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ANMC Women's Health Service
Diabetes Mellitus in Pregnancy
Screening and Management Guidelines

I. Introduction

In the last 2 generations diabetes in pregnancy has increased in Alaska Natives. Diabetes can be associated with morbidity and mortality for both the pregnant patient and her offspring. Management of diabetes in pregnancy offers a unique opportunity to positively impact both patient's lives.

II. Screening Procedures

A. Patients with pre-gestational diabetes do not require gestational diabetes testing. Proceed directly to management plan. Do not perform glucose challenge testing.

B. If the patient does not tolerate the standard glucose solution, there are several alternative modalities. (Appendix A)

C. Initial Screen, Average Risk Patients

All patients should be screened at 24-28 weeks, (or at first visit, if after 28 weeks) as follows:

1. Give a 50 gram oral glucose load, at any time of day, without regard to time of last food intake.

2. Draw a venous blood sample one-hour later.

3. A venous serum or plasma glucose level of 140 mg/dL or greater at one hour constitutes a positive screen.

D. Initial Screen, High Risk Patients

1. High risk patients include those with the following factors:

   a. history of infant over 8 lb.14oz. (4000 grams) at birth;
   b. family history of diabetes (parents or sibling);
   c. initial visit BMI $\geq$ 25 BMI = kg/m^2 X 100 (see Appendix C)
   d. past hx: stillbirth, habitual abortion, congenital anomaly
   e. current pregnancy: unexplained polyhydraminos, persistent glycosuria
   f. age > 35 years;
   g. prior history of gestational diabetes.

2. Screen high risk patients on the first prenatal visit with a 50 gram oral glucose load.

3. If the screen is normal, repeat at 24 weeks and 32 weeks.

III. Diagnosis of Gestational Diabetes

A. All patients with a positive screen (one hour $\geq$ 140 mg/dL) should be given a 3 hr GTT after a 8-14
hour fast as follows:

1. Draw a fasting venous blood sample.

2. Administer a 100 gram oral glucose load in 400 ml fluid.

3. Draw venous blood samples at one, two, and three hours.

B. Two or more values at or above the following make the diagnosis of gestational diabetes.

time	plasma glucose mg/dL
fasting	≥ 105
one hour	≥ 190
two hours	≥ 165
three hours	≥ 145

Other diagnostic criteria have been suggested by various professional organizations, e.g., Carpenter and Coustan criteria, but there is little data to support that use of other criteria significantly improve maternal or neonatal outcomes.

C. There is some data to suggest that patients with one abnormal value have an increased risk of macrosomia. In these patients, Medical Nutrition Therapy (MNT) is suggested.

D. Note that glycosylated hemoglobin and finger-stick capillary blood values are not well enough standardized to be used for a definitive diagnosis of gestational diabetes.

E. Patients who demonstrate an abnormal OGTT in the first trimester should be consider a pre-gestational diabetics, unless other medical circumstances suggest otherwise, e.g., intercurrent illness.

IV .Management Categories of Gestational Diabetes

These next two sections refer to diabetes diagnosed during pregnancy.
Please note there are later sections on pre-existing diabetes, Type I DM, and Class B (and above) diabetes in pregnancy

Gestational Diabetes Classification

Class	Fasting Glucose Level		Post prandial Glucose Level
A-1	< 105 mg/dL	and	< 120 mg/dL
A-2	≥ 105 mg/dL	and/or	≥ 120 mg/dL

A. Class A-1 patients are those who can achieve the above glycemic control with diet alone. Patients in this class may deteriorate to Class A-2. Management should then be changed accordingly.

B. Class A-2 patients are those who require insulin or hypoglycemic therapy to achieve the above level of control. Prior to initiating insulin or hypoglycemic therapy, the patient should have been treated with at least 2 weeks of Medical Nutrition Therapy (MNT) after consultation with a skilled nutrition counselor.

V. Management - Class A-1 (diet controlled)

A. Diet:
Please note: These are general recommendations.

Your, or your nutrition counselor, should individualize these recommendations to the reality of each specific patient's home environment.

This following counseling should be reality based and allow enough leeway so the patient feels she is in control of this process.

1. Nutrition consult:

   a. initial to include diet recall.
   b. periodic follow-up with nutritionist if possible.

2. A diet of 30 kcal / kg, or 2,200 calories, is recommended for those patients whose initial BMI is < 30.

3. For those patients who have a BMI ≥ 30 on their initial visit, a diet of 25 kcal / kg pre-pregnancy ideal body weight, can be calculated. In these patients, restrict carbohydrate to 35-40% of the total calories.

4. In Medical Nutritional Therapy source of calories can be divided as:

   a. 40% carbohydrates, especially complex unrefined carbohydrates
   b. 20% protein
   c. 40 % fat
      -less than 10% saturated fats;
      -up to 10% polyunsaturated fatty acids. The rest of the fats can come from mono-unsaturated sources.

5. Calories can be distributed as:

   a. 10-15% breakfast
   b. 5-10 % snack
   c. 20-30 % lunch
   c. 5-10% snack
   d. 30-40% dinner
   e. 5-10 % bedtime snack.

6. The objectives for weight gain are:

   a. BMI < 25 22-28 lbs
   b. BMI ≥ 25 not over 22 lbs
   c. these goals should be maintained <u>without ketosis</u>, if ketones are noted, have patient
      check urine QID x1-2 days and report results;
   d. pregnancy is not the time for weight loss.

B. Clinic Management:

1. Frequency of visits
   a. at least weekly until glucose control established
   b. every four weeks until 36 weeks gestation
   c. weekly after 36 weeks gestation.

2. Initial nutrition consult, then repeat prior to addition of insulin, or hypoglycemic

3. Exercise therapy: <u>Please note</u> this is a Level A Recommendation
   Moderate exercise of 60-150 minutes per week divided 3x/wk improves glucose control.

4. Home glucose monitoring should be taught to all women with GDM, and equipment (machine and strips) supplied. Frequency of monitoring should be QID (fasting, and either 1 hrs. or 2 hrs. after meals) initially. Individualize the schedule based on initial few days' results.

5. Glucose goals
   Major goals of management should be maintenance of glucose at
   a. fasting whole blood ≤ 95 mg/dL,
   or
   b. 1 hour post prandial whole blood ≤ 130-140 mg/dL
   or
   c. 2 hour post prandial whole blood ≤ 120 mg/dL.

6. Periodic lab work
   -urine dipstick for protein after 36 weeks
   -ketone measurement may be helpful in women with BMI > 30 treated with diet restriction

7. Ultrasound for precise dating prior to 18-24 weeks, Careful clinical dating is important as well.

8. Repeat ultrasound at 29-33 weeks to include abdominal circumference. If abdominal circumference > 70 percentile, then consider insulin therapy.

9. Daily fetal movement count - begin at 32 weeks.

10. Consult OB-GYN if any of these factors are noted:

    a. increased blood pressure
    b. prior stillbirth
    c. marked decrease in fetal movement

11. When glucose control is good and no other complications supervene, there is no good evidence to support routine delivery before 40 weeks

C. Intrapartum Management:

Alaska Native Medical Center (ANMC) OB-GYN department recommends transfer of any pregnant woman at 37 weeks not controlled within the above parameters. In situations where exceptions are made, specific consultation on labor management is advised

VI. Management - Class A-2, pre-gestational, Class B and above

A. Classification
-Patients with an abnormal OGTT should receive a 2-week trial of medical nutrition therapy (MNT). If after a trial of MNT, FBS ≥ 105 mg/dL or 2 hour PPBS ≥ 120 mg/dL, then they are considered Class A-2 and their care should be discussed with ANMC Ob/Gyn about possible insulin or hypoglycemic therapy.

-Patients with pre-existing diabetes should be classified by Type I and Type II. This can be supplemented with the White Classification. See Appendix.

B. The patient should be discussed with the ANMC OB/GYN prior to initiating insulin therapy. Following are the objectives to be met at the time of starting insulin.

1. Education on the need for good control;

2. Diet education. See previous discussion of Medical Nutrition Therapy (MNT)

3. Learning to administer insulin and recognize signs and symptoms of hypoglycemia;

4. Reviewing home glucose monitoring by finger-stick;

5. Baseline physical assessment relating to diabetes in pre-gestational and above, especially:

   a. creatinine clearance and 24 hour urine protein
   b. ophthalmologic exam

6. If not yet done, ultrasound assessment of dates, fetal anatomy, and possible polyhydraminos.

C. Insulin Therapy

1. The goal is euglycemia. See previous glucose goals

2. Human and DNA Recombinant Origin Insulin should be used.

3. Split doses of short and intermediate fasting insulin should be given twice daily; two-thirds of the day's insulin is given before breakfast and one-third prior to supper. Each dose can be divided two-thirds intermediate and one-third short acting insulin.

4. One common formula for initiating therapy is:
   - 20u NPH and 10u Regular insulin before breakfast, or Lispro insulin at breakfast
   - 5-10u Regular before, or Lispro at meals,
   - 7u NPH at supper.
   - Another helpful approach is to administer the NPH insulin at 9-10 pm to decrease fasting glucose.

5. The patient should monitor her own blood glucose with chemstrips with a portable glucometer. See glucose goals above. This regimen may be liberalized if stable as an outpatient. The patient should maintain a flow sheet.

6. While tight control is the objective, hypoglycemia is a significant risk. If the patient has been admitted to initiate insulin, many feel it is best to discharge the patient as her control approaches but falls short of ideal. Fine tuning is then done on an outpatient basis under conditions of diet and exercise more normal for the patient.

7. Diet composition is the same as for Class A-1 but calories need to be spread among three meals and three or four snacks.

8. Glyburide has been used as an oral hypoglycemic in the 2nd and 3rd trimesters of pregnancy successfully in one randomized controlled trial at the time of this writing. ACOG states that further study is recommended before the newer oral hypoglycemic can be supported for use in pregnancy. Glyburide is being used onsite at ANMC in a monitored prospective manner with an OB/GYN consultation.

D. Indications for admission:

1. The patient should be admitted for evaluation and control if any of the following conditions are noted:

   a. poor adherence or persistent hyperglycemia;
   b. pyelonephritis or severe infection;
   c. ketoacidosis;
   d. hypertension or pre-eclampsia.

E. Clinical Management

The insulin treated patient should be followed according to these guidelines:

1. Frequency of visits

   a. as often as daily until glycemic control as outpatient established;
   b. at least every two weeks until 36 weeks unless glucose control is poor, then q wk;
   c. weekly after 36 weeks.
   d. These visit intervals can be lengthened with good phone follow-up

2. Labs each visit

   a. the home flow sheet should be reviewed and a lab-done glucose obtained to verify control. This may be liberalized if village conditions warrant;
   b. urine for ketones, glucose, and protein. Note all three results in chart each visit.

3. Periodic lab work

   a. for women with diabetes predating pregnancy (Type I or Type II) a glycosylated hemoglobin should be obtained on the first visit. Counseling regarding risk of congenital anomalies should be provided based on result;
   d. Serum triple testing should be offered at 15-20 weeks.
   e. Fetal echocardiogram at 18-22 weeks.

4. US to be repeated q 4-6 weeks to monitor fetal growth, e.g., AC > 70th percentile

5. Fetal well-being assessment

   a. daily fetal movement count starting at 28 weeks;
   b. non-stress testing (NST) should be considered, though little data supports its benefit
      Low risk: good control, no hypertension or vasculopathy, no stillbirth
      -NST twice weekly starting at 34 weeks,
      High risk poor control, hypertension, vasculopathy, previous stillbirth
      -NST twice weekly starting at 32 weeks

6. Delivery

   Delivery recommendations need to be tailored to diabetic class on a case by case basis
   -Deliver in the 38th week, if good early dating
   -amniocentesis not necessary, if good glucose control and good dating
   -cesarean delivery not indicated for EFW < 4,500 g

7. Intrapartum Insulin

   The goal of intrapartum insulin therapy is maternal and fetal euglycemia with a maternal glucose less than 90 mg/dL.

If patient is in active labor, then a mainline of D5LR @ 125 cc/hr should be maintained. On morning of induction patient should arrive NPO, having not taken her usual a.m. insulin dose. Obtain blood glucose q 1 hour in labor. The goal is to maintain glucose 60 –90 mg/dL to decrease neonatal hypoglycemia.

Mix 125 units regular insulin in 250cc normal saline. (1u/2cc)

Blood glucose	Bolus	Insulin Drip
< 65 mg/dL	-----	0.5 unit insulin / hr
65-99 mg/dL	-----	1 unit insulin / hr
100-125 mgdL	2 unit	1 unit insulin /hr
126-150 mg/dL	3 unit	1 unit insulin hr
> 150 mg/dL	4 units	2 units insulin / hr

Adjust drip to keep glucose between 60 – 90 mg/dL

VII. Postpartum Management

1. The pre-gestational DM patient may undergo a transient honeymoon period with euglycemia soon after delivery. The patient should be monitored closely prior to discharge and at home for impending hyperglycemia. The patient needs to be thoroughly evaluated for her insulin requirements at her 6-week postpartum check up.

2. Nutrition consult.

3. The patient should be encouraged to maintain the exercise or dietary habits learned during pregnancy. The long-term goal should be to maintain her ideal body weight. A significant percentage of these patients will become overtly diabetic within 15 years, especially if > BMI 27.

4. Glucose tolerance should be re-evaluated at the six-week postpartum check-up and at a minimum of every 3 years thereafter.

5. Both Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT) should re-tested yearly and treated with MNT and exercise because of their high risk of developing diabetes.

6. The more sensitive test is a 75 gm 2 hour OGTT, but a fasting glucose can be diagnostic and may be logistically easier. This test requires the use of a glucose load containing the equivalent of 75 gm annhydrous glucose dissolved in water

7. The patient may also be diagnosed with classic symptoms of DM and a casual glucose $\geq$ 200 mg/dL.

8. Outside of pregnancy the laboratory criteria for diabetes mellitus are:

Normoglycemia	**Impaired Fasting glucose (IFG)**	**Impaired Glucose tolerance (IGT)**	**Diabetes mellitus**

FPG < 110 mg/dL FPG 110 -125mg/dL FPG ≥ 126 mg/ dL

2-h PG < 140 mg/dL 2-h PG 140-199 mg/dL 2-h PG ≥ 200 mg/dL

A diagnosis of diabetes must be confirmed on a subsequent day by any of the methods.

VII. Family Planning and Future Pregnancy Consideration:

1. All contraceptive modalities are appropriate for the diabetic woman.
   Caveats include:
   -risk of weight gain with injectable medroxyprogesterone acetate and
   -increased insulin requirements with combination oral contraceptives.

2. Family planning and six-week postpartum weight control, exercise, and diet considerations are the same as for Class A-1 and pre-gestational DM patients.

VIII. Preconception counseling

1.) Weight loss and tight glycemic control should be effected before conception of the next pregnancy. The teratrogenic effects of diabetes usually occur before the pregnancy is diagnosed.
Euglycemia can prevent these effects.

2.) Pre-existing diabetic preconception goals

Before meals (capillary blood glucose)	70 - 100 mg/dL
2 hours after meals"	< 140 mg/dL
Hgb A1C	within lab normal range

3.) The gestational diabetic may prevent diabetes with her next pregnancy by achieving her ideal body weight prior to conception.

4.) Folic acid supplementation is particularly important for diabetic women who already at increased risk of malformations.
-Patients with no previous offspring with neural tube defects should take 0.4 mg / day
-Those with a previous infant with neural tube defects should take 4 mg.

IX. Care of the Newborn and child:

1. Hypoglycemia is the major risk.
2. Early initiation of breast feeding / enteral milk (within 30-60 minutes of birth)
3. Maintenance of neutral thermal environment to minimize unnecessary energy expenditure
4. Putting the infant to breast at the earliest sign of hunger (note: crying is a late hunger cue)
5. See the 12/01 Pediatric Department Hypoglycemia guidelines (Appendix D)
6. Enter “infant of diabetic pregnancy” on baby’s problem list.
7. The offspring of diabetic mothers are at increased risk for development of overweight or obesity, and glucose intolerance. The offspring should maintain their ideal body weight along appropriate growth curves and be followed for subsequent glucose intolerance on a periodic basis.

Summary of recommendations

Blood glucose monitoring recommendations

Fasting glucose levels	less than 95 mg/dL	(Level C)
1 hour post prandial levels	less than 140 mg/dL	(Level A)
2 hour post prandial levels	less than 120 mg/dL	(Level C)

When medical nutritional therapy has not resulted in the above glucose levels, then insulin or hypoglycemic therapy should be considered (Level C)

Other Recommendations

Level A

(The following recommendation is based on good and consistent scientific evidence)

-There appears to be no clear evidence of benefit from very tight glycemic control for pregnant diabetic women. Since very strict control may have a substantial impact on lifestyle, this suggests caution in advising such a degree of control
-Fasting and post prandial glucose levels should be monitored, e.g., as opposed to pre-prandial levels
-Regular moderate exercise of 150 minutes divided 3 times a week should be encouraged

Level B

(The following recommendations are based on limited or inconsistent scientific evidence)

-Laboratory screening should consist of a 50 g, 1-hour oral glucose challenge, which may be administered without regard to the time of the last meal.
-The screening test should be performed on venous plasma or serum samples using well calibrated and well maintained laboratory instruments
-Available evidence does not support a recommendation for or against moderate caloric restriction in patients with a BMI > 30. However, if caloric restriction is used, the diet should be restricted by no more than 33% of calories.
-There is very little evidence to support either elective delivery or expectant management at term in pregnant women with insulin-requiring diabetes. Limited data from a single randomized controlled trial

suggest that induction of labor in women with gestational diabetes treated with insulin reduces the risk of macrosomia.

-For women with GDM and an estimated fetal weight of 4,500 g or more, cesarean delivery may be considered because it may reduce the likelihood of permanent brachial plexus injury in the infant

Level C

(The following recommendations are based primarily on consensus and expert opinion)

-Expert panels have supported two sets of diagnostic criteria. There is no data from clinical trials to change from the current criteria.

-There is not enough evidence to evaluate the use of primary dietary therapy for women who show impaired glucose metabolism during pregnancy.

-There is insufficient evidence to determine the optimal antenatal surveillance regimen for women with GDM with relatively normal glucose levels on diet therapy and no other risk factors

-At present, there is not enough evidence from randomized trials to evaluate the use of biophysical profile as a test of fetal well-being in high risk pregnancies.

-Women who have had GDM are at high risk for subsequent diabetes or glucose intolerance, especially if they develop overweight, BMI > 27. An OGTT (75 gm, 2-h) should be performed at 6 weeks post partum and every 3 years thereafter. A fasting plasma glucose can be substituted for the OGTT, if logistics dictate, or if the initial OGTT is normal.

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Appendix A

Alternative Options for Screening

Regional center based screening

A. Give 50 g of Polycose solution. Polycose is the best tolerated, e.g., no nausea, bloating, or lightheadedness and most reproducible.

Polycose can be prepared ahead of time in the Pharmacy in the following manner:
50 g of Polycose*, 50 mL of unsweetened club soda, and 1.5 gm of unsweetened lemon-lime Kool-Aid mix. Use standard blood glucose screening cut-off.
* This can be easily prepared in the Pharmacy: Polycose 50 g = 100 mL of 43% polymer solution (2 cal / mL)

B. Give either 28 each Brach, No. 110, or 18 each of the Brach 150 jellybeans per pound. Use standard blood glucose screening cut-off.
Please note: This has poor sensitivity compared to Polycose.

Village clinic based screening

A. A variety of methods are being tried. The most accurate, is to send a glucola drink to the health aide to be administered in clinic. A gray top tube is drawn at 1 hour and the plasma separated off within 2-3 hours, refrigerated, and sent in.

B. Other options include:
1. Have the health aide obtain a capillary random glucose value by using a portable glucometer. If a value of 120 mg/dL or greater is found, then consult the referral physician.

2. Send a Standard 100 gram glucose drink to the health aide and have him/her administer half of it, followed by a 1 hour capillary glucose. If a value of 120 mg/dL or greater is found, then consult the referral physician.

3. Have the health aide give a simulated glucola drink, made by dissolving four tablespoons table sugar in eight ounces of water. Flavor with some lemon juice, if possible. Follow with a 1 hour glucose determination. If a value of 120 mg/dL or greater is found, then consult the referral physician.
Please note: sucrose is metabolized differently than glucose. This method is better than nothing, but sending out a glucola bottle is far superior.

Appendix B

Diabetes Predating Pregnancy
White Classification

Age of Onset	Duration

Class	(year)		(year)		Vascular Disease		Therapy
A	Any		Any		0	A-1, A-2,	Diet only Insulin
B	> 20		< 10		0		Insulin
C	10-19	or	10-19		0		Insulin
D	10	or	20		Benign retinopathy		Insulin
F	Any		Any		Nephropathy		Insulin
R	Any		Any		Proliferative retinopathy		Insulin
H	Any			Any	Heart Disease		Insulin

Appendix C

BMI table here

Appendix D

ANMC Pediatric Department Hypoglycemia 12/01Guidelines here