

ANTENATAL/  
INTRAPARTUM/  
POSTNATAL CARE

WIRRAL WOMEN & CHILDREN'S HOSPITAL

**Guideline No: 13**

**Diabetes in Pregnancy:  
Management of (From  
Preconception through to the  
Postnatal Period, including  
Gestational Diabetes)**

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**ANTENATAL/  
INTRAPARTUM/  
POSTNATAL CARE**

**WIRRAL WOMEN & CHILDREN'S HOSPITAL**

<b>MONITORING COMPLIANCE WITH THE GUIDELINE</b>	
<b>Minimum requirement to be monitored</b>	Auditable Standards – See below
<b>Process for monitoring</b>	Audit of Guideline
<b>Responsible individual/group/committee</b>	Risk Management Department
<b>Frequency of monitoring</b>	3 Yearly
<b>Responsible individual/group/committee for review of results</b>	Obstetric & Gynaecology Audit Meeting
<b>Responsible individual/group/committee for development of action plan</b>	Audit Lead
<b>Responsible individual/group/committee for monitoring of action plan</b>	Divisional Clinical Governance Steering Group

<b>COMPLIANT WITH:</b>	
1.	NHSLA Standard 3.9
2.	NICE Clinical Guideline 63: Diabetes in Pregnancy 2008

<b>AUDITABLE STANDARDS</b>	
1.	All diabetic pregnant women should have input from a multidisciplinary team involved in her maternity care
2.	All diabetic women attend antenatal appointments as per the Antenatal Care pathway (Appendix 2)
3.	All women should have a scan at 20 weeks which examines the four chambers and outlet tracks of the heart
4.	All women with pre existing diabetes have fetal medicine cardiac scan at 22 weeks gestation

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## 1.0 INTRODUCTION

Diabetes in pregnancy is associated with risks to the woman and to the developing fetus. Pregnancy outcomes for women with diabetes and their babies are poor when compared to those for women who do not have diabetes. The prevalence of diabetes in the local population is increasing especially for type 2 diabetes mellitus.

Miscarriage, pre-eclampsia and preterm labours are more common in women with pre-existing diabetes. Stillbirth, congenital malformations, macrosomia, birth injury, perinatal mortality and postnatal adaptation problems (such as hypoglycaemia) are more common in babies born to women with pre-existing diabetes. Diabetic retinopathy can worsen rapidly during pregnancy.

### 1.1 This guideline is for women with pre-existing type 1 or type 2 diabetes mellitus and Gestational Diabetes.

The guideline builds on existing clinical guidelines for routine care during the antenatal, intrapartum and postnatal periods, focusing on areas where additional or different care should be offered to women with diabetes and their newborn babies. It also covers pre-conception care for women with diabetes who wish to become pregnant.

### 1.2 Multidisciplinary Team

WUTH has a weekly Medical Disorders Clinic (MDC) for women with endocrine disorders, staffed by a multidisciplinary team which includes;

- Named obstetrician with an interest in maternal medicine (Mrs Mwenechanya)
- Specialist Midwife (Named Lead; Jacqui Tellett)
- Named Endocrinologists (Dr I Jones, Dr S Wynne)
- Diabetes Specialist Nurse ( Named Lead; Lesley Metcalfe, Jane Leach, Kay Jones)
- Dieticians (Named Lead; Julia Collier)
- Chiropody and Ophthalmology services are also available.

### 1.3 Pre-conception care (Appendix 1)

Women with diabetes who are planning to become pregnant should be informed that establishing good glycaemic control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death. It is important to explain that risks can be reduced but not eliminated.

The importance of avoiding unplanned pregnancy should be an essential component of diabetes education from adolescence for women with diabetes.

Women with diabetes who are planning to become pregnant should be offered pre-conception care and advice before discontinuing contraception.

Although preconception care should be provided by all health care providers looking after diabetic women of childbearing age, women may also be referred to the Monday morning Medical Disorders Clinic for preconception care.

#### **1.4 Gestational Diabetes**

Women at high risk of impaired glucose tolerance in pregnancy should have a glucose tolerance test arranged with their General Practitioner between 26 and 28 weeks gestation unless the test is required on clinical grounds at other gestations.

All glucose tolerance tests whether routine screening in the High Risk cases or on clinical grounds must be done at the GP Surgery (unless unreasonable delay is anticipated, in which case an incident form must be generated). A standard referral letter is to be used. Copies of all results are to be sent to the Fetal Medicine Unit (FMU) for action or filing.

High risk women who require a screening glucose tolerance test are as follows:-

BMI >30 kg/m<sup>2</sup>

Previous baby birth weight >4.5 kg

First-degree relative with diabetes.

Previous perinatal death

History of Gestational Diabetes Mellitus (GTT at 16-18 weeks)

Family origin with a high prevalence of diabetes mellitus (South Asian, black Caribbean and Middle Eastern)

Polyhydramnios (any gestation)

Glycosuria >2 episodes (any gestation)

## **2.0 ANTENATAL CARE**

### **2.1 Antenatal Pathway of Care**

All women with diabetes are provided with separate “blue” case notes to enable all maternity staff to recognise the woman is diabetic. All appointments are in the multidisciplinary Medical Disorders Clinic. The schedule of appointments is shown in Appendix 2.

### **2.2 Patient Management Plan**

All women attending the Medical Disorders Clinic have an individualised management plan, which is adapted as necessary and includes postnatal care and future contraception. This runs along side the appointments schedule. (Appendix 2)

### 2.3 Targets for Glycaemic Control/Hypoglycaemia Awareness

Women with diabetes are encouraged to attend the Medical Disorders Clinic pre-conceptually for counselling (Appendix 1). This assessment will also include targets for glycaemic control (Appendix 3). This form is also used for women who attend for their first appointment in pregnancy.

Women check their blood glucose levels pre meals and pre bedtime (4 times in one day) and are advised to maintain levels between 3 and 6 mmol/L to achieve HbA1C of < 6.2%.

All women with diabetes have documented individualised advice (See Appendix 2) about the risks of hypoglycaemia and unawareness in pregnancy. This is further supported by patient information which is provided within the Pregnancy and Diabetes Booklet produced by Diabetes UK.

### 2.4 Management of Nephropathy in Diabetic Pregnancy

- If macro-albuminuria is present (persistent 2+ on dipstix), perform formal renal function and monthly 24h protein estimates. Remember that proteinuria will increase during pregnancy.
- Ensure BP < 120/75mmHg
- If serum creatinine > 120micromol/l or total protein >2g per day consider referral to a nephrologist.
- Thromboprophylaxis if proteinuria > 5g per day (Wirral Women & Children's hospital guideline No 33; Venous Thromboembolism Prophylaxis & Treatment).

### 2.5 Management of Retinopathy in Diabetic Pregnancy

- Arrange referral for screening at first visit.
- If diabetic retinopathy present at booking offer additional screening at 16-20 weeks.
- Diabetic retinopathy **is not** a contraindication to rapid optimisation of HbA1c in early pregnancy or vaginal delivery.
- If pre-proliferative retinopathy is diagnosed in early pregnancy, the patient should be followed up for at least six months postnatally.

### 2.6 Fetal Anomaly Scanning

All women are offered first trimester screening or detailed scan. A fetal anomaly ultrasound scan is performed between 18 and 20 weeks. This includes examination of the four chambers and outlet tracks of the heart. For diabetic patients an additional scan is performed by the Fetal Medicine Specialists at 22 weeks which includes an echocardiogram (Appendix 2).

### 2.7 Diabetic Emergencies

All women are provided with contact phone numbers of the Specialist Midwife and Diabetes Specialist Nurses to ensure easy access for advice and if necessary hospital assessment and admission to the medical unit.

However if a woman is admitted to the maternity unit with suspected ketoacidosis, the Diabetes Team or the on call Medical Team, if out of hours,

must be contacted for advice in further management. In all cases the consultant obstetrician should be informed. Pregnant women with diabetic ketoacidosis should be managed in the main high dependency unit if <24 weeks pregnant and in a high dependency room on delivery suite if >24 weeks pregnant following Wirral University Teaching Hospital Adult Diabetic Ketoacidosis Pathway (Appendix 4).

## 2.8 Antenatal Corticosteroids in Diabetic Patients on Insulin

**INFORM DIABETES TEAM** regularly as hyperglycaemia likely.

- Initially monitor blood glucose 2 hourly after the first dose of steroids for the first six hours. Thereafter, blood glucose should be monitored hourly until the blood glucose levels have settled after the second dose of steroids, which may be 24 hours or more. Aim to keep blood glucose tightly within 4 - 7mmol/L.
- The Diabetes Team will advise on the correct dose of insulin. However, as a guide insulin is likely to increase by 2-4 units per dose for the next 48 - 72 hours. This will be adjusted according to the blood glucose results:
  - If blood glucose is >16 mmol/L, give additional stat dose of 4 - 6 units of soluble insulin e.g. Actrapid<sup>®</sup> or rapid acting insulin like Novorapid<sup>®</sup>
  - If blood glucose is persistently above 16mmol/l inform the Diabetes Team and start intravenous treatment regime with glucose infusion and insulin infusion as per below:

### 2.8.1 I.V Variable Insulin Infusion and Glucose Infusion Regime

#### Glucose infusion

- 500 ml of 10% glucose with 10 mmol potassium chloride
- Infuse through IMED or IVAC pump
- Infusion rate of 100 ml per hour
- **Do not adjust rate; have next bag ready as delay in putting up next bag may lead to hypoglycaemia.**

#### Insulin infusion

- Use pre-made syringes from pharmacy containing **50 units of Actrapid<sup>®</sup> in 50 mL sodium chloride 0.9%**. (The pre made syringes should be stocked on labour ward or available from pharmacy)
- **Connect via Y-connector to glucose infusion**
- Infuse through an electric syringe pump
- **Measure blood glucose hourly and document on chart**
- **Adjust rate of insulin infusion as per guidance below**

**Initial blood glucose**

Below 4 mmol/L  
 4-6 mmol/L  
 6-10 mmol/L  
 Above 10 mmol/L

**Insulin Infusion**

0.5 units/hour  
 1 unit/hour  
 2 units/ hour  
 3 units/ hour

*i.e.*: 0.5 mls/hour  
*i.e.*: 1 mls/hour  
*i.e.*: 2 mls/hour  
*i.e.*: 3 mls/hour.

**Adjustment**

If blood glucose (Meter) subsequently moves outside the target range 4-7 mmol/L then adjust as follows:

**Blood glucose**

4-7 mmol/L

**Insulin Infusion**

Leave infusion at its current rate

Below 4 mmol/L and falling  
 (or not rising)

Decrease by 1 unit/hr  
 (minimum 0.5 units/hour)

*i.e.* 1 mls/hour

*i.e.* 0.5 mls/hour)

Above 7 mmol/L and rising  
 (or not falling).

Increase by 1 unit/hr

*i.e.* 1 mls/hr

If ketoacidosis develops (vomiting, high blood sugar, tachypnoea, tachycardia, ketones in urine, acidosis) – inform medical on call team and treat as an emergency using treatment regime in appendix 4.

**N.B.**

The Cardiotocogram (CTG) will almost certainly be abnormal in ketoacidosis but correction of mother's acidosis will usually correct the CTG abnormalities.

If Hypoglycaemia develops follow Wirral Hospital Trust "Hypoglycaemia – Treatment in Obstetric Patients ONLY" Guideline (Appendix 5).

N.B Hypoglycaemia in Pregnancy is defined as blood glucose levels of < 3.0 mmol/L or when clinical signs of hypoglycaemia are observed.

**3.0 PERINATAL MEDICAL MANAGEMENT OF DIABETIC PATIENT****3.1 Intrapartum Care****3.1.1 Induction of Labour**

Any woman with diabetes admitted for prostaglandin induction of labour is allowed to continue with their normal diet and subcutaneous (sc) insulin until in labour (or artificial rupture of membranes (ARM) and Syntocinon augmentation).

Diabetic women admitted in latent phase of labour should also continue with normal oral intake and sc insulin until labour is established.

Aim to keep blood glucose readings before meals between 4-7 mmol/l.

When labour is diagnosed an IV insulin regime is initiated as below. Inform the diabetes nurse of her admission unless out of hours in which case they should be informed the following working day.

- If Syntocinon<sup>®</sup> (oxytocin) is required, administer in sodium chloride 0.9% (not glucose)

**At onset of established labour or before Caesarean Section, use IV Variable Insulin Infusion and Glucose Infusion regime as below:**

**3.1.2 IV Variable Insulin Infusion and Glucose infusion Regime (see Drug Administration Chart in Appendix 6)**

- Measure blood glucose estimate (capillary sample using approved blood glucose meter)
- From commencement of regimen: no eating; clear fluids are allowed
- Stop all fast acting subcutaneous insulin
- Do not discontinue long acting insulin (e.g. Levemir<sup>®</sup> or Lantus<sup>®</sup>). Give usual dose at usual time.
- If initial glucose is < 3.0 mmol/L or clinical signs of hypoglycaemia: Administer glucose immediately following Hypoglycaemia Treatment in Obstetric Patients ONLY guideline (Appendix 5)
- If initial glucose is > 17 mmol/L
  - Check for ketones
  - Blood test for U+Es, glucose, venous gases
  - Inform diabetes team
- Establish IV access

**Glucose infusion**

- 500 ml of 10% glucose with 10 mmol KCl
- Infuse through IMED or IVAC pump
- Infusion rate of 100 ml per hour
- Do not adjust rate; have next bag ready

**Insulin infusion**

- Use pre-made syringes available from pharmacy containing 50 units of Actrapid<sup>®</sup> in 50 mL of sodium chloride 0.9%.
- **Connect via Y-connector to glucose infusion**
- Infuse through an electric syringe pump as below
- **Measure blood glucose hourly and document on chart**
- **Adjust rate of insulin infusion as per guidance below**

**Initial blood glucose**

Below 4 mmol/L

4-6 mmol/L

6-10 mmol/L

Above 10 mmol/L

**Insulin Infusion**

0.5 units/hour

1 unit/hour

2 units/ hour

3 units/ hour

*i.e.*: 0.5 mls/hour

*i.e.*: 1 mls/hour

*i.e.*: 2 mls/hour

*i.e.*: 3 mls/hour.

**Adjustment**

If blood glucose (Meter) subsequently moves outside the target range 4-7 mmol/L then adjust as follows:

**Blood glucose**

4-7 mmol/L

Below 4 mmol/L and falling (or not rising)

Above 7 mmol/L and rising (or not falling).

**Insulin Infusion**

Leave infusion at its current rate

Decrease by 1 unit/hr (minimum 0.5 units/hour

Increase by 1 unit/hr

*i.e.* 1 mls/hour

*i.e.* 0.5 mls/hour)

*i.e.* 1 mls/hr

### Monitoring

- Measure capillary blood glucose hourly
- Chart hourly measurements on a blood glucose chart
- Check potassium values 4 hourly.
- **Ensure no infusions with Hartmann's solution in progress. Hartmann's solution should not be used as it has high lactate levels which increase blood glucose.**
- **Never stop insulin infusion in Type 1 diabetes; this may cause keto-acidosis.**

## 3.2 Patients undergoing delivery by Caesarean Section (C/S)

### 3.2.1 Elective C/S

- Elective C/S lists are done in the afternoon. Patient should have breakfast and sc insulin in the morning as usual and start IV variable insulin infusion and glucose infusion regime at lunchtime)
- (if elective CS to be done in the morning; the night before the C/S patient to have normal evening meal and insulin, Normal 10pm snack then starve after snack and instead of breakfast and insulin the following morning start IV insulin regime as above.)

### 3.2.2 Emergency C/S

Check blood sugar and start IV insulin regime as above if not on it already – adjust rate of insulin according to blood sugars.

## 3.3 After Delivery of the Placenta

- **For those on insulin pre-pregnancy**
  - Halve the rate of Insulin Infusion (minimum of 0.5 mls /hour (i.e.: 0.5 units/hr). Adjust as before to maintain blood glucose 6 -12 mmol/L. (i.e. **higher** target)
- **For insulin treated gestational diabetics**
  - Stop the insulin and glucose infusions after delivery of placenta and monitor blood sugars pre-meal.

## 4.0 Postnatal Care

### 4.1 Oral Intake and Recommencing of Subcutaneous Insulin.

- Continue IV regimen until tolerating diet
- Women with established type 1 diabetes should return to their pre-pregnancy insulin dosage. (This dosage will have been documented in patients individualised care plan in blue diabetic notes under post natal care.) Ensure that subcutaneous insulin is given before eating and before stopping iv insulin infusion

- Women with type 2 diabetes can resume/continue metformin immediately following birth.
- Drugs for diabetic complications that were discontinued for safety reasons should still be avoided whilst breastfeeding unless discussed with diabetes team.
- If breastfeeding, advise to check blood glucose before and have a snack available due to the increased risk of hypoglycaemia.
- If not breast feeding blood glucose monitoring can usually be reduced in frequency to before meals and before bedtime once off IV infusion.
- Offer advice about contraception
- Gestational diabetic patients do not require insulin after delivery but must have a 6 week post-natal glucose tolerance test (G.T.T) prior to clinic review.
- Post natal medical disorders clinic (MDC) review to be arranged for 6-8 weeks with GTT results
- For Type 1 and 2 diabetic patients post natal follow up appointment liaise with diabetic team.

#### **4.2 If Patient is on Insulin and develops severe Pre-Eclampsia:**

- Follow Wirral Women & Children Hospital Guideline No.12 Pre – eclampsia: **Keep total fluids intake restricted at a maximum rate of 85mls/hr as per.**

#### **4.3 In case of hypoglycaemia, follow Hypoglycaemia Treatment in Obstetric Patients ONLY Guideline (Appendix 5). Pre packed hypoglycaemia boxes available on wards or from Diabetic Specialist Nurses)**

## **5.0 REFERENCES**

Confidential Enquiry into Maternal and Child Health. (2005). Pregnancy in Women with Type 1 and Type 2 Diabetes in 2002-03, England, Wales and Northern Ireland.

Confidential Enquiry into Maternal and Child Health. (2007). Diabetes in Pregnancy: Are we providing the best care? Findings of a national enquiry. England, Wales and Northern Ireland.

Department of Health. (2001). National Service Framework for Diabetes: Standards

Healthcare Commission. (2008). Towards better births: A review of maternity services in England.

Infant and perinatal mortality 2008: health areas, England and Wales, National Statistical Office September 2009

National Institute for Health and Clinical Excellence. (2008). Diabetes in pregnancy: Management of diabetes and its complications from pre-conception to the postnatal period.

Royal College of Obstetricians and Gynaecologists, Royal College of Anaesthetists, Royal College of Midwives, Royal College of Paediatrics and Child Health. (2008). Standards for Maternity Care: Report of a Working Party.

## **6.0 RELATED DOCUMENTS**

No. 65        Obesity Guideline  
No. 36        Polyhydramnios Guideline  
Pregnancy and Diabetes – Diabetes UK

## **7.0 APPENDICES**

Appendix 1    Pre-conceptual counselling  
Appendix 2    Schedule of appointments and pregnancy care plan  
Appendix 3    Clinical summary and demographics sheet  
Appendix 4    WUTH Adult Diabetic Ketoacidosis pathway  
Appendix 5    Diagnosis and management of DKA  
Appendix 6    IV Insulin Regime Chart for Obstetric Patients  
Appendix 7    Midwife referral letter to GP for GTT

## Appendix 1 – Pre-conceptual Counselling in IDDM

## PRE-CONCEPTUAL COUNSELLING IN IDDM

Item to be discussed	Discussed	Further information
Folic acid supplementation 5 mg/day Ensure good balanced diet, Vitamin supplementation if necessary Check rubella status		
Diabetic control – need to get HbA1c as near to 6% as possible to reduce risk of miscarriage and fetal abnormality. As HbA1c above 10% associated with 1:4 congenital anomaly advise against pregnancy		
Check for diabetic complications and if severe arterial disease/renal disease need to consider risks of pregnancy. Change antihypertensives if necessary; Discontinue ACE inhibitors and statins.		
Explain tight control in pregnancy reduces risk of prematurity, stillbirth, polyhydramnios, macrosomia (and associated birth injury), neonatal problems (admissions to SCBU, hypoglycaemia and other metabolic problems)		
Explain normal rising insulin resistance in pregnancy and need for very regular visits to monitor insulin requirements based on pre meal BM's every day. Insulin requirements double over pregnancy		
Run through plan of care chart and discuss issues around Nuchal Translucency versus serum screening, fetal echo,		

<p>eye screening each trimester, monitoring growth and BPP's need to see midwife, parentcraft, Delivery 38/40. Explain close management between physicians and obstetricians</p>		
<p>Contraception</p>		

## Appendix 2 – Antenatal Care for Women with Diabetes

## ANTENATAL CARE FOR WOMEN WITH PRE EXISTING DIABETES

STAGE	SEEN BY	CARE	Date	Signature
Preconception	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic Team and Obstetric Team pre- conceptual assessment – Folic Acid 5 mg, see App 3		
At diagnosis of pregnancy	Midwife	Refer to MDC as soon as possible <ul style="list-style-type: none"> <li>• Diabetic and Obstetric Assessment</li> </ul> Issue Diabetes UK <ul style="list-style-type: none"> <li>• Viability scan <input type="checkbox"/></li> <li>• Pregnancy and Diabetes Booklet – re advice on diabetic control <input type="checkbox"/></li> </ul>		
12/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic Assessment – refer to ANC for: <ul style="list-style-type: none"> <li>• Eye screen <input type="checkbox"/></li> <li>• Booking scan and bloods <input type="checkbox"/></li> <li>• 1<sup>st</sup> Trimester screening <input type="checkbox"/></li> <li>• Teenage Pregnancy referral if &lt; 18yrs <input type="checkbox"/></li> </ul>		
14/40	Consultant Physician/DLN	Diabetic assessment		
16/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment		
18/40	Consultant Physician/DLN	Diabetic assessment		
20/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment 20/40 anomaly scan <input type="checkbox"/> four chamber view of fetal heart and outflow tracts. Book - <ul style="list-style-type: none"> <li>• Echocardiogram <input type="checkbox"/></li> <li>• Growth Scans at</li> </ul>		

		28weeks <input type="checkbox"/> • 32weeks <input type="checkbox"/> • 36weeks <input type="checkbox"/>		
22/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment • Eye check <input type="checkbox"/> • Fetal echocardiogram in FMSU <input type="checkbox"/>		
24/40	Consultant Physician/DLN	Diabetic assessment		

STAGE	SEEN BY	CARE	Date	Signature
26/40	Consultant Physician/DLN	Diabetic assessment		
28/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and Obstetric assessment • Review growth scan <input type="checkbox"/> • FBC and red cell antibodies <input type="checkbox"/> • Mat B1 <input type="checkbox"/>		
30/40	Consultant Physician/DLN	Diabetes and obstetric assessment		
32/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetes and obstetric assessments • Review growth scan <input type="checkbox"/> • Eye check <input type="checkbox"/>		
34/40	Consultant Physician/DLN	Diabetes assessment		
36/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetes and obstetric assessment • Review growth scan <input type="checkbox"/> • FBC <input type="checkbox"/> • Book IOL @ 38/40 or <input type="checkbox"/> • Consent and book C/S @ 38/40 <input type="checkbox"/>		
37/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetes and Obstetric assessment Offer vaginal sweep to pts who are being		

		Induced		
38/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Deliver women with pre-existing Diabetes Diabetic and obstetric assessment & Offer vaginal sweep to women who decline IOL		

STAGE	SEEN BY	CARE	Date	Signature
39/40 – Delivery for women who decline IOL	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment Offer vaginal sweep		
Postnatal Care	Midwife on Ward & DLN	Discuss contraception Arrange P/N follow up in Diabetic clinic		

### PREGNANCY CARE PLAN

Date of Eye examination: 1: ..... 2: ..... 3: .....

Date of Feet examination: .....

### ANTENATAL CARE FOR WOMEN WITH GESTATIONAL DIABETES

STAGE	SEEN BY	CARE	Date	Signature
At Diagnosis or 28/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and Obstetric assessment <ul style="list-style-type: none"> <li>• Arrange growth scan</li> <li>• FBC and red cell antibodies if 28/40</li> <li>• Mat B1</li> </ul>		
1 Week later	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetes and obstetric assessments <ul style="list-style-type: none"> <li>• Review growth</li> </ul>		

		scan and make 4 weekly growth scan future appointment		
4 Weekly	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetes and obstetric assessment <ul style="list-style-type: none"> <li>• Review growth scan</li> <li>• FBC at 36/40</li> </ul>		
38/40	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment <ul style="list-style-type: none"> <li>• Arrange induction of labour if clinically indicated, otherwise weekly sweeps.</li> </ul>		
40/40 - Delivery	Consultant Physician Consultant Obstetrician DLN/Dietician/Midwife	Diabetic and obstetric assessment Offer vaginal sweep weekly Arrange induction of labour at 42/40		
<b>STAGE</b>	<b>SEEN BY</b>	<b>CARE</b>	<b>Date</b>	<b>Signature</b>
Postnatal Care	Midwife on Ward & DLN	Discuss contraception Arrange P/N follow up in diabetic clinic in 8 weeks Patient to arrange P/N GTT with GP in 6 weeks		

## Appendix 3 – Wirral Hospital Diabetes/Obstetric Record

Wirral University Teaching Hospital   
NHS Foundation Trust

WIRRAL HOSPITAL DIABETES/OBSTETRIC RECORD  
DR I R JONES/MRS S MWENECHANYA

Demographics: -

Gravida:

Parity:

Type 1 Diabetes Mellitus : insulin .....dose :..... (At booking)

Type 2 Diabetes Mellitus: medication..... dose..... (At booking)

Gestational Diabetes

Impaired Glucose Tolerance } GTT result =

Preconceptual Care Yes  No

Folic Acid 5mg daily Yes No

**Targets**

Date discussed: .....

Blood Glucose Values 3-6 mmol/L

HbA1C <6.2%

Weight/BMI

Consent – Regional data Yes  No

Contact Number:

Lesley Metcalfe 678 5111 Bleep 2208  
Jane Leach bleep 2706  
Kay Jones bleep 2705

Jacqui Tellett 678 5111 Ext: 2860

## Appendix 4 – Diabetic Ketoacidosis (DKA)

### Diabetic Ketoacidosis (DKA) (follow Pregnancy DKA pathway below)

#### Diagnosis and Management of Diabetic Ketoacidosis (DKA)

- Diabetic Keto-Acidosis (DKA) is a potentially life threatening condition.
- Remember DKA can occur in pregnancy at lower blood glucose values
- Inform obstetric and anaesthetic registrar on call
- Inform consultants in obstetrics and anaesthesia.
- Inform Diabetic team (Dr Wynne/diabetic nurses or if out of hours contact medical registrar on call for advise)
- Admit in HDU on delivery suite if fetus viable ( $\geq 24$  weeks)
- Transfer to Medical HDU if fetus pre-viable
- Commence treatment immediately if DKA is suspected.
- Commence CTG monitoring but remember that DKA will cause changes in variability and rate that can resemble fetal compromise but these will correct once the mother's acidosis is corrected.

#### Diagnosis of DKA (from trust DKA protocol)

- Blood glucose  $>11$  mmol/l
- urine ketones  $>2+$ . Or blood ketones  $>3$ mmol/l
- Venous PH  $<7.3$  and or venous bicarbonate  $<15$  mmol/l or (Arterial pH  $<7.2$  )
- (Blood glucose level  $>11$  mmol/l, urine ketones  $++$ , pH  $7.2-7.4$  and plasma bicarbonate of  $15-20$  mmol/l may suggest early DKA)

#### Investigations

Urgent:

- Laboratory blood glucose and blood ketones
- venous Blood Gases.
- U+E's and
- Urine for ketones, glucose, protein
- Blood culture, MSU.

U+E and Laboratory Blood Glucose should be checked:

- every 3 hours for 6 hours,

then

- 6 hourly for 12 hours,

then

- every 12 hours for 1 day,
- then daily.

#### Search for a Cause:

- Screen for infection. CXR, msu , blood cultures and skin survey for infection
- Antibiotics are only required in the presence of infection – moderate leucocytosis is a common feature of DKA

**Transfer to Medical HDU if patient condition requires:**

**Involve Critical Care Team if**

- **MEOWS score indicates their involvement**
- **Patient's condition is not improving or is deteriorating**

## **Management**

### **Fluids**

- Usually 4-8 litres are needed during the first 24 hours
- Start IV Sodium Chloride 0.9% as soon as the diagnosis is suspected and adjust infusion rate according to severity of dehydration.

e.g.

1 litre over 1 hour, then

1 litre over 2 hours, then

1 litre over 4 hours, then

1 litre every 6-8 hours.

### **Potassium**

- plasma levels usually initially high but concentration falls quickly.
- When U&Es available, use premixed IV bags containing potassium as below:

Plasma potassium (mmol/L)	mmol potassium added per litre 0.9% saline
> 5.0	nil
3.5 - 5.0	40
< 3.5	40 and discuss with medical registrar

### **Insulin regime for DKA**

- Patients on long acting analogue insulins – (Lantus or Levemir) should have them continued at their normal dose whilst they are being treated for DKA.
- Stop all other forms of sc insulin

Administer as an intravenous infusion via a syringe driver.

1. Use pre mixed syringe of 50 units of soluble insulin Actrapid made up to 50 ml with Sodium Chloride 0.9% (i.e. 1 unit/ml).
2. Start at 6 ml/hour (6 units per hour).
3. A fresh solution should be prepared every eight hours for immediate use.
  - Monitor blood glucose hourly and act on results.
  - Rapid correction of hyperglycaemia is not advisable.
  - Aim to decrease blood glucose levels by 5-10% per hour.
  - After 1 hour, if glucose does not fall by 3-5 mmol/l, increase insulin infusion rate to 12 units/hour. (to check as local protocol using ketones and bicarbonate as a guide – new guidelines awaiting D&T approval)

- **When blood glucose is <15 mmol/L change IV fluid to 5% Glucose connected to insulin infusion via Y-connector at 100mls/hr**
- Thereafter, aim at maintaining blood glucose at 4 - 7 mmol/L by adjusting insulin infusion rate as per normal guidance for intrapartum care.

### **Management of Cerebral Oedema**

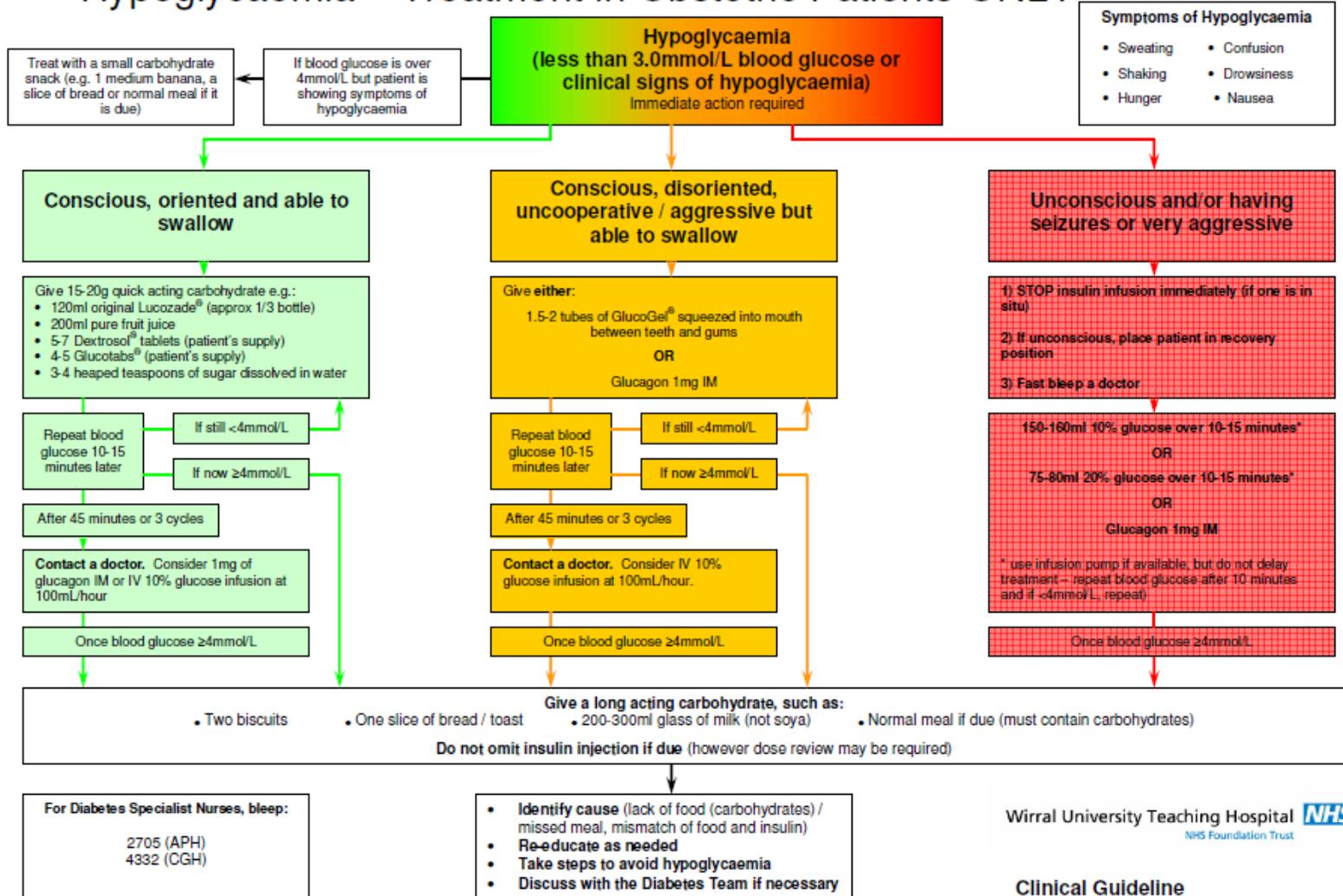
- Cerebral oedema occurs more often in extremes of age especially if hyperglycaemia is rapidly corrected.
- Presents with headache, confusion with/without papilloedema.
- **if suspected urgently refer for immediate medical review**
- inform consultant obstetrician and Anaesthetist
- Arrange an urgent brain CT scan.
- **Transfer patient to medical HDU if still on delivery suite**
- Avoid fluid overload.

### **Conversion to Conventional Insulin**

Once blood ketones are less <0.3mmol/L and venous PH > 7.3, DKA is resolved.

- Patients can eat and drink as soon as they feel able.
- inform Specialist Nurse for Diabetes.
- If normally on subcutaneous insulin, restart the patient's usual regimen prior to their next meal (e.g. if on insulin analogue give it just before or with the meal) and stop IV insulin 60 minutes later.
- If patient can not eat and drink continue IV insulin as per intrapartum regime.
- If the patient has not had insulin prior to this episode, contact Diabetic team for advice.

# Hypoglycaemia – Treatment in Obstetric Patients ONLY





## Intravenous variable rate insulin infusion and glucose infusion regime for obstetric patients only

### Glucose infusion

- 500 ml of 10% glucose with 10 mmol potassium chloride
- Infuse through IMED or IVAC pump
- Infusion rate of 100 ml per hour
- **Do not adjust rate; have next bag ready as delay in putting up next bag may lead to hypoglycaemia.**

### Insulin infusion

- Use pre-made syringes from pharmacy of **50 units of soluble insulin Actrapid® in 50ml sodium chloride 0.9%**. (The pre made syringes should be stocked on labour ward and available from pharmacy).
- **Connect via Y-connector to glucose infusion.**
- Infuse through an electric syringe pump.
- **Measure blood glucose hourly and document on chart.**
- **Adjust Insulin Infusion rate as per guidance below:**

<b>Initial blood glucose</b>	<b>Insulin Infusion rate</b>
<4 mmol/L	0.5 units/hour (0.5 mls/hour)
4-6 mmol/L	1 unit/hour (1 mls/hour)
6-10 mmol/L	2 units/ hour (2 mls/hour)
>10 mmol/L	3 units/ hour (3 mls/hour)

### Adjustment

If blood glucose (Meter) subsequently moves outside the target range 4-7 mmol/L then adjust as follows:

<b>Blood glucose</b>	<b>Insulin Infusion</b>
4-7 mmol/L	Leave infusion at its current rate
Below 4 mmol/L and falling (or not rising)	Decrease by 1 unit/hr <i>i.e.</i> 1 mls/hour (minimum 0.5 units/hour <i>i.e.</i> 0.5 mls/hour)
Above 7 mmol/L and rising (or not falling).	Increase by 1 unit/hr <i>i.e.</i> 1 mls/hr

**Appendix 7 - Midwife Referral Letter to GP for GTT**

Wirral University Teaching Hospital   
NHS Foundation Trust

Patient details
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Date:

Dear Dr

Would you please arrange for this lady to have a Glucose tolerance test (GTT)

- o At 26-28 weeks gestation.
- o As soon as possible

EDD: \_\_\_/\_\_\_/\_\_\_                      Gestation today.....

Risk factor	√
BMI >30	
Prev. baby Bwt >4.5kg	
First degree relative with Diabetes	
Prev. Perinatal death	
History of GDM (GTT at 16-18 wks)	
Ethnic origin(South Asian, Black Caribbean, Middle Eastern)	
Polyhydramnios (any gestation)	
Glycosuria >2 episodes (any gestation)	

Many thanks

Midwife

.....

**Results:**    Date OGTT performed:-----

Fasting blood glucose: ----- (if  $\geq 6.0$ mmol/L refer to MDC)

2 hour blood glucose: ----- (If  $\geq 7.8$ mmol/L refer to MDC)

**ACTION: Abnormal results to be faxed to Medical disorders Clinic (MDC) using the separate MDC referral letter. (fax number**

**Normal results:** fax to FMU (Fax number 6047776)