

Guideline for the Management of Diabetes		Barnsley Hospital  NHS Foundation Trust
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Introduction

Rationale

Diabetes is the most common medical disorder that can affect pregnancy. Women with diabetes have an increased risk of perinatal mortality and congenital malformations. The aim is to ensure that evidence based information and best practice guidance is available for all staff involved in caring for women with Diabetes during pregnancy, the intrapartum and postpartum period.

Scope

This guideline applies to all staff working in the maternity unit who care for women with diabetes.

Background

Approximately 650,000 women give birth in England and Wales each year, and 2–5% of pregnancies involve women with diabetes. Approximately 87.5% of pregnancies complicated by diabetes are estimated to be due to gestational diabetes (which may or may not resolve after pregnancy), with 7.5% being due to type 1 diabetes and the remaining 5% being due to type 2 diabetes. (NICE, 2008)

Diabetes in pregnancy is associated with risks to both the woman and the developing fetus. Miscarriage, pre-eclampsia, preterm labour and stillbirth are more common in women with pre-existing diabetes. Congenital malformations, Macrosomia, birth injury, perinatal mortality and postnatal problems such as hypoglycaemia are more common in the newborn of women with pre-existing diabetes. In addition diabetic retinopathy can worsen rapidly during pregnancy. Maternity services must ensure implementation of robust processes to manage the risks associated with pre-existing diabetes.

Guideline Outline

PRE- CONCEPTUAL CARE

Women with diabetes should be strongly advised to avoid unplanned pregnancy and encouraged to seek advice when planning a pregnancy. By establishing good glycaemic control before conception and continuing this throughout pregnancy, the risk of miscarriage, congenital malformation, stillbirth and neonatal death may be reduced.

Specialist health professionals can offer pre-conception care and advice to women and their partners before discontinuing contraception that may help reduce the risks.

- Offer lifestyle advice on diet, exercise and weight management. Refer to dietician.

- Establish glycaemic control with HbA1c assessment. Measure monthly until target value of <6.1% achieved. Any reduction in HbA1c may reduce risks but pregnancy should definitely be avoided with levels >10%
- Encourage continued self monitoring of blood glucose and agree individualised targets.
- Arrange retinol screening and any treatment if necessary.
- Renal assessment with 24 hour urine collection for protein/ creatinine clearance

When conception is deemed safe:

- Advise Folic Acid 5mg and arrange prescription. To be continued until 12 weeks gestation
- Review medication. Oral hypoglycaemic agents should be stopped and insulin therapy commenced. A basal bolus regime is recommended to give greater flexibility and glycaemic control using analogue and isophane insulin's.
- Stop statins
- Stop Angiotensin-converting enzyme (ACE) inhibitors and angiotensin-II receptor antagonists and consider alternative antihypertensives.
- Discuss hypoglycaemia and hypoglycaemia unawareness. Provide Glucagon kit.
- Discuss pregnancy related nausea and vomiting and glycaemic control
- Encourage ketone testing if hyperglycaemic or unwell and clarify action plan.
- Discuss proposed plan of care for the antenatal period. Provide contact numbers.

Pre-conceptual care is available from the Diabetes Specialist Nurse and Diabetes Link Midwife at BHNFT. Please contact them directly or ring Antenatal clinic for advice.

REFERRAL PATHWAY

Women with type 1 & 2 Diabetes

Early referral of women with pre-existing Diabetes to antenatal services is crucial for the chance of a successful pregnancy. Any referral will be dealt with as high priority.

- Referrals will be accepted from GP's, Midwives, Diabetes Specialist Nurse, Diabetologist.
- Verbal referral can be taken initially so that an appointment can be expedited as soon as possible.
- Antenatal clinics for this client group are held at BHNFT on Thursday afternoon. This consists of members of the multidisciplinary team who specialise in diabetes.
- An Ultrasound Scan will be arranged and the pregnancy dated.

- An individualised plan of care, encompassing pregnancy and the postnatal period (6 weeks) will be formulated with the woman in antenatal clinic and documented in her own maternity notes.

For verbal referrals please contact Antenatal clinic or the Lead Diabetes Specialist Nurse.

Women with previous gestational diabetes

Women who have been affected by Gestational Diabetes in previous pregnancies should be referred for shared care in the medical disorders antenatal clinic.

An Oral Glucose Tolerance Test is not indicated. Early self monitoring of Blood Glucose is recommended.

- Refer to Diabetes Team to obtain monitoring equipment and to attend for teaching of blood glucose monitoring. This is held every Thursday in the Antenatal Clinic. Contact 01226 433985 to arrange. (This should be at least 1 week before antenatal clinic appointment with the consultant)
- Arrange Antenatal Clinic appointment in medical disorders clinic

TIMETABLE OF ANTENATAL CLINIC APPOINTMENTS

Gestational diabetes:

- Women with a previous history of gestational diabetes will have referral to the combined endocrine clinic – first hospital appointment.
- Newly diagnosed women following impaired GTT will be seen in the combined endocrine clinic within 1-2 weeks of diagnosis..
- After the initial appointment they will be seen as a minimum every 4 weeks in the clinic.

Pre-existing diabetes:

- Early referral to combined endocrine clinic- First hospital appointment.
- Second appointment between 11+2 -14+2 weeks gestation incorporating dating scan and choice of 1st trimester screening
- Non-Insulin requiring women are seen as a minimum every 2-4 weeks.
- Insulin requiring women are seen as a minimum 1-2 weekly for titration of insulin.

This will be recorded on the Antenatal Diabetes care pathway

INVOLVEMENT OF THE MULTIDISCIPLINARY TEAM

Women with a pre-existing Diabetes will be classed as high risk and attend the combined endocrine clinic where they will have regular consultations with members of the multidisciplinary team.

As a **minimum** they will be seen by the following people at the specified times:

- Obstetrician at the first appointment and then after the USS appointments at 20,28, 32 and 36 weeks. They will be reviewed in between as appropriate.
- Diabetologist at first appointment. For type 1 and 2 diabetes they will be reviewed thereafter as appropriate.
- Specialist Midwife at each hospital appointment.
- Diabetes Specialist Nurse (DSN) at each hospital appointment
- Dietician at the first appointment. They are offered referral at each visit.

This will be recorded on the Antenatal Diabetes Care Pathways. An individualised plan of care, encompassing pregnancy and the postnatal period up to 6 weeks will be documented in the antenatal clinic care plan and hospital records.

Commence Diabetes in pregnancy notes in addition to hand held green notes.

ULTRASOUND EXAMINATION AT 20 WEEKS

Women are offered a fetal anatomy ultrasound scan at 20 weeks. This includes an examination of the four chamber view of the heart for any abnormality in line with NICE recommendations. The fetal anatomy scan report clearly indicates that this has been done and if there are any problems identified.

GLUCOSE TOLERANCE TEST (GTT) IN PREGNANCY

Criteria for booking a GTT in pregnancy:

- BMI >30
- Previous baby over 4.5kg
- Family history – 1st degree relative
- Ethnicity (South Asian, Black Caribbean and Middle Eastern have a high prevalence of diabetes)
- Large for dates fetus / polyhydramnios
- Presenting symptoms of diabetes (Glycosuria alone is not an indication).
- Polycystic ovary syndrome.

Women who have had previous abnormal GTT do not require testing in subsequent pregnancies. Early self monitoring of Blood Glucose is recommended.

Referral should be made to Diabetes Team and Medical disorders antenatal clinic.

Management pre test

- Rationale should be discussed in ANC
- Appointment made for 28/40 and letter with information given to the woman
- Normal diet for 3 days prior to the test
- No food from midnight before test. Water only.
- No smoking is advised until completion of the test.

Procedure

- Ensure woman has fasted as instructed
- Explain the test and obtain consent
- Check Blood Glucose level with Accu Check prior to test. If ≥ 7.0 mmol/l await result of fasting venous blood sample before proceeding to give Lucozade.
- Obtain fasting venous blood sample
- Woman to drink 75g / 410mls Lucozade
- Obtain venous blood sample 2 hours after Lucozade
- Offer woman food and drink following procedure
- Document in hospital case notes and hand held notes
- Inform of results the same day by telephone

Interpretation of GTT results

Fasting plasma glucose	<6.1	= Normal
Fasting plasma glucose	6.1 – 6.9mmol/l	= Impaired fasting glycaemia (IFG)
Fasting plasma glucose	≥ 7 mmol/l	= Diabetes
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120mins glucose	≤ 7.8	= Normal
120mins glucose	7.9 – 11.0mmol/l	= Impaired glucose tolerance (IGT)
120mins glucose	≥ 11.1 mmol/l	= Diabetes (WHO 2002)

Management of abnormal result

- Refer to Diabetes Specialist nurse for teaching of Blood Glucose monitoring – usually the following Thursday in antenatal clinic. The woman will also meet the Dietician at this visit
- Refer to Medical disorders antenatal clinic. Make appointment for 1 - 2 week following Blood glucose teaching appointment.
- Explain clearly to the woman the result and need for subsequent appointments with specialist health professionals. Give all appointment dates and times.

WOMEN WITH GESTATIONAL DIABETES.

Care and advice:

- Commence orange Diabetes in pregnancy noted.
- Ensure equipment and information given regarding self blood glucose monitoring. Agree individualised targets. Aim for fasting blood glucose of <5.5mmols and 1 hour postprandial blood glucose levels <7.8mmol/l
- Offer information and advice around healthy lifestyle choices
- Contact with dietician via antenatal clinic appointments for dietary advice
- Regular contact with diabetes specialist nurse / diabetes midwife for review of blood glucose levels, information and education (2 - 4 weekly)
- Monthly laboratory testing for HbA1c assessment. Aim for <6.1% (<43mmol/mol IFCC)
- Insulin initiation may be necessary if blood glucose levels are persistently raised despite dietary and lifestyle adjustments.
- Growth scans are not necessary unless clinically indicated.
- Aim for spontaneous vaginal delivery at term. (No indication for early induction of labour if not on insulin therapy)

WOMEN WITH PRE-EXISTING DIABETES

Care and advice required:

Non Insulin requiring pre-existing diabetes (Type 2):

- Folic Acid 5mg pre-conceptually and for the first trimester
- Commence 75mgs aspirin daily from 12 weeks gestation until the birth of the baby
- Advise the woman of the risks of hypoglycaemia and the risks of poor control in pregnancy.
- Ensure equipment and information given regarding self blood glucose monitoring. Agree individualised targets. Aim for fasting blood glucose of <5.5mmol/l and 1 hour postprandial blood glucose levels <7.8mmol/l
- Oral hypoglycaemic therapy should be reviewed at each contact.

- Women who are on Metformin may wish to continue with this medication. This should be a shared informed decision between the woman and the specialist clinical team.
- Offer contact with dietician via antenatal clinic appointments for dietary advice
- Regular contact with diabetes specialist nurse / diabetes midwife for review of blood glucose levels, information and education (2 - 4 weekly)
- Review by Diabetologist at 1st appointment and at weeks 20, 28 and 36. More regularly if diabetes control is problematic and diabetes specialist nurse is concerned.
- Monthly laboratory testing for HbA1c assessment. Aim for 43mmol / mol IFCC and below.
- Women may not require insulin therapy initially but this may become necessary if blood glucose levels are persistently raised despite dietary adjustments
- Baseline renal assessment with 24hour urine collection for protein / creatinine clearance (ideally should be pre-conceptually but definitely when pregnancy confirmed) If abnormal, referral to nephrologist may be necessary and repeat test every 4 weeks. If normal renal function, repeat in each trimester at week.
- Baseline retinal screening as soon as pregnancy confirmed (if not performed pre-pregnancy) Repeat in each trimester
- Regular fetal surveillance with anomaly ultrasound scan at 20 weeks which includes 4 chamber view of fetal heart and assessment for growth and liquor volume at 28 – 32 – 36 weeks
- Aim for spontaneous vaginal delivery at term.

NB - Some women who are on Metformin may wish to continue this medication during pregnancy. NICE guidelines currently support the use of Metformin during pregnancy. This should be discussed with the lead Obstetrician and Diabetologist.

Insulin requiring diabetes (Type 1 and Type 2)

- Review Oral therapy if taking Metformin. All other oral hypoglycaemic therapy should be stopped.
- Review use of angiotensin-converting enzyme inhibitors and angiotensin-II receptor antagonists and consider alternative antihypertensives.
- Stop use of statins.
- Folic acid 5mg pre-conceptually and for first trimester
- Commence aspirin 75mgs daily from 12 weeks gestation until the birth of the baby
- Discuss self blood glucose monitoring. Agree individualised targets. Aim for fasting blood glucose of ≤ 5.5 mmol/l and 1 hour postprandial blood glucose levels < 7.8 mmol/l
- Discuss the risks of hypoglycaemia, hypoglycaemia unawareness and treatment options with the woman and family members. Provide glucagen treatment.

- Give blood ketone testing equipment and advise women with type 1 diabetes to test their ketone levels if hyperglycaemic or during illness. Provide education and advice to woman and her family regarding action plan if unwell.
- 4 weekly HbA1c assessment aiming for 43 mmol / IFCC or below.
- Baseline renal assessment with 24hour urine collection for protein / creatinine clearance (ideally should be pre-conceptually but definitely when pregnancy confirmed) If abnormal (e.g.) serum creatinine > 120 and/or total > 2grms in 24 hours, referral to nephrologist may be necessary. Repeat every 4 weeks. If normal renal function, repeat in each trimester
- Refer for baseline retinal screening as soon as pregnancy confirmed (if not performed pre-pregnancy) Repeat in each trimester
- Regular fetal surveillance with anomaly ultrasound scan at 20 weeks and assessment for growth and liquor volume at 28 – 32 – 36 weeks
- Ongoing information and education as documented within the Diabetes in Pregnancy notes
- Mode of delivery should be determined on an individual basis where possible, aiming for spontaneous vaginal delivery at term but before 40 weeks
- Discuss the beneficial effects of breast feeding on metabolic control for both mother and baby

MANAGEMENT OF ELECTIVE SURGERY

The peri-operative management of a person with diabetes aims to maintain adequate control of blood glucose and reduce risk of complications. From the moment of admission, the multidisciplinary team with expertise in caring for people with diabetes should continue to be involved in care provision.

Some women with gestational diabetes who have required only small amounts of a meal related short acting insulin (<20units total doses) and not on long acting insulin's, may not require sliding scale regime for surgery. This will be assessed on an individual basis and documented in the case notes.

Pre- operative management:

- Ceasarean sections at BHNFT are currently on Tuesday or Thursday afternoons. Therefore women can be admitted at 8am on the day of surgery.
- Women should have breakfast with their usual dose of insulin before 7am and then fast.
- On admission, obtain bloods for U & E's and laboratory glucose test.
- If blood glucose levels >15mmol/l inform anaesthetist. Surgery may be cancelled.

The day of surgery:

Afternoon List

- To have breakfast with usual dose of insulin before 7am then fast.
- Test blood glucose at 10.00hrs and commence sliding scale regime as below.
- Commence infusion of 500ML 10% Dextrose with 10mmol Potassium Chloride (KCL) via IVAC infusion pump. Infuse at 100ml / hour
- Draw up 49.5ml of Normal Saline in a 50ml syringe. Add 50 units of soluble Insulin – Actrapid. Infuse via syringe pump. Rate according to sliding scale below.

The two infusions can run through separate intravenous lines or through the same cannula via a Y connector.

BLOOD GLUCOSE MMOL / L	INSULIN INFUSION RATE UNITS / HOUR
<2	No Insulin
2.1 - 3	0.5
3.1 – 4.5	1
4.6 – 6.4	2
6.5 – 11.0	3
11.1 - 17	4
17+	6

Insulin = 1 unit / ml

- Record Hourly Blood Glucose
- If blood glucose >11, inform Registrar

This sliding scale regime is a guide and will be successful for maintaining stable blood glucose for the majority of cases. But be aware that women who have been extremely insulin resistant during pregnancy may also require slight modification of this regime. Contact DSN for advice.

Should it become necessary to do the caesarean section on a morning list :

- Fast from midnight
- Omit usual morning dose of insulin.
- Check Blood Glucose levels at 07.00hrs prior to commencing Sliding Scale insulin regime.
- Commence infusion of 500ML 10% Dextrose with 10mmol Potassium Chloride (KCL) via IVAC infusion pump. Infuse at 100ml / hour
- Draw up 49.5ml of Normal Saline in a 50ml syringe. Add 50 units of soluble Insulin – Actrapid. Infuse via syringe pump. Rate according to sliding scale.

Post-operative management:

- IV infusion of insulin should be reduced by half at delivery of the placenta.
- Monitor blood glucose levels hourly in the initial post operative period.
- Normal diet should be resumed as soon as possible
- For women who had gestational diabetes, discontinue sliding scale regime. No further treatment is necessary.
- For women with pre-existing diabetes, once eating and drinking, discontinue the Sliding Scale regime. Pre-pregnancy insulin regime should be recommenced with advice and guidance from the Diabetes Specialist Nurse. If breast feeding, insulin requirements may be less. A plan should be documented in the patients orange hand held notes.
- If unable to tolerate diet, the Sliding Scale Insulin regime must be maintained and blood glucose levels monitored 2 hourly. Check U & E's at 6 hours
- The woman should resume control of monitoring her diabetes as soon as possible. Frequency of testing blood glucose levels should be determined by glycaemic control but testing pre-meals and 2 hours post-meals is advisable.
- Ensure appropriate treatment readily available for hypoglycaemic episodes.
- Following birth, the baby should have a feed as soon as possible and be commenced on the "high risk" hypoglycaemia regime.
- Advise good glycaemic control prior to considering future pregnancies.
- Refer back to routine diabetes care

MANAGEMENT IN LABOUR

Women requiring insulin

Labour should ideally be spontaneous at Term, but poor diabetic control or deterioration in maternal/fetal condition may necessitate earlier planned delivery. Pregnancy should not continue beyond 40 weeks.

In all cases the care plan will reflect the management and interim care for the woman's individual needs and will be recorded in the woman's records

Induction of labour using PGE2 is the desired method. Women with diabetes who undergo induction of labour using PGE2 will be cared for on the antenatal ward where they can eat and drink normally. Their regime for diabetic control remains unchanged until the woman is transferred to the Labour Ward where the following regime is instigated:

Management pre- delivery

- Measure blood glucose levels on arrival. Obtain bloods for FBC, U & E's, Haematocrit and blood glucose
- Commence infusion of 500ML 10% Dextrose with 10mmol Potassium Chloride (KCL) via IVAC infusion pump. Infuse at 100ml / hour

- Draw up 49.5ml of Normal Saline in a 50ml syringe. Add 50 units of soluble Insulin – Actrapid
- Infuse via syringe pump. Rate according to sliding scale. (as below)
- The two infusions can run through separate intravenous lines or through the same cannula via a Y connector.

BLOOD GLUCOSE MMOL / L	INSULIN INFUSION RATE UNITS / HOUR
<2	No insulin
2.1 - 3	0.5
3.1 – 4.5	1
4.6 – 6.4	2
6.5 – 11.0	3
11.1 - 17	4
17+	6

Insulin = 1 unit / ml

Please Note: Some women who have been extremely insulin resistant during pregnancy may require modification of this regime depending upon individual blood glucose control.

- Remember that these women are high risk and therefore no food or drinks are allowed during labour. **Water only.**
- Record Hourly Blood Glucose. Aim for 4-7mmol/l
- If blood glucose >11, inform Registrar
- If Syntocinon is required during labour – ensure it is diluted with Normal Saline. Infuse through a separate line.
Do not give Hartmann's or further Glucose
- Continuous CTG monitoring is recommended.

Management Post delivery

- IV infusion of insulin should be reduced by half at delivery of the placenta
- Following delivery, Insulin requirements fall dramatically. Once the woman is able to eat and drink normally, the Insulin and Dextrose infusions should be discontinued.
- Pre pregnancy insulin regime should be resumed. Requirements may be less if breast feeding. Liaise with Diabetes Specialist Nurse / Link Midwife for further advice.
- Record blood glucose Levels hourly for 6 hours
- The baby should have a feed as soon as possible and be commenced on the “high risk” hypoglycaemia regime.

Gestational diabetes (insulin requiring)

- Should be managed in labour using insulin requiring diabetes guidelines.
- Women who have required only small doses of analogue insulin with food (<20units total doses) and no isophane insulin may not require sliding scale regime. This will be decided on an individual basis and documented in the case notes.
- Should stop insulin immediately after delivery and monitor blood glucose levels
- Baby should feed as soon as possible following birth and commence the hypoglycaemia regime

Gestational diabetes (diet controlled)

- Continuous Electronic Fetal Monitoring to be used during labour. No other intervention required unless indicated.
- Monitor Blood Glucose levels 2 hourly.
- Should only need dextrose/potassium infusions during labour if blood sugars become unstable. This is the decision of the senior obstetrician.
- No need for regular blood glucose monitoring post delivery if no insulin required during labour.
- Baby should feed as soon as possible following birth and commence the hypoglycaemia regime

MANAGEMENT OF PRE-TERM/SUSPECTED PRE-TERM LABOUR IN WOMEN WITH DIABETES (In addition to existing pre-term/suspected pre term labour guideline)

- Women should be an in-patient on labour ward or antenatal ward
- Consider administration of steroids for fetal lung maturation
- Consider tocolytic medication to suppress labour if indicated. (Not betamimetic drugs) Atosiban is appropriate to use.
- Monitor blood glucose levels closely if steroids are used. Insulin administration will be case specific based on individual circumstances and may be intermittent or sliding scale (liaise with diabetes specialist nurse / Endocrinologist)
- Record fluid intake and output on fluid balance chart. Test each urine specimen for ketones.
- Women can eat and drink normally. Normal insulin administration should be continued for insulin requiring diabetes.

REMEMBER REGULAR BLOOD GLUCOSE TESTING IS THE KEY TO AVOIDING COMPLICATIONS.

POSTNATAL CARE OF WOMEN WITH DIABETES

Immediately after delivery of the placenta, maternal insulin sensitivity improves and insulin requirements fall dramatically. There must be a clear plan of care documented in the woman's case notes to ensure:

- The appropriate management of diabetes in the postnatal period
- The maintenance of good glycaemic control

Postnatal management of TYPE 1 diabetes:

- IV infusion of insulin should be reduced by half at delivery of the placenta.
- When eating and drinking normally, discontinue insulin infusion and recommence pre-pregnancy insulin doses. If breast feeding insulin requirements may be lower and carbohydrate intake needs to be increased.
- Liaise with diabetes specialist nurse for advice:
 - Insulin requirements - the woman should resume control of monitoring her diabetes as soon as possible. Frequency of testing blood glucose levels should be determined by glycaemic control. Ensure appropriate treatment readily available for hypoglycaemic episodes.
 - Advise good glycaemic control prior to considering future pregnancies and discuss contraceptive needs
- Refer back to routine diabetes care

Postnatal management of TYPE 2 diabetes:

- IV infusion of insulin should be reduced by half at delivery of the placenta.
- When eating and drinking normally, discontinue insulin infusion.
- Close monitoring of blood glucose levels is vital to the management of women with type 2 diabetes
- Liaise with diabetes specialist nurse for further advice on diabetic control:
 - Oral hypoglycaemic agents should be avoided if breastfeeding and insulin may be continued.
 - Advise the woman regarding the requirements for an increased carbohydrate intake during breast feeding.
 - Metformin and glibenclamide may be recommenced immediately following birth even if breast feeding.
 - If not breast feeding, recommence pre pregnancy oral hypoglycaemic agents
 - The woman should resume control of monitoring her diabetes as soon as possible. Frequency of testing blood glucose levels should be determined by glycaemic control. Ensure appropriate treatment readily available for hypoglycaemic episodes.

- Advise good glycaemic control prior to considering future pregnancies and discuss contraceptive needs
- Refer back to routine diabetes care

For any women who have retinopathy diagnosed in pregnancy, further screening should be performed within 6 months following birth

Postnatal Management of gestational Diabetes

Insulin requiring gestational diabetes

- IV infusion of insulin to be discontinued following delivery of placenta.
- Resume normal eating and drinking as soon as possible.
- Advise continued close monitoring of blood glucose levels. Testing pre-meal and 2 hours post-meals is advisable. Women should be reminded of the symptoms of hyperglycaemia.
- No further treatment required unless hyperglycaemia persists.
- Inform about the almost certain risk of having diabetes in subsequent pregnancies.
- Arrange a full Oral Glucose Tolerance Test for 6 weeks post delivery.
- Inform woman of importance of this test.

It is the position of BHNFT diabetes team that women who have had gestational diabetes and required insulin should have a full oral glucose tolerance test.

Non-insulin requiring gestational diabetes

- Resume normal eating and drinking as soon as possible.
- Perform random monitoring of blood glucose levels prior to transfer to community care to exclude persisting hyperglycaemia.
- Advise of increase risk of diabetes in future pregnancies.
- Ensure request to GP in postnatal discharge letter for fasting plasma glucose test at 6 week postnatal check.
- Inform woman of importance of this test.

Women who were diagnosed with gestational diabetes should be offered lifestyle advice (including weight control, diet and exercise) and offered a fasting plasma glucose measurement (but not an oral glucose tolerance test) at the 6-week postnatal check and annually thereafter

NEONATAL CARE

- Babies of women with diabetes should be kept with their mother unless there are clinical complications that warrant admission to the neonatal intensive care unit.
- Skin to skin contact should be initiated at birth to prevent hypothermia and subsequent hypoglycaemia.

- The mother should be made aware of the benefits of breast feeding on metabolic control for both her and her baby.
- Ideally feeding should be initiated within 30 minutes of birth and this aspect of care documented. Regular feeding should be encouraged thereafter.
- Blood Glucose levels should be tested 3-4 hours following birth and then according to Trust's "screening for hypoglycaemia" protocol. The method of testing used should be documented. (Testing too soon after birth will detect the normal physiological fall in blood glucose levels)
- Any concerns for the newborn should be referred to the paediatrician without delay.
- Tests for polycythaemia, hyperbilirubinaemia, hypocalcaemia and hypomagnesaemia should be carried out if the baby has clinical signs of hypoglycaemia
- Do not transfer to community care until at least 24 hours old and blood glucose levels are maintained. Babies must be feeding well.

NOTE: The current NICE guidelines use a blood glucose level of < 2mmols to define hypoglycaemia in the newborn. This is assumed specific blood glucose monitoring equipment for neonates is used

DIABETIC KETOACIDOSIS (DKA)

DKA manifests clinically as a state of severe uncontrolled diabetes and gross dehydration which will inevitably progress unless it is corrected by rehydration with intravenous fluids and adequate insulin. Its characteristic biochemical features are:

- Severe hyperglycaemia
- Significant ketonaemia
- Severe metabolic acidosis
- Glycosuria and ketonuria

Major precipitating causes of DKA:

- Non-compliance
- Alcohol excess
- Infections
- Myocardial infarction
- Pulmonary embolism

Clinical signs:

- Kussmaul respiration
- Acetone smell on breath
- Raised Blood Glucose
- Blood ketones
- Ketones on urinalysis
- Nausea and vomiting
- Abdominal pain

Immediate Management

Patients with suspected diabetic ketoacidosis will be admitted to the High Dependency Care unit on Labour Suite where they will be managed by a multi-disciplinary team including Obstetricians and Medical physicians, Diabetic specialist nurse and the Anaesthetist

Assess ABC - Airway, Breathing, Circulation

Give Oxygen - Oxygen via a facemask at 15L/minute

Start IV Fluids - 0.9% Normal Saline at 1litre/Hour. **Do not** give Potassium in first litre

Take Venous blood - Glucose, U&E's, Bicarbonate, FBC, Blood Cultures (if there are clear signs of infection)

Other investigations may include - ECG, CXR, and MSU. Exclude DIC if indicated

Arterial Blood gases - If severe DKA (Venous Bicarbonate <13mmol/l)

Fluid Replacement:

- Fluid deficit can be 3 – 7 litres
- Give 1 litre Normal Saline over first hour
- Second litre over 2 hours then 1 litre every 3 – 4 hours. (adjust to clinical state)
- Continue Normal Saline until Blood Glucose is <11mmol/l THEN start 5% Glucose
- If Serum Na becomes >145mmol/l during rehydration change to 0.45% Saline

Potassium:

- Do not add potassium to first litre of IV fluids. DKA is associated with a high normal or elevated serum potassium level as a result of insulin deficiency.
- After insulin replacement is established, potassium is required. Add 40mmol KCL per litre of fluid after first litre unless serum potassium remains >5.5mmol

Insulin:

- Draw up 49.5mls of Normal Saline in a 50ml syringe. Add 50 units of Soluble Insulin – Actrapid.
- Infuse via syringe pump. Rate according to sliding scale below.
- Monitor blood glucose levels hourly. If blood glucose fall below 4mmol/l, increase testing. Insulin must be recommenced when blood glucose >4mmol/l as ketoacidosis may re-establish

- If there is delay with initiating insulin infusion, give 6 units of soluble insulin intramuscularly. **Not** subcutaneous as the skin is poorly perfused in DKA

BLOOD GLUCOSE MMOL / L	INSULIN INFUSION RATE UNITS / HOUR
<4	No Insulin
4 - 7	1
7.1 - 11	2
11.1 - 17	4
17.1 – 27.9	6
>27.9	8

Bicarbonate:

- Bicarbonate should not be given unless severe acidosis persists
- Bicarbonate should only be given once an adequate circulation has been restored
- 100mmol of 1.26% Sodium Bicarbonate should be given over 20 minutes
- This should be accompanied by an extra 20mmol of Potassium Chloride
- Re-measure arterial Ph 60 – 90 minutes after Bicarbonate

Supportive measures:

- Treat underlying cause
- Nasogastric tube if patient unconscious and/or presence of gastric dilatation
- Urinary catheter if patient unconscious or anuric
- Warming measures for IV fluids

CONTACT NUMBERS

Antenatal day unit (GTT)	Ext 2203
Antenatal clinic	Ext 2583
Antenatal clinic appointments	Ext 3985
Diabetes Centre	Ext 2379 or 01226 209884
Dietician	Ext 2606
Pauline Dixon (Link Midwife)	Ext 2583
Sue Jones Lead Diabetes Specialist Nurse	07909930604

Equality Impact assessment

Women's and Children's Services are committed to ensure that both current and potential service users and their families will not be discriminated against on the grounds of religion, gender, race, sexuality, age, disability, ethnic origin, social circumstance or background. The principles of tolerance, understanding and respect for others are central to what we believe and central to all care provided.

Audit

Pre-existing diabetes will be audited in line with the annual audit programme, as agreed by the CSU. The guideline will be audited, as a minimum, on a three-year basis. The results will be reviewed and presented to the multidisciplinary audit meeting. Any deficiencies will be actioned via the audit action plan to try and improve safety and learn from previous mistakes. The audit action plan will be reviewed at the monthly risk management meetings on a quarterly basis and monitored by the risk midwife to ensure that improvements in care are made.

Any adverse incidents relating to diabetes will be monitored via the incident reporting system. Any problems will be actioned via the case review and Root cause analysis action plans. The action plans are monitored by the risk midwife to ensure that improvements in care are made. The trends and any root cause analysis are discussed at the monthly risk meetings to ensure that appropriate action has been taken to maintain safety.

Training

Any training will be given as documented in the Maternity Training Needs Analysis. This is updated on an annual basis.

Dissemination

This guideline will be available on the intranet or from the practice facilitator.

Review

The guideline will be reviewed if any incidents occur which necessitate changes to be made or due to any government legislation. Otherwise it will be reviewed three years from authorisation.

Roles and Responsibilities

All staff involved in the care of pregnant women who have diabetes are responsible for ensuring that the guidelines are followed and safe practice is maintained.

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Glossary of Terms

ANC – Antenatal Clinic
BHNFT – Barnsley Hospital NHS Foundation Trust
BMI – Body Mass Index
CTG – Cardiotocograph
CXR – Chest X-ray
DIC – Disseminated Intravascular Coagulation
DKA – Diabetic Ketoacidosis
ECG – Echocardiogram
FBC – Full Blood Count
GKI – Glucose Potassium Infusion
GP – General Practitioner
HbA1c – Glycosylated Haemoglobin
IVI – Intravenous Infusion
KCl – Potassium Chloride
MSU – Midstream Urine
NHS – National Health Service
U&E – Urea and Electrolytes

Appendix 1 – Obstetric Guideline Checklist

Appendix 1

Obstetric Guideline Checklist

Guideline Diabetes in Pregnancy	Lead Professional	Review Date: 06/2015
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Formatting	Included/attached
Headings	yes
Quality Impact Statement	yes
References	yes

Consultation Process	Date Disseminated/Presented	Relevant information.
Initial circulation to Guideline Group and relevant parties (draft 1)	16/01/09	
Comments sent to development lead	16/01/09	
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Comments sent to development lead	Feb/09	
Presented to Guideline group (Ratification)	Reviewed 06/12	Ratified 07/ 12
Presented to Women's Governance meeting (Ratification)	08/12	Ratified 08/12
Presented to Trust Guideline Group (Ratification)		

Archiving	Date of distribution	Date of Archiving
Distribution and Retrieval	01/08/11	01/08/11

Training	Date		
Training Package Devised			
Training Package Delivered			

Audit	Method	Date Commenced	Date Completed
Audit Process			