TYGERBERG HOSPITAL
Department of Obstetrics and Gynaecology: General Specialist Services

PROTOCOL FOR THE MANAGEMENT OF DIABETES IN PREGNANCY

(BASED ON THE ACCREDITED PROVINCIAL GUIDELINE FOR DIABETES IN PREGNANCY)

GESTATIONAL DIABETES MELLITUS (GDM) (SECTION A)

- Glucose intolerance with onset or first recognition during pregnancy.
- *It therefore includes mothers who have Impaired Glucose Tolerance (IGT) and Diabetes diagnosed during the index pregnancy.*

PRE-GESTATIONAL DIABETES MELLITUS (PDM) (SECTION B & C)

- Pregnancy is safely achievable, women with diabetes who are planning to become pregnant should aim to maintain their HbA_{1c} below 6.1% and take folic acid 5mg daily.
- Women with diabetes whose HbA_{1c} is above 10% should be strongly advised to avoid pregnancy.
- All known Type 1 & 2 pregnant diabetic patients should be referred to the nearest high risk clinic directly after booking. Do not stop any anti-diabetic drugs before referral

SUMMARY OF CARE FOR DIABETES IN PREGNANCY:

APPOINTMENT	CARE FOR WOMEN WITH DIABETES DURING PREGNANCY
First appointment (joint diabetes and antenatal clinic)	Offer information, advice and support in relation to optimising glycaemic control. Take a clinical history to establish the extent of diabetes-related complications. Review medications for diabetes and its complications, review record of glycaemic control [HbA_{1c}] (Consider performing HbA_{1c} on a monthly basis). Retinal and/or renal assessments if these have not been undertaken in the previous 12 months.
7–9 weeks	Confirm viability of pregnancy and gestational age.
Booking appointment (ideally by 10 weeks)	Offer information, education and advice about how diabetes will affect the pregnancy, birth and early parenting
12 weeks	NT scan (for pre-existing diabetes)
16 weeks	Offer retinal assessment at 16–20 weeks (or earlier if necessary) to women with pre-existing diabetes who showed signs of diabetic retinopathy at the first antenatal appointment.
20 weeks	Fetal anomaly scan
24 weeks	Doppler tests of the umbilical artery (if pre-existing diabetes)
34 weeks	Ultrasound monitoring of fetal growth and amniotic fluid volume.
36 weeks	Offer information and advice about: • Timing, mode and management of birth • Analgesia and anaesthesia • Changes to hypoglycaemic therapy during and after birth • Management of the baby after birth • Initiation of breastfeeding and the effect of breastfeeding on glycaemic control • Contraception and follow-up.
38 weeks	Do ultrasound fetal weight and morphometry. Offer elective delivery.
39 weeks -41 weeks	Offer tests for fetal well being on weekly basis if patient declines delivery at 38 weeks.

A. MANAGEMENT: GESTATIONAL DIABETES

1. Who to screen for diabetes at any antenatal clinic:

1.1. Do a urine test for glucose with each antenatal visit:

- If 1+ glucose or more on diagnostic strips: do a random blood glucose test (If patient is at local MOU/BANC) or glucose profile (if patient is at High Risk Clinic)

1.2. In addition, the following patients must be screened [with a glucose profile or, preferably, with a 75g Oral Glucose Tolerance Test (OGTT)]; preferably before the visit at 28 weeks at a doctor's clinic even if the urinary diagnostic strips remain negative for glucose:

- Previous gestational diabetes (do OGTT already with booking)
- Unexplained intra-uterine death in a previous pregnancy
- Previous macrosomic baby > 4.5 kg
- Body Mass Index at booking >40 kg/m^2
- Maternal age >40 years
- Family history of diabetes (first-degree relative with diabetes)
- Family origin with a high prevalence of diabetes (Asiatic)
- Acanthosis nigricans
- Polycystic ovarian syndrome

2. Glucose testing at Local MOU/BANC clinic and interpretation of the values:

2.1. **Interpretation of a random glucose test (BANC/MOU care):**

- **<8 mmol/l** is normal. Continue with BANC/MOU care.
- ≥**8 but < 11 mmol/l:** return to the clinic the next morning (or as soon as possible thereafter) for a fasting blood glucose test.
- ≥**11 mmol/l:** Refer to the nearest specialist high-risk clinic (within 1 day).

2.2. **Interpretation of a fasting blood glucose (glucose profile) (BANC/MOU care) -** do not eat or drink anything after 22h00 the previous night (except for water).

- <6 mmol/l is normal- continue with BANC/MOU care
- ≥6: Put on 7600 kJ diet and refer to a doctor's clinic for further management of the pregnancy. At the doctor's clinic: do a glucose profile (see below) after 2 weeks and then every 4 weeks until after delivery. If fasting still ≥6 mmol/l and/or 2-hour value ≥8 mmol/l, refer to a high-risk clinic.
- ≥8 mmol/l: Refer to the nearest specialist/ high-risk clinic (within 1 day).

3. Glucose profile at the antenatal clinic (Tygerberg Hospital) and interpretation of the values:

3.1. How to do a glucose profile at the clinic:

- NPO from midnight (only water allowed)
- Patient brings own breakfast to clinic
- Test fasting blood glucose level
- Eat breakfast, repeat blood glucose test 2 hours later

3.2. Values diagnostic of GDM:

- Fasting value > 5.5 mmol/L
- 2-Hour value > 7.7 mmol/L

4. Initial management of GDM:

4.1. Do thorough medical examination including a baseline serum urea and creatinine.

4.2. Start on 7600 kJ diet and refer to dietician for advice. All diabetic pregnant patients must do moderate exercise for 30 minutes each day.

MAINTAIN CONTROL - *Aim for a fasting value of 3.5 - 5.5 mmol/l and a 2-hour post-prandial level of below 7mmol/l. HbA_{1c} should ideally be performed every 4 weeks to monitor glycaemic control with the aim of maintaining this value below 6.1%.*

4.3. Clinical judgement should be exercised when moving from lifestyle to medical interventions. Certain women can be given 2 weeks to assess the impact of lifestyle interventions.

- Start on oral anti-diabetic drugs: Metformin (first choice) 500mg twice a day; increase if needed to 850mg three times a day. Alternative choice Daonil® (glybenclamide) 2.5-5 mg twice daily. Follow up in two weeks with a glucose profile.

4.4. If there is poor control at follow up, admit the patient to antenatal ward (F2). While continuing with the oral medication, perform a 24-hour blood sugar monitoring profile for additional <u>insulin requirement</u> (determine glucose values half an hour before each main meal and 2 hours after the meal). Then add insulin to control blood sugar:

- Begin an insulin regimen with Protophane (GREEN) [Humulin N] only. Start at a dose of 0.2u/kg. If the calculated dose comes to more than 20 units, start with 20 units. It is generally a good idea to start 2 units lower than the calculated dose if the dose is less than 20 units and the patient has not been on insulin before. Protophane should be administered 30 minutes before bedtime and the patient should have a snack just before going to sleep. Monitor the fasting glucose values and HbA_{1c}. When the <u>fasting morning</u> value remains high, Protophane can be increased in a stepwise fashion until fasting values are normal.

- As safety precaution monitor glucose level 4 hours after administration once protophane has been initiated or dosages modified. If fasting values are normal but HbA_{1c} is raised there are post-prandial excursions. Determine glucose values half an hour before each main meal and 2 hours after the main meal (three times a day) for 24-48 hours before any changes and then add Actrapid (YELLOW) [Humulin R] as indicated below only once fasting values have been normalised.
- Identify the meal with the largest post-prandial increase and begin with Actrapid® 4 units (30 minutes prior to meal). Increase by 2 units until the post-prandial value is within the target range. If necessary apply the same principle to other meals.
- As soon as the profile is satisfactory and the patient can inject herself, she can be discharged. Mark the antenatal card as level 3 (high risk).

4.5. Follow up at a high risk/diabetic clinic according to the schedule below.

4.6. Remember to offer home monitoring to any patient on insulin.

4.7. Review control with HbA_{1c} 2 weeks after discharge along with home monitoring values before and after meals.

5. Follow up of gestational diabetics at a high-risk clinic / diabetes clinic:

5.1. Perform glucose profile with each visit. Follow up 2 weekly (if well controlled glycaemic profile) until 36 weeks. Thereafter weekly until delivery. (Rural patients can be followed up at their own clinic in conjunction with a specialist outreach program.)

5.2. Perform detail ultrasound at 20 weeks including four-chamber view of the fetal heart and outflow tracts.

5.3. Perform ultrasound fetal evaluation and weight estimation at 36-38 weeks (weight estimation clinically or with ultrasound, if available).

5.4. **Offer delivery at 38 weeks if certain gestation** (preferable option). If patient opts to continue with pregnancy, do weekly fetal surveillance until 41 weeks and then deliver. If gestation uncertain, perform amniocentesis and fetal lung maturity tests.

- Opt for **elective caesarean section if the estimated fetal weight is > 4kg** at term and the baby has typical diabetic morphometry (AC >90^{th} centile, HC ± 50^{th} centile).

6. Management of GDM in Labour:

ALL DIABETIC PATIENTS MUST DELIVER IN A HOSPITAL WITH SPECIALIST SUPERVISION AND 24-HOUR NEONATAL RESUSCITATION FACILITIES

6.1. Stop oral hypoglycaemic agents on the day of scheduled delivery or the night before an elective induction or caesarean section.

6.2. Do hourly blood sugar values- aim for a value of between 4 and 7 mmol/l during delivery (if patient still eating meals).

6.3. If this can be achieved without additional insulin, monitoring blood sugar may be all that is needed.

6.4. As soon as patient is nil per os, start a maintenance infusion of 10 units of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre of 5% dextrose and administer intravenously at 100ml/hour.

- Aim for hourly blood sugar values maintained between 4 and 7 mmol/L
- If blood sugar levels rise >8mmol/l, place on a maintenance infusion of 12-14 units of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre of 5% dextrose. Administer at 100 ml per hour. (Discard any previous infusions).
- If blood sugar level is <4mmol/l replace the maintenance infusion with a new infusion of 6-8U of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre 5% dextrose, at 100 ml/hour. (Discard any previous infusions).

6.5. Perform continuous fetal heart rate monitoring with CTG during labour.

6.6. Delivery in the lithotomy position is preferable.

6.7. The labour ward doctor must be present during delivery (danger of shoulder impaction).

6.8. The doctor on call for paediatrics must be present at delivery (remind them in time).

6.9. Do not continue with oral anti-diabetic drugs after delivery

6.10. Follow up 6 weeks–3 months after delivery to determine the long-term risk for diabetes.

NB! *Women who were diagnosed with gestational diabetes should be offered lifestyle advice (including weight control, diet and exercise) and offered at least a glucose profile (as described earlier) at the 6-week postnatal check and annually thereafter.*

B. MANAGEMENT: PRE-GESTATIONAL DIABETES (NON-INSULIN DEPENDANT)

1. Management of Type 2 Diabetic at High Risk Clinic:

1.1. Search for complete medical records on the management of her disease to date. Do thorough medical examination: look for complications of diabetes and for signs of long-standing diabetes.

1.2. Refer to ophthalmology for retinal check up if long standing type 2 diabetes and no assessment in the past year.

1.3. Do renal assessment: Serum-creatinine and urine diagnostic strips

- If serum-creatinine > 120 micromol/L refer to nephrologists
- If ≥ 1+ proteinuria do 24-hour urine protein quantification. If total protein > 2g/24-ours refer to nephrologists.

1.4. Start on 7600 kJ diet and refer to dietician for advice. All diabetic pregnant patients must do moderate exercise for 30 minutes each day.

1.5. Review with glucose profile. How to do a **glucose profile** at the antenatal clinic:

- NPO from midnight (only water allowed)
- Patient brings own breakfast to clinic
- Test fasting blood glucose level
- Eat breakfast, repeat blood glucose test 2 hours later

MAINTAIN CONTROL - *Aim for a fasting value of 3.5 - 5.5 mmol/l and a 2-hour post-prandial level of below 7mmol/l. HbA_{1c} should ideally be performed every 4 weeks to monitor glycaemic control with the aim of maintaining this value below 6.1%.*

2. Pharmacological management of type 2 pregnant diabetics at the high risk clinic:

2.1. Stop all anti-diabetic drugs and replace with: metformin 500mg twice a day; increase if needed to 850mg three times per day. Follow up in two weeks with a glucose profile.

2.2. If there is poor control at follow up, admit the patient to hospital. While continuing with the oral medication, perform a 24-hour blood sugar monitoring profile for additional insulin requirement (determine glucose values half an hour before each main meal and 2 hours after the meal). Then add insulin to control blood sugar:

- Begin an insulin regimen with Protophane (GREEN) [Humulin N] only. Start at a dose of 0.2u/kg. If the calculated dose comes to more than 20 units, start with 20 units. It is generally a good idea to start 2 units lower than the calculated dose if the dose is less than 20 units and the patient has not been on insulin before. Protophane should be administered 30 minutes before bedtime and the patient should have a snack just

before going to sleep. Monitor the fasting glucose values and HbA_{1c}. When the fasting morning value remains high, Protophane can be increased in a stepwise fashion until fasting values are normal.

- As safety precaution monitor glucose level 4 hours after administration once Protophane has been initiated or dosages modified. If fasting values are normal but HbA_{1c} is raised there are post-prandial excursions. Determine glucose values half an hour before each main meal and 2 hours after the main meal (three times a day) for 24-48 hours before any changes and then add Actrapid (YELLOW) [Actrapid HM or Humulin R] as indicated below only once fasting values have been normalised.
- Identify the meal with the largest post-prandial increase and begin with Actrapid® 4 units (30 minutes prior to meal). Increase by 2 units until the post-prandial value is within the target range. If necessary apply the same principle to other meals.
- As soon as the profile is satisfactory and the patient can inject herself, she can be discharged. Mark the antenatal card as level 3 (high risk).

2.3. Follow up at the high risk/diabetic clinic according to the schedule below.

2.4. Remember to offer home monitoring to any patient on insulin.

2.5. Review control with HbA_{1c} 2-4 weeks after discharge along with home monitoring values before and after meals.

3. Follow up of type 2 diabetics at a high-risk clinic / diabetes clinic:

3.1. Perform glucose profile with each visit. Follow up 2 weekly (if well controlled glyceamic profile) until 36 weeks. Thereafter weekly until delivery. (Rural patients can be followed up at their own clinic in conjunction with a specialist outreach program.)

3.2. Perform NT scan at 11-13 weeks and detail ultrasound at 20 weeks including four-chamber view of the fetal heart and outflow tracts.

3.3. Perform Doppler test of the umbilical artery at 24 weeks.

3.4. Perform ultrasound fetal evaluation and weight estimation at 36-38 weeks (weight estimation clinically or with ultrasound, if available).

3.5. **Offer delivery at 38 weeks if certain gestation** (preferable option). If patient opts to continue with pregnancy, do weekly fetal surveillance until 41 weeks and then deliver. If gestation uncertain, perform amniocentesis and fetal lung maturity tests.

- Opt for **elective caesarean section if the estimated fetal weight is > 4kg** at term and the baby has typical diabetic morphometry (AC >90^{th} centile, HC ± 50^{th} centile).

4. Management of Type 2 diabetes in Labour:

ALL DIABETIC PATIENTS MUST DELIVER IN A HOSPITAL WITH SPECIALIST SUPERVISION AND 24-HOUR NEONATAL RESUSCITATION FACILITIES

4.1. If the patient is only on oral anti-diabetic drugs, manage the same as for GDM.

4.2. If she is using insulin, put up a maintenance infusion of 10 units of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre of 5% dextrose and administer intravenously at 100ml/hour.

4.3. If hourly values not maintained between 4 and 7 mmol/l:

- If blood sugar levels rise >8mmol/l, replace the maintenance infusion with a new infusion of 12-14 units of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre of 5% dextrose. Administer at 100 ml per hour. (Discard any previous infusions).
- If blood sugar level is <4mmol/l replace the maintenance infusion with a new infusion of 6-8U of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre 5% dextrose, at 100 ml/hour. (Discard any previous infusions).

4.4. Perform continuous fetal heart rate monitoring with CTG during labour.

4.5. Delivery in the lithotomy position is preferable.

4.6. The labour ward doctor must be present during delivery (danger of shoulder impaction).

4.7. The doctor on call for paediatrics must be present at delivery (remind them in time).

4.8. Stop the infusion after delivery and restart the same dose of oral drugs as before the pregnancy.

4.9. Follow up after delivery at the woman's regular diabetes clinic.

Women with pre-existing type 2 diabetes who are breastfeeding can resume or continue to take metformin and/or glibenclamide immediately following birth but other oral hypoglycaemic agents should be avoided while breastfeeding.

C. MANAGEMENT: PRE-GESTATIONAL DIABETES (INSULIN DEPENDANT)

1. Management of Type 1 Diabetic at High Risk Clinic:

1.1. Search for complete medical records on the management of her disease to date. Review the records of glycaemic control and HbA_{1c} (ideally perform HbA_{1c} on a monthly basis). Do thorough medical examination: look for complications of diabetes and for signs of long-standing diabetes.

1.2. An ophthalmic examination should be done (fundoscopy). Refer to ophthalmology for retinal check up if no assessment in the past year.

1.3. Do renal assessment: Serum-creatinine and urine diagnostic strips

- If serum-creatinine > 120 micromol/L refer to nephrologists
- If ≥ 1+ proteinuria do 24-hour urine protein quantification. If total protein > 2g/24-ours refer to nephrologists.

1.4. Start on 7600 kJ diet and refer to dietician for advice. All diabetic pregnant patients must do moderate exercise for 30 minutes each day.

1.5. Most patients on insulin will already be using short acting insulin three times a day with intermediate or long-acting insulin at night (basal bolus). If this is not the case but there is good control, continue with the current regime, otherwise change to the basal bolus approach, which is the ideal.

1.6. If a change of regimen is necessary admit to hospital. Calculate total daily insulin requirement, and then administer 50% as intermediate acting (Protophane / Humulin N) 30 min before bed time (with a maximum starting dose of 30U) and 50% as short acting insulin (Actrapid / Humulin R) 30 minutes prior to each main meal (divide evenly over the three meals).

- While on the basal bolus regimen, determine glucose values half an hour before each main meal and 2 hours after the main meal (three times a day) and at bedtime for 24-48 hours before any changes.
- Begin with the fasting glucose value. If this is still high increase the dose of Protophane by 2-4U increments until within the target range.
- Next compare pre- and post-prandial values. If there is an increase of >2mmol/l over meals and the post–prandial value is not within the target range, add 2U Actrapid to existing dosage until within the target range.
- In Type I diabetics it is sometimes necessary to use Protophane twice daily as the effect lasts only for 12-18 hours (shorter in pregnancy). Consider a second dose of Protophane when pre-prandial values at lunch and supper remain high.
- All patients with IDDM must do home monitoring of blood glucose. If she does not have the necessary equipment, motivate for this before discharge.

- All insulin dependent diabetics must carry glucagon and sweets with them at all times with detailed instructions on their use in cases of hypoglycaemia.

MAINTAIN CONTROL - *Aim for a fasting value of 3.5 - 5.5 mmol/l and a 2-hour post-prandial level of below 7mmol/l. HbA_{1c} should ideally be performed every 4 weeks to monitor glycaemic control with the aim of maintaining this value below 6.1%.*

1.7. As soon as the profile is satisfactory and the patient can inject herself, she may be discharged. Mark the antenatal card as level 3 (high risk).

1.8. Follow up at a diabetic or high risk clinic according to the schedule below

2. Follow up of controlled type 1 diabetics at a high-risk clinic / diabetes clinic:

2.1. Perform glucose profile with each visit. Follow up 2 weekly (if well controlled glycaemic profile) until 36 weeks. Thereafter weekly until delivery. (Rural patients can be followed up at their own clinic in conjunction with the specialist outreach program, but must preferably stay with family or friends in a larger centre for the duration of the pregnancy to attend the tertiary diabetic unit.)

2.2. Perform NT scan at 11-13 weeks and detail ultrasound at 20 weeks including four-chamber view of the fetal heart and outflow tracts.

2.3. Perform Doppler test f the umbilical artery at 24 weeks.

2.4. Perform ultrasound fetal evaluation and weight estimation at 36-38 weeks (weight estimation clinically or with ultrasound, if available).

2.5. **Offer delivery at 38 weeks if certain gestation** (preferable option). If patient opts to continue with pregnancy, do weekly fetal surveillance until 41 weeks and then deliver. If gestation uncertain, perform amniocentesis and fetal lung maturity tests.

- Opt for **elective caesarean section if the estimated fetal weight is > 4kg** at term and the baby has typical diabetic morphometry (AC >90th centile, HC ± 50th centile).

3. Management of Type 1 diabetes in Labour:

ALL DIABETIC PATIENTS MUST DELIVER IN A HOSPITAL WITH SPECIALIST SUPERVISION AND 24-HOUR NEONATAL RESUSCITATION FACILITIES

3.1. Put up a maintenance infusion of 10 units of short-acting insulin in 1 liter of 5% Dextrose and administer intravenously at 100ml/hour as soon as patient is nil per os

3.2. Perform hourly glucose determination- must be maintained between 4 and 7 mmol/lL.

3.3. If hourly values not maintained between 4 and 7 mmol/l:

- If blood sugar levels rise >8mmol/l, replace the maintenance infusion with a new infusion of 12-14 units of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre of 5% dextrose. Administer at 100 ml per hour. (Discard any previous infusions).

- If blood sugar level is <4mmol/l replace the maintenance infusion with a new infusion of 6-8U of short-acting (Actrapid HM® or Humulin R) insulin in 1 litre 5% dextrose, at 100 ml/hour. (Discard any previous infusions).

3.4. Perform continuous fetal heart rate monitoring with CTG during labour.

3.5. Delivery in the lithotomy position is preferable.

3.6. The labour ward doctor must be present during delivery (danger of shoulder impaction).

3.7. The doctor on call for paediatrics must be present at delivery (remind them in time).

3.8. After the delivery the patient can be returned to the insulin doses used before pregnancy. As insulin requirements will be much less directly after the delivery, the patient should be monitored for hypoglycaemia.

D. MANAGEMENT: DIABETIC KETO-ACIDOSIS (DKA) IN PREGNANCY

1. DKA in pregnancy is diagnosed and managed the same way as any other adult patient with DKA using standard protocols.

2. Diagnosis:

- Clinical signs
- Serum glucose > 11 mmol/l
- BLOOD GAS: Ph< 7.3, HCO_3< 15 mmol/l, Base Excess >10
- Ketones: + urine, serum acetone>1:2

3. There is often fetal distress observed during the management of DKA, but management of the fetus should be delayed until the mother is adequately resuscitated.

4. ADMIT TO A HIGH CARE UNIT IN A SECONDARY OR TERTIARY HOSPITAL

4.1. *FLUID MANAGEMENT:*

- Calculate the fluid deficit = 100ml/kg [Aim to replace 75% over 24 hrs]
- 0.9% NaCl: 1 to 1.5 litres in the first hour (infusion rate: 15–20 ml/kg).
- Reassess hydration status hourly and check serum sodium concentration (s-Na^+)
- Continue with 0.9% NaCl if s-Na^+ is normal or low: 250–500 ml/h (4–14 ml/kg depending on the hydration status)
- If s-Na^+ is elevated change to 0.45% NaCl

4.2. INSULIN MANAGEMENT:

- IV bolus: Regular insulin 0.1IU/kg followed by a continuous infusion at a rate of 0.1 IU/kg per hour
- Usually prepared as follows: 20 IU in 200 ml 0.9% saline (0.1 IU/ml) Thus for an 80 kg person: 8 IU/h = 80 ml/h or 80 microdrops/min
- Reassess blood glucose: if >15mmol/l, continue at 0.1U/kg/hour
- Decrease the insulin infusion rate to 0.05U/kg/hour if glucose <15mmol/l

MAKE SURE THAT THERE IS 5% DEXTROSE IN THE IV FLUIDS IF HGT<15mmol/l

4.3. *BICARBONATE (Controversial)*

- If the pH < 7.1, HCO_3<5: give 50 mmol/l $NaHCO_3$ in 200 ml 0.45% saline over one hour
- If the pH < 6.9: 100 mmol/l NaHCO3 in 400 ml 0.45% saline over one hour
- This can be repeated two-hourly

4.4. POTASSIUM (K^+)

- Always check K concentration before commencing with insulin administration.
- If K > 5.0 mmol/l no K^+ supplement but check two-hourly
- If K <5.0 mmol/l add 20 mmol in each litre of IV fluid in order to maintain the K^+ concentration between 4.0–5.0 mmol/l
- If K^+ < 4.0 mmol/l add 30 mmol to the initial IV fluid (withhold insulin untill K^+ > 3.0 mmol/l)
- If K < 3.0 mmol/l add 40 mmol to the initial IV fluid (withhold insulin until K^+ > 3.0 mmol/l)

AUTHORISED BY	GS Gebhardt
COMMITTEE RESPONSIBLE	GS Gebhardt, E Langenegger, L Geerts, JL van der Merwe
DATE REVISED	
DATE EFFECTIVE	1 August 2010
REVIEW DATE	31 July 2013
EVIDENCE	Evidence basis for the above decision is available on request

Signed: GS Gebhardt

Head: general specialist services; Obstetrics and Gynaecology