unknown (tick appropriate box or complete details below)		
Drug (or other)	Reaction/Type/Date	Initials

Sign: ..... Print: ..... Date: .....

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. ____/____/____	M.O.
ADDRESS	
LOCATION / WARD	

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

HNEMR268

HOSPITAL/ WARD: _____

1ST PRESCRIBER TO PRINT PATIENT

NAME & CHECK LABEL CORRECT: _____

See Medication Chart for details

IV INSULIN PROTOCOLS (Do **NOT** circle – prescribe changes in Section 2)

Note each *PROTOCOL* has a variable *RATE* of infusion adjusted based on capillary BGL measurements every 30-60 minutes

*PROTOCOL to be adjusted if BGL readings remain outside target range despite changes in RATE (based on monitoring overleaf *)*

Blood Glucose (BGL, mmol/L)	PROTOCOL A	PROTOCOL B	PROTOCOL C	PROTOCOL D	PROTOCOL E
	All intravenous insulin infusion rates in mL/hour (= units/hour)				INFUSION RATE
<3.8	Pause IV insulin. Give 15 g glucose. Repeat BGL 15 mins. Call Medical Officer for advice.				
3.8 – 4.9	0.2	0.5	0.8	1	____
5.0 – 5.9	0.3	0.7	1	1.5	____
6.0 – 6.9	0.5	1	2	3	____
7.0 – 7.9	1	1.5	3	4	____
8.0 – 8.9	1.5	2	4	6	____
9.0 – 9.9	2	3	5	8	____
≥ 10	3	4	6	10	____
	Apply CTG ≥ 25 wk. Check IV Infusion Line. Check capillary ketones <0.6mol/l. Call Medical Officer for advice.				

1. INSULIN INFUSION STARTING PRESCRIPTION - MEDICAL OFFICER TO COMPLETE

Date	Time	Insulin Type	Route	Starting Protocol*	MO Sign/Print
			IV		

☐ Commence automatically with BGL > 6.7 mmol/L. OR ☐ Midwife to contact MO before commencement

☐ Midwife to vary Protocol (A-E) as per monitoring*. OR ☐ Midwife to contact MO to adjust Protocol

* Suggested Starting Protocol: Most women should commence Protocol B. Women with high insulin requirements (> 100 units/day) may commence Protocol C. Insulin sensitive women may require Protocol A

* Suggested IV Fluids: Glucose 4% + sodium chloride 0.18% + 30 mmol/L potassium chloride. Antenatal: 80 mL/hr. Labour/NBM: 125 mL/hr

* Concurrent subcutaneous insulin: Continue subcut basal insulin in all women. Withhold subcut bolus insulin with meals if fasting

2. INSULIN INFUSION PROTOCOL ADJUSTMENT - DOCUMENT ALL CHANGES TO PROTOCOL (A–E)

Date	Time	New Protocol	MO Sign/Print (if contacted)	Midwife/RN 1 Sign/Print	Midwife/RN 2 Sign/Print

3. IV FLUID PRESCRIPTION - MEDICAL OFFICER AND MIDWIFE TO COMPLETE

Date	Fluid	Route	Rate (mL/hr)	MO Sign/Print	Midwife/ RN 1 Sign	Midwife/ RN 2 Sign	Time Commenced
		IV					
		IV					
		IV					

4. RECORD OF SYRINGE PREPARATION – MIDWIFE TO COMPLETE

Syringe No.	Date	Time	Insulin Concentration ALL PROTOCOLS: 50 units short acting insulin made up to 50 mL total volume with sodium chloride 0.9% (final concentration is 1unit in 1mL)	Midwife/ RN 1 Sign	Midwife/ RN 2 Sign
			50 units of _____ insulin in 50 mL sodium chloride 0.9% for injection		
			50 units of _____ insulin in 50 mL sodium chloride 0.9% for injection		
			50 units of _____ insulin in 50 mL sodium chloride 0.9% for injection		

300817

BINDING MARGIN – DO NOT WRITE

PREGNANCY INTRAVENOUS INSULIN – GLUCOSE INFUSION FORM

Medication

Page 1 of 2

HUNTER NEW ENGLAND LOCAL HEALTH DISTRICT

Facility: ____________________________

HNE025905

PREGNANCY INTRAVENOUS INSULIN – GLUCOSE INFUSION FORM

FAMILY NAME		MRN	
GIVEN NAME		☐ MALE	☐ FEMALE
D.O.B. ____ / ____ / ____	M.O.		
ADDRESS			
LOCATION / WARD			
COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE			

HOSPITAL/ WARD: ______________________________

1ST PRESCRIBER TO PRINT PATIENT NAME & CHECK LABEL CORRECT: ______________________________

See Medication Chart for Details

Date	Time	Protocol (A–E)	BGL (mmol/L)	Rate (mL/hr)	mL remaining in syringe	Midwife/RN Initial	Comment

Obtain new recording sheet and prescription every 24 hours

BINDING MARGIN – DO NOT WRITE

MONITORING AND ADJUSTMENT[8].

While on infusion BGL is monitored every 30 minutes in labour or when outside target, or hourly otherwise.

BGL	Action
Less than 3.8 mmol/L	1. Pause IV insulin. Give 150 mL Lucozade (or 150 mL glucose 10% if NBM). 2. Inform Medical Officer. 3. Repeat BGL in 15 minutes. Repeat Step 1 if BGL remains less than 3.8mmol/L. 4. When BGL above 3.8 mmol/L for 2 readings 15 minutes apart, restart IV insulin at REDUCED Protocol (e.g. C → B)
3.8–7 mmol/L	At target. No change to Protocol. Adjust infusion rate based on 30-60 minutely BGLs.
Above 7 mmol/L	Above target. Adjust rate. Repeat BGL in 30 minutes.
Above 7 mmol/L for 3 consecutive readings	Above target. 1. Check infusion line. 2. Increase **Protocol** (e.g. B → C or C → D). 3. Repeat 30 minutely checking and adjust **rate** as required
Any reading 10mmol/L or higher	1. Repeat immediately to confirm. 2. Check infusion line. 3. Consider increasing Protocol (e.g.. B → C) 4. Apply CTG. 5. Check capillary ketones <0.6mmol/L. 6. Call Medical Officer for advice.

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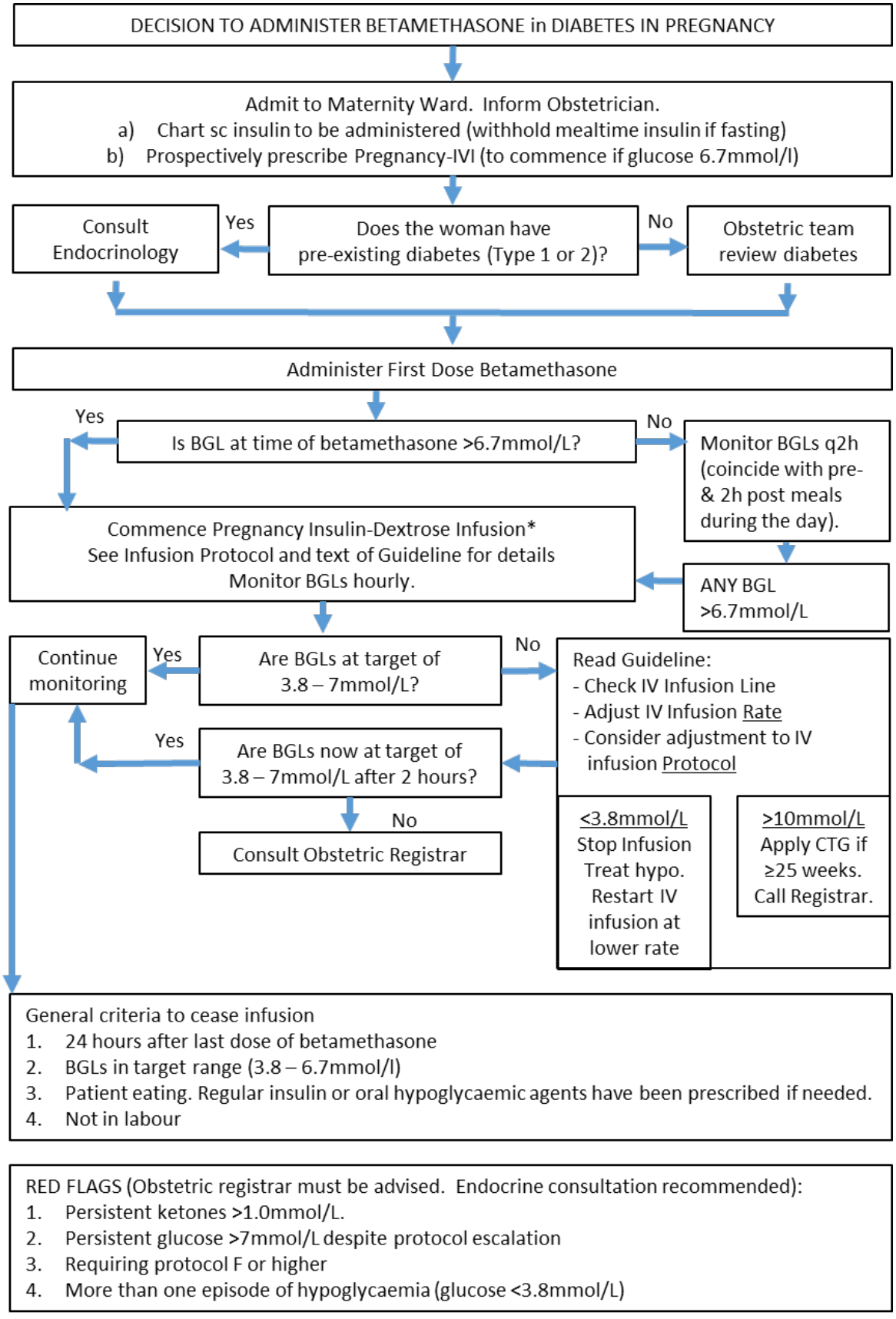
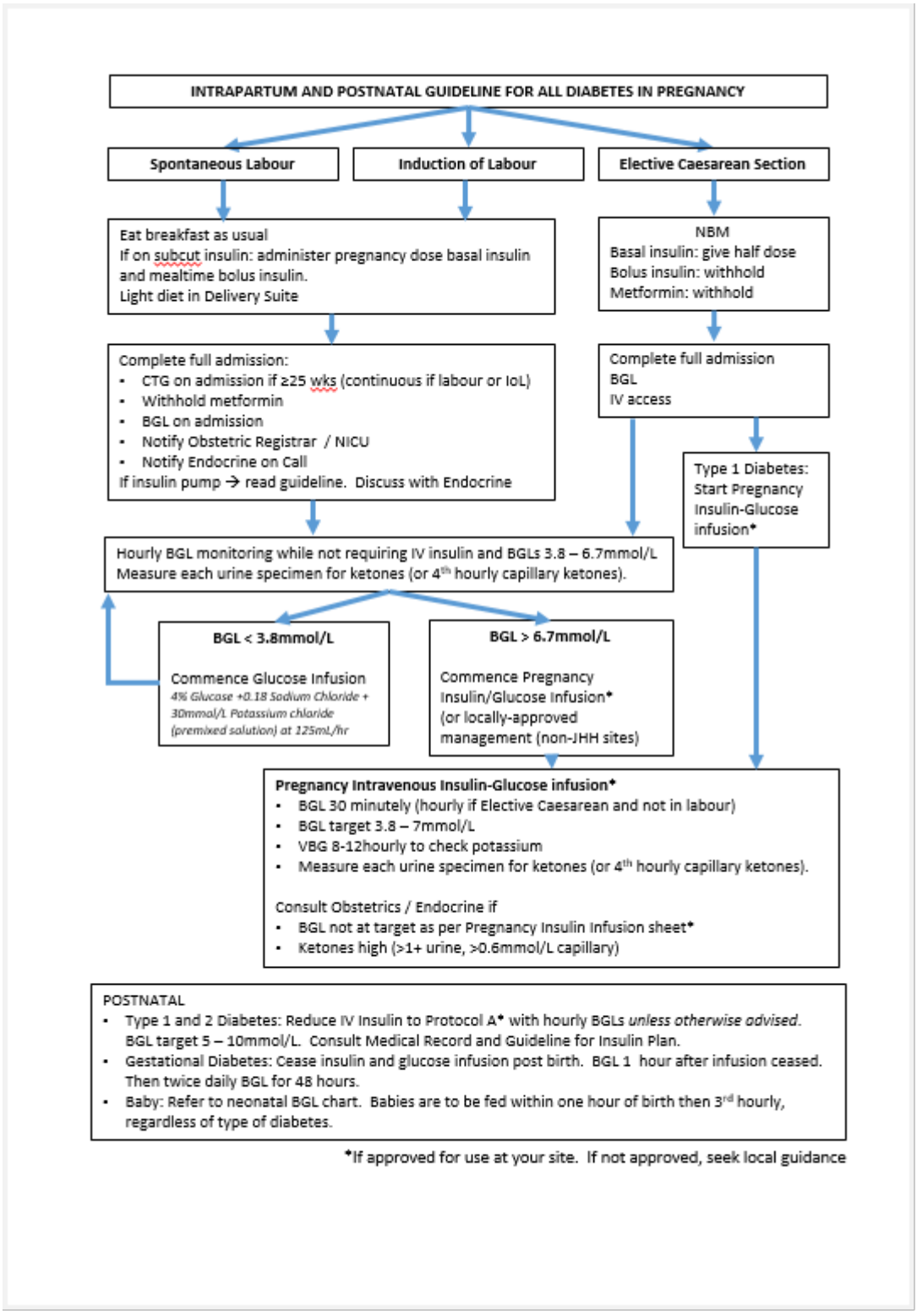
Appendix 6: Glycaemic Management Following Antenatal Betamethasone



Appendix 7: Intrapartum and Postnatal Flowchart for All types of Diabetes in Pregnancy



Appendix 8: Clinical Audit

(NSQHS Action 1.27 Evidence – based care)

Criterion no.	Criterion	Exceptions	Definition of terms and/or general guidance	Data source	Frequency	Position Responsible
1	*Recorded IIMS relating to women with diabetes in pregnancy*	*None.*	*Recording of incidents reported through the IIMS system relating to care of the woman with diabetes in pregnancy & the care provided in relation to diabetes & the guideline developed as required by the woman*	*Reported IIMS incidents*	*12 monthly*	*Birthing Unit Facility Manager*
2						
3						
4						
5						

Reference: *Electronic audit tool - National Institute for* Health *and Clinical Excellence (NICE)*