



CLINICAL PRACTICE GUIDELINE

Diabetes in Pregnancy

This document should be read in conjunction with the [Disclaimer](#)

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Diabetes in pregnancy: Screening

Screening Process

The diagnosis of diabetes in pregnancy will include those women with previously undiagnosed abnormalities of glucose tolerance, as well as women with glucose abnormalities related to the pregnancy alone.

Likely Overt Diabetes

Women with markedly elevated glucose levels during pregnancy (fasting ≥ 7.0 mmol/L or a random of > 11.1 mmol/L (WHO guidelines) or an HbA1c $\geq 6.5\%$) can be classified as having 'likely overt diabetes'. These women may have pre-existing diabetes mellitus (DM) and should be screened for diabetes complications.

A definitive diagnosis of non-gestational diabetes cannot be made until the post-partum period.

Risk Factors

High risk factors for GDM

- Previous GDM
- Ethnicity: Asian (including Indian), Aboriginal, Pacific Islander, Maori, Middle Eastern, non-white African
- Maternal age ≥ 40 yrs
- Family history of DM (1st degree relative with DM including a sister with GDM)
- Obesity, especially if BMI > 35 kg/m²
- Hypertension prior to 20 weeks
- Previous macrosomia (baby with birth weight more than 4000g)
- History of unexplained stillbirth
- Previous baby with congenital abnormalities
- Polycystic ovarian syndrome
- Medications: corticosteroids, antipsychotics

Any woman may be tested for diabetes at any time in pregnancy if there is clinical suspicion based on symptoms or other factors such as heavy glycosuria, fetal macrosomia or polyhydramnios.

High Risk of GDM: Early Screening

- A standard 75g oral glucose tolerance test (OGTT) either before, or at the first opportunity after, conception.
- If this is not feasible, fasting or non-fasting venous plasma glucose (PG) should be performed

Low risk for GDM: Early screening if:

- Fasting plasma glucose: GDM diagnosed if ≥ 5.1 mmol/L
- Non-fasting random plasma glucose. Proceed to a OGTT if ≥ 7.8 mmol/L but <11.1 (diagnostic of gestational diabetes)

Repeat Screening for GDM

If initial (early) screening is negative, then women at high risk of GDM should continue to be monitored closely and undergo a repeat OGTT (see recommendations for routine testing)

Routine testing for GDM

- All women not previously diagnosed with diabetes should have a standard 75g OGTT at 24 – 28 weeks gestation. Women should be directed to read the GDM information in the Pregnancy, Birth and Beyond book.

Screening for GDM following Bariatric Surgery

Dumping syndrome can occur after ingestion of refined sugars and high-glycemic carbohydrates in patients who have had previous bariatric surgery. Symptoms include abdominal cramping, bloating, nausea, vomiting, and diarrhea.

Hyperinsulinemia and hypo-glycemia can occur later, resulting in tachycardia, palpitations, anxiety, and diaphoresis. Women with dumping syndrome may not tolerate the 75-g glucose solution typically administered to screen for gestational diabetes. Alternative screening methods, such as

Fasting Plasma Glucose HbA1c or home glucose monitoring, should be considered in patients who have undergone restrictive/malabsorptive surgery.

When treating a pregnant patient who has undergone bariatric surgery, the clinician should conduct screening for diabetes during the first or early second trimester and again in the third trimester when HPL levels can influence glucose metabolism.

If it is confirmed that a patient has gestational diabetes, the patient or clinician should be referred to Diabetes Services where she will receive diabetes education and see a dietitian who is familiar with bariatric surgery.

Key Points for Doctors and Midwives

- Ability to tolerate OGTT depends on surgery type and timing (see below)
- Early fasting plasma BGLs can help diagnose GDM early
- Additional growth scans should be requested if the fetus shows signs of being large for gestational age (LGA)

Can women have an OGTT after Bariatric Surgery?

Patients' ability to tolerate the test will depend on the type and timing of their bariatric surgery.

Type of Bariatric Surgery	Tolerance of the OGTT	
Lap Band	Most women tolerate the OGTT well	
Gastric Sleeve	Less than 12-18 months since surgery	OGTT may be poorly tolerated
	More than 12-18 months since surgery	OGTT normally well tolerated
Roux-en-Y Bypass	Most women can NOT tolerate the OGTT	

Doctors at KEMH recommend the following for women with Bariatric Surgery who are unable to tolerate the OGTT:

Gestation	Test	Diagnosis
Booking visit (all women)	Fasting Plasma BGL	≥ 5.1 – Diagnostic of GDM
24-28/40 if previous FBGL was normal	Repeat Fasting Plasma BGL	≥ 5.1 – Diagnostic of GDM
At 28/40 if previous FBGL was normal	Loan a meter from Diabetes Service and monitor post-prandial BGLs for ~1 week	Diabetes Educator Midwives will review and diagnose GDM if indicated
If at any gestation after 28/40 baby is showing signs of being LGA, women will need an extra growth scan.	Random finger prick BGLs at clinics. PAGE Dietitian or DEMW if RBGLs are >6.7 .	

For more information or advice, contact Diabetes Service on 6458 2163.

Diagnostic criteria for GDM from 75g OGTT (KEMH recommendation)

The current ADIPS (Australasian Diabetes in Pregnancy Society) guidelines for the diagnosis of Gestational Diabetes Mellitus (GDM) on OGTT are a venous plasma glucose level of:

Fasting venous PG	≥ 5.1 mmol/L
1 hour venous PG	≥ 10.0 mmol/L
2 hour venous PG	≥ 8.5 mmol/L

The diagnosis of GDM is made if one or more of the above values are abnormal.

Pre-screening discussion / education

Procedure	Additional information
<ol style="list-style-type: none"> 1. Explain to the women that the OGTT is a diagnostic test for GDM and the reasons for seeking GDM. 2. Obtain verbal consent for the test after giving the woman the following information. 3. Inform the woman: <ul style="list-style-type: none"> • She should eat normal CHO amounts for the 2 days prior to the test (not restrict CHO) • She should fast from midnight the night prior to the test (water is allowed). • The test involves three venepunctures and takes two hours to complete. • A fasting venous blood glucose sample will be obtained and the result checked before proceeding. • She will be asked to consume a 75g glucose drink within 5 minutes – this may result in some nausea. • One hour and two hours after the 75g load, a venous blood sample is taken. • If the test is positive she will be referred to the diabetes educators/ dietitian for an education session and will learn to monitor her BGL's at home. 	<p>The end points differ from those in the non-pregnant range.</p> <p>If the fasting result is ≥ 5.1mmol/L, the procedure is complete. No glucose load or further blood tests are required.</p> <p>This is the recommended glucose load used in pregnancy to diagnose gestational diabetes</p> <p>This test indicates the speed of the body's response to ingested glucose.</p>
<ol style="list-style-type: none"> 4. A laboratory request form signed by medical staff / nurse practitioner – diabetes is required. 	<p>Women may attend any laboratory for the test.</p>
<ol style="list-style-type: none"> 5. Women make their own appointment at the laboratory. 	<p>The laboratory staff will then give instructions concerning arrival time. Refer to patient instruction sheet from the KEMH laboratory.</p>

Referral to Diabetes Service

Referrals to the diabetes in pregnancy service are made via diabetes educator (08) 6458 2163 or fax on 6458 2164.

A Medical Practitioner's referral is required for medical services.

Note: The referral should include results of all recent diabetes related tests if type 1 or type 2, and all antenatal blood tests and ultrasounds if currently pregnant.

Diabetes & Pregnancy Service provides:

All diabetes and pregnancy clinics involve a full multidisciplinary team approach to care

- Pre pregnancy counselling for women with Type 1 or Type 2 diabetes.
- Pregnancy care for women with Type 1, Type 2 or Gestational diabetes (GDM).
 - 2 x Diabetes antenatal clinics each week
 - 1 x Specialised gestational diabetes clinic each week
- Shared antenatal care is available to women on consultation with the Diabetes Service and their GP.
- Advice to health professionals regarding diabetes and pregnancy.
- Education:
 - Diabetes (Type 1, Type 2 or GDM) & Pregnancy
 - Pre conception care
 - Blood glucose meters
 - Insulin – ambulatory stabilisation
 - Continuous glucose monitoring
 - Insulin pumps
 - NDSS(National Diabetes Services Scheme) registration to obtain consumables

Education

Key Points

1. All women with Gestational Diabetes who are referred to the Diabetes Service are offered a gestational diabetes education class as soon as possible after diagnosis.
2. All women with pre-existing diabetes are offered a pregnancy and diabetes education class.
3. Diabetes education classes are culturally appropriate and adapted to meet individual needs. Interpreter classes are available for non -English speaking women.

Education Sessions

Education sessions are facilitated by a diabetes educator/ midwife and dietician. Classes are available regularly each week. Bookings are required.

Diabetes Education

Education sessions facilitated by a diabetes midwife and dietician are conducted routinely. Extra sessions can be arranged as negotiated.

All education sessions are shared jointly by the diabetes educator and dietician:

Preconception sessions	
Type 1 / Type 2 diabetes 1 – 2 hour class depending on need	All by Appointment only
Type 1 / Type 2 diabetes in pregnancy clinics 1 – 2 hour class depending on need	

*All women are contacted and invited to attend a Diabetes & Pregnancy Class prior to attending the Pregnancy & Diabetes Clinic

GDM sessions	
GDM classes (2 hour class)	By appointment only via Diabetes Midwife on: Ph (08) 6458 2163 Fax (08) 6458 2164
GDM – Non English speaking (Interpreter) class (2 hour class)	

Gestational Diabetes

Class Content

As classes are adapted to suit individuals- the content may vary.

- What is diabetes?
- Basic physiology - the role of food and insulin.
- The effects of diabetes on pregnancy.
- The effects of pregnancy on diabetes.
- The role of healthy eating in blood glucose control.
- The role of exercise in blood glucose control.
- Breastfeeding and GDM.
- Lifestyle changes.
- Postnatal issues.
- Future risk of diabetes.
- Advice regarding planning future pregnancy and contraception.
- Managing the psychological/ psychosocial aspects of coping with diabetes.
- Providing women access to equipment and supplies to effectively manage their diabetes.
- Self-monitoring blood glucose.
- Self-insulin administration and insulin adjustment (if required).

Type 2 Diabetes

Class Content

Education includes aspects of the following as appropriate:

- What is diabetes? The types of diabetes
- Basic physiology - the role of food and insulin.
- Insulin requirements in each trimester
- The effects of diabetes on pregnancy
- The effects of pregnancy on diabetes
- The role of healthy eating in blood glucose control
- The role of exercise in blood glucose control
- Self -monitoring of blood glucose levels (BGL) / equipment check
- Review of type 2 medications in regards to suitability in pregnancy
- Insulin self -administration and insulin adjustment / equipment check
- Lifestyle changes
- Postnatal issues
- Long and short term complications of diabetes.
- Advice regarding planning future pregnancy and contraception
- Managing the psychological/ psychosocial aspects of coping with diabetes
- Providing women access to equipment and supplies to effectively manage their diabetes

Type 1 Diabetes

Class Content

Education includes aspects of the following as appropriate:

- What is diabetes? The types of diabetes
- Basic physiology - the role of food and insulin.
- Insulin requirements in each trimester
- The effects of diabetes on pregnancy
- The effects of pregnancy on diabetes
- The role of healthy eating in blood glucose control
- The role of exercise in blood glucose control
- Self- monitoring blood glucose / equipment check
- Self- insulin administration and insulin adjustment / equipment check
- Breast feeding & hypoglycaemia – insulin adjustment
- Lifestyle changes
- Postnatal issues
- Long and short term complications of diabetes.

- Advice regarding planning future pregnancy and contraception
- Managing the psychological/ psychosocial aspects of coping with diabetes
- Providing women access to equipment and supplies to effectively manage their diabetes

Nurse Practitioner / Diabetes Educator Led Gestational Diabetes Mellitus(GDM) Clinic

Aims

- To provide an alternate model of care for women with GDM.
- To provide a multidisciplinary approach to care.
- To provide continuity of antenatal care and diabetes self-management.
- To provide an educational program for midwives to optimise skills in the management of diabetes in pregnancy.
- To provide diabetes management to women with GDM according to best practice guidelines.

Referral Pathway

The policy of screening all pregnant women for GDM will continue.

Confirmation of diagnosis by : either a fasting plasma glucose of 5.1mmol/L at any gestation throughout the pregnancy or a 75g oral glucose tolerance test (fasting) with a venous plasma glucose level at 0 hours of ≥ 5.1 mmol/L, 1 hour > 10.0 mmol/L and/or at 2 hours of ≥ 8.0 mmol/L.

- Following a positive glucose tolerance test women are referred to a GDM group session with the diabetes educator and dietician.
- Education classes provide comprehensive diabetes education for women with GDM with the aim of enabling and encouraging self-management and includes
 - Understanding what diabetes is and how it can affect the fetus.
 - Enabling the woman to make lifestyle changes that are ongoing and assist in the prevention / delay of type 2 DM in the future for both herself and her family.
 - Understanding diet in relation to controlling blood glucose levels and nutritional needs for pregnancy.
 - Self-monitoring of blood glucose levels at recommended times, understanding the results and making changes to diet / lifestyle to assist keeping BG levels in the acceptable range.
 - Understanding the reasons and possible need for medications (e.g. insulin) to assist with BG control during pregnancy.

- Understanding of KEMH management policy in relation to pregnancy tests, assessments and timing of birth for women with diabetes in pregnancy.
- Actively encouraging the woman to attend for screening for DM post-partum.

Women are required to attend a GDM review class with the Diabetes Educator and Dietician 2 weeks after the initial GDM class.

Women who fit the criteria for low – medium risk are referred to the Nurse Practitioner/ Diabetes Educator led GDM Clinic for continuing management of maternity and diabetes care.

Dietician review – a dietician will be in attendance at the clinic each week to review women.

Women with GDM who have BGL's outside the recommended range are seen by the dietician and then discussed with the Nurse Practitioner or Obstetric Physician regarding the commencing medication.

Women commencing insulin are seen by the Diabetes Educator for insulin education, are enrolled into the Insulin Adjustment Program and make contract with the Diabetes Educator on at least a weekly basis.

Exclusion criteria

- Pre-existing Type 1 Diabetes Mellitus
- Pre-existing Type 2 Diabetes Mellitus
- OGTT with fasting level ≥ 7.0 mmol/L or 2hr level ≥ 11.1 mmol/L in pregnancy
- If assessing fetal position difficult due to maternal weight
- Significant obstetric complications
- Significant medical complications
- Women attending MFM clinic

Staff

- Nurse Practitioner
- 1 Diabetes Educator/ Midwife
- Medical Registrar
- RMR midwife/EWC midwife
- 1 Dietician

Obstetric Support

The Gold Obstetric Team Registrars or Diabetes Clinic Consultants are on call for the clinic.

The Nurse practitioner must discuss any patients of concern with the Diabetes clinic consultant for management plan.

In some cases the management plan will involve shared care between the NP clinic and the Diabetes Dr's clinic.

Medical Support

Medical Registrar or Obstetric Physician as per roster.

Data collection

Data collection will be via STORK and ADIPS data base interface reporting

Pregnancy care

Pregnancy care of women with GDM will follow the Diabetes Service management flow chart "Pregnancy Care for Diabetes in Pregnancy".

Antenatal consultations

Pregnancy care by Midwife

- 4 Weekly until 32 weeks
- 2 weekly until 36 weeks
- then weekly

Delivery is to be arranged at term if managed with diet alone and no other obstetric complications are evident. Women with diabetes in pregnancy on insulin will be delivered at 38 weeks gestation.

All women who have had a previous LSCS or previous difficult delivery, will have an obstetric assessment by their original obstetric team at 36 weeks for:

- overall maternal and fetal well being
- mode of delivery
- timing of delivery.

Weekly clinic review

There will be a formal weekly review of all patients attending clinic at the end of each clinic. More frequent case discussions will be held as needed.

Postpartum management

All women should be followed -up prior to discharge from hospital. If woman is discharged prior to being seen (e.g. over weekend) then follow-up via telephone.

Reinforce need for postpartum OGTT in 6 – 8 weeks through general practitioner.

Reinforce continued lifestyle changes (weight loss/maintenance, exercise, good nutrition) to assist in prevention / delay type 2 DM .

Reinforce need for continued annual screening for diabetes mellitus through general practitioner.

3 months after the expected due date, a reminder letter and GTT form will be sent to all women who have attended the clinic.

Education package

All Midwives involved in this clinic will complete an education package on the care and management of women with gestational diabetes.

Evaluation

The Nurse Practitioner/ Diabetes Educator clinic will be evaluated across several domains:

- Patient satisfaction survey
- Staff satisfaction and knowledge
- Pregnancy outcomes reviewed regularly

Reference

[Hoffman L, Nolan C, Wilson JD](#), Australasian Diabetes in Pregnancy Society(ADIPS). Med J Aus 1998; 169: 93-97.

GDM: Obstetric team clinic management

Background

The Diabetes Service at KEMH provides expert diabetes and obstetric management within a multidisciplinary team setting for women with diabetes during pregnancy and for those women with pre-existing diabetes who are planning pregnancy.

It is also important to recognise that women without a diagnosis of type1, type 2 or GDM are unable to access the National Diabetes Services Scheme (NDSS) for supplies e.g. blood glucose strips. The cost of strips outside the scheme ranges from \$40 - \$70 per pack.

Criteria for the management of women with GDM

- All women with pre-existing diabetes or diagnosed with GDM attend for diabetes education with the diabetes educator and dietitian.
- Women with an early diagnosis of GDM (<24 weeks) remain with the diabetes service as do women transferred from other hospitals who are on or commencing insulin.
- Women with GDM diagnosed after 24 weeks whether on insulin or not will remain with their own obstetric team for ongoing care.
- Women attending low risk midwifery clinics and with a 2 hour OGTT level up to 8.9mmol/L may remain within that team unless insulin is commenced in which case they will then transfer to the relevant obstetric team clinic. See 'GDM: MGP /CMP Management of' section below.
- The Diabetes Service team will continue to provide support and advice to women with GDM and also for team clinic staff when they need assistance with managing suboptimal blood glucose levels.

- The guidelines for [fetal and maternal surveillance](#), [timing and mode of delivery for women with GDM](#) are available in this document.
- Diet and exercise only
- [Insulin and oral hypoglycaemic agents](#) (OHA)

Process for the Management of GDM in Team Obstetric Clinics

- Women diagnosed with GDM are referred to the Diabetes in Pregnancy Service.
- Referrals to the diabetes service should be FAXED on 2164. All appointments **MUST** be made via the diabetes service on ext 2163.
- Women are contacted by the diabetes educator and invited to attend a 2 hour education session. Both these sessions are held with a diabetes midwife/educator and dietitian working together. Women are taught to self blood glucose monitor at home, and keep a record of their blood glucose levels and food intake.
- A sticker is placed on the MR004 advising that the woman has GDM, reminding health care professionals to review BGL's records at hospital visits and includes recommended blood glucose goals.
- **The responsibility for reviewing blood glucose levels during routine antenatal clinic visits will remain with the health professional undertaking the antenatal check.**

Self-blood glucose monitoring: Current ADIPS recommended goals:

- Fasting <5.1mmol/L
- One hour post prandial <7.4 mmol/L
- Two hours post-prandial < 6.7 mmol/L

GDM: MGP / CMP management

The following describes management specific to women receiving MGP / CMP care:

See [Appendix I](#)

26-28 weeks

- Client has OGTT (This test is definitive, no further testing will occur)
- GDM Negative – Continue with low risk midwifery care
- GDM Positive – Fax OGTT results to Diabetes Team on 9340 2164
- Diabetes team will contact client and arrange appointment for education
- Client's care to remain with MGP/CMP unless advised otherwise by Diabetes team/Doctors. For CMP clients outside of the FBC the midwife must make an appropriate referral to the obstetrician and dietician at the support hospital within one week of diagnosis and follow their documented plan of management. Women with GDM who are diet controlled may birth at home

following obstetric and paediatric review and endorsement including a plan of management for mother and baby from their supporting hospital.

31 week appointment

- Telephone dietician on 3688 to review clients blood sugars (BSL's)
- Consider taking a Random Blood Sugar (RBS)
- Book 34/40 USS for growth - USS form

34 week appointment

- Client to attend 34/40 USS, the USS dept. will plot the growth on the standard KEMH chart
- Midwife to review 34/40 USS within 72 hours and MGP/FBC to plot EFW on the customised GROW chart.
- Midwife to collect all clients results and place in clients hospital notes
-
- Place on FBC doctors shelf section "GDM for review"
- FBC doctor will review all information (client does not need to be seen in person)
- Dr will either clear client to birth in FBC or will request further USS at 37 should it be required
- If the blood sugar readings are elevated on several occasions (more than 3) or should the baby be macrosomic the client must be referred to the Nurse Practitioners GDM clinic. This will become a shared care arrangement and the CMP/MGP midwife should attend these appointments with the woman if possible. The diabetes team will oversee the management of the woman.

Birth

- It is KEMH policy that all clients with diet controlled GDM can birth in the FBC until 40 weeks gestation if the pregnancy is proceeding normally
- Women who have a macrosomic baby and/or are on insulin will need to be delivered at 38 weeks gestation in the hospital.

Postnatal

- Midwives to follow KEMH guideline "[Diabetes postnatal care/follow up](#)".
- Women with GDM require a postnatal GTT.

Important things to consider:

- GTT's that are close to normal can eventually lead to women requiring insulin.
- Beware of the woman's ethnicity. Incidence of diabetes is higher in women of Asian and Indian ethnicity, even for those with low BMI.
- Follow KEMH guidelines for early GTT for women with increased risk factors for GDM. See [Nurse Practitioner/Diabetes Educator Led GDM Clinic](#) guideline.

- Low threshold for random blood sugar at each antenatal visit.
- GDM is a marker for Type 2 diabetes later in life. Use this opportunity to educate women regarding delay or prevention of onset – maintain good health.

Admission Procedure

Key points

- During admission to hospital, all women with diabetes shall be referred to the Diabetes Service
- The Diabetes Educator / Midwife (page 3309) should be notified when women attend the Maternal Fetal Assessment Unit. Most attendances will be planned. For unbooked attendances outside normal business hours (Monday –Friday 07:30- 16:00) please leave a message on the Diabetes Service answering machine extension 2163.

Admission procedure

On admission Nursing/Midwifery staff shall:

- If the woman has type 1 or type 2 Diabetes Mellitus, notify the:
 - Diabetes Educator / Midwife extension 2163 (leave a message after hours)
 - Dietician page 3126 (during office hours)
- Commence Diabetes Record MR 265. All women should check their BGLs pre breakfast and 2 hours post meals unless otherwise instructed (See [Blood Glucose Monitoring](#))
- Women should use their own blood glucose meter and insulin equipment
- Ensure women have access to "snack cards" available from food services
- Inform the Diabetes Educator (pager 3309) if women require further diabetes supplies
- Ensure women on insulin have snack foods available in their room in case of hypoglycaemic episodes.
- In the event of a woman being unable to give her own insulin injections, staff should revert to using a vial, syringe and safety needle. Insulin pen devices are not to be used by staff due to increased finger stick injury risk.

Medication Orders

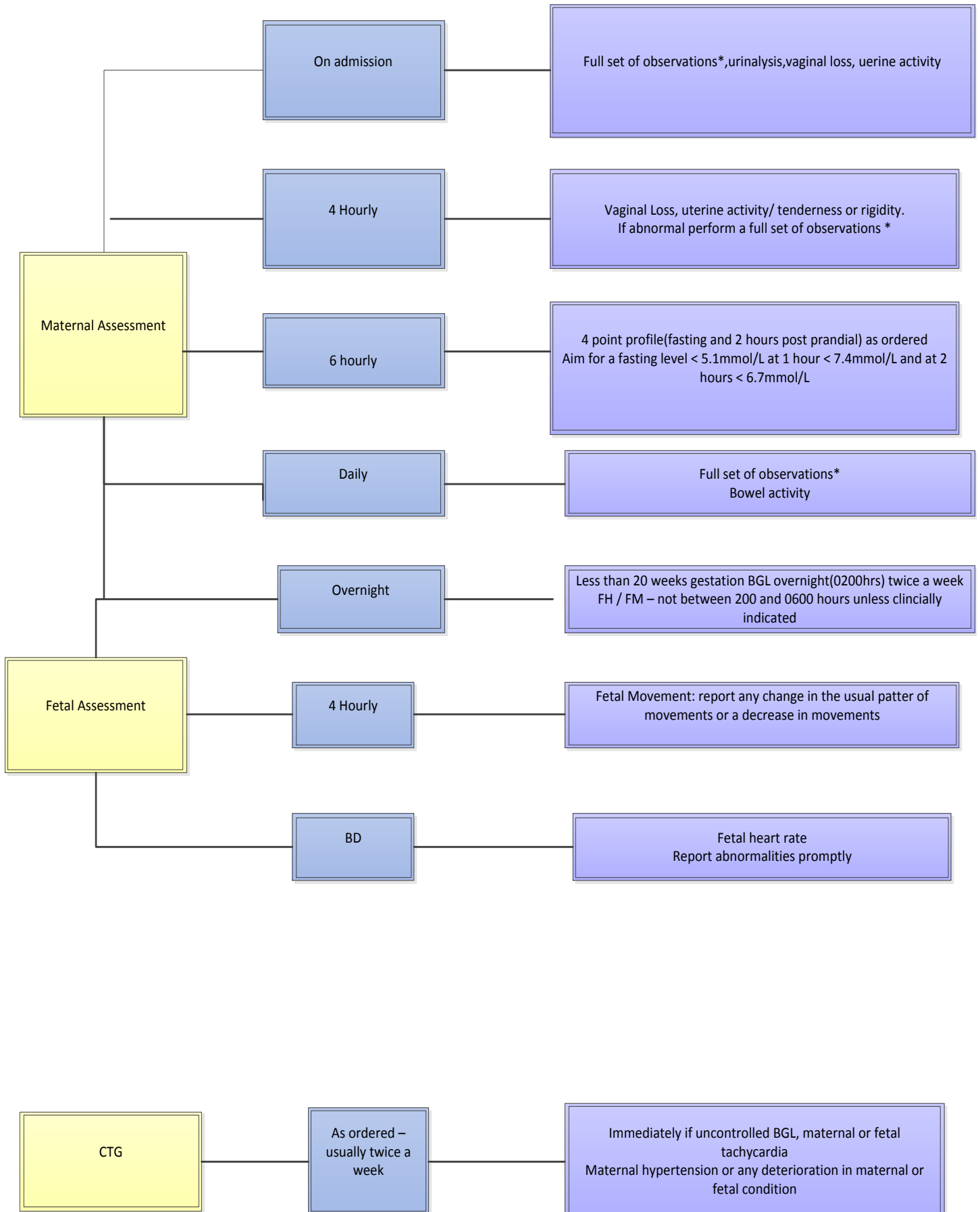
- On admission, continue the woman's usual home insulin or OHA regimen until:
 - review by the diabetes physicians / medical registrar / diabetes educator/or gold team registrar

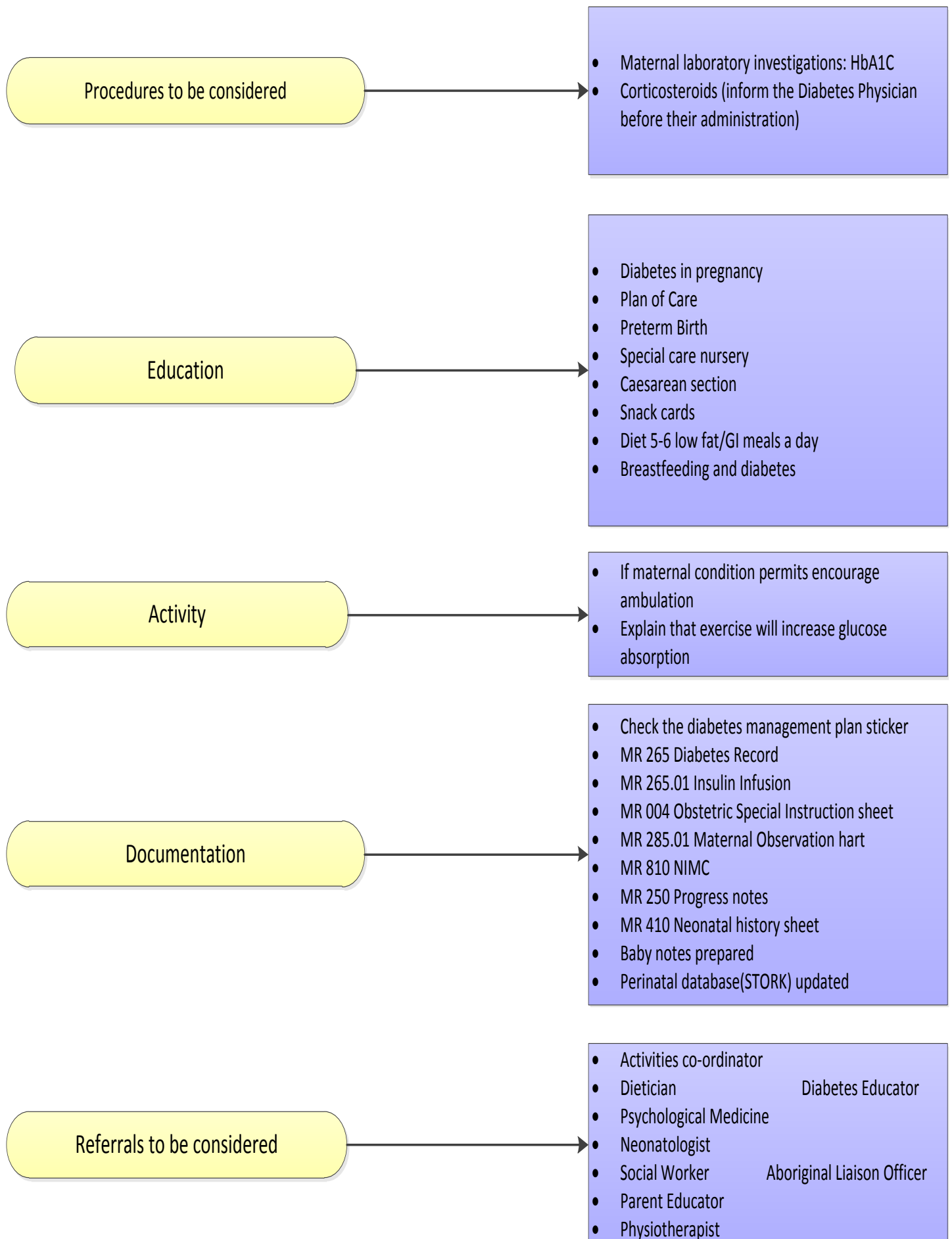
- **Call the medical Registrar or diabetic educators if in doubt regarding insulin /OHA orders (during office hours) or the physician on call if after hours**
- Insulin orders are prescribed on the Diabetes Record MR 265.
- OHA doses are prescribed on the Medication chart (MR 810)

The insulin / OHA dose will be reviewed when:

- induction of labour (IOL) or caesarean section is planned (document the medication plan on the MR004)
- the woman is in labour
- the woman is admitted for induction
- the baby is born
- blood glucose results are out of target range on more than two occasions at the same time period.
- Changes in dose should be made in consultation with the woman by:
 - Medical Officer
 - Credentialed Diabetes Educator
 - Nurse Practitioner – Diabetes

Antenatal care (midwifery) on the obstetric wards





Blood glucose monitoring & equipment

Aim

Women are provided with the knowledge and skills to be able to:

- Accurately monitor their blood glucose levels (BGL) at specified times
- State the goals of blood glucose management in pregnancy
- Respond appropriately when blood glucose results are abnormal
- Keep accurate records of BGL's

Key Points

1. Routine monitoring of blood glucose is generally undertaken 3-4 days per week for women diet controlled and daily if women are on medication to control their BGL's.
2. Routine monitoring infers 4 daily readings – pre breakfast and 2 hours after the start of each main meal.
3. Staff shall:
 - Supervise at least one BGL performed by the woman, then encourage women to take control of their own blood glucose monitoring and keep record of results
 - Record all BGL's performed on - Diabetes Record MR 265 (in-patients)
 - Review the BGL results in the home monitoring diary each antenatal visit.
 - Respond appropriately by **notifying the Diabetes Physician / Registrar or Diabetes Educator/ Midwife if:**
 - prolonged episode/s of BGL out of range
 - the woman is unwell and BGL are elevated.
 - administration of Celestone is planned.

Inpatient Care

Women with diabetes who are inpatients are reviewed daily Monday – Friday by the Diabetes service.

Equipment: Blood Glucose Meter – Access of supplies

Source of supplies for ward meters

Equipment	Supplied by
Optium Xceed Meter (Sensor) & Case	Diabetes Service
Optium Neo (H)* Blood Glucose Electrodes & Pack Insert (H)	Pharmacy
Optium Control Solution (Low & Hi in the one box)	Pharmacy
Log Books, User manual, battery back covers	Diabetes Service
Lithium Batteries x 2	Supply
Lancets – one use only (hospital tender)	Supply
Gloves	Supply
Container for sharps disposal	Supply

NB: Patient's own Optium Xceed Meter and strips and the ward Optium Neo H Meter

and strips are **not** interchangeable.

* The letter 'H' denotes that these electrodes are for hospital use only.

Do not give ward meter strips to patients to use in their own meter.

Inserting Batteries

1. Slide battery cover from back of meter.
2. Insert 2 x lithium batteries (memory, time and date will be maintained if batteries are replaced as soon as low battery symbol is displayed).
3. Replace battery cover.
4. Wait 5 seconds and turn on meter.

Hypoglycaemia Management

Aim

Women with type1, type2 and gestational diabetes mellitus and who are using insulin or oral medications will be provided with the knowledge and skills to be able to:

- Recognise the signs and symptoms of hypoglycaemia.
- Be able to adequately treat hypoglycaemia
- Recognise the reason for hypoglycaemia and take steps to avoid a reoccurrence

Key Points

1. Hypoglycaemia is defined as a blood glucose level < 4.0 mmol/L.
2. Symptomatic hypoglycaemia in a patient treated with insulin or an OHA is an emergency and requires prompt correction.
3. Hypoglycaemia with mild or no symptoms is usually successfully treated with a fast acting carbohydrate (see below) followed by a snack or meal.

Signs and Symptoms

Adrenergic symptoms (Sympathetic Nervous System)	Neuroglycopaenic symptoms
<ul style="list-style-type: none"> • sweating • tremor • anxiety • pallor • palpitations • tachycardia 	<ul style="list-style-type: none"> • confusion, drowsiness • inappropriate behaviour • perioral and peripheral tingling • diplopia • slurred speech • hunger • headache • unsteady gait • aggressive behaviour • convulsions, coma
<p>Note: Many women recognise early warning signs and treat themselves. However, with confusion or drowsiness, the patient may be unable to initiate treatment.</p>	

Conscious patient: Management:

Give fast acting carbohydrate, e.g.:

- sweet drink – one glass (250mL) of cordial, soft drink (NOT diet drink)
- five to six jelly beans
- 3 teaspoons honey
- two to three sweet biscuits
- three barley sugars.
- glucose gel 15g (glucose)
 - Check blood glucose level as soon as practical.

Repeat above treatment if symptoms persist or BGL < 4.0 in 15 minutes.

Follow up

- Follow up with a longer acting low GI carbohydrate, e.g.:
 - Sandwich
 - Snack e.g. fruit and / or 2 – 4 cracker biscuits & cheese
 - Meal
- Recheck blood sugar level (BSL) in 2 hours or sooner if the woman is symptomatic of hypoglycaemia.
- Discuss the possible causes of the hypo with the woman (preventative management) and adjust insulin regimen if required (discuss with diabetes team).

Unconscious, uncooperative patient: Management:

- Dial 55 - State 'Code Blue Medical Emergency' and location (e.g. ward and room number.).
- If glucagon (Glucagon®) is available, give intramuscularly. If the woman is not responding within 10 minutes IV glucose is required.
- Set up / obtain IV access
- Give intravenous 50% glucose, 50 mL
- Leave IV cannula for at least 6 hours as hypoglycaemia may recur

Follow-up

- Once the woman is fully alert and cooperative, provide her with a snack or meal (e.g. glass of milk, dry biscuits & cheese/ sandwiches)
- Repeat blood glucose level in 20 –30 minutes and if > 4.0mmol/L repeat in 1 hour.
- Document all blood glucose levels, IV / IM treatment and food/drink ingested on the MR 265.
- Notify Physician/ Credentialed Diabetes Educator to review insulin regimen where practical.
- Discuss with the woman the possible causes of the hypo (prevention management), insulin adjustment may be required (discuss with diabetes team).

Diabetic ketoacidosis (DKA) management

Aims

To provide clinical staff with the information to be able to manage diabetic ketoacidosis appropriately.

Staff shall be able to:

- Define hyperglycaemia in pregnancy
- Distinguish between hyperglycaemia, diabetic ketoacidosis and hyperosmolar hyperglycaemic state
- Respond appropriately when blood glucose results are abnormal

The Physician on call MUST be notified of all women admitted with suspected DKA BEFORE extensive management plans have been made or started.

Background

In the absence of prompt diagnosis and treatment DKA can be life threatening to both the mother and the fetus.

Diabetic ketoacidosis is:

- a life threatening metabolic complication of absolute insulin deficiency
- characterised by the triad of:
 - Hyperglycaemia
 - Ketonaemia from fatty acid metabolism
 - Metabolic acidosis.

The resulting hyperglycaemia results in loss of water and electrolytes, hyperosmolality and fluid depletion.

Although more commonly associated with Type 1 diabetes, DKA can also occur in Type 2 or gestational diabetes in the context of severe illness such as sepsis, insulin disruption, myocardial infarction or medication administration (e.g. corticosteroids).

As a general rule:

- Stabilise maternal condition
- Continue close fetal surveillance
- Consider delivery if despite aggressive therapy fetal status does not improve or maternal condition continues to deteriorate.

Diagnosis

The diagnosis of diabetic ketoacidosis is made on the basis of a compatible history (including polyuria, polydipsia, vomiting, abdominal pain, weight loss, dehydration, precipitating infection or event) and:

- Hyperglycaemia, typically BSL>13mmol/L but may be lower or normal in pregnancy
- Metabolic acidosis (pH<7.30) with high anion gap
- Presence of ketones in urine or serum

The most common precipitants for DKA are:

- omission or inadequate dosing of insulin
- infection (pneumonia, UTI, gastroenteritis, viral)
- hyperemesis
- medical / surgical intercurrent illness such as pancreatitis
- steroid induced hyperglycaemia after administration for fetal lung maturation
- β 2 agonists (e.g. salbutamol, terbutaline) for tocolysis can cause and further aggravate DKA.

Remember, in addition to the usual symptoms and signs of DKA, pregnant women can also present with non-specific abdominal pain and / or contractions.

Differential diagnosis includes acute pancreatitis, alcoholic ketoacidosis, appendicitis, cystitis, hyperosmolar coma, lactic acidosis, salicylate toxicity and septic shock.

Assessment

Initial investigation for diabetic ketoacidosis should include:

1. BSL (laboratory and fingerpick): Check hourly
2. Arterial blood gases
3. Urine and serum ketone level (blood β – ketone testing can be done using the Optium meter)
4. Urea and electrolytes
5. Considering the precipitating cause/s and manage as appropriate. These could include
 - Newly diagnosed Type 1 diabetes or Type 1 with missed insulin doses
 - Insufficient insulin for intercurrent illness e.g.
 - infection (consider CXR, MSU, blood cultures, meningism).
 - ischaemic event e.g. AMI (may be silent, check ECG), CVA, ischaemic bowel, gangrene
 - acute abdomen e.g. pancreatitis, peritonitis
 - drugs (alcohol, glucocorticoids, sympathomimetics)

Treatment

The Medical Registrar or Diabetes Physician must be contacted regarding the management of DKA

All patients with DKA should be monitored in a high dependency unit (ASCU) or labour and birth suite. At KEMH the duty anaesthetist must be informed of all ASCU admissions (and / or labour and birth suite if the patient is in DKA).

Consider:

1. Urinary catheter (if not producing urine after 3 hours).
2. Arterial line
3. Nasogastric tube (if drowsy / vomiting).

Transfer to an ICU may be required if:

- severe ketoacidosis (pH < 7.0)
- altered consciousness
- poor response to acute resuscitation
- more intensive monitoring anticipated (e.g. K+, intercurrent illness)

Volume expansion:

The treatment of DKA includes correction of dehydration (typical water deficits are 5 - 10L), hyperglycaemia and electrolyte imbalance, (the most dangerous of which is hypokalaemia) combined with treatment of the provocative illness and frequent maternal monitoring. Aim to replace total volume loss in 24-36 hours, with approximately 50% of the resuscitation fluid being administered in the first 8-12 hours.

Sodium Chloride 0.9%

- Use for initial resuscitation
- Consider
 - 1 – 2 L in the first hour
 - 500-1000mL / hour over the next 2-4 hours

Insulin infusion

- If the patient is already on long acting insulin, this should be continued.
- 50 units Neutral insulin **Actrapid**® in 500mL 0.9% sodium chloride (i.e. 0.1 Units/mL) via infusion pump; flush and discard the first 20 mL.
- Commence the infusion at **60 mL/hr** (i.e. 6 units per hour). An Insulin bolus may be given if recommended by the physician.
- **Repeat ABG's** at 2 - 4 hours to check acidosis is being corrected, according to the discretion of the physician.
 - *(Venous Blood Gases may be acceptable with less severe acidosis - check that the bicarbonate is rising).

Potassium (K+)

Patients with DKA may be depleted in total body potassium despite normal or even elevated potassium on presentation. Initially the potassium may be high due to acidosis but will fall rapidly when acidosis is corrected. The key to adequate potassium replacement is regular monitoring (1-2 hourly). An arterial line is recommended and arterial blood gas can give rapid information on the potassium level

- Potassium <3.5, give 10mmol/L potassium chloride (KCL) per hour IV. Recheck every 1 – 2 hours. If higher doses are required consider the insertion of a central line, cardiac monitoring and ASCU admission.
- Potassium = 3.5-5.5, give 20 mmol/L KCL over 1-2 hours IV. Recheck prior to any further administration.
- Potassium > 5.5, no replacement.

Bicarbonate

- Randomised trials outside pregnancy have not shown any benefit from bicarbonate therapy in patients with pH 6.9-7.1, although there are no studies in pregnancy.
- In pregnancy, the normal PH is 7.4-7.45, so a PH of 7 represents severe acidosis and bicarbonate may be considered. **Patients in this situation should be considered for transfer to an Intensive Care Unit, or considered for delivery.**

Phosphate

Not usually indicated. May be considered if severe hypophosphataemia (<0.35mmol/L) +/- cardiorespiratory depression

10% Dextrose

- Commence at 40mL/hour when BGL <10 mmol/ hour to be run concurrently with 0.9% sodium chloride (as needed to restore euvolaemia).
- Check the BGL and ketones hourly.
- If the capillary ketones are not falling by 0.5mmol/L/hour, increase the insulin by 1 unit/hour.
- If the blood glucose continues to fall below 7.0 within the first hour, consider increasing the dextrose infusion rate to 80mL/ hour and contact the physician

IV Infusions are to be ceased only when:

- acidosis is corrected (i.e. blood ketones<0.5)
and
- the patient is able to eat normally (to allow the safe recommencement of subcutaneous insulin)

NB If patient normoglycaemic or becomes hypoglycaemic with IV insulin, **do not cease the insulin infusion until acidosis is corrected** (extra dextrose and/or an increase in the dextrose infusion rate can be administered).

Conversion to subcutaneous insulin

Once the ketones have been cleared and if the patient is eating and drinking normally, the patient should be transferred to subcutaneous insulin therapy by the diabetes team

For patients with known diabetes on multiple daily injections:

- Recommence the usual bolus insulin with the patient's next meal
- Cease infusions:
 - Half an hour after rapid onset S/C insulin given.
 - Basal insulin must be arranged with diabetes team prior to cessation of insulin infusion.
 - **5-10 minutes** after the administration of fast acting analogs (Novorapid, Humalog, Apidra)

For patients who are on CS11 (insulin pump) therapy:

- Consider that the cause of DKA could be a result of pump failure; evaluate this prior to restarting the pump
- Seek advice from the physician
- If appropriate, recommence the pump when the ketones have cleared and the patient is eating and drinking.
- Cease the insulin infusion 30 minutes after recommencing pump.

Perinatal complications

The frequency and severity of perinatal complications is dependent upon the severity of the maternal condition at the time of presentation, adequacy of management, and the gestational age and condition of the fetus prior to onset of the DKA. The reported fetal mortality in recent years has ranged from 10-36%. Perinatal morbidity is high due to preterm delivery, hypoxia and acidosis

Effect of DKA on the Fetus

The mechanism of fetal loss is not clear but believed to be due to:

- Massive osmotic diuresis and consequent dehydration, which leads to volume depletion and reduced utero-placental blood perfusion.
- Maternal acidemia is known to reduce placental blood flow with resultant fetal hypoxia.
- Maternal hypophosphatemia leads to altered red blood cell oxygen metabolism causing further fetal hypoxia.
- Fetal hyperinsulinemia resulting from maternal hyperglycaemia leads to increased fetal oxygen requirements by stimulating oxidative metabolic pathways, further aggravating the insult.
- Maternal hypokalaemia can potentially cause fetal hypokalaemia, leading to fatal arrhythmias.

Management of DKA – Fetal monitoring:

- The mode and intensity of fetal monitoring will largely be influenced by the gestational age at the time of DKA and also by other pregnancy risk factors and past obstetric history.
- Decisions regarding the type and intensity of fetal surveillance at gestations under 28 weeks are difficult and should be individualised and made at a consultant level. The MFM consultant's opinion should be sought.
- Usually with gestations over 28 weeks, continuous fetal heart rate monitoring is recommended and should be commenced at the time of diagnosis and continued until the mother is stabilised with correction of the majority of metabolic derangements. It may sometimes be necessary to continue the CTG until the FHR abnormalities disappear and this may take 4-8 hrs.
- NB: all modes of fetal testing will be influenced by the fetal hypoxemia and acidosis.
- FHR abnormalities, not uncommonly seen during an acute DKA episode are:
 - minimal or absent variability

- absent accelerations
- repetitive variable or late decelerations
- Consider an ultrasound scan to check fetal well-being, especially in very preterm gestations where CTG is more difficult to interpret and other situations where these findings may help with delivery decisions.
- USS findings are quite often abnormal and show:
 - abnormal biophysical profile
 - abnormal umbilical artery Doppler
 - abnormal middle cerebral artery Doppler with evidence of redistribution.
- The frequency and severity of fetal abnormalities are directly related to the severity and duration of the episode and appropriateness of its management.
- Most fetal abnormalities will usually improve after correction of the metabolic derangements and maternal stabilisation.
- The decision to continue the pregnancy or to proceed with delivery in the setting of DKA can be very challenging and should be made at the consultant level. The MFM consultant's opinion should be sought if possible. These decisions should take into consideration:
 - The gestational age of the fetus
 - The maternal status
 - The fetal status
 - The response to treatment
 - The background medical history of co-morbidities
 - The past obstetric history.
- Resist the natural inclination to proceed with an urgent C-section for fetal heart rate abnormalities, prior to stabilisation of the maternal condition.
- DKA on its own is NOT an indication for urgent delivery as this increases both maternal morbidity and mortality and also leads to the delivery of a hypoxic, acidotic and usually preterm neonate.

DKA management protocol tables

Volume expansion (with potassium as per protocol)

DATE	TIME	FLUID	Additives/ Batch no.	Vol	Rate	Ordered by	Given by	Checked by
		N/Sal	NIL	1L				
		N/Sal		1L				

Insulin infusion (flush and discard first 20ml)

Date	Time	Fluid	Additives/ Batch no.	Vol	Rate	Ordered by	Given by	Checked by
		N/Sal	Actrapid 50 units	500 mL	60mL/hr			

Dextrose (to commence when BGL <10)

Date	Time	Fluid	Additives/ Batch no.	Vol	Rate	Ordered by	Given by	Checked by
		10% Dextrose		1L	40mL/hr			

DKA monitoring flowsheet

Elapsed time (hr)	Date and time	BGL (hourly)	Insulin rate (mL/hr)	Dextrose rate (mL/hr)	Insulin pump volume	Saline pump volume	Dextrose pump volume	PH/pCO2	Bicarb	Na+/K+	Urea/Creat.	Blood ketones	Signature
0.5													
1													
1.5													
2													
2.5													
3													
3.5													
4													
4.5													
5													
5.5													
6													
6.5													
7													
7.5													
8													
8.5													
9													
9.5													
10													
10.5													
11													
11.5													
12													

Diabetes (GDM & type 2) **not** requiring insulin or OHA: Management

Management Guidelines		Rationale
Education	<ul style="list-style-type: none"> Refer to Diabetes Educator for instruction on diabetes, management plan, risk factors and blood glucose monitoring Diabetes Service conducts education classes for women who plan to birth at KEMH 	<p>Ensures understanding of GDM and its implications and helps reduce anxiety.</p> <p>Will encourage adherence with treatment recommendations and BGL monitoring.</p>
Diet	<p>Refer to Dietician. Recommend:</p> <ul style="list-style-type: none"> 5 – 6 low fat low GI meals/day Snacks & supper are important Ensure nutritional adequacy Energy restricted diet for obese women (BMI >30). 	<p>Nutritional education is the main treatment strategy for BGL control. This is best received from a dietitian who is able to individualise nutritional requirements to maintain optimum BGLs</p>
BGL	<p>Aim for BGL of:</p> <p>< 5.1 mmol/L fasting level</p> <p>< 7.4 mmol/L 1 hour post prandial</p> <p>< 6.7mmol/L 2 hour postprandial level</p>	<p>Strict control of BGLs significantly reduces rates of:</p> <ul style="list-style-type: none"> fetal anomalies and macrosomia maternal hypo/ hyperglycaemia neonatal hypoglycaemia
HbA_{1c}	Measure each trimester *	The HbA _{1c} level is a useful guide to the reliability of self-monitored BGLs
Exercise	Recommend 30 minutes of moderate exercise each day (e.g. swim / walk) provided no medical / obstetric contraindications	Exercise is a useful adjunct to dietary therapy in BGL control, maintaining general wellbeing and decreasing long-term complications
Fetal surveillance	Growth scan at 34 weeks	Further scans are not routinely ordered by the woman's team unless insulin commenced, fetal macrosomia or in Nurse Practitioner GDM clinic.

* HbA_{1c}- Women with GDM who are NOT going through the Diabetes Service for their antenatal care (i.e. GDM diagnosed after 22 weeks) do not need HbA_{1c} done each trimester. When the woman attends the diabetes education class, the Diabetes Educator decides if a HbA_{1c} is required depending on factors including her GTT result.

Diabetes requiring insulin or OHA

Management Guidelines		Rationale
Education	Refer to Diabetes Educator for instruction on diabetes, management plan, risk factors, blood glucose monitoring & insulin administration.	Ensures understanding of GDM and its implications and helps reduce anxiety. Will encourage compliance with treatment recommendations and BGL monitoring.
Diet	Refer to Dietician. Recommend: <ul style="list-style-type: none"> • 5 – 6 low fat low GI meals/day • Snacks and supper are important • Ensure nutritional adequacy • Energy restricted diet for obese women (BMI >30). 	Nutritional education is the main treatment strategy for BGL control. This is best received from a dietitian who is able to individualise nutritional requirements to maintain optimum BGLs.
BGL: GDM and Type 2 DM	Aim for BGL of: <ul style="list-style-type: none"> • <5.1 mmol/L fasting level. • <10.0 mmol/L 1 hour post prandial level • <6.7 mmol/L 2 hour postprandial level. 	Control of BGLs significantly reduces rates of : <ul style="list-style-type: none"> • fetal anomalies and macrosomia • maternal hypo/ hyperglycaemia • neonatal hypoglycaemia
BGL: Type 1 DM	Aim for best control possible with each individual woman	
HbA_{1c}	Measure at first visit & each trimester, women may benefit from extra tests	The HbA _{1c} level is a useful guide to the reliability of self-monitored BGLs.
OHA's	In women resistant to large doses of insulin, OHA's may be considered, but such treatment remains experimental and should be prescribed only by the Diabetes Physician	Experience with the use of selected OHA's in pregnancy is growing. OHA's are undergoing investigation in randomized control trials
Exercise	Recommend 30 minutes of moderate exercise each day (e.g. swim / walk) provided no medical / obstetric contraindications.	Exercise is a useful adjunct to dietary therapy in BGL control, maintaining general wellbeing and decreasing long-term complications.
Insulin	Consult with Diabetes Physician if BGLs greater than goals	Avoid fetal macrosomia and complications during the delivery

Fetal surveillance	Ultrasonography		
	<ul style="list-style-type: none"> First Trimester Screen 	11 ⁺⁶ – 13 ⁺⁶ weeks	Includes gestational age, nuchal fold translucency and blood test: HCG, PAPP- A (10 – 13+6weeks) Blood test is sensitive if performed earlier rather than later approx. 2 weeks prior to USS
	<ul style="list-style-type: none"> Anatomy 	18-22 weeks	To assess whether structural anomalies are present.
	<ul style="list-style-type: none"> Consider baseline growth scan 	24 weeks	If history of pre-existing vascular or renal disease, hypertension, previous preeclampsia, thrombophilia or stillbirth
	<ul style="list-style-type: none"> Serial USS for Growth, AFI, and umbilical artery Doppler 	28*weeks 32*weeks 34 weeks 36-37 weeks * omit for GDM diagnosed > 26wks	To detect irregularities in: <ul style="list-style-type: none"> fetal growth amniotic fluid index (e.g. polyhydramnios) Fetal AC measurement at 34 weeks is strongly correlated with birth weight. ² <i>Consider increased fetal 'wellbeing' scans if glycaemic control is poor or reduction in insulin requirements</i>
	Cardiotocograph (CTG) After 34 weeks, consider 2-3 x week CTG if poor glycaemic control, reduction in insulin requirements, hypertension, renal disease, IUGR or fetal cardiomegaly		Commencement of CTG monitoring is determined by the degree of maternal vascular disease, renal involvement, glucose control and fetal growth on serial ultrasounds.
Betamethasone	The diabetes physician should be notified if steroids are considered necessary for enhancing fetal lung maturity. A BGL profile for 48-72 hours should be performed post steroids. BGL > 10mmol/L seek advice from the physician		Significant changes in insulin requirements often follow Betamethasone administration. Insulin adjustment may be required from 6 hours post 1 st dose until 48 hours after last dose

Maternal surveillance	Ophthalmology Review (Pre-existing diabetes)	Review pre or early pregnancy to obtain a baseline and enable monitoring of the influence pregnancy has on the retina.
	Thyroid Function Test (TFT)	Women with diabetes are at a higher risk of abnormal thyroid function
	Spot urine – PC Ratio at booking, consider repeating if blood pressure elevated (PC Ratio- Protein: Creatinine ratio)	Review pre or early pregnancy to monitor the influence pregnancy has on the renal system and track any changes. This is also a predictor of pre-eclampsia.
	Baseline assessments of maternal vasculopathy	
	Insulin adjustment: The woman should have 1 - 2 weekly contact with a member of the team, by phone or in person.	This will assist in BGL control and enhance awareness for both the woman and the team members.
Mode of Birth	Consider elective Caesarean Section if: <ul style="list-style-type: none"> • estimated fetal weight >4250g or • fetal abdominal circumference is >40mm than head circumference 	To reduce the risk of shoulder dystocia
Timing of Birth	Arrange an elective birth at 38-39 weeks for women requiring insulin or OHA's (or earlier as indicated by clinical situation)	To reduce the rate of fetal macrosomia and birth injury.

Antenatal care / tests planner QRG

Refer directly to form: "Pregnancy Care for Diabetes" (MR 223.98).

Antenatal medication

Oral hypoglycaemic agents (OHA's)

Key points

1. Most OHA's are not currently recommended for use in pregnancy. Clinical trials are continuing to determine if there is any long term effect on the fetus.
2. Oral hypoglycaemic agents are not generally used in type 1 DM. Oral hypoglycaemic agents may be prescribed by the physician for women with type 2 or gestational DM following discussion with the woman regarding emerging data regarding possible long term effects on the offspring in the following circumstances:
 - Where the woman has been taking OHA's prior to and in early pregnancy (e.g. PCOS)
 - Where the woman refuses to take insulin injections.
 - When insulin compliance is poor.
 - As a supplement to insulin or when large doses of insulin are required to control blood glucose levels.
3. On admission notify the diabetes educators / medical registrar of women taking OHA's during pregnancy.
4. Blood glucose monitoring is essential throughout pregnancy – fasting and 1 or 2 hours post meals. If BGL's are not maintained within range subcutaneous insulin is offered.
5. Notify the diabetes physician / medical registrar of the woman's planned method for birth, for further instruction regarding OHA's in labour or prior to caesarean section.

Insulin therapy

Key points

1. Women with type 1DM require insulin for life. Some type 1 women will be using a subcutaneous insulin pump for delivery of insulin.
2. Insulin pumps deliver a constant basal rate of short acting insulin and the woman will give a bolus dose for meals.
3. The woman will know how to manage her pump.
4. Frequent monitoring of BGLs pre and post meals is required for pump management
5. If diet and exercise has failed to achieve normoglycaemia in women with type 2 DM and GDM, diabetes medication is commenced.
6. Initiation of medication is discussed with the Diabetes Physician or Obstetrician.
7. Women requiring insulin during pregnancy monitor their BGLs at least three days a week pre breakfast and 1 or 2 hours after meals to determine the effect of insulin doses on blood glucose levels.

Commencing insulin therapy

- The need for and timing of insulin administration depends on the blood glucose profile as demonstrated by BGL monitoring and cannot be predicted by the OGTT result.
- Diet may be sufficient to achieve control after some meals, but not after others, depending on the individual's eating pattern and other life factors. For example, insulin may be necessary only after breakfast, and not after other meals. In addition, insulin resistance increases progressively as pregnancy proceeds. For this reason, there is no final dose of insulin that will achieve control.
- Monitoring must be continued, and insulin dosage adjusted (usually increases two - three fold) as the pregnancy proceeds, determined by blood glucose response.

Timing and type of insulin

- When starting women on insulin the appropriate insulin to commence them on is determined by the time of day when glucose levels are high.

BGL elevated	Before breakfast	After breakfast	After lunch	After dinner
Start Insulin:	Nocte 2100-2130	Pre breakfast	Pre lunch	Pre-dinner
Type of insulin	Protophane. Humulin NPH Lantus or Levemir	Short-acting e.g. Novorapid ®/ Humalog		

* Discuss with the patient a suitable time to take longer acting insulin with regards their normal sleeping habits, needs to be at a consistent time e.g. 2130 rather than "Before Bed"

Dose of insulin

- The key to the management of a pregnant woman requiring insulin is flexibility and providing the correct amount of insulin to maintain euglycaemia.
- When starting insulin, a SMALL DOSE IS PRESCRIBED by the medical officer, in anticipation that increasing insulin stepwise will be required to achieve blood glucose control as soon as possible.
- Women with diabetes mellitus who are inpatients are reviewed daily (Monday – Friday) by the medical registrar and/or diabetes educators and the physician on call should be notified of any problems out of hours or on weekends.
- Once discharged, the woman should maintain phone contact with the diabetes educators for assistance in determining subsequent changes to her insulin regimen on a least a weekly basis.

Intrapartum management of GDM (& planning for IOL / caesarean)

Key points

- Very few women with Gestational Diabetes Mellitus (GDM), whether using insulin or not, require insulin for labour or caesarean section.
- All women with GDM for induction of labour or caesarean section who are on insulin or oral hypoglycaemic agents shall have the plan for their intrapartum and postpartum management discussed and documented on the MR 004 during antenatal clinic visits at 34 – 36weeks.

Induction of labour or caesarean section

GDM on treatment (insulin or oral hypoglycaemic agents)

- Measure Blood Glucose Level (BGL) at usual times i.e. fasting and two hours post- prandial until fasting.
- **Guidelines for the management of GDM women using insulin or oral hypoglycaemic agents**
 - Bedtime insulin
Insulin: Reduce night time long acting insulin by 50% - e.g. human isophane insulin (Protaphane or Humulin NPH) or insulin glargine (Lantus).
 - **Oral agents:** Do not give night time oral hypoglycaemic agents
- During induction of labour:
 - **Meal time medication:**
Continue normal meal time short acting insulin (e.g. Novo Rapid) when eating meals until obstetrician determines fasting should commence.
 - **Check BGL at usual intervals i.e. fasting and two hours post prandial**
- With onset of fasting (labour or caesarean section)
 - For most women insulin is not required during labour or caesarean section.
 - If BGL exceeds 7.0 mmol/L start IV Dextrose/insulin infusion regime- see Clinical Guideline intrapartum management of type 2 diabetes mellitus
 - If BGL falls below 4.0 mmol/L refer to [Hypoglycaemia Management](#)
 - Continue BGLs four - six hourly while in labour

GDM on diet only

- It is rare for women controlled by diet alone to require insulin in labour.
- If BGL exceeds 7.0 mmol/L inform the Diabetes Physician or Obstetric Medicine Registrar.

Post-partum management of GDM

- Women with GDM should not require insulin following delivery.
- If insulin has been required in labour or caesarean section, **discontinue insulin** following delivery of the placenta.
- Women with GDM who are treated with insulin or oral hypoglycaemic agents during pregnancy should complete a 24 hour BGL profile (fasting and 2 hours post each meal) prior to discharge. If results are 10.0 mmol/L or greater notify Diabetes Educator or on-call Physician(not necessary for women with GDM treated with diet / exercise only during pregnancy, unless otherwise requested).
- All women with GDM are advised to have an OGTT 6 – 8 weeks after the birth of the baby and this is repeated every 2 years at a minimum.
- Lifestyle changes are advised e.g. weight loss/maintenance, healthy diet, regular activity

Intrapartum management of type 1 DM (& planning for IOL/ CS)

Key Points

- All women with TYPE 1 DIABETES require insulin and dextrose for labour or Caesarean section.
- All women with TYPE 1 DIABETES for induction of labour or caesarean section shall have the plan for their intrapartum and postpartum management discussed and documented on the **MR 004** during antenatal clinic visits at 34 – 36weeks.

Induction of labour

- Measure Blood Glucose Level (BGL) at usual times until fasting.
- **Evening prior**
 - **Meal time treatment**
Continue normal meal time insulin and diet until obstetrician determines fasting should commence.
 - **Night time treatment**
Insulin: Reduce night time insulin by 50% - usually insulin detemir (**Levemir**) or insulin glargine (**Lantus**) and less commonly humanised isophane insulin (**Protaphane or Humulin NPH**).
- **With onset of fasting**
 - Commence IV Dextrose/ insulin infusion according to protocol (see below) if blood glucose level is greater than 7.0 mmol/l
 - The physician must be notified if an insulin infusion is commenced

- **Continuous Subcutaneous Insulin Infusion (CSII) Pumps**
 - Women with their own insulin pumps are to be individually managed by the physician. (See below)
 - The physician must be notified if a woman with an insulin pump is labouring.
 - In the event of unstable BGL's, inability of patient to self-manage the pump or uncertainty or unfamiliarity with pumps, consider early conversion to intravenous insulin/dextrose infusion.

Elective caesarean section

- Book the woman's Caesarean section first on the theatre list.
- **Evening Prior:**
 - Women with Type 1 diabetes should be admitted the evening before surgery in case of hypoglycaemia during overnight fast.
 - Measure BGL at usual times (fasting and 2 hours post meals) unless insulin infusion in progress.
- **Meal time treatment**
 - Continue normal meal time insulin and diet until fasting commences.
- **Night time treatment**

Insulin: Reduce night time insulin by 50% - usually insulin detemir (**Levemir**) or insulin glargine (**Lantus**) and less commonly humanised isophane insulin (**Protaphane or Humulin NPH**) (See MR 004)

On admission:

- **An intravenous cannula should be in situ once fasting commences in case of a hypoglycaemic episode during the overnight fast.**
- No insulin infusion is necessary unless BGL is above 7 mmol/L two hours post evening meal.
- If BGL is below 7 mmol/L, leave the woman to sleep unless hypoglycaemia is suspected and check BGL next at 0600 hours.
- If BGL greater than 7 mmol/L commence IV Dextrose/ insulin infusion, as in INSULIN DOSE TITRATION (Table 1 on page 3).
- If BGL is 5 to 7 mmol/L, repeat at 0600.
- For women admitted on the **day of surgery** check BGL on admission and if BGL greater than 7 mmol/L, commence insulin/ dextrose infusion, as in INSULIN DOSE TITRATION (Table 1)

Subcutaneous insulin pumps

Subcutaneous Insulin Pump use prior to and following caesarean section

- Check BGL 2 hours prior to caesarean section and if < 8.0 mmol/L the woman should **SUSPEND** pump insulin delivery and **DISCONNECT** the pump from the sensor or remove line and sensor completely.

NOTE: If BGL >8.0 mmol/L **DO NOT SUSPEND** the pump. Check with on-call Physician regarding continuing management plan.

- Check BGL and repeat each 30 minutes. IF BGL >7.0 mmol/L commence I.V Dextrose/insulin infusion according to Table 1.
- The woman should now set the pump basal rate to pre-pregnancy levels as already determined by the Physician (see MR 004).
- The woman should reconnect and restart the insulin pump once in theatre recovery area. Will need a new sensor and line if this has been removed (patient to supply).
- **NOTE:** If IV Dextrose/insulin infusion has been commenced **DO NOT RESTART SUBCUTANEOUS INSULIN PUMP**. Continue to follow IV Dextrose/ insulin infusion protocol. Notify Physician.

Insulin infusion set up

- Commence an **intravenous infusion of 10% dextrose at 50mL / hour** via an infusion pump once intravenous insulin is required - see INSULIN DOSE TITRATION –Table 1.
- **Potassium Chloride (KCl) supplementation is generally not required but may be commenced at the medical staff's discretion.** Baseline serum potassium should be measured and rechecked if I.V therapy continues for more than 12 hours or patient is vomiting.
- Commence **50 units of Actrapid® (short-acting) insulin in 50mL of 0.9% Normal Saline** (i.e. 1 unit per mL) via a 50mL syringe pump, if required – see INSULIN DOSE TITRATION Table-1.
- Titrate insulin dosage to BGL as shown in the Table 2.

NOTE: Before attaching the intravenous line, run the insulin / saline solution through the length of tubing twice to saturate the insulin binding sites on the plastic tubing.

This guideline is intended to apply on the morning of induction / caesarean section.

Please note, this protocol **SHOULD NOT be used in the event of a hyperglycaemic crisis** such as ketoacidosis, coma or hyperosmolar hyperglycaemic syndrome. **Instead, contact the on call physician or obstetric medicine Registrar.**

Insulin dose titration

This guideline is intended to apply on the morning of Induction / Caesarean section.

Table 1- Rate to COMMENCE insulin infusion

Blood glucose level	Rate of Insulin Infusion	Measure BGL in:
Less than 7 mmol/L	Withhold insulin	1 hours
7 to 8 mmol/L	1mL/hour (i.e. 1 unit/hour)	2 hours
Greater than 8 mmol/L	2mL / hour	1 hour

Table 2 - Rate to MAINTAIN insulin infusion

BGL in mmol/L	Action Required	Frequency of BGLs
>15mmol/L	Give 4mL (=4 units) bolus. Increase infusion rate by 1mL (=1 unit) per hour.	Retest BGL in 1 hour. (If BGL remains >15mmol/L notify Physician)
7-15mmol/L	Increase insulin rate by 1mL (= 1 unit) per hour. If \geq 4mL (= 4 units) per hour, notify the physician on call	Retest BGL in 1 hour.
5-7mmol/L AND recent increase to insulin infusion rate in the last hour .	Reduce insulin rate by 1mL (= 1 unit) per hour.	Retest BGL in 1 hour.
5-7mmol/L AND NO increase to insulin infusion rate in the last hour .	Maintain infusion rate.	Retest BGL in 1 hour. If BGL stable for 3 hours, retest BGL 2 hourly instead.
4-5mmol/L	Halve insulin infusion rate.	Retest BGL in 1 hour.
<4mmol/L	Stop Insulin infusion Give 50mL bolus of 10% Dextrose IV If still <4 mmol/L, leave infusion off and consult with physician. If BGL 4-6 mmol/L leave infusion off Once BGL > 6.0 mmol/L, recommence infusion at HALF the previous rate.	Retest BGL in 15 minutes. Retest BGL in 15 minutes. Retest BGL in 1 hour and follow Table 2 (if BGL remains <4 mmol/L notify Physician)

Postpartum management of type 1 DM

On delivery of the placenta or soon after

- Decrease insulin infusion rate by 50% and continue as per INSULIN DOSE TITRATION until subcutaneous insulin is commenced with the first meal post-partum.

- Continue with intravenous 10% dextrose at 50 mL/hour until the first meal following the birth.
- Monitor BGL 2 hourly until subcutaneous insulin recommenced.

With the first meal i.e. full diet tolerated by the woman:

- Commence subcutaneous insulin as charted on the MR265. Contact the On Call Diabetes Physician if this is not charted or documented on the MR004.
- Maintain intravenous access for 4 hours.
- Return to 4 point BGL profile (fasting and 2 hours post each meal)

Ongoing management of diabetes mellitus

- Ongoing management for Women with type 1 DM should be with an Endocrinologist / Physician or Specialist Diabetes Team. Obstetric team RMO should confirm follow up arrangements prior to discharge.

Intrapartum management of type 2 DM (Includes IOL / CS plan)

Aims

- Women with diabetes will maintain blood glucose control (4 – 7 mmol/L) during labour/Caesarean section to avoid hypo / hyperglycaemia.
- Some women with TYPE 2 DIABETES may require insulin and glucose for labour or Caesarean section.
- All women with TYPE 2 DIABETES for induction of labour or caesarean section who are on insulin or oral hypoglycaemic agents shall have the plan for their intrapartum and postpartum management discussed and documented on the MR 004 during antenatal clinic visits at 34 – 36weeks
- Measure Blood Glucose Level (BGL) at usual times (pre-breakfast and 2hrs post meals) until fasting.

Evening prior to induction or caesarean section:

- **Night time treatment**
 Insulin: Reduce night time insulin by 50% - usually insulin detemir (**Levemir**) or insulin glargine (**Lantus**) and less commonly humanised isophane insulin (**Protaphane or Humulin NPH**).
- **Oral agents:** Do not give night time oral hypoglycaemic agents
- **Meal time blood glucose management treatment during induction of labour**
 Continue normal meal time medication (insulin or OHAs) and diet until obstetrician determines fasting should commence.

- **With onset of fasting**

Monitor blood glucose levels 2 hourly and if > 7.0mmol/L commence IV Dextrose/ Insulin infusion according to protocol as follows.

Caesarean section

- Book the woman's Caesarean section first on the theatre list unless a Type 1 is also booked the same day (Type 1 women have priority)

Evening before:

- Insulin: Night time insulin is reduced by 50% - usually insulin detemir (**Levemir**) or insulin glargine (**Lantus**) and less commonly humanised isophane insulin (**Protaphane or Humulin NPH**). (See MR 004)
- Oral agents: Night time oral hypoglycaemic agents are withheld

On the morning of caesarean section:

- check BGL on admission and if BGL greater than 7 mmol/L, commence IV Dextrose/ insulin infusion, as per INSULIN DOSE TITRATION table 1 – see below

NOTE: Insulin infusion is not required for women with type 2 DM if BGLs are within normal range i.e. less than 7.0 mmol/L

See section Post-Partum Management of Type 2 DM

Insulin dose titration

This guideline is intended to apply on the morning of Induction / Caesarean section.

Note, this protocol SHOULD NOT be used in the event of a hyperglycaemic crisis such as ketoacidosis, coma or hyperosmolar hyperglycaemic syndrome. **Instead, contact the on call Physician or Obstetric Medicine Registrar.**

Table 1- Rate to COMMENCE insulin infusion

Blood glucose level	Rate of Insulin Infusion	Measure BGL in:
Less than 7 mmol/L	Withhold insulin	2 hours
7 to 8 mmol/L	1mL/hour (i.e. 1 unit/hour)	2 hours
Greater than 8 mmol/L	2mL / hour	1 hour

Continue to adjust insulin infusion according to BGLs as shown in table 2

Table 2- Rate to MAINTAIN insulin infusion

BGL in mmol/L	Action Required	Frequency of BGLs
>15 mmol/L	Give 4mL (=4 units) bolus. Increase infusion rate by 1mL (=1 unit) per hour.	Retest BGL in 1 hour. (if BGL remains >15mmol/L notify Physician)
7-15 mmol/L	Increase insulin rate by 1mL (= 1 unit) per hour. If exceeding 4mL (= 4 units) per hour, inform RMO.	Retest BGL in 1 hour.
5-7mmol/L AND recent increase to insulin infusion rate in the last hour .	Reduce insulin rate by 1mL (= 1 unit) per hour.	Retest BGL in 1 hour.
5-7mmol/L AND NO increase to insulin infusion rate in the last hour .	Maintain infusion rate.	Retest BGL in 1 hour. If BGL stable for 3 hours, retest BGL 2 hourly instead.
4-5mmol/L	Halve insulin infusion rate.	Retest BGL in 1 hour.
<4mmol/L	Stop Insulin infusion Give 50mL bolus of 10% Dextrose IV If <4 mmol/L, leave infusion off and consult with physician. If BGL 4-6 mmol/L leave infusion off Once BGL > 6.0 mmol/L, recommence infusion at HALF the previous rate.	Retest BGL in 15 minutes. Retest BGL in 15 minutes. Retest BGL in 1 hour and follow Table 2 (if BGL remains <4 mmol/L notify Physician)

Postpartum Management of type 2 DM

- If used during labour/ caesarean section, cease insulin/ dextrose infusion at delivery of the placenta
- Check MR 004 for any ongoing medication orders
- Monitor BGL (fasting and 2 hours post each meal) for 24 hours, then as decided by Physician/ Diabetes Educator
- Contact Physician/ Diabetes Educator if blood glucose levels are consistently above 10.0mmol/L.
- Women are referred back to their General Practitioner or Specialist Centre for ongoing management of their diabetes

Postnatal care / follow-up

Aims

- All women with Gestational Diabetes receive advice reinforcing lifestyle changes necessary to prevent/ delay the onset of future type 2 DM including weight loss / maintenance, healthy diet and regular activity.
- Women with Type 1 diabetes receive information to minimise the risk of hypo / hyperglycaemia occurring in the postpartum period.
- Women with Type 1 diabetes receive information regarding the possible change in insulin requirements with breastfeeding.
- Women with pre-existing diabetes have a summary letter sent to the Diabetes Physician or clinic of their choice and their GP. A new referral should be made if necessary.

Gestational diabetes- postnatal care

- Most women with gestational diabetes revert to normoglycaemia at the time of the birth and do not require insulin in labour.
- If insulin has been required in labour, **discontinue** insulin immediately after the birth.

Management

- Check a random blood glucose the day after the birth.
- Repeat 4 point BGL (fasting and 2 hours post meals for three meals) once, on day prior to discharge.
- Cease blood glucose monitoring if BGL within normal range.
- Elevated BGL (above 10 mmol/L): contact the Medical Registrar / diabetes educator. After hours contact the Diabetes Consultant on call if BGLs are consistently elevated.
- It is recommended that women who have had GDM visit their GP for a follow up oral glucose tolerance test at 6-12 weeks postpartum, and every 1-2 years thereafter³
- Lifestyle counselling is given (information over page).
- A summary letter is sent to the woman's GP for follow-up care.

Note: Less than 10% of women with GDM remain hyperglycaemic after the birth. The management of these women requires ongoing care from a diabetes or medical clinic in collaboration with their general practitioner.

Lifestyle counselling

- Approximately 50% of women who have had gestational diabetes develop Type 2 diabetes mellitus later in life. Lifestyle counselling for the prevention of diabetes is therefore vital.

- Prior to discharge, all women with gestational diabetes should be offered information about:
 - Healthy eating patterns (small frequent low fat meals and snacks)
 - Regular physical activity (30 minutes/day – moderate intensity)
 - Weight control
 - Contraception
 - Long term follow-up
 - Preconception counselling
 - Future pregnancy

Type 1 diabetes- postnatal care

- Women with type 1 DM require insulin for life.
- Circulating insulin must be available at all times and the timing of ceasing an intravenous insulin infusion and commencing subcutaneous insulin is important to ensure sufficient circulating insulin.
- There is a dramatic decrease in insulin requirements post partum, usually less than the pre pregnancy requirement.
- Review the instructions on the MR 004 regarding commencing the insulin dose postpartum.
- Continue monitoring the blood glucose levels. Type 1 women require more frequent testing. If the BGL is elevated $> 10\text{mmol/L}$ or lowered $< 4.0\text{mmol/L}$ contact the diabetes educator or medical registrar for review.

Continuous Subcutaneous Insulin Infusion (CSII) Pumps

- Women with their own insulin pumps are individually managed by the physician.
- Staff should know how to switch the pump off in case of severe hypoglycaemia.

Type 2 diabetes – postnatal care

- Postpartum there is usually a dramatic decrease in insulin needs.
On delivery of the placenta:
 - Many women do not require insulin / OHA'S for some time after delivery – review instructions on MR 004.
 - There is clear evidence that glibenclamide does not appear in breast milk in more than vestigial quantities, and metformin levels in milk are also very low. It is therefore reasonable to use these with breastfeeding if required.^{4, 5}

- Repeat 4 point BGL (fasting and 2 hours post meals for three meals). If elevated, (FBG > 5.5 or post meals >10), refer the woman to the diabetes educator or medical Registrar for review.
- Continue blood glucose monitoring, two to three days per week, in accordance with usual non-pregnant monitoring
- Ensure the woman has a follow up appointment with her GP or Diabetes Specialist for further diabetes monitoring.

Contraception

- Pregnancy in a woman with diabetes has implications for the health of the woman and her baby.
- Unplanned pregnancy in a woman with diabetes with less than optimal diabetic control is accompanied by an increase in the risk of fetal abnormalities and other adverse events.
- Contraception must be discussed **before** the patient leaves hospital. This includes both reversible and permanent methods of contraception.
- Implanon is a suitable contraceptive for diabetic women.
- The combined oral contraceptive pill is safe in diabetes. The progesterone only pill has a higher failure rate than the combined OCP and other long acting progesterone only contraceptives.
- The progesterone only pill is preferred to the combined OCP from 8 weeks postpartum. It does not affect lactation.⁵
- Women undergoing a second or further caesarean section must be counselled of the risks of further caesarean births.

Blood glucose meter –Optium Neo H

Key points

1. Ensure that the sensor and sensor electrodes are at room temperature. The operating temperature range is 18° to 30° C.
2. If the sensor is moved to an area that is warmer or cooler than its original place, allow 10 - 12 minutes for it to reach the new temperature.
3. The relative humidity range is 10% to 90%
4. The Optium Neo H blood glucose meter must be correctly coded to the pack of strips in current use.
5. Monthly monitoring of the hospital Optium Neo H blood glucose meters is required through the 'MediPro glucose monitoring quality assurance program' which is coordinated through the diabetes service.

Equipment required

- Optium Neo (H) blood glucose meter portable work station (available on each ward and department).
- Optium "Freestyle (H)" Blood Glucose Sensor Electrodes (available from pharmacy). NB: The letter 'H' denotes that these electrodes are for hospital use only.
- Lancing device prepared for use (available from stores).

Important warning

Women with diabetes may have their own Optium Xceed blood glucose meter. The Optium home meters use different strips called "FreeStyle Optium" blood glucose strips which do not require coding and **do not have the letter 'H' on the box.**

These are not interchangeable with hospital strips and must not be given to women to use in their own meters.

NDSS (National Diabetes Supply Scheme)

- The diabetes service is a sub agent for NDSS as are most chemists.
- Most women who attend the Diabetes Service are registered with the NDSS (excluding overseas visitors).
- Women requiring test strips (for any meter) or insulin pen needles may access their supplies through NDSS as subsidised prices.

Completing a blood glucose test using the ward / department meter

PROCEDURE	ADDITIONAL INFORMATION
1. Perform hand hygiene.	Make sure hands are thoroughly dry before handling sensor electrode and testing
2. Check the expiry date on the packet	Expired sensor electrodes may give false results.

3. Calibration procedure

- | | |
|--|---|
| <p>With lot number facing toward you, insert contact bars of the calibrator into the monitor. 'LOT' and number appear in the display window. Check that the numbers match.</p> | <p>A calibration sensor is in every pack of electrodes.</p> |
| <p>4. Open a sensor electrode packet by tearing diagonally at the notch in the foil.</p> | <p>Tear off the smaller end of the packet so that the contact bars of the sensor electrode are showing. Don't cut the sensor electrode.</p> |
| <p>5. Pull the electrode out of the packet.</p> | <p>You can use the packet later to discard the used electrode.</p> |
| <p>6. Insert electrode with contact bars, facing up, into the sensor test port.</p> | <p>Damaged sensors may give inaccurate results.</p> |
| <p>7. Push the electrode in until it stops. The sensor turns on automatically. LOT =, the five-digit lot number and then Apply Blood appear in the display window.</p> | <p>The sensor will turn on by itself.</p> |
| <p>8. Check that the lot number displayed matches the lot number on the calibrator bar and the electrode package insert for the electrodes currently in use.</p> | |
| <p>9. Obtain a hanging drop of blood using your lancing device and the correct technique.</p> | |
| <p>10. Touch the blood drop to the white target area of the electrode while Apply Blood appears in the display window. Gently hold your finger on the target area while the blood drop is drawn into the electrode.</p> | <p>The test will start when the blood sample is detected.</p> |
| <p>11. Move your finger away from the target area when the display shows -- (three dashes).</p> | <p>Once enough blood has collected the sensor displays ---,--, and then the countdown.</p> |
| <p>12. After the countdown, your blood glucose result will appear. Record the result.</p> | <p>The result is also stored in your sensor's memory.</p> |
| <p>13. Your sensor will automatically turn off 30 seconds after result is displayed.</p> | <p>You can also press the button to turn your sensor off.</p> |
| <p>14. Remove the electrode and discard it properly.</p> | <p>You may slip the electrode into the opened foil packet to remove and discard.</p> |

Glucagon education (partners) – Type 1 diabetes

Aims

- All women with type 1 diabetes shall be offered a Glucagon prescription and education if she presents in early pregnancy (4-24 weeks).
- Pregnant women with type 1 diabetes require a support person who has been trained to effectively administer Glucagon (Glucagen® hypo kit)

Reasons/causes of hypoglycaemic episodes	<ul style="list-style-type: none"> • Early pregnancy – 6 to 16 weeks gestation • Too much insulin • Skipping meals / insufficient carbohydrate • Morning sickness
Signs and symptoms of hypoglycaemia	<ul style="list-style-type: none"> • Partner to ask / identify what symptoms person usually feels • Discuss the signs seen when partner is “low”
“Do not’s” in hypo	If unconscious – do not force food or drink
Method	<ul style="list-style-type: none"> • Snap lid off vial • Inject sterile water from syringe into vial containing powder • Keep needle and syringe in vial and shake until powder dissolved • Draw up into syringe, expel air • Inject GlucaGen® into muscle
Sites for injection	INTRAMUSCULAR INJECTION: <ul style="list-style-type: none"> • upper arm, upper thigh, buttocks
Dose	Women require a full dose to be given = 1mg/ml (1i.u)
Action of GlucaGen®	Usually takes 10 to 15 minutes to respond.
If no response to GlucaGen®	<ul style="list-style-type: none"> • Phone for Ambulance assistance • IV glucose is required
When returns to consciousness and able to swallow safely	<ul style="list-style-type: none"> • Give fast acting carbohydrate • List the types of food suitable • Reassure the woman
Side effects	Nausea/vomiting
Storage	<ul style="list-style-type: none"> • Room temperature <25°C • Easy accessible location (out of reach of children) • Use immediately once prepared • Release tape when purchased for easy access in emergency
Supplies	Obtain prescription from GP Check expiry date regularly
Emergency numbers	<ul style="list-style-type: none"> • Ambulance service • Local hospital Emergency Department

Insulin pen devices

Key Points

- Women with diabetes are encouraged to be self-managing and continue to use their own insulin pen devices and needles.
- **However, as there is real risk of needle stick injury, staff should not under any circumstances recap and/or remove a standard pen needle from an insulin pen.**
- Where a patient is unable to complete the process of removing and disposing of the needle, **staff should use a safety pen needle (BD AutoShield™ Duo) available in all areas and suitable for all insulin pens.**
- Staff assisting women to give insulin shall attend in-service on insulin pen devices.
- Staff shall contact the Diabetes service (6458 2163) if unfamiliar with the insulin pen device in use.

Staff instructions: Using patient pen devices

Use of BD Autosshield™ duo safety pen needle (staff)

1. When a patient is unable to complete the process of removing and disposing of the pen needle **staff should use the AUTOSHIELD™ DUO SAFETY PEN NEEDLE and administer the insulin.**
2. **AUTOSHIELD™ DUO SAFETY PEN NEEDLE are not for patient's use. They are for staff use only**
 - Take the Peel Tab off the pen needle. Holding the outer cover, push and twist the pen needle onto the pen in a clockwise direction until it meets resistance.
 - Pull **ONLY** the outer cover straight off.
 - Always check the flow in the pen needle before each injection by priming the device with an airshot (dial 2 units) repeat if needed.
 - Dial prescribed dose on the pen, place pen on skin at 90 degree angle and with slight pressure the needle will automatically be inserted into the skin.
 - Maintain this pressure on the skin as you deliver the dose (by pressing the button with your thumb) and continue the pressure on the skin for a further 6 seconds allowing the insulin dose to be fully administered.
 - Do not inject with the needle pointing at an angle toward your fingers. This may result in a needle stick injury.
 - Once dose is fully delivered lift pen away from the skin. The Inner Shield will automatically deploy and lock in place.
 - A Red Indicator Band will appear confirming Shield is locked in place and that the Pen Needle has been used.
 - Always hold the Pen Needle by the White Sleeve when removing. Twist pen needle in an anticlockwise direction to remove needle from the pen.

- Pen Connection end is protected – confirmed when orange shield deploys and covers the needle.
- DO NOT PLACE YOUR FINGERS ON THE ACTIVATED SHIELDS.

Patient instructions: Using own devices and needles

Use of an insulin pen device

- Wash and dry hands.
- Remove the Pen cap.

Attaching the needle

- Remove the protective tab from patient's insulin pen needle and screw the needle securely onto the Pen.
- Pull off the clear outer and keep to remove needle after injection
- Pull off inner needle cap when ready to inject, and discard.
- Do not discard the clear outer needle cap.

Injecting a dose

- Re-suspend cloudy insulin by rocking / rolling the pen until the insulin is uniformly suspended.
- **Prime pen prior to each injection as follows:**
 - Dial 2 units by turning the dose selector forward.
 - Hold FlexPen with the needle pointing up. Tap the reservoir gently with your finger a few times to make sure any air bubbles collect at the top.
 - With the needle still pointing upwards, press the Push Button fully in until the dose selector returns to zero. A drop of insulin should appear at the needle tip.
 - If not, repeat the air shot up to 6 times until a drop of insulin does appear. If a drop still does not appear, do not use your FlexPen.

Dose selection:

- Ensure the Push Button is fully depressed and the dose selector is set at zero. Dial the number of units required by turning the dose selector in a clockwise direction.
- The dose can be corrected both up and downwards.
- You cannot set a dose larger than the number of units remaining in the reservoir. 60 units is the maximum dose.

Injection of insulin:

- Pinch your skin between two fingers, push the needle into the skin fold and then inject the insulin by pressing the Push Button down fully with your thumb.

Be careful to only press the Push Button when injecting)

Leave the needle under the skin for at least 6 seconds. Keep the Push Button fully pushed in until you remove the needle from the skin this will ensure that the full dose is given.

Removing the needle

- Replace the clear outer needle cap and unscrew the needle. Dispose of it into a sharp's container.
- It is important that you use a new needle for each injection.
- Replace the Flexpen cap and store the FlexPen you are using in the refrigerator or below 25 degrees Celsius.
- Insulin can be kept at room temperature (less than 25 degrees Celsius) for 30 days from opening. After this time, the insulin pen should be discarded.
- Flexpen not in current use must be stored in the refrigerator between 2-8 degrees.

Function check

If your pen is not working properly, follow this procedure.

- Screw on a new pen needle.
- Prime pen
- Dial 20 units and put the outer needle cap into the needle.
- Dispense 20 units into the needle cap holding the pen with the needle pointing downwards.
- The solution will fill the lower part of the cap to the top of the phalanges on the cap.
- If pen has released too much or too little, repeat the test. If it happens again do not use the pen.

Insulin infusion pump management - inpatient

Aim

- To enable individuals whose diabetes is being treated in the outpatient setting with a continuous subcutaneous insulin infusion (CSII) can continue to be managed safely with their insulin pump during their hospitalisation.

Key points

1. Hospital staff should assume, unless otherwise advised, that the only person who can manage the pump during their hospitalisation is the patient.
2. Any changes in insulin administration will need to be made by the patient who must be competent in managing the pump and physically and mentally able to accept and institute these recommendations.

Competency

Any patient who is admitted to hospital using an insulin pump must be assessed for their competency to use their device. If they can demonstrate their physical and mental competency to manage the device, the patient should be allowed to continue on their insulin pump.

On admission to hospital, either to a ward or Emergency Department, the patient must demonstrate to the satisfaction of the assessing health professional that they have the ability to use the management program of the device and understand how to modify the program.

The diabetes educator or diabetes physician on call for the hospital should be notified upon admission of a patient with an insulin pump. An urgent consultation should be obtained if there is a concern about competency of the patient to continue on pump therapy. It may be possible to rectify any issues or concerns, allowing the patient to continue on their insulin pump.

If the patient is not proficient with their pump, the physician on call may institute alternative therapy.

Contraindications

The use of the CSII is contra-indicated in situations where the patient's safety may be compromised by the physical illness or mental state of the patient.

Contra-indications for CSII using an insulin pump are:-

- Patients with an impaired level of consciousness.
- Labour and birth is not an absolute contraindication to the use of an insulin pump, and may be used as determined by the physician.
- Patients with critical illness requiring intensive care.
- Patients with major psychiatric disturbance.
- Diabetic ketoacidosis. Patients refusing or unwilling to participate in self care.

- Lack of infusion sets, spare batteries and other equipment required to maintain patient on CSII therapy.
- Any other medical circumstance deemed unsuitable by the supervising medical officer.

Any discontinuation of pump therapy should be preceded by a discussion with the diabetes physician, diabetes educator and obstetric team.

Documentation

Before a patient continues on CSII as an in-patient, the following criteria must be documented.

- It must be clearly written in the medical record and on the blood glucose monitoring form that the patient is on an insulin pump.
- The brand name and model of the pump must be written in the medical record.
- The type of insulin used in the insulin pump must be identified and recorded in the blood glucose monitoring form.
- The current basal and bolus insulin doses must be documented in the medical record.
- That competency has been assessed and deemed satisfactory, as per above section.
- The patient agrees to notify the medical staff of any changes they make to their insulin pump.

Consultations

The following health professionals should be consulted.

- Diabetes Physician.
- Diabetes Educator.
- Dietitian.

Insulin adjustment

- Changes to the patient's insulin therapy may be made at any time by the patient provided the change is notified to the diabetes educator / medical staff, as stated above.
- Any change to the insulin regimen recommended by the diabetes educator /medical staff will be documented in the medical record and confirmed by the patient at the time of implementation, as stated above.

Blood glucose monitoring

- Patients on an insulin pump should perform a minimum of 4 blood glucose tests per day.

- A minimum of 4 tests per day may be performed in patients with satisfactory control.
- In patients with less satisfactory control, 6 tests per day should be performed
- An overnight test (e.g. 02:00) may be necessary.
- Additional blood glucose levels may be undertaken at any time by the patient.
- Additional tests may be performed at the request of the medical officer or nursing / midwifery staff when clinically indicated.
- The number of tests performed each day can only be reduced on the orders of the medical officer and can **NEVER** be reduced to less than 4 tests per day.

Device management

- The patient is responsible for ensuring the correct operation of the insulin pump.
- The patient will rotate the infusion set consistent with the recommendations for the device. This will be every three days, unless other documentation is provided.
- The patient will make the adjustments to the insulin pump's program.
- The patient will be responsible for all bolus dose administration.
- The insulin pump may need to be discontinued temporarily during a number of circumstances during hospitalisation. In this situation, discontinuation of the insulin pump for more than 30 minutes may result in significant hyperglycaemia.
- Such circumstances where the insulin pump needs to be temporarily disconnected includes:-
 - Any radiological investigation (pump must be removed)
 - CT Scan (pump must be removed)
 - MRI scan (pump must be removed, including metal cannula)
 - Physiotherapy (depending on the therapy)
 - Hydrotherapy (if pump is not water-proof)
- Patients whose insulin pump needs to be discontinued for longer than 30 minutes may need to be considered for an injection of subcutaneous insulin, e.g. subcutaneous soluble insulin (Actrapid, Humulin R, Humalog, Novorapid or Apidra) to cover their short term requirements.
- Patients needing to be regularly disconnected from their insulin pump should be considered for basal/bolus subcutaneous insulin injection therapy.

Operations and procedures

- The use of the CSII in operating theatres, procedure rooms etc is not contraindicated. Its use must be considered carefully in consultation between the anaesthetist, surgeon, physician, diabetes educator and patient.
- Potentially the insulin pump, by delivering stable and consistent insulin administration over hours can provide excellent peri-operative blood glucose control.
- In the basal infusion mode only, it can be considered “equivalent” to a very long acting insulin.
- As with all patients with diabetes undergoing surgery, patients who are unconscious need to be monitored carefully during and after their surgical procedure. Their blood glucose should be measured frequently while their conscious state is impaired.

Patients continuing on CSII peri-operatively

- The patient must consent to continuing on the insulin pump therapy peri-operatively.
- CSII and IV insulin should not run at the same time.
- The infusion site must be placed away from the operation site with consideration also given to where a diathermy pad may be placed. Ensure the insertion cannula is plastic, not metal. If the pump is to be used during surgery, the patient must replace metal cannulas with plastic insertion cannulas before any surgical procedures that may involve diathermy.
- An identification tag must be attached to the patient that states that the patient is using an insulin pump. This should be sited in a readily visible position appropriate to the procedure to be undertaken.
- The anaesthetist must have access to the insulin pump during surgery to enable it to be turned off or disconnected if necessary.
- The patients BGLs must be monitored every hour peri-operatively until they have satisfactorily regained consciousness and the patient is capable of making decisions regarding managing their insulin pump.
- In the event of the blood glucose levels increasing to an unsatisfactory level peri-operatively, the diabetes physician on-call should be notified and switching to an IV insulin infusion should be considered.
- In the event of the BGL levels falling below 4mmol/L peri-operatively, the insulin pump must be turned and / or disconnected. Once euglycaemia is restored, CSII may be recommenced, either at a lower insulin infusion rate (if the medical staff are able to programme the device) or at a higher IV glucose infusion rate to prevent further episodes of hypoglycaemia. Alternatively, the insulin pump may remain off and an IV insulin infusion commenced to control the patients BGLs.

- The use of CSII in major procedures should only be considered in rare circumstances due to the strong possibility that an adjustment to the patients' insulin therapy will be required during the prolonged peri-operative period. Discontinuation of the insulin pump and commencement of IV insulin therapy is recommended in this situation.

Patients not continuing on CSII peri-operatively.

- Patients whose insulin pump is discontinued prior to surgery **will** require an intravenous insulin infusion.
- Discontinuation of the insulin pump even for short periods of time with no alternative source of insulin may result in the rapid development of hyperglycaemia and the patient should be carefully monitored.
- The CSII can be recommenced when (a) the patient has regained full consciousness and (b) it is considered medically appropriate.

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Related WNHS policies, procedures and guidelines

KEMH Clinical Guidelines, O&G:

- **Antenatal Care Schedule**
- **Midwifery Led Care Exclusions**

Keywords:	Diabetes, pregnancy, education, type 1, type 2, GDM, NDSS, diabetes education, diabetes classes, blood glucose, blood sugar levels, blood glucose monitoring, blood glucose test, BSL, BGL, abnormal blood glucose levels, monitoring blood glucose, recording blood glucose, blood glucose meter, diabetes service, hypoglycaemia, management of hypoglycaemia, symptoms hypoglycaemia, treatment hypoglycaemia, ketoacidosis, DKA, OHA, insulin, diabetes educators, blood glucose monitoring, normoglycaemia, labour, induction, caesarean section, neonate, postnatal, Blood glucose meter, Optium Xceed, sensor, diabetes, calibration, electrode, GDM after Bariatric Surgery,		
Document owner:	Diabetes Service		
Author / Reviewer:	Evidence Based Clinical Guidelines Co-ordinator		
Date first issued:	February 2003		
Last reviewed:	Dec 2017; April 2018	Next review date:	April 2021
Endorsed by:	Maternity Services Management Sub Committee (MSMSC)	Date:	April 2018
Standards Applicable:	NSQHS Standards: 1  Clinical Care is Guided by Current Best Practice 4-  Medication Safety; 9  Clinical Deterioration		
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Appendix I: Low Risk Models of Care Planner: GDM



Low Risk Models of Care Planner

for all Women with Gestational Diabetes (GDM) in Pregnancy

Plan of Care	Date	Sign
24 Weeks		
Book obstetric team review for next appt		
28 Weeks		
Obstetric team review ***FBC clients identified as GDM, chart review by General Practitioner/ Obstetrician (GP), GP to request 34/40 USS. Low risk midwives clinic – midwife to order 34/40USS Growth scan (if woman on treatment or large/ small for dates) Dietitian review		
32 Weeks		
Dietitian review Growth Scan if woman on treatment or large/ small for dates Book obstetric team review for next appt Midwife to view BGLs **CTG - twice weekly if there is poor BGL control, IUGR or ↑ BP on medication or fetal macrosomia		
34 Weeks		
Obstetric team review – mode of birth plan Growth scan all GDM's Dietitian review if sugars abnormal FBC client midwife to view BGLs **CTG		

Plan of Care	Date	Sign
36 Weeks		
Book obstetric team review for next appt FBC clients GP to review USS and review chart, document if suitable for FBC birth otherwise alternative plan of care. **CTG		
37 Weeks		
Obstetric team review Growth scan if on treatment, > 95th percentile @ 34/40 or large for dates. Midwife to view BGLs **CTG		
38 Weeks		
Birth if on treatment FBC client MGP midwife to view BGLs **CTG		
40 Weeks		
Birth		

** Women with GDM who are well controlled on diet, insulin or oral hypoglycaemics do not need routine monitoring. Women who have poor blood glucose control, are hypertensive on treatment or who have a macrosomic or IUGR fetus should be discussed with the consultant re management and twice weekly CTG's.

***FBC clients who are well controlled on diet, normotensive and do not have a macrosomic or IUGR fetus may remain under the care of the FBC GP and MGP midwife and birth at the FBC by 40 weeks. Otherwise the GP will review the client and make a plan of care which may involve transfer to an obstetric team and birth on LBS.

****MGP/FBC clients requiring insulin therapy following review by GPO and FBC CMS may attend Diabetes Nurse Practitioner Clinic with MGP/FBC midwife in attendance. The Nurse Practitioner will review USS and adjust insulin. These clients will birth on LBS.

Blood Glucose Goals

Before Breakfast – Less than 5.1mmol/L

2 hours from start of each meal – Less than 6.7