

MANAGEMENT OF DIABETES IN PREGNANCY

September 2001



This report has been published by the Clinical Resource Efficiency Support Team (CREST). CREST is a small team of health care professionals established in 1988 under the auspices of the Central Medical Advisory Committee. Its aim is to promote clinical efficiency in the health service in Northern Ireland while ensuring that the highest possible standard of clinical practice is maintained.

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1.0 INTRODUCTION

These guidelines seek to address the unacceptably high perinatal mortality and malformation rates in babies born to diabetic mothers by proposing a uniform standard of joint diabetic and obstetric specialist care across the province in the management of diabetic pregnancy.

Evidence presented has been collated from the following sources:

- (a) A systematic review of the literature.
- (b) Published experience of the Royal Maternity Hospital Regional Centre, Belfast and The Northern Ireland Diabetes Study Group.
- (c) Information collected by the Pregnancy and Neonatal Care Subgroup of the UK Department of Health, St. Vincent Joint Task Force for Diabetes.
- (d) Existing guidelines published by the Scottish Intercollegiate Guidelines Network (SIGN), The American Diabetes Association and the 4th International Workshop for the Management of Gestational Diabetes Mellitus.

The first sections outline the evidence which points to the need for change and make recommendations on the future pattern of care in Northern Ireland. These are followed by more detailed sections which contain key advice on clinical management of patients, including:

- Contraception
- Pre-pregnancy care
- Antenatal care
- The role of the specialist team members and GPs
- Management of labour, delivery and the postnatal period
- Gestational Diabetes
- Neonatal Care

The recommendations on both the pattern of care and the clinical issues are summarised in section 8.

2.0 BACKGROUND

The St. Vincent Declaration, which has been adopted by the UK, calls for “an outcome in diabetic pregnancy approximating the non-diabetic woman” ⁽¹⁾. The importance and desirability of this goal was endorsed in July 1993 by the creation of a Joint Task Force for pregnancy and other diabetes-related problems between the Department of Health and the British Diabetic Association (now Diabetes UK). The goal was to implement the aims of the Declaration by the year 2000 ⁽²⁾.

Unfortunately, the pregnancy target has been achieved only in a few centres of excellence in Scandinavia ⁽³⁾ and by the small intensive preconception control arm of the 9 year US Diabetes Control and Complications Trial ⁽⁴⁾.

The increased perinatal morbidity and mortality associated with diabetes is possibly due to vascular complications. As macrovascular disease in this age group is rare, microangiopathy and its consequences give rise to many of the clinical problems encountered in diabetic pregnancy.

- Progression of retinopathy with proliferative disease during pregnancy can occur and is more common in those women with background retinopathy at presentation and associated nephropathy.
- Pregnancies complicated by proliferative retinopathy and nephropathy are characterised by poor fetal growth. Nephropathy is associated with perinatal morbidity.
- A pre-pregnancy serum creatinine of >140 micromoles/l or proteinuria >3g/24h is associated with:
 - Maternal hypertension.
 - Increasing blood pressure and proteinuria during pregnancy.
 - Increasing risk of pre-eclampsia.
 - High Caesarean section rate.
 - Increased perinatal mortality.
 - Increased rate of congenital malformations.
- While outcomes in pregnancy complicated by diabetic nephropathy have steadily improved over the last decade, perinatal outcome depends largely on expertise in management of maternal hypertension and quality of neonatal intensive care.

Other high-risk situations include:

- Age over 35 years.
- Previous still birth.
- Previous fetal malformation.
- Previous severe pre-eclampsia.
- Previous big baby (greater than 4 kg).
- Very poor control prior to conception.

The risk of major malformations is markedly increased in infants of diabetic mothers, ranging from 4-10%. There is no specific abnormality associated with diabetes but the caudal regression syndrome, neurological and cardiac abnormalities are particularly increased. Abnormalities tend to be more severe, multiple and fatal. These abnormalities occur early in pregnancy, between the fifth and ninth week, and so are likely to be established at the first antenatal visit.

In population-based studies of diabetic pregnancy in the north of England, perinatal mortality rates were 5 times and congenital malformation rates 4 times that of the background population ^(5,6).

Studies from many centres have shown that the higher the blood glucose levels, as assessed by glycosylated haemoglobin (HbA_{1c}) in early pregnancy, the greater the incidence of abnormalities ^(7,8). Improved control in early pregnancy can reduce the incidence of malformations from over 12% to under 2% ^(9,10). Improved control also reduces early spontaneous pregnancy loss. There is no evidence that hypoglycaemia can cause abnormalities in human pregnancy.

Milder hyperglycaemia is also a risk factor for obstetric complications. The need for the early detection and treatment of gestational diabetes is the rationale for regular screening for glycosuria during all pregnancies.

The St. Vincent Declaration and Diabetes UK have proposed measures to facilitate reduction of perinatal mortality, neonatal morbidity and congenital malformation in babies born to diabetic mothers. An optimal outcome may be obtained if good diabetic control is achieved before and during pregnancy. This requires careful planning of the pregnancy, early antenatal care, frequent obstetric and diabetic surveillance and access to neonatal supportive care.

The European Type 1 Diabetes Policy Group has published consensus guidelines on the management of diabetic pregnancy. These recognise that diabetic pregnancy is a high-risk state for both the woman and fetus.

Diabetes UK recommends that:

- Care of the pregnant diabetic should take place in centres managing sufficient numbers of cases.
- There should be multidisciplinary care teams comprising a diabetes specialist physician, obstetrician, ophthalmologist, neonatologist and diabetes teaching nurse.
- Near normoglycaemia should be maintained before and during pregnancy.

3.0 REMIT OF THE CREST WORKING GROUP

On the basis of this evidence, the CREST Working Group on Diabetes in Pregnancy was asked to examine this issue in the Northern Ireland context. The remit of the group was:

- To consider the results of the recent audit of the process and outcome of pregnancy in diabetic women in Northern Ireland.
- To identify where practice needs to be improved.
- To review existing guidance.
- To produce clinical guidelines which will outline accepted good practice and address any problem areas identified by the group.
- To prepare an implementation strategy, including a timescale for re-audit.

The membership of the group is shown in Appendix 1

4.0 THE CURRENT PATTERN OF CARE IN NORTHERN IRELAND AND RECOMMENDATIONS FOR CHANGE

Type 1 diabetes mellitus is the most common pre-existing medical disorder complicating pregnancy in Northern Ireland.

Of the some 24,000 deliveries per year in the province, approximately 100 pregnancies occur in women with diabetes. Of these women, 75% have pre-existing type 1 diabetes, 15% have insulin treated diabetes during pregnancy (pre-existing type 2 diabetes, newly diagnosed type 1 or gestational diabetes) and the remaining 10% have gestational diabetes treated with diet alone.

A recent 10-year review (1985-1995) of diabetic pregnancy in Northern Ireland ⁽¹¹⁾ found perinatal mortality rates (36.7/1000) and congenital malformation rates (64.7/1000) 4-5 times higher than the background population. These rates are similar to those reported in the north of England.

The Northern Ireland audit identified that some 13 hospitals in the province provided care for pregnant diabetics during that decade. Of the 986 pregnancies, 416 or 42% were booked for their antenatal care and delivery in the Royal Maternity Hospital, which is the regional centre for the province. A further 85 cases were referred mid-pregnancy to RMH having originally been booked for care at a local hospital. Of the 485 pregnancies booked and delivered in local hospitals during the decade, 90 were in the six smallest hospitals. The annual average on each of the latter sites is therefore very low.

Data from the 10 year audit of diabetic pregnancies, combined with information from the Neonatal Intensive Care Outcomes Research and Evaluation Group (NICORE) indicates that in Northern Ireland, 80% of the babies born to diabetic mothers are admitted to neonatal units. Of these, half require intensive care and one in six requires level I neonatal intensive care. Although a small number have short stays, the median length of stay for the group who require level I care is 5 days.

There is a need for a standardised approach to the care of pregnant women with diabetes, which this document aims to address. Group members were aware that in the months since the audit results were made available, several Trusts had already made changes to the way care was provided. It was considered important to have some up to date baseline information on the structure and organisation of services that could then be used to measure change brought about following production of these guidelines.

A questionnaire was sent to all 11 Trusts providing obstetric care in 13 hospitals in N.I. All responded. Of the 13 hospitals, 5 indicated that they had a policy of referring all pregnant

diabetic patients to another hospital for their antenatal care. Of the remainder, 5 offer a joint diabetic and antenatal clinic. All of these were on sites that also have level I neonatal intensive care. Three of these joint clinics were established after the period covered by the regional audit.

Responses from all 8 units offering antenatal care showed that there was some variation in the preconception investigations, advice and treatment that was offered to diabetic women who indicated a wish to become pregnant.

During pregnancy, the frequency of antenatal clinic visits was similar in most units, although those without joint clinics also required separate diabetic clinic visits. Most units reported fortnightly clinic attendance up to 36 weeks for assessment of diabetic control. Two units indicated more variation, ranging from weekly to 4 weekly attendances, depending upon individual patients.

All units were asked if they had written policies for the management of labour in pregnant diabetics, or on infant feeding and management of infant hypoglycaemia. While many of the responses indicated that there was an implicit policy on management of labour within the unit, only three had written policies which were forwarded to the group. One of these was from a unit which had a policy not to undertake care of pregnant diabetics, but aimed to assist staff called upon to undertake unplanned deliveries. Five units returned written policies on feeding and the management of hypoglycaemia.

The results of this survey indicate that a move towards joint physician/obstetrician care of these patients is already underway. Optimum antenatal care for these patients requires a minimum of 18 hospital visits for diabetic control. If organised separately, a further twelve visits are needed for obstetric and ultrasound checks. For some patients, appointments may also be required at ophthalmology clinics. It is one of the aims of these guidelines to reduce the number of hospital visits to a minimum, consistent with providing the best level of care. This team approach is more difficult to provide in centres that care for very small numbers of cases. There is no published evidence on the minimum numbers of cases which any unit or individual clinician should see each year. However, infrequent involvement in this type of care clearly would not allow the clinicians concerned to maintain skills in this field.

The regional audit results show that a high proportion of these babies are admitted to neonatal intensive care units. It is not always possible to predict those who will need to access this service. Babies born in units without this service are therefore exposed to the risk of emergency interhospital transfer. Once again it is the units dealing with small numbers of cases that are less likely to have neonatal intensive care on site.

Level I neonatal care* is currently available on only five sites in Northern Ireland. It follows that the number of centres which can offer the full range of services to pregnant diabetic patients, is less than the number of hospitals currently offering obstetric care.

There are a number of criteria that would identify those hospitals able to offer the best possible care for pregnant diabetics. These include:

- A joint antenatal clinic staffed by a team comprising a nominated and experienced physician and obstetrician, supported by a specialist nurse or midwife.
- A designated ward for all inpatient obstetric care.
- Level I neonatal care.
- Formal arrangements for provision of emergency advice and rapid admission.
- A daily physician ward round.
- A daily obstetrician ward round.
- Standardised record keeping and patient information.

It is recommended that commissioners should examine the services available within Trusts offering obstetric services against these criteria, with the aim of arranging all antenatal and intrapartum care for pregnant patients with diabetes or gestational diabetes to take place in designated centres which meet these criteria.

Following designation, commissioners and designated provider Trusts should take steps to circulate to all GPs and community midwives, written information on the clinic in their area. This should include the names of team members and relevant contact numbers to facilitate early referral.

From Autumn 2001 standardised record cards should be used when caring for all cases of diabetes in pregnancy in Northern Ireland. These should be in the format reproduced in Appendix 2. This information should be used in a regional audit of care. Interim findings of the first six months' data should be reported to all participating hospitals by June 2002. A report on the first year's findings should be available in summarised form for CREST and RMAG by March 2003.

** Level I care is that given in an intensive care nursery which provides continuous skilled supervision by qualified and specially trained nursing and medical staff. Such care includes support of the infant's parents. Minimal medical staffing should consist of both an experienced paediatric registrar and a senior house officer on duty and available in the intensive care area at all times, with an appropriately trained consultant in charge. Source BAPM.*

Suggestions for two audits to measure the implementation of the recommendations in this report are shown at Appendix 3. These include one audit on the structure of services available in each hospital offering care to pregnant diabetic women. This could commence in 2001/2. The second audit is much more complex and would rely upon the data collection referred to above. This audit would require further discussion involving a range of clinical staff involved in the care of pregnant diabetic women to agree the level of clinical detail required. As there are relatively few pregnancies in diabetic women each year in N.I. it should be possible to have more detail on each patient than would be usual in many clinical audits. Although the audit standards for certain components of care may be agreed after local discussion, there are certain standards, such as those for the frequency and content of antenatal monitoring (Appendix 4) which should not be subject to local amendment.

Despite the availability of specialist clinics in designated centres, a proportion of cases will continue to need onward referral to the regional centre. Those pregnancies at higher risk, where consideration should be given to such referral are:

- 1) Patients with diabetic nephropathy should have detailed pre-pregnancy counselling with regard to the increased risks to the mother and fetus associated with the presence of nephropathy.
- 2) Patients with pre-pregnancy serum creatinine >140 micromoles/l or 24hour urinary protein >1g/24hours should be referred for specialist nephrologist care.
- 3) Subjects with macrovascular complications (coronary artery disease) and organ transplantation (eg kidney) should be referred to the Regional Centre in Belfast.
- 4) There may be a case for referral of patients with other high risk situations such as pre-proliferative retinopathy or previous severe pre-eclampsia at the discretion of the physician/obstetrician.

5.0 PATIENT CHOICE

It is acknowledged that women have the right to choose where they would like to receive their diabetic/antenatal care. Despite the potential advantages of the team approach in terms of outcome, some may still express a wish to be cared for at non-designated centres, even though these will not be able to provide the same service. This may be influenced by the proximity of their local hospital compared to the designated centre.

As already stated, optimum antenatal care for these patients requires multiple clinic visits. It is one of the aims of these guidelines to reduce the number of hospital visits to a minimum, consistent with providing the best level of care. One of the advantages of attendance at a designated centre is that the diabetic and obstetric visits are co-ordinated at the same jointly run clinic. At the regional centre, ophthalmology appointments can also already be arranged on the same day. For this reason, patients with eye complications may find attendance at the regional centre most convenient. Over time, other designated centres should also try to hold their joint clinic on the same day as an existing ophthalmology clinic.

GPs who refer newly diagnosed patients to an obstetric clinic for booking need to be aware of both the clinical and organisational advantages for their patients of attendance at a designated centre. However, if a patient still wishes to receive care at a local hospital rather than a designated centre, the clinician accepting responsibility for the patient should:

- a) Record that advice has been given to the patient that their care may not meet the standard available in the centre.
- b) Notify the identified centre in that area that the patient is under their care.
- c) Adhere to the protocol (Appendix 4) in terms of the frequency and timing of the necessary investigations.
- d) Use the standardised registration card (Appendix 2) to monitor progress.
- e) Have available for ward staff, the protocols for the administration of betamethasone (Appendix 5), management of labour (Appendix 6) and management of neonatal hypoglycaemia (Appendix 7).

Similar practice should be adopted by clinicians working in those designated centres outside the regional unit, if patients who are in the high-risk categories do not accept referral to the regional centre.

6.00 KEY ADVICE ON CLINICAL MANAGEMENT

6.1 Contraception for Diabetic Women

All forms of contraception carry some risk and every woman must be considered individually ⁽¹²⁾.

Additional considerations for diabetic women include:

- The importance of periconceptual control of diabetes.
- The constraints imposed by the complications of diabetes.

The Combined Oral Contraceptive Pill

- Effective if taken reliably.
- First generation high dose oestrogen pills may increase insulin requirements and increase risk of vascular disease ⁽¹³⁾.
- Second and third generation pills have a much lower dose of oestrogen and can probably be used safely in the majority of women with diabetes.
- Contraindications: diabetic complications, high arterial risk, age>35years.

The Progestogen-only Pill

- There is no epidemiological evidence associating this pill with vascular side effects and detrimental effects on lipids or clotting factors are minimal.
- This is reliable if taken regularly but omission may be more likely to result in pregnancy than with the combined pill.
- Menstrual irregularity can be problematic but usually responds to a temporary increase in dose or use of an alternative preparation.
- If amenorrhoea occurs and is of concern, a pregnancy test should be performed; a negative result suggests that the preparation is working effectively.
- Injectable progestogens/implants are suitable for some patients.

Intrauterine Contraceptive Device

- An advantage is the lack of detrimental metabolic effects and need for compliance.
- Failure rate is high (2/100 women per year).

- There is no convincing evidence for the IUCD promoting pelvic inflammatory disease ⁽¹⁴⁾.
- There is disagreement as to whether or not nulliparous women with diabetes should use this form of contraception.

Mechanical Contraception

- This method has no metabolic consequence, is still popular and has been widely promoted to reduce risk of infection with HIV.
- High failure rates usually result from omission or incorrect usage and the method is not recommended if it is essential to avoid pregnancy.
- Highly motivated couples taught to use the diaphragm and sheath correctly, may find this an effective and acceptable form of contraception.

Sterilization

- Requested by many mothers when their family is complete.
- The reduced life expectancy of those with longstanding diabetes should be borne in mind when making this decision.
- Sterilization is occasionally advised if there is felt to be a serious risk to the woman's health.
- For some couples vasectomy is appropriate.

Natural Methods

- Highly motivated couples taught to use these methods correctly, may find this an effective and acceptable form of contraception.

Emergency Contraception

- This is safe for diabetic women and should be prescribed if needed.

KEY POINTS - Contraception for Diabetic Women

- All women of childbearing age need contraceptive advice if pregnancy is not intended
- Barrier methods/low-dose oral contraceptive if low arterial risk
- Stop contraception only when adequate control is achieved
- Sterilization may be preferable when the family is complete
- Emergency contraception can be used by diabetic women

6.2 Pre-Pregnancy Care

Rationale for Pre-pregnancy Care

Good control of diabetes during pregnancy combined with intensive antenatal care reduces the perinatal mortality rate in infants of diabetic mothers ⁽¹⁵⁾. Pre-pregnancy care is cost effective in human and financial terms ^(16,17). Discussion about pregnancy and contraception should be conducted with all diabetic girls and women of childbearing age.

Women with type 2 diabetes should be assessed in a similar way. Oral hypoglycaemic agents are contraindicated during pregnancy. If it is not possible to obtain good control with diet and exercise, insulin therapy should be initiated.

Other problems can still be encountered:

Diabetic Complications

- Renal disease and hypertension can be associated with intrauterine growth retardation.
- Retinopathy can deteriorate during pregnancy.
- Autonomic neuropathy can be associated with intractable vomiting.
- Severe ischaemic heart disease can cause maternal death.

KEYPOINTS - Pre-pregnancy Care 1

- Annual review as to pregnancy intentions is recommended
- Emphasise pregnancy planning and contraception
- Education about diabetic pregnancy, including risks to fetus
- Stop oral hypoglycaemics and start insulin if needed
- Stop statins and ACE Inhibitors
- Assess and treat diabetic complications before pregnancy
- Control BP with methyldopa, nifedipine, labetalol

KEYPOINTS - Pre-Pregnancy Care 2

- Optimise control with regular self monitoring & dietary education
- Insulin: usually basal bolus regimen or bd (type 2)
- Targets: preprandial blood glucose 3.5-5.5 mmol/l and near normal HbA_{1c}
- Stop smoking
- Check rubella immunity
- Start Folic Acid 0.4mg/day (at least 4 weeks pre-conception)
- Ensure awareness of early referral and centre for antenatal care

6.3 The Diabetes in Pregnancy Specialist Team

A Multidisciplinary Approach

Antenatal care should be provided in a special “Diabetes Antenatal Clinic’ held at a time when all members of “the team” caring for pregnant women (diabetes midwife or nurse specialist, dietician, diabetologist and obstetrician) are present ⁽¹⁸⁾. The precise roles of different members of the diabetes in pregnancy care team are not clearly demarcated, as all members of the team are involved, each adding their own contribution.

Care of a pregnant woman should be the responsibility of a single physician and a single obstetrician with a special interest in this condition.

It is not acceptable for women to have to go to separate clinics on different days nor is it acceptable for several obstetricians from different teams in one centre each to look after small numbers of patients ^(19,20).

There is no need for routine admission in early or late pregnancy, other than when diabetic or obstetric complications of pregnancy are present.

The diabetes team should give all women clear instructions about how to obtain advice at any time of the day or night. This can be done by doctors or by diabetes nurse specialists with medical backup.

KEYPOINTS - The Diabetes in Pregnancy Specialist Team

- A specialist team including a named physician and a named obstetrician should see all pregnant diabetic women in a combined clinic
- The availability of an emergency advice service is essential
- At delivery, Level I Neonatal Intensive Care facilities should be available

6.4 Role of the Physician in Antenatal Care

Optimisation of Diabetic Control

Good diabetes control before and during pregnancy reduces the incidence of malformations ^(13,14). Good diabetes control during pregnancy reduces the incidence of stillbirths, respiratory distress syndrome, anoxia, polycythaemia, and prolonged hypoglycaemia ⁽²¹⁻²³⁾.

Monitoring, Insulin and Targets

All women should possess a meter and carry out regular blood glucose monitoring before and during pregnancy. The frequency can be individualised but daily preprandial monitoring is usually recommended.

Insulin regimens should be individualised but in type 1 patients a multiple injection basal bolus injection regimen of human insulin is preferable. Alternatively (eg in type 2 diabetes) a twice daily injection of short and intermediate acting (or in combination) insulin may be appropriate.

The aim is to achieve blood glucose levels as near to normal as possible without excessive risk of hypoglycaemia. Recommended targets are preprandial levels of 3.5-5.5 mmol/l, postprandial levels of 5.0-8.0 mmol/l and HbA_{1c} within the normal non-diabetic range.

Hypoglycaemia

Hypoglycaemia is common in pregnancy particularly in the first trimester. Some women may also lose the warning signs of hypoglycaemia in pregnancy. Education of patients and their partners in the recognition and management of hypoglycaemia is vital. A glucagon “kit” should be provided early in pregnancy ⁽²⁴⁾.

Ketoacidosis

Ketoacidosis is a preventable condition but potentially lethal to the fetus at any stage of pregnancy. Women should be instructed to test the urine for ketones if their blood glucose readings are high or if they are vomiting or unwell. Immediate advice should be available if ketones are found ^(25,26).

Vomiting

Women should have written instructions as to how to cope with vomiting. An antiemetic can be given for severe nausea. Those women with severe vomiting should be hospitalised promptly.

Retinopathy and Nephropathy

These complications can deteriorate during pregnancy. All women should have retinal ⁽²⁷⁾ and microalbuminuria assessment ⁽²⁸⁾ at booking and regularly during pregnancy.

KEYPOINTS - Role of the Physician

- Frequent review is required (every 1-2 weeks)
- Multiple injection regimen with highly purified human/pork insulin
- Target preprandial glucose levels are 3.5-5.5 mmol/l
- Target HbA_{1c} levels are as close to normal as possible
- Partner/relative instruction in hypoglycaemia and glucagon administration
- Regular assessment of fundi, BP, renal function
- Advise urine testing for ketonuria if hyperglycaemic or ill

6.5 Role of the Dietician

Regular access to individualised dietary advice from a dietitian is essential for optimal diabetic control before and during pregnancy. Relevant factors include maternal weight, home glucose monitoring, lifestyle, cultural and personal circumstances. Weight loss (if weight exceeds 120% of ideal body weight) should be encouraged before conception and may require a lower energy intake per kg in order to limit weight gain during pregnancy.

Complex carbohydrates should provide about 50% of the total calories distributed in the form of 10 gram exchanges as regular meals and snacks throughout the day. Refined carbohydrate should be restricted. Daily dietary fibre should be 30-50g per day as recommended by Diabetes UK. Foods rich in antioxidants such as fresh fruit and vegetables may have a role in reducing malformations.

An energy prescription of 30-35 kcal/kg pre-pregnant ideal body weight is recommended. This should be flexible since women alter their activities during pregnancy and may gain or even lose weight in the first trimester ⁽²⁹⁾.

Illness

Strategies for coping with illness, nausea and vomiting should be discussed. Patients should be given a written list of suggested foods to be taken at the time of illness or vomiting. 24-hour telephone assistance and immediate admission to hospital should be available.

Folic Acid

All women planning pregnancy are now advised to take 0.4mg folic acid each day for at least a month before conception and during the first 12 weeks of pregnancy to prevent neural tube defects ^(30,31). Women with a personal or family history of neural tube defects should take 5 mg/day.

Breast Feeding

Breast-feeding should be encouraged but may prove difficult because of the high incidence of premature delivery and the need for early bottle supplementation to treat neonatal hypoglycaemia. An additional 40-50g of carbohydrate compared to the pre-pregnancy diet is usually recommended during breast feeding ⁽³²⁾. The breast milk of diabetic women has a normal macronutrient composition provided the diabetes is well controlled.

Breast-feeding may reduce the risk of type 1 diabetes in the babies of diabetic mothers ⁽³³⁾.

KEYPOINTS - Role of the Dietician

- All diabetic women should receive dietary advice before and during pregnancy
- Start folic acid at least 4 weeks before and continue until 12 weeks after conception
- The diet should contain high levels of complex carbohydrate, soluble fibre and reduced saturated fats
- Women should be encouraged to breast feed
- Women who breast feed should consume an additional 40-50g carbohydrate daily

6.6 Role of the Diabetes Nurse Specialist and Designated Midwife

Pregnant diabetic women are usually highly motivated to optimise glycaemic control. The opportunity must be grasped to review all aspects of diabetic management. General advice, care and support should be provided. Liaison with partners and other family members is particularly important. The role of diabetes nurse specialists in advising diabetic patients on all aspects of diabetes care is well recognised. The group believes that there is also value in having a midwife member of the diabetes specialist team who has additional experience in this field. However, inquiries to hospitals elsewhere in the UK did not identify any formally designated posts.

It is recommended that designated centres should explore the feasibility of identifying a designated midwife to work with the diabetes team. The time commitment would vary with each unit's expected workload. Responsibilities could include:

- Provision of support to the patient during antenatal, intrapartum and postnatal care.
- Support and advice to the partner/immediate family on the management of diabetes during pregnancy.
- Establishment of a telephone helpline service.
- Advice to delivery suite staff on the management of labour.
- Advice on feeding of the neonate.
- Ongoing education of all midwifery staff.

Pre-pregnancy

There is a high incidence of congenital malformation in children born to diabetic mothers. This can be reduced by good blood glucose control in early pregnancy. If possible, diabetic women should be encouraged to plan their pregnancies, with the aim of achieving good control before pregnancy occurs. However, even in unplanned pregnancy, it is important that blood glucose levels should be controlled as early as possible. The diabetic nurse specialist has therefore a most important role in discussing conception and parenthood with newly diagnosed diabetic teenagers and women of childbearing years. Provision of advice on the importance of urgent referral if they should become pregnant is also essential. Continuing educational support of women with type I diabetes should also continue to be provided.

Pregnancy

The diabetes specialist midwife should undertake midwifery duties in the diabetic antenatal clinic and together with the diabetes specialist nurse offer support and

advice. The diabetes nurse has an important role in teaching insulin administration and self-monitoring. The specialist midwife is valuable during labour and delivery and can educate other midwives.

KEYPOINTS - Role of the Diabetes Nurse Specialist and Designated Midwife

- The diabetes specialist nurse should help to identify and offer pre-pregnancy counselling to women at risk of pregnancy
- All centres caring for pregnant diabetic women should provide a diabetes nurse specialist or specialist midwife (ideally both) to provide support and advice
- Specialist nurses should be involved in the training of other health professionals

6.7 Role of the General Practitioner

The care of pregnant women and girls with diabetes should be largely hospital based, as it requires considerable specialist expertise. General practitioners, however, have a very important contribution in:

- Discussing the importance of planned pregnancy and giving contraceptive and pre-pregnancy advice
- Targeting young women with diabetes who default from hospital clinics and liaising with hospital clinics in their management
- Referring women for pre-pregnancy counselling
- Ensuring urgent referral to the appropriate antenatal clinic on diagnosis of pregnancy

The diabetes pregnancy care team should ensure that the general practitioner is kept informed about the patient's progress at regular intervals.

KEY POINT - Role of the General Practitioner

- The care of the pregnant woman with diabetes should be hospital based but the general practitioner has a vital role to play in pre-pregnancy advice and urgent (same day) referral on diagnosis of pregnancy

6.8 Role of the Obstetrician

Antenatal care should be undertaken:

- a) By an obstetrician with a special interest in diabetes and pregnancy
- b) In a unit providing:
 - Standard methods of assessing fetal well-being
 - Level I Neonatal Intensive Care.

The major risks for the fetus of a diabetic woman are:

- Congenital malformation
- Intrauterine death - usually after 30 weeks
- Macrosomia, which usually results in significant problems in labour for both mother and baby.

Patients should be counselled carefully early in pregnancy about these risks and hence the need for good blood sugar control and frequent antenatal assessment. Antenatal fetal surveillance must be planned so that each risk is addressed in a logical way and at an appropriate time.

Unfortunately, all the standard methods of fetal assessment are unreliable when the mother has diabetes and so a “normal test” cannot be interpreted with the same confidence as in the non-diabetic state. In contrast, the abnormal result should be treated with even more urgency and vigilance than that in the non-diabetic patient, bearing in mind the already high-risk environment.

Congenital Abnormality

Fetal malformation is 2-3 times more common in diabetic pregnancy and in addition there may be other factors, such as a positive family history or maternal age, which increase the risk further.

All diabetic patients should be counselled about the possibility of neural tube defects and offered a serum alpha-fetoprotein blood test between 15 and 19 weeks gestation. A detailed ultrasound scan at between 20 and 22 weeks for careful assessment of fetal anatomy is mandatory ⁽³⁴⁾. Women over 35 years of age should also be counselled about the value of:

- A double/triple test
- Amniocentesis.

Because of the increased risk of fetal malformations in general, obstetricians should be vigilant at all subsequent scans for growth as to the possibility of other previously undetected fetal anomalies which may become obvious as the fetus matures.

Intrauterine Death

The risk of intrauterine fetal death is increased by a factor of approximately 3 times, mostly confined to the third trimester. Strict control of maternal blood glucose levels will reduce this risk, but not down to that of the general population. Surveillance of fetal wellbeing is therefore based on the assumption that no matter how good the control is, the fetus is at high risk. Ultrasound assessment should be carried out at each visit from 26 weeks, i.e. two weekly until 36 weeks and weekly thereafter. If there are additional recognised risk factors, such as hypertension, or renal disease, then the programme of surveillance must be modified and this may mean more frequent ultrasound assessment in addition to umbilical artery Doppler measurements ⁽³⁵⁾ and cardiotocography.

Poor fetal growth, growth acceleration and polyhydramnios are all significant risk factors and demand further investigation. Abnormal growth, whether above or below the tenth centile will necessitate early delivery, which will usually be urgent if the Doppler or CTG are also abnormal. But if these tests are normal and there are absolutely no other risk factors, then depending on gestation, delaying delivery for one or two weeks to confirm the abnormal growth pattern may be of benefit in gaining further fetal lung maturation. In these circumstances very careful fetal surveillance, perhaps daily, should be undertaken, bearing in mind that the risk of developing RDS may be greatly outweighed by the risks of sudden intrauterine death.

Unlike in the non-diabetic, it is excessive fetal growth rather than retarded growth that may be associated with the greatest risk. Increasingly large abdominal circumference in relation to the biparietal diameter can be easily monitored by serial ultrasound scans and these two parameters should be measured and documented at every visit, in association with assessment of liquor volume.

Intrauterine growth retardation is uncommon in diabetic women and if present, is usually associated with diabetes complicated by vascular disease, nephropathy or hypertension.

Macrosomia

The programme of ultrasound measurements outlined above will detect the large-for-date fetus and if the excessive growth indicates that delivery is necessary, then the risks associated with a large fetus, namely trauma to the mother and baby, will often necessitate elective Caesarean section ⁽³³⁾.

Ultrasound Scanning Programme

1. *First visit.*

- Confirm ongoing pregnancy.
- Single or multiple.
- Check gestational age.

2. *20-22 weeks.*

- Detailed assessment for anomalies.
- Final confirmation of gestational age.

3. *26 weeks onwards.*

- Fetal growth: BPD, abdominal circumference, estimated fetal weight.
- Fetal anatomy: look for malformation that may become apparent as fetus gets bigger.
- Liquor volume.
- Placental maturity.

Timing of Delivery

In the entirely uncomplicated case with no evidence of fetal compromise, delivery at 39-40 weeks is standard practice, as allowing the pregnancy to go past term is probably introducing an additional risk factor. When there are maternal complications of diabetes, complications of pregnancy, a previous still birth or evidence of abnormal fetal growth, each case must be considered on its own merit, with timely delivery in a hospital with Level I Neonatal Intensive Care. The aim should be to have a spontaneous vaginal delivery but this is not always possible.

Steroids

If delivery is indicated before 36 weeks then administration of steroids to the mother for 48 hours prior to delivery should be undertaken. Steroids will upset glycaemic control and should only be given on an in-patient basis to permit careful monitoring of the glucose levels and appropriate alteration of the insulin regimen. A betamethasone protocol should be available on all obstetric wards (Appendix 5).

KEYPOINTS - Role of the Obstetrician

- The clinical judgement of an obstetrician experienced in diabetic pregnancy is essential
- Ultrasound scanning must be available for assessing gestational age, examining for congenital anomalies and for assessing fetal growth
- Maternal monitoring of fetal movements should be encouraged
- If there are other factors indicating an additional risk for the fetus then more detailed assessment is mandatory

6.9 Management of Labour and Delivery

Glucose Control During Labour

Every labour ward managing the care of women with diabetes should have a clear protocol such as that in Appendix 6. Unless the patient has a very rapid spontaneous labour, it is necessary to administer intravenous insulin and dextrose to prevent ketoacidosis and to maintain the blood glucose as near normal as possible. The management of diabetes in labour should be supervised by a diabetes physician. Blood glucose should be measured hourly by a meter at the bedside. The aim is to maintain blood glucose levels between 4.0-6.0 mmol/l.

Immediately after delivery, the insulin requirements fall dramatically. Any insulin and glucose infusions can be stopped and the patient allowed to eat. Over the next few hours very little insulin may be needed and the insulin requirements then usually return to about the pre-pregnancy level.

Pain Relief

Effective pain relief is important and epidural anaesthesia should be considered.

Fetal Heart Rate Monitoring

Continuous fetal heart rate monitoring should be used routinely.

Shoulder Dystocia

The possibility of the baby being very large and causing mechanical problems should always be considered. Fetal size may be underestimated both clinically and by ultrasound. Where the baby is thought to be large but vaginal delivery is planned, slow progress in labour should always prompt consideration of Caesarean section. Experienced midwifery and obstetric staff should be present for vaginal delivery and must be aware of the protocol for management of shoulder dystocia.

Caesarean Section

A dextrose infusion should be instituted for vaginal delivery and insulin infused as necessary using an agreed protocol (example shown in Appendix 6). If insulin is used it should be stopped at delivery and restarted at a lower level when the blood glucose starts to rise. The dextrose and insulin infusion should be continued until the patient is able to eat without vomiting. The patient should then be restarted on the pre-pregnancy subcutaneous insulin regimen.

KEYPOINTS - Management of Labour and Delivery

- Individualised timing of delivery, aiming for a spontaneous vaginal delivery if possible
- Intravenous dextrose and insulin should be administered during labour and delivery following an agreed protocol and supervised by a diabetologist
- Continuous fetal heart rate monitoring should be used routinely
- Labour ward staff must be aware of the possibility of shoulder dystocia and have clear protocols for the management of this complication

6.10 Neonatal Care

Pregnancy, labour and delivery of women with diabetes should be undertaken in units where there is level I neonatal care. All infants require a period of close observation and monitoring after birth, but some babies can be cared for in the Delivery and then Postnatal Ward with their mothers, provided that staffing levels are adequate to ensure good supervision. By contrast, in situations where hypoxic or other stress has occurred or where the mother's diabetes was poorly controlled, prolonged and profound neonatal hypoglycaemia is likely and all such infants should be admitted to the Neonatal Unit ⁽³⁶⁾.

Hypoglycaemia

The aim is to minimise the incidence and severity of hypoglycaemia (<2.6mmol/l) by early feeding and careful monitoring.

- Capillary blood glucose should be measured 30 minutes to one hour after birth, then at 2, 4, 6 and 12 hours of age (before feeds).
- The normal response is a fall by 2 hours, which begins to rise again by 4 hours.
- If otherwise asymptomatic, the infant should be put to the breast or fed as soon as stable after birth (within 30 minutes), and then at 2 hours and then 3-4 hourly for the next 12-24 hours.
- If breast feeding is intended, the infant should be allowed to suckle at the times of feeds with provision of complement as mother's expressed breast milk (if available) or formula.
- If the infant remains asymptomatic and when the capillary blood glucose is staying above 2.0-2.5 mmol/l, complements are no longer necessary (usually by 12-18 hours).
- If bottle-feeding is intended, normal infant formula should be fed at an initial rate of 60ml/kg/day for 24 hours (by tube if necessary). This is the normal fluid intake for the first day of life and is increased thereafter.
- If by 4 hours the glucose has not risen above 2.0-2.5 mmol/l, but the infant is asymptomatic, (i.e. no lethargy, jitteriness, abnormality of tone, convulsions or apnoea) it may be necessary to give tube feeds 2 hourly for the next 6-12 hours

to minimise the need for intravenous dextrose. Preterm formula can also be tried in view of its higher energy content (0.8 kcal/ml versus 0.65 in normal infant formula).

If the infant becomes symptomatic or blood glucose remains low, IV glucose must be considered (Appendix 7).

Polycythaemia

Haematocrits are higher in infants of diabetic mothers than other infants. If the infant appears plethoric or becomes symptomatic, the haemoglobin and haematocrit should be checked on a central free-flowing sample (not capillary) and assessed in the normal way in relation to the results and any symptoms.

Respiratory Distress Syndrome

Both surfactant deficiency and transient tachypnoea are more common in infants of diabetic mothers, but these are unlikely with delivery at 39-40 weeks and avoidance of Caesarean section. Both conditions, along with other rarer conditions such as diaphragmatic hernia, pneumothorax, congenital heart disease and infection must be considered if the infant shows clinical evidence of respiratory distress, with investigation and management as appropriate.

Other Metabolic Problems

Infants of diabetic mothers are also more likely to develop jaundice, hypocalcaemia and hypomagnesaemia and these must be considered in the presence of suggestive symptoms, with investigation and management as for other infants.

Other Problems

Congenital malformations are more common in infants of diabetic mothers particularly if there has been poor periconceptual diabetic control. These include cardiac defects, the caudal regression syndrome, renal anomalies, vertebral dysplasia and single umbilical artery. Other neonatal problems include renal vein thrombosis, small left colon syndrome, poor feeding tolerance and septal hypertrophic cardiomyopathy.

There is also an increased risk of macrosomia which can result in superficial and deep trauma (including shoulder dystocia, bruising, fractures and damage to nerves).

KEY POINTS - Neonatal Care

- Women with diabetes should plan to be delivered in hospitals with Level I Neonatal Intensive Care
- Admission to the neonatal unit is necessary only if a problem is apparent or anticipated
- Routine blood glucose monitoring of the baby should be performed for the first 12 hours

6.11 Postnatal Care

Insulin requirements fall dramatically at the time of delivery (see above) and the insulin dose should be reduced to about the pre-pregnancy level. Women should be encouraged to run their blood glucose levels slightly higher than during pregnancy but to continue to spend time caring for their diabetes so they will be fit to look after the child.

Breast feeding also reduces the insulin requirement. Appropriate reduction should therefore be made once feeding is established.

It is usually possible to stop insulin post delivery in women with type 2 or gestational diabetes but capillary glucose readings should be monitored regularly in hospital.

Contraception should be discussed while the patient is in hospital.

All women should be seen by the diabetes pregnancy care team six weeks after delivery. Women with diabetes diagnosed during pregnancy should have an oral glucose tolerance test at this stage.

KEY POINTS - Postnatal Care

- The insulin dosage is immediately reduced after delivery and approximates the pre-pregnancy dose
- Continuing good diabetic control should be encouraged but with slightly lower target levels than during pregnancy
- Contraception should be discussed in hospital
- Women should be reviewed at 6 weeks after delivery and an oral glucose tolerance test performed in women with diabetes diagnosed during pregnancy

6.12 Gestational Diabetes Mellitus (GDM)

Definition and Diagnosis

Gestational diabetes has been defined as “carbohydrate intolerance of variable severity with onset or first recognition during pregnancy” (37).

Uncertainty and confusion surrounds the screening and diagnosis of GDM (38). Different diagnostic and management protocols are used in different countries (especially Europe and North America) which makes comparisons difficult (39).

During pregnancy the normal range for fasting blood glucose is much lower than in non-pregnant women and glycosuria with normal blood glucose levels is common due to a lowering of the renal glucose threshold.

With advancing pregnancy, resistance to insulin increases and this results in an increasing incidence of glucose intolerance.

The basic issue remains the relevance of minor degrees of glucose intolerance to the maternal-fetal unit. This will hopefully be addressed by the Hyperglycaemia and Adverse Pregnancy Outcome Study (HAPO), a large multicentre study which will report in 2005.

Recommended Screening Protocol

- Urine testing for glycosuria at every antenatal visit
- Timed random laboratory glucose:
 - If glycosuria ($\geq 1+$) is detected.
 - At the booking visit and 28 weeks gestation.
- Proceed to 75g (Oral Glucose Tolerance Test) with laboratory glucose measurement if timed random blood glucose concentrations are:
 - >5.5 mmol/l fasting or two hours after food.
 - >7.0 mmol/l within two hours of food.

Diagnosis

The guideline is cognisant of the fall in fasting glucose and rise in two-hour glucose that occurs in normal pregnancy. Using WHO criteria would result in some 15% of women having GDM. It is therefore proposed that the 95th centile of the 2-hour post-load plasma glucose as the cut-off point is used for diagnosis, as recommended by the Diabetic Pregnancy Study Group of the European Association for the Study of Diabetes, detailed below ⁽⁴⁰⁾. The fasting glucose of 7.0 mmol/l follows the recent revision of the diagnostic criteria for diabetes proposed by the American Diabetes Association.

**Revised WHO Criteria for the
75g Oral Glucose Tolerance Test (OGTT) During Pregnancy**

	Plasma glucose		
	Fasting		2-hour
Normal	<5.5 mmol/l	and	<9.0 mmol/l
Gestational IGT	5.5-6.9 mmol/l	and/or	9.0-10.9 mmol/l
Diabetes	>7.0 mmol/l	and/or	>11.0 mmol/l

Management of Gestational Diabetes Mellitus (Gestationally Impaired Glucose Tolerance and Diabetes)

Women diagnosed with GDM should be seen by a physician and obstetrician with a special interest in diabetes.

- Dietary advice is essential. Sweet foods should be avoided. Calorie intake should be reduced if overweight. An exercise programme may be appropriate. Such measures will achieve metabolic control in the majority of women.
- If the fasting/preprandial glucose levels are consistently above 5.5 mmol/l and postprandial levels consistently above 8.0 mmol/l insulin should be commenced. A bd insulin regimen may suffice. Target glucose levels are similar to type 1 patients. Insulin can usually be discontinued at delivery.
- Postpartum monitoring of capillary glucose is essential in all women with GDM to ensure that normal glycaemia returns after delivery. A 75g OGTT should be performed between 6 weeks and 6 months after delivery and the results

interpreted by revised WHO criteria: (fasting >7.0 mmol/l or 2 hour >11.0 mmol/l represents diabetes).

- Women with a history of GDM should be screened for GDM during any future pregnancy. The risk of subsequent diabetes (usually type 2) in GDM is about 60% over 20 years. Obesity increases the risk and therefore weight loss should be advised even if normal glucose tolerance returns postpartum. An annual check of fasting or postprandial glucose allows early identification of asymptomatic individuals.
- The infant of a mother with GDM should be managed in a similar manner to the infant of an established type 1 diabetic mother.

7.0 IMPLEMENTATION OF THE GUIDELINES

Dissemination

The group advises that the **full** guidelines should be sent to:

- a) All diabetologists, obstetricians and paediatricians in Northern Ireland
- b) Chief Executives, Directors of Public Health and other chief professional officers in Health and Social Services Boards
- c) Chief Executives of Trusts for distribution to Clinical Directors
- d) Chairmen of Area Clinical Audit Committees and of Area Medical and other professional Advisory Committees
- e) Local Diabetes Advisory Groups
- f) Relevant education and training bodies

A **summary** version of the guidelines will be sent to general practitioners

This will include:

- An emphasis on the importance of pre-pregnancy counselling and advice on contraception for women with diabetes
- The importance of rapid referral
- Summary of recommendations

Monitoring

It is recommended that after publication and dissemination of these guidelines, CREST should request Boards to report on progress in designating diabetes centres. This should be followed by the first audit in Appendix 3. A regional audit should be planned, with the aim of reporting progress to CREST and RMAG by September 2002. The results should be considered by CREST alongside information from the Neonatal Intensive Care Outcomes Research and Evaluation Group (NICORE). This may be followed by a programme of visits to designated units as appropriate. Long-term measurement of outcomes will be obtained from the standardised records to be used by all designated centres.



Timescale for Review of the Guidelines

These guidelines contain recommendations based on the best available evidence. Adherence to them will not ensure a successful outcome in every case, but their implementation should result in a significant improvement in outcomes for pregnant diabetic women and their babies. The guidelines may require revision as scientific knowledge and technology advances and changes. They should be reviewed no later than three years from the date of publication.

The ultimate judgement regarding a particular clinical procedure or treatment, must be made by the clinician in light of the clinical data presented by the patient and the diagnostic and treatment options available. However, significant departures from the guidelines as expressed in this local protocol should be fully documented in the patient's notes and the reasons for the differences explained.

8.0 SUMMARY OF RECOMMENDATIONS

In order to achieve the goals of the St Vincent Declaration, effort needs to be made to:

- Increase the proportion of pregnancies in diabetic mothers that are planned.
- Improve control of diabetes before pregnancy occurs.
- Improve the care of mothers and babies in the antenatal, delivery and postnatal stages.

Structure of Services

There are a number of criteria that would identify those hospitals able to offer the best possible care for pregnant diabetics. These include:

- A joint antenatal clinic staffed by a team comprising a nominated and experienced physician and obstetrician, supported by a specialist nurse or midwife.
- A designated ward for all inpatient obstetric care.
- Level I neonatal care.
- Formal arrangements for provision of emergency advice and rapid admission.
- A daily physician ward round.
- A daily obstetrician ward round.
- Standardised record keeping and patient information.

It is recommended that commissioners should examine the services available within Trusts offering obstetric services against these criteria, with the aim of arranging all antenatal and intrapartum care for pregnant patients with diabetes or gestational diabetes to take place in designated centres which meet these criteria.

Following designation, commissioners and designated provider Trusts should take steps to circulate to all GPs and community midwives, written information on the clinic in their area. This should include the names of team members and relevant contact numbers to facilitate early referral.

From Autumn 2001 standardised record cards should be used when caring for all cases of diabetes in pregnancy in Northern Ireland. This should be in the format reproduced in Appendix 2. This information should be used in a regional audit of care. Interim findings of the first six months' data should be reported to all participating hospitals by June 2002. A report on the first year's findings should be available in summarised form for CREST and RMAG by March 2003.

There follows more detailed recommendations on the clinical care of patients.

Pre-Pregnancy Care

All diabetic women should be assessed and counselled about their contraceptive and pre-pregnancy needs:

- To assess suitability for pregnancy.
- To emphasise the need for pregnancy planning and contraception.
- To optimise control (type 2 diabetes by diet or insulin).
- To advise on need for euglycaemia (4.0-7.0 mmol/l) at time of conception and throughout pregnancy.
- To check rubella immunity.
- To ensure that women receive folic acid (0.4mg/day) before conception and throughout the first trimester .
- To advise about smoking and medication.

Organisation of Services

- Women with diabetes should be referred as early as possible in the first trimester for antenatal care (before 8 weeks gestation).
- Care should be provided at a dedicated, multidisciplinary (named obstetrician, named diabetes physician, specialist nurse/midwife) combined clinic in a designated centre with Level I Neonatal Intensive Care.
- It is unacceptable for a woman to have to attend her obstetrician and physician on different days.
- A standardised management protocol should be used throughout Northern Ireland (Appendix 4).
- Information should be managed efficiently to allow audit of outcome.

Management of Pregnancy Requires

- Frequent review (1-2 weekly).
- Appropriate educational support.
- Capillary glucose self-monitoring undertaken at least four times daily.
- Maintenance of blood glucose and glycated haemoglobin as close to normal as possible while avoiding hypoglycaemia.
- Regular examination of fundi and renal function (microalbuminuria).
- Access to the dietician and diabetes specialist nurse in the clinic.
- 24 hour access to the specialist team, with a telephone link.
- Quality ultrasound scanning to:
 1. Assess gestation.
 2. Look for fetal abnormalities.
 3. Assess fetal growth at each visit after 26 weeks.
- Assessment of fetal well-being by cardiotocography and umbilical artery Doppler should be available, but their limitations must be appreciated.

Delivery

- Women with diabetes should be delivered vaginally at 39-40 weeks unless specified obstetric or diabetic risks are present.
- Blood glucose should be maintained at 4.0 to 7.0 mmol/l during labour or Caesarean section using intravenous glucose/insulin regimen according to standard protocol, supervised by the specialist team.
- Access to specialist neonatal intensive care is required with the neonatologist warned of expected delivery.

Immediately Postpartum

- Breast-feeding should be encouraged and the baby offered a feed within the first hour of birth.
- Insulin infusion rate should be halved immediately.
- Pre-pregnancy insulin dose should be resumed after delivery.
- Neonatal capillary blood glucose should be measured 30 minutes to one hour after birth, and then at 2, 4, 6 and 12 hours of age before feeds.
- If diabetes has been diagnosed for the first time in pregnancy, insulin should be stopped and capillary glucose readings monitored closely.

Postnatal

- All women should be seen for a 6-week postnatal examination.
- Contraceptive advice should be offered.
- If diabetes has been diagnosed for the first time during pregnancy but now apparently in remission perform 75g oral glucose tolerance test (OGTT).

Screening for Gestational Diabetes Mellitus

- Urine testing for glycosuria at every antenatal visit.
- Timed random laboratory glucose:
 - If glycosuria ($\geq 1+$) is detected.
 - At the booking visit and 28 weeks gestation.
- Proceed to 75g OGTT with laboratory glucose measurement if timed random blood glucose concentrations are:
 - >5.5 mmol/l fasting or two hours after food.
 - >7.0 mmol/l within two hours of food.

Management of Gestational Diabetes Mellitus (Gestationally Impaired Glucose Tolerance and Diabetes)

- Sugar free diet.
- Start insulin if:
 - Preprandial glucose >5.5 mmol/l.
 - 1 hour postprandial glucose >8.0 mmol/l.

PREGNANCY AND DIABETES

Summary of Recommendations for Primary Care Staff

- Advise about the importance of PLANNED pregnancy.
- Offer contraception. See Section 6.1 for details on appropriate methods.
- Patients wishing to become pregnant need
 - RUBELLA immunity check
 - Periconceptual folic acid (0.4mg/day) throughout first trimester.
 - Possible referral to local diabetic clinic for advice on need to change from oral hypoglycaemics to insulin, review of other medication (such as need to stop statins and ACE inhibitors) and to maximise blood sugar control.
- ENCOURAGE GOOD CONTROL: capillary monitoring at least 4 times daily aiming for preprandial glucose levels 3.5 - 5.5 mmol/l and postprandial < 8.0 mmol/l. HbA_{1c} should be within the upper part of the normal range.
- ADVISE TO STOP SMOKING.
- In view of risk of hypoglycaemia, advise STOPPING ALCOHOL.
- ARRANGE URGENT TELEPHONE REFERRAL (same day) on diagnosis of pregnancy.

KEY POINT - Role of the General Practitioner

- The care of the pregnant woman with diabetes should be hospital based but the general practitioner has a vital role to play in pre-pregnancy advice and urgent (same day) referral on diagnosis of pregnancy

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Diabetes Specialist Nurse, Newry Medical Village

Professor D Hadden
Consultant Endocrinologist, Royal GHT

Mrs J Irwin
Midwife, Royal Maternity Hospital

Dr J Jenkins
Consultant Paediatrician, Antrim Area Hospital

Dr S Magee
Consultant Obstetrician, Altnagelvin Area Hospital

Dr D McCance
Consultant Physician, Royal GHT

Mrs K McMullan
Patient Representative, Diabetes UK

Dr J Milliken
General Practitioner, Bangor Health Centre

Membership of the Management of Diabetes in Pregnancy Working Group (Cont.)

Dr K Moles
Consultant Physician, Altnagelvin Area Hospital

Miss A Moore
Chief Dietician, Royal GHT

Mr M O'Hare
Consultant Obstetrician, Daisy Hill Hospital

Dr C Ritchie
Consultant Physician, Craigavon Area Hospital

Dr S Tharma
Consultant Obstetrician, Belfast City Hospital

Dr A Traub
Consultant Obstetrician, Royal GHT

Dr K Walshe
General Practitioner, Dundrum Surgery

Secretariat: Mr G Hannan, CREST

NORTHERN IRELAND DIABETIC PREGNANCY REGISTRATION						
Name		GP Name				
Address		GP Address				
DOB						
Phone Number		GP Phone Number				
Name of Diabetes Physician pre-pregnancy and place attended:						
Source of initial referral to maternity hospital: GP/Hospital/Self-referral/Other						
BACKGROUND INFORMATION						
Parity at booking (excluding this pregnancy)						
Expected date of delivery (dd/mm/yyyy)		Based on Dates/Scan/Other				
Date of first day of LMP (dd/mm/yyyy)						
Ethnicity		White/other detail if necessary				
MATERNITY HOSPITAL:						
HOSPITAL 1		HOSPITAL 2				
Hospital Name						
Hospital No.						
Antenatal number						
Date of first antenatal visit (dd/mm/yyyy)						
Gestational age at first visit(dd/mm/yyyy)						
Reason for transfer to hospital 2 (if applicable)						
BOOKING DETAILS OF MOTHER						
Height (m)						
Weight (kg) pre-pregnancy						
Smoking prior to pregnancy	Yes/No	No of cigarettes				
Smoking during pregnancy	Yes/No	No of cigarettes				
Taking folic acid periconceptually	Yes/No/Not known	Dose (specify)				
Planned pregnancy	Yes/No/Not assessable	Detail				
Pre-pregnancy counselling	Yes/No/Not assessable	Detail				
Most recent contraception pre-pregnancy	Combined OCP/Progestogen only pill/IUCD/Barrier/Depot/Other/None					
Civil status at booking	Married/Single/Widowed/Cohabit					
PAST OBSTETRIC HISTORY						
Pregnancy	I	II	III	IV	V	VI
Date (dd/mm/yyyy)						
Place delivery						
Mode delivery (ND/Instrument/CS)						
Outcome(miscarriage/abortion/termination/stillbirth/livebirth/neonatal death/other)						
Antenatal complications (Yes/No; detail)						
Sex (male/female)						
Birth weight (g)						
Malformations (Yes/No; detail)						
Gestational diabetes (Yes/No; detail)						

DETAILS OF DIABETES STATUS BEFORE AND DURING PREGNANCY			
Type 1 diabetes	Yes/No	Date diag (dd/mm/yyyy)	
Type 2 diabetes	Yes/No	Date diag (dd/mm/yyyy)	
Carbohydrate intolerance	Yes/No	Date diag (dd/mm/yyyy)	
Gestational diabetes	Yes/No	Date diag (dd/mm/yyyy)	Gestational age (wks)
Diag GDM: Random glucose (mmol/l)		Date (dd/mm/yyyy)	Gestational age (wks)
Diag GDM: Fasting glucose (mmol/l)		Date (dd/mm/yyyy)	Gestational age (wks)
Diag GDM: 2-hour glucose (mmol/l)		Date (dd/mm/yyyy)	Gestational age (wks)
GDM: Date commencement on diet		Date (dd/mm/yyyy)	Gestational age (wks)
GDM: Date commencement on insulin		Date (dd/mm/yyyy)	Gestational age (wks)

MATERNAL HISTORY INCLUDING DIABETES			
Age onset diabetes (years)		Year onset diabetes (yyyy)	
Date started diet :	(dd/mm/yyyy)		
Date started tablets	(dd/mm/yyyy)	Specify	
Date started insulin	(dd/mm/yyyy)		
No of insulin injections at conception	Not recorded/one daily/two daily (sol & intermediate)/3 daily/4 daily/other/not applicable Detail:		
No of insulin injections at delivery	Not recorded/one daily/two daily (sol & intermediate)/3 daily/4 daily/other/not applicable Detail:		
Total dose of insulin (units)	At booking	Pre-delivery	Post-natal
Self monitoring pre-preg	None/Urine/Strip/Meter/Unknown		
Retinopathy pre-pregnancy	None/Maculopathy/Background/Pre-proliferative/Proliferative/Not known Detail if necessary:		
Retinopathy progression during pregnancy	Yes/No/Not known Detail:		
Nephropathy	None/Microalbuminuria/Persistent Proteinuria/Proteinuria and Creatinine >120mmoles/l Detail:		
Progression nephropathy during pregnancy	Yes/No/Not known Detail:		
Hypertension pre-pregnancy	Yes/No/Not known	Pre-preg SBP mm/Hg	Pre-preg DBP mm/Hg
HbA _{1c} (last two values within 6 months pre conception)	Latest value (normal range)	Value (normal range)	
Additional antenatal complications of type 1 diabetes	Yes/No/Not known (eg IHD/Autonomic neuropathy/Transplant) Detail:		
Past Medical History (eg SLE/thyroid disease/cancer etc)			

DRUGS TAKEN DURING PREGNANCY (apart from insulin)			
Name of drug	Dosing schedule	Date started (dd/mm/yyyy)	Date finished (dd/mm/yyyy)

CLINICAL DETAIL DURING PREGNANCY AND FOLLOW UP		
Anaemia (Hb <10.3 g/dl)	Yes/No/Not known	Detail
Proven UTI	Yes/No/Not known	Detail
Max proteinuria during preg (0-4+)		Detail
Pregnancy-induced hypertension	Yes/No/Not known	Detail
Pre-eclampsia (proteinuria associated hypertension PIH)	Yes/No/Not known	Detail
Polyhydramnios	Yes/No/Not known	Detail
Suspected preterm labour	Yes/No/Not known	Detail
Bleeding PV	Yes/No/Not known	
Betnesol treatment	Yes/No/Not known	
Post partum OGTT	Yes/No/Not known	Detail
Maternal follow up	Yes/No/Not known	Detail

OUTCOME OF CURRENT PREGNANCY (photocopy page for twin 2 if applicable)					
Date delivery (dd/mm/yyyy)					
Fetal presentation	Cephalic/Breech/Other/Not assessable				
Labour	Spontaneous/Induced/Elective CS Detail:				
Mode delivery	Normal/Forceps/Vacuum/CS in labour/Elective CS/Emergency CS/Other/Not known Detail:				
Gestational age at delivery/abortion	Weeks				
Delivery outcome	Miscarriage (<24 weeks)/Abortion (>24 weeks)/Termination/Stillbirth/Livebirth Detail:				
Neonatal death	No/Early<7d/Late 7-28d				
Morbidity	Yes/No; Detail:				
Malformations	Yes/No Detail:				
Placental weight (grams)	Grams				
Maternal complications	Yes/No/Not recorded Detail:				
DETAILS OF INFANT					
No of infants	Single/Twins/Other				
Sex	Male/Female/Indeterminate				
Birth weight (grams)	Grams				
Agpar 1 minute			Agpar 5 minutes		
Infant length (cms)	Cms		Infant head circumference (cms) Cms		
Neonatal hypoglycaemia	Yes/No/Not known	Shoulder dystocia		Yes/No/Not known	
Admitted to neonatal unit	Yes/No Timing and reason for admission:				
No. of days in neonatal unit	Days				
Transfer to other unit	Yes/No	Date transfer (dd/mm/yyyy)			
Hospital transferred to					
Feeding method on discharge	Bottle/Breast/Other				
Date of discharge from hospital	Mm/dd/yyyy				
Planned follow up of baby	Yes/No	If Yes- detail			
Hospital number of baby if applicable					
REVIEW OF CURRENT PREGNANCY					
Total no. antenatal visits			Total no. scans		
Was patient a 'regular defaulter' (>3 scheduled visits?)	Yes/No/Not known				
No. of episodes of hypoglycaemia requiring assistance	First trimester No.	Second trimester No.	Third trimester No.	Total No.	
No. of DKA during pregnancy	First trimester No.	Second trimester No.	Third trimester No.		
Hospital admissions during pregnancy	Yes/No/Not known	Number Detail:			
Management at a joint diabetic/antenatal clinic Yes/No/NK If no give details:					
Name diabetes physician			Name obstetrician		
Fundi examined	At booking: Yes/No/NK		At 28 weeks: Yes/No/NK		
Microalbuminuria tested	At booking: Yes/No/NK		At 28 weeks: Yes/No/NK		
HbA1c list all recorded					
	HbA1c	Normal range	Date	HbA1	Normal range
Date at booking					
Date					
Date					
Date					
Date					
Date					
Date					
Date					
Date					
Date					

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Date	Gest age	Blood glucose Mmol/l	HbA1c	Comment Insulin dose	Signature	Next appt

Suggested audits on the organisational arrangements and clinical management of pregnancy in diabetic women

This appendix contains suggestions for audit on the structure, process and outcome of services for pregnant women with diabetes. They are intended to assist clinical staff to devise audits on these topics. The items of care to be audited are derived from the recommendations contained within the CREST guidelines. The wording and format of the items of care may be amended in the light of local areas of interest or concern and are therefore to be considered as draft at this stage.

The second audit is designed to be undertaken simultaneously by all hospitals providing care for pregnant women with diabetes. It is detailed, but there are relatively few cases of diabetic pregnancy in Northern Ireland each year and as the records will have to be extracted in any event, it seems advisable to collect all the relevant information on one occasion. This will require regional agreement and at least one meeting to agree the audit standards and definitions to be used.

DRAFT AUDIT DESIGN

Organisational arrangements for the management of pregnancy in diabetic women (1st audit project in the rolling audit programme)

- Title:** Review of the services available within Trusts offering obstetric services for pregnant diabetic women.
- Aim:** Identify those Trusts/hospitals which are able to offer the best possible care.
- Intended outcome:** Designate Trusts which meet established criteria.
Facilitate commissioners and designated Trusts to circulate to GPs and community midwives, written information on clinics in their area.
- Standards:** CREST guidelines: Management of Diabetes in Pregnancy
- Sample:** All Trusts which offer antenatal care for pregnant women with diabetes.
- Methodology:** Postal questionnaire to Clinical Director in Obs & Gynae **and/or** Clinical Director in Medicine.
- Timescale:** Questionnaire issued in December 2001
Questionnaire returned to project co-ordinator within 4 weeks of issue.
Analysis within one month of the questionnaires being returned.
- Action plan:** Timeframes identified for:
CREST/commissioners to identify designated Trusts.
Commissioners and Trusts to notify GPs and community midwives with written information on the clinic in their area.
Questionnaire to be reissued within 12 months of guidelines being issued.

Review of the services available within Trusts offering obstetric services for pregnant women with diabetes

Name of Trust: Either insert (or tick list)

	Does your Trust have :		Comments
1a.	A joint antenatal clinic which is staffed by: - a nominated and experienced physician - a nominated and experienced obstetrician - a nominated nurse or midwife	Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	
1b.	How frequently is the joint clinic held?		
1c.	Does the Trust have a policy that all pregnant diabetics are referred to this clinic?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
2.	A designated ward to which all pregnant diabetics are admitted when they need inpatient care?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
3.	Level 1 neonatal care?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.	Formal arrangements for the provision of emergency advice and rapid admission? (Please enclose a copy of the policy/protocol)	Yes <input type="checkbox"/> No <input type="checkbox"/>	
5.	An agreed protocol for diabetes management during labour and delivery? (Please enclose a copy)	Yes <input type="checkbox"/> No <input type="checkbox"/>	
6.	A system for ensuring that both a physician and an obstetrician sees inpatients on a daily basis during their antenatal and/or postnatal care?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
7.	Standardised record keeping as detailed in the CREST guidelines?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
8.	A protocol on betamethasone? (Please enclose a copy)	Yes <input type="checkbox"/> No <input type="checkbox"/>	
9.	A protocol on management of neonatal hypoglycaemia?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
10.	Additional comments relevant to the above		

Name of doctor completing this form (please print)

Designation

Date form was completed:

Please forward the completed form to at before

Clinical management of pregnancy in diabetic women (2nd audit project in the rolling audit programme)

- Aim:** Improve maternal and fetal outcome by establishing if pregnant diabetic patients have had:
- Appropriate pre-pregnancy counselling.
 - Timely referral for antenatal care.
 - Management by a specialist team.
 - Relevant monitoring at appropriate intervals, within the minimum number of hospital visits.
 - Onward referral to the regional centre, where appropriate.
- Standards:** Management of Diabetes in Pregnancy.
- Sample:** All pregnant diabetic patients delivered in NI between (select dates).
Patients identified through PAS / NIMATS.
Validation of sample via NICORE and HbA_{1c}/ blood glucose laboratory tests ordered by Consultant Obstetrician.
- Methodology:** Retrospective case note review.
(When standardised records are introduced, it might be easiest for the manual records to be photocopied and the data extracted/correlated by one individual, with follow-up/detailed review of only the notes where unusual /abnormal results were identified).
- Timescale:** Audit data collection to be agreed.
Interim report of first six months' results to clinicians by Summer 2002.
Report of first year's data to CREST/RMAG by March 2003.
- Project co-ordination:** To be decided. May be by nomination of one individual to coordinate regionally.
- Definitions and instructions:** Some definitions required. These to be agreed following a regional meeting to agree details of audit.

BACKGROUND INFORMATION

Trust's Name:	Name of Obstetrician:	Physician managing care:
Patients name/address:	Unit No:	Date of Birth:
Past obstetric history: previous complications during pregnancy/risk factors		
Date of LMP:	Diabetes classification: pre-existing type 1/type 2/gestational diabetes	
Diabetes controlled by:	Diet and exercise <input type="checkbox"/> Insulin <input type="checkbox"/> Other (please specify):	

Management pre-pregnancy				
No.	Care being audited	Standard	Finding	Comment
1.	Documentation that the following were discussed pre-pregnancy:			
	(a) Contraceptive advice was discussed in the year before LMP		Yes <input type="checkbox"/> No <input type="checkbox"/>	
	(b) Advantages of good control prior to pregnancy in order to reduce the risks to mother and fetus associated with diabetes		Yes <input type="checkbox"/> No <input type="checkbox"/>	
	(c) Smoking		Yes <input type="checkbox"/> No <input type="checkbox"/> Non smoker <input type="checkbox"/>	
	(d) Alcohol		Yes <input type="checkbox"/> No <input type="checkbox"/> No alcohol intake <input type="checkbox"/>	
	(e) Folic acid		Yes <input type="checkbox"/> No <input type="checkbox"/>	
	(f) Rubella immunity checked pre-pregnancy		Yes <input type="checkbox"/> No <input type="checkbox"/>	
2.	Pre-pregnancy HbA _{1c} within (time frame to be agreed) before LMP		Yes <input type="checkbox"/> No <input type="checkbox"/> Date Result HbA _{1c} ..	
3.	Folic acid taken at least 4 weeks pre-conception (report dosage if known)		Yes <input type="checkbox"/> No <input type="checkbox"/>	

Early referral and access to antenatal services

No.	Care being audited	Standard	Finding	Comment
4.	<p>Patient referred to Consultant Obstetrician on the day pregnancy was confirmed?</p> <p>If No, report interval in working days between being seen by GP and the date referral letter was written. Record the reason for the delay</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Working days Reason</p>	
5.	<p>Gestation at first antenatal visit \leq 8 weeks</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Gestation at first visit:</p>	
6.	<p>Folic acid taken during the first trimester (report dosage if known)</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Dosage</p>	

Overall monitoring during pregnancy			
No.	Care being audited	Standard	Finding
			Yes <input type="checkbox"/> No <input type="checkbox"/>
7.	Was the first antenatal visit to a joint clinic?		Yes <input type="checkbox"/> No <input type="checkbox"/>
8.	<p>Were the following undertaken at the first antenatal visit:</p> <input type="checkbox"/> USS to confirm gestational age AND single/multiple pregnancy <input type="checkbox"/> Microalbuminuria checked <input type="checkbox"/> Rubella immunity checked <input type="checkbox"/> Comment on folic acid <input type="checkbox"/> Retinal examination (report result)		
9.	Report medications		
10.	BP and weight recorded at each clinic visit		BP Yes <input type="checkbox"/> No <input type="checkbox"/> Weight Yes <input type="checkbox"/> No <input type="checkbox"/>
11.	<p>Monitoring undertaken in accordance with management schedule outlined in appendix 4</p> <p>Report variations, total number of each investigation undertaken and the reason for increased monitoring, where appropriate</p>		
12.	Report the uptake and result of AFP		

Frequency of visits for combined antenatal care

No.	Care being audited	Standard	Finding	Comment
13.	Report the uptake and result of double/triple test and amniocentesis if woman is ≥ 35 yrs			
14.	Report the % HbA _{1c} investigations within the normal range (to be agreed for each participating hospital)			
15.	<p>Was the patient reviewed at least fortnightly up to 36 weeks gestation? <small>(Instruction sheet to say, if seen more than fortnightly up to 36 weeks = Yes answer for the purpose of this question, but will pick up on number of visits and reasons for increased number later on)</small></p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	
16.	<p>Was the patient reviewed at least weekly from 36 weeks to term? <small>(if No, report reason for alternative arrangements e.g. DNA and/or primary care team saw the woman and liaised with secondary care team)</small></p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	
17.	<p>Report the number of dates of visits to: Joint clinic Separate clinic by obstetrician Separate clinic by physician Ophthalmology clinic</p>			

Access to specialist members of the team				
No.	Care being audited	Standard	Finding	Comment
18.	<p>Did the dietician see the patient at least once during the six months before LMP?</p> <p>If No, report the date the patient was last seen by a dietician/....</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	
19.	<p>How often was the patient seen by the diabetic specialist nurse or specialist midwife during antenatal period?</p>			
Referral for specialist advice				
No.	Care being audited		Standard	Comment
20.	<p>Has the patient any of the following complications? (List to be agreed)</p> <p><input type="checkbox"/> Diabetic nephropathy</p> <p><input type="checkbox"/> Pre-pregnancy serum creatinine > 140 micromols/l or</p> <p><input type="checkbox"/> 24 hour urinary protein > 1g/24 hours</p> <p><input type="checkbox"/> Macrovascular complications</p> <p><input type="checkbox"/> Organ transplantation</p> <p><input type="checkbox"/> Pre-proliferative retinopathy</p> <p><input type="checkbox"/> Severe pre-eclampsia</p> <p><input type="checkbox"/> Other (specify)</p>	<p>If yes, date when diagnosed/....</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>		

21.	If Yes to any of the above, was the patient referred to the regional unit?	Referred to	Date referred	Date seen	Outcome (enclose report)				
Complications									
No.	Care being audited	Standard	Finding	Comment					
22.	Please list diabetic and obstetric complications (tick list to be agreed at regional meeting)								
23.	Report the number of admissions since LMP, reason and length of stay								

Maternal and fetal outcome				
No.	Care being audited	Standard	Finding	Comment
24.	<p>Did the delivery take place in a designated centre?</p> <p>If No, was the proforma filled stating that the patient did not wish to be managed in a designated centre</p> <p>Report reason for patient's choice</p>		<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	
25.	<p>What was the grade of the most senior doctor present at the delivery?</p> <p>Grade Speciality</p>			
26.	<p>Report the date and time of delivery</p>		<p>Date Time (24 hr clock)</p>	
27.	<p>What was the method of delivery:</p> <p>Vaginal delivery Forceps Elective CS Emergency CS, etc Breech Vacuum</p>			
28.	<p>Report the number of infants, alive, etc</p>			
29.	<p>Report the gestation at delivery</p> <p>If gestation was <36 weeks, were steroids given for 48 hours pre delivery</p> <p>If No, reason e.g. in established labour on admission etc</p>		<p>Gestation Yes/No/ >36 weeks</p>	

30.	Birthweight			Grms	
31.	Apgar scores at 1 and 5 minutes			1 min 5 mins	
32.	Was the baby admitted to the Neonatal Unit? If Yes, reason, length of stay, outcome, diagnosis / enclose a copy of the form forwarded to NICORE (may be followed up through NICORE audit)			Yes <input type="checkbox"/> No <input type="checkbox"/> Reason Length of stay Outcome Final diagnosis	
Post-natal care and review arrangements					
No.	Care being audited	Standard	Finding	Comment	
33.	Report the uptake of breastfeeding following delivery and at discharge. Identify feeding methods in previous pregnancy(ies), where appropriate				
34.	Was contraception discussed prior to discharge?		Yes <input type="checkbox"/> No <input type="checkbox"/>		
35.	Did the patient attend for postnatal review at 6 weeks? If no, was the patient followed up by the primary care team		Yes <input type="checkbox"/> No <input type="checkbox"/>		
36.	If gestational diabetes report outcome of GTT.				

Possible future audits

Management during delivery / post-natal period.

Questionnaire to women/partners re self-monitoring, counselling, awareness issues.



MANAGEMENT SCHEDULE OF DIABETES (TYPE 1 AND TYPE 2) IN PREGNANCY

Miscellaneous		HbA1c	RPG	Hb	U/S	Eyes	MSSU	Urinalysis	
Prepregnancy	Rubella Folic Acid	HbA1c	RPG	Hb		Eyes	MSSU	UA	MA
6-8 weeks	TFT	HbA1c	RPG	Hb Gp	U/S	Eyes	MSSU	UA	MA
10 weeks		HbA1c	RPG				MSSU		MA
12 weeks		HbA1c	RPG		U/S			UA	
14 weeks		HbA1c	RPG						
16 weeks	AFP	HbA1c	RPG					UA	
18 weeks		HbA1c	RPG						
20 weeks		HbA1c	RGP		U/S	Eyes	MSSU	UA	MA
22 weeks		HbA1c	RPG						
24 weeks		HbA1c	RPG					UA	
26 weeks		HbA1c	RPG		U/S				
28 weeks		HbA1c	RPG	Hb	U/S	Eyes	MSSU	UA	
30 weeks		HbA1c	RPG		U/S				MA
32 weeks		HbA1c	RPG		U/S			UA	
34 weeks		HbA1c	RPG		U/S				
36 weeks	CTG	HbA1c	RPG		U/S	Eyes		UA	MA
37 weeks	CTG		RPG		U/S			UA	
38 weeks	CTG	HbA1c	RPG		U/S			UA	
39 weeks	CTG		RPG		U/S			UA	
Postnatal		HbA1c	RPG	Hb				UA	

AFP- alpha feto-protein; CTG- cardiotocography; Eyes- visual acuity and retinal examination; Hb-full blood count; RPG-random plasma glucose; Gp- blood group; MA- urinary microalbumin; MSSU- urine for culture; TFT-thyroid function tests; U/S- ultrasonography.

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Insulin Administration During Steroid Treatment for Lung Maturation

- All patients should be admitted to hospital
- Monitor capillary glucose at least 4 times daily
- Increased insulin requirements must be anticipated
- Note that diet treated type 2 diabetics may need insulin
- Regimen may vary with the urgency of delivery

Increase evening long-acting insulin by 20% on first day of steroids
(Day 0)

On day 1 increase insulin at each meal by 40%, 40%, 20%, 10%

- If immediate delivery, monitor capillary glucose carefully as the fall in insulin requirements postpartum may be reduced
- If delayed delivery, maintain increased insulin as above for a further 2-3 days with additional 8 units actrapid s.c. if capillary glucose >8 mmol/l

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CLINICAL RESOURCE EFFICIENCY SUPPORT TEAM

Management of Diabetes During Labour and Delivery

For Type 1 and Type 2 diabetic patients treated with insulin, and women with onset of diabetes during the pregnancy who are treated with insulin.

- Inform the obstetric consultant or specialist registrar and the diabetes physician when the patient is admitted.
- If necessary reduce the evening dose of long acting insulin by 50% the night before delivery.

First Stage of Labour

- The following applies.
 - a) At spontaneous onset of labour, or:
 - b) At 8am before induction of labour or elective Caesarean section, or:
 - c) At any time before emergency Caesarean section.
- If light early breakfast is allowed on morning of induction of labour, cover with small dose of soluble insulin, otherwise nil by mouth till after delivery.
- Insulin infusion. One regime is shown below. Alternative regimes may be initiated on the advice of the local diabetes physician.

Glucose/Insulin Infusion

- Measure maternal capillary blood glucose hourly.
- Maintain maternal blood glucose between 4-7 mmol/l according to the guideline below.

Maternal capillary blood glucose (mmol/l)	Infusion 5% dextrose	Short acting actrapid insulin added to infusion	Approx. time of infusion of insulin	Supplementary subcutaneous short acting insulin every 6 hours
< 2.0	500 ml	0	2 hr	0
2.0-3.9	500 ml	0	5 hr	0
4.0-7.9	500 ml	6 units	5 hr	0
8.0-11.9	500 ml	6 units	5 hr	6 units
12.0-15.9	500 ml	6 units	5 hr	10 units
>16	Contact diabetes staff			

Third Stage: After Delivery of the Placenta

- Halve the rate of insulin infusion and adjust as necessary.
- Continue IV fluids until the patient is able to eat.
- Contact diabetic team and establish a new dose of subcutaneous insulin which will be less than that prior to delivery.
- If breast feeding is contemplated, mother must have her food and insulin before starting to feed the baby.
- Insulin can be stopped after delivery in mothers who did not take it before the pregnancy, but blood glucose measurements should be continued until the postnatal visit.

Management Protocol for Intravenous Dextrose Treatment of Neonatal Hypoglycaemia

Asymptomatic Hypoglycaemia

When feeding management is unsuccessful in reversing hypoglycaemia but the infant is asymptomatic.

- Erect initial infusion of 10% dextrose at 3 - 5 ml/kg/hour (5.0 - 8.5 mg/kg/minute).

Symptomatic Hypoglycaemia

- Confirm hypoglycaemia with laboratory blood glucose prior to treatment (capillary strips may not be reliable especially at the lower end of range).
- Initial bolus of 2 - 5 ml/kg of 10% dextrose IV over 5 minutes.
- Follow this with IV infusion of 10% dextrose at 3 ml/kg/hour.
- Feeding should be continued unless there is a specific contraindication.

NOTE:

- IV dextrose must never be given only by bolus, but must also be followed by an infusion.
- IV dextrose should never be discontinued abruptly, but gradually decreased as oral feeding progresses.
- Dextrose is irritant to peripheral veins, so if high concentration (>12%) or prolonged administration is necessary, a central line should be considered.
- IV sites must be kept under careful observation during infusion.
- Refractory hypoglycaemia not responding to the above treatment (requiring more than 12 mg/kg/minute of IV dextrose) may occasionally require administration of glucagon, hydrocortisone or diazoxide.

The Infant of the Diabetic Mother

This is a brief guide only - full text must also be consulted

Immediate stabilisation / resuscitation at birth

- Full clinical assessment (including weight for gestation and for congenital malformations)
- If risk factors for hypoglycaemia, consider admission to neonatal unit



Close observation and early feeding



Check capillary blood glucose before feeds at 30 to 60 minutes,
then at 2, 4, 6 and 12 hours

If glucose < 2.6 mmol/l but asymptomatic and feeding well,
discuss with mother and start supplementary/tube feeds



If hypoglycaemia does not respond to this, consider IV infusion of 10% dextrose

Continue feeds unless contraindicated

If symptomatic hypoglycaemia develops:

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Admit to neonatal unit

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Obtain blood for glucose estimation and any other tests as indicated by clinical assessment

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Immediately give IV bolus of 10% dextrose 2-5 ml/kg over 5 mins, followed by infusion

↓

Continue feeds unless contraindicated

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Adjust rate and concentration of dextrose to achieve and maintain normoglycaemia

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If hypoglycaemia persists despite this, consider central line for higher dextrose concentrations and possible need for other therapy