# Management of Gestational Diabetes

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CHAPTER 20

## LEARNING OBJECTIVES

1. Describe the protocols for screening and diagnosis of gestational diabetes.
2. Formulate a plan for patient education concerning goals of therapy.
3. Evaluate the rationale for using oral agents or insulin during pregnancy.

## I. Introduction

Diabetes is fast emerging as a health concern for people residing in developing countries and in the developing world. Increasing rates of obesity are linked to rising rates of insulin resistance, impaired glucose tolerance, and development of type 2 diabetes in many populations. As these conditions begin to afflict a younger cohort of people, the reproductive health issues associated with the diagnosis of diabetes become more important to address in a systematic manner. It is now estimated that 30% of the population in the "border regions" between California and Mexico have either impaired glucose tolerance or diabetes, and that 1 in 3 people in this region is obese.[1] Among women of reproductive age in the United States, approximately 4%–5% have either impaired glucose tolerance or diabetes.[2] The hormonal milieu of pregnancy potentiates this underlying insulin resistance. The hidden, chronic beta cell defect is revealed as the pregnancy progresses—usually, in the third trimester as insulin resistance peaks. Most patients revert to a state of normal glucose tolerance after delivery, but remain at risk to develop type 2 diabetes as they age or become more obese. Since today's pregnant population is, on average, older and heavier than that of just a decade ago, the development of gestational diabetes is occurring more frequently and at earlier gestational ages. Clinicians caring for pregnant women must be familiar with the diagnosis and management of this condition in pregnancy to prevent maternal and fetal morbidity. This chapter highlights the screening protocols for gestational diabetes and the needs assessment for patients diagnosed in early pregnancy and reviews the expanded range of therapeutic options available for treating gestational diabetes.

## II. PATIENT CASE (PART 1): CLINICAL INFORMATION

Y.L. is a 28-year-old patient, gravida 2 para 1-0-0-1, who presents at 14 weeks' pregnancy for her first visit. She received care with you 4 years ago during her last pregnancy, which was complicated by Class A1 diabetes, successfully controlled by diet. She had a vaginal delivery at term of a 9 pound, 2 ounce (approximately 4.143 kilograms) baby. Your notes reflect a mild shoulder dystocia, but the baby had no deficits at discharge. She has no other medical problems, with the exception of morbid obesity. Her only surgical procedure was a cholecystectomy, which was uncomplicated. She has a strong family history of diabetes, with three first-degree relatives already known to have diabetes. She has no allergies and is taking no medications. She does not smoke or drink and denies any drug use. She does not recall any recent exposure to any unusual substances or illnesses. The pregnancy, while unplanned, is desired.

She is 5'2" tall and weighs 208 pounds. Blood pressure is 120/78. Pulse is 82 and regular. Urine shows trace glucose, trace proteinuria, and moderate ketonuria. There is no thyromegaly noted and there are no clinically significant cardiovascular or pulmonary findings. The fundal height is consistent with her reported menstrual dates.

## III. Screening Strategies

There are several screening strategies in use for the diagnosis of gestational diabetes. The American Diabetes Association and the American College of Obstetrics and Gynecology have published criteria for risk assessment and screening (Table 1). At the first visit, a risk assessment should be performed and the patient placed in a risk group.[3] Patients who fulfill all the criteria for inclusion in the low-risk group do not require screening. Patients who have any criteria that place them in the high-risk group should be screened at first visit. If that screening is normal, it should be repeated for high-risk patients in the third trimester. All other patients fall into a category of average risk and should be screened in the early third trimester. Screening can be performed using either the two-step or one-step method. In the one-step method, a fasting glucose level is obtained before administering 75 grams of oral glucose solution. One and two hours after ingestion, plasma glucose levels are obtained. In the two-step method, an oral solution of 50 grams glucose is given and plasma glucose is obtained 1 hour after ingestion. If the screening threshold of 140 mg/dL is exceeded,[4] the patient proceeds to a 3-hour test with administration of 100 grams glucose solution. The "cut-off" values for screening and diagnostic tests are listed in Table 2. Table 3 lists the characteristics used to classify gestational diabetic patients as well as pregestational diabetic patients. A retrospective review failed to identify any diagnostic advantage in choosing the one-step or the two-step method.[5] Physicians in the United States tend to favor the two-step model, while physicians in Europe favor the one-step model. Patients who have had gastric bypass should not be given osmotically active solutions of glucose, as this may induce severe gastrointestinal distress. A

**Table 1. Screening for Gestational Diabetes. Assessment of Need for and Timing of Screening for Gestational Diabetes Based on Presence of Risk Factors**

| Risk Group | Patient Characteristics | Screening Recommendations |
|---|---|---|
| Low risk: Fulfills all listed criteria | Member of ethnic group with low prevalence of GDM, age <25 y, normal weight before pregnancy, normal weight at birth, no personal history of poor obstetric history or prior abnormal glucose metabolism, no first-degree relatives with diabetes | Blood glucose screening not routinely required |
| Average risk | Does not meet criteria for low or high risk | Screen at 24–28 wks' gestation using one-step or two-step method |
| High risk: At least one criteria is present | Severe obesity, strong family history of type 2 diabetes, history of GDM, glucosuria, or impaired glucose tolerance | Screen at first visit; repeat at 24–28 wk if initial screening is normal |

GDM = gestational diabetes mellitus.
From Metzger BE, et al.[3]

**Table 2. Recommended Criteria for Diagnosis of Gestational Diabetes by One-Step and Two-Step Methods**

| Test | Fasting | 1 Hour | 2 Hour | 3 Hour | Comment |
|---|---|---|---|---|---|
| 50-gram screening test | — | <140 mg/dL | — | — | A positive screen requires 100-gram, 3-h diagnostic testing |
| 100-gram diagnostic test | <95 mg/dL | <180 mg/dL | <155 mg/dL | <140 mg/dL | Requires a 3-d unrestricted carbohydrate diet before performing test; any two abnormal values confirm diagnosis of GDM |
| 75-gram diagnostic test | <95 mg/dL | <180 mg/dL | <155 mg/dL | — | Any two abnormal values confirm diagnosis of GDM |

GDM = gestational diabetes mellitus.
Abnormal values = those exceeding the normal values above.
From Carpenter MW, Coustan DR.[4]

**Table 3. Classification of Gestational Diabetes and Pregestational Diabetes**

| Class of Diabetes | Age at Onset | Duration of Disease | Presence of Vascular Complications |
|---|---|---|---|
| Class A1 | First recognized during pregnancy | First recognized during pregnancy | None; fasting sugars <105 mg/dL |
| Class A2 | First recognized during pregnancy | First recognized during pregnancy | None; at least one fasting sugar >105 mg/dL |
| Class B | >20 y | <10 y | None |
| Class C | 10–19 y | 10–19 y | None |
| Class D | <10 y | >20 y | Microalbuminuria or background retinopathy |
| Class F | Any age onset | Any duration | Nephropathy |
| Class R | Any age onset | Any duration | Retinopathy |
| Class H | Any age onset | Any duration | History of myocardial infarct |

mixed-meal preparation or fasting glucose levels should be used for diagnosis of gestational diabetes in this population.

## IV. PATIENT CASE (PART 2): DIAGNOSIS AND INITIATION OF THERAPY

### A. Diagnosis

Y.L. fulfills criteria for inclusion in a high-risk group and undergoes screening by the two-step method. Her 1-hour, 50-gram screen result is 182 mg/dL. Her 3-hour diagnostic test results are 108 mg/dL fasting, 212 mg/dL 1 hour, 185 mg/dL 2 hour, and 166 mg/dL 3 hour.

### B. Initiation of Therapy

Before initiating therapy, it is important to review what normal glucose levels are in the pregnant population. These normal values serve as a reference point for the patient to understand her condition. Compliance with a difficult therapeutic regimen can be expected only when she understands the definition of "normal" glucose tolerance during pregnancy and the consequences to herself and her fetus if that baseline is significantly exceeded in a prolonged manner. Normal fasting glucose values during pregnancy are generally in the 60–90 mg/dL range; normal 1-hour postmeal glucose values should be below 120 mg/dL.[6,7] A discussion of glycemic targets and the rationale for choosing those targets should occur within a week of diagnosing gestational diabetes. The initial plan of management requires teaching the patient about diet therapy, exercise recommendations, and home glucose monitoring. Most general obstetricians find it time-consuming and difficult to provide these services in their offices, and thus use a team of professionals to assist

in patient education and surveillance. Ideally, the team should consist of a physician with experience dealing with diabetes during pregnancy, a diabetic nurse educator, a specially trained nutritionist, and pharmacist clinical specialists.

Nutritional interventions are the primary focus for initial therapy. Emphasis must be placed on portion control, keeping diet logs, and maintaining a schedule of frequent meals and snacks. Carbohydrates should form about 35% of the caloric intake daily. The new regimen is most likely to be accepted and maintained if the patient finds it to be minimally disruptive. Thus, nutritional information must be tailored to a patient's cultural dietary preferences and flexible enough to help her make healthy choices when dining out in fast food establishments. The patient must also be made to feel that her team wishes to hear about the challenges she faces in initiating therapy. If she does not feel "safe" in reporting poor control, she is likely to adjust her glucose log to please her health care team. Findings and recommendations from the diabetes treatment team should be communicated promptly and in an ongoing manner to the obstetrician caring for the patient. Patients with pregestational diabetes usually require the same multidisciplinary approach. These patients pose additional challenges, as many have entrenched habits providing them with fair-to-poor glycemic control. It is an excellent time to highlight the life-long benefits of good glycemic control as the relatively long gestational period allows for reestablishing new mechanisms of coping with disease. Pregestational diabetes may also be complicated by vascular damage to major organs. Existence of comorbidities, such as hypertension, thyroid disease, or nephropathy, must be determined early in pregnancy, as the risk of maternal and fetal morbidity increases markedly in the presence of these conditions (see Table 3).

## V. PATIENT CASE (PART 3): ASSESSMENT OF COMPLIANCE

Y.L. has a 1-hour counseling session to discuss diet, exercise, and home glucose monitoring. She is asked to maintain a 2000-calorie diet divided into three meals and three snacks. She is asked to keep a diet log and begin home glucose monitoring. She is instructed to check fasting and 1-hour postmeal glucose values and record those values in her diet log. She is asked to begin a program of exercise, consisting of walking either 20–30 minutes a day or at least 10 minutes after each meal. She returns in 1 week with a diet and exercise log that is inadequately maintained. A review of the home blood glucose meter's memory feature reveals she is checking glucose levels at most twice a day and that the glucose values recorded in her log are 10%–30% lower than those stored in the meter's memory. Upon checking a random blood sugar in your office, the value is found to be 196 mg/dL. There has been a 3-pound weight gain in 1 week's time. A urine sample is obtained and reveals both ketonuria and glucosuria.

The initiation of therapy is an emotionally traumatic time. For some, it is the first time that their obesity and eating habits have been linked to the occurrence of an actual medical complication. Faced with a choice of complying with a difficult change in diet or being labeled as noncompliant, many patients will embellish on their ability to make these changes. Thus, the first return visit should occur within 1 week of initiation of therapy. Objective data, such as patient weight and urine sample, serve as independent markers for compliance and control. At this time, it is appropriate to have a more detailed discussion of the pregnancy risks and desired benefits of therapy. For the patient diagnosed in the third trimester, complications include macrosomia, preeclampsia, increased risk for stillbirth, and the occurrence of neonatal metabolic disturbances. The link between the effect of glycemic control and reduction in these risks must be clear to the patient. An evidence-based approach yields some basic tenets to adhere to. Therapy should be initiated before 30 weeks' gestation to minimize disruptions in fetal growth patterns and neonatal metabolic parameters. Patients should be performing home blood glucose monitoring and should be testing fasting and postprandial glucose levels.[8] There is no consensus concerning the use of 1-hour versus 2-hour postprandial monitoring, although physiologically the 1-hour values more closely reflect peak postprandial values. The optimal target values for glycemic control are a subject of much debate. Most treatment trials have proceeded by setting somewhat arbitrary target levels and then evaluating maternal and fetal complications rates based on compliance with those targets. Thus, there are nearly as many recommendations in the literature as there are publications. Indeed, the U.S. Preventative Health Services Task Force was unable to find consistent evidence that treating mild degrees of glucose intolerance improved the incidence of several short-term maternal and fetal health outcomes.[9] A practical way to evaluate a patient's response to therapy is to categorize her efforts at one of three levels: as achieving a level of glycemic control, which the majority of providers accept as being associated with decreased complication rates, achieving an inadequate level of glycemic control clearly associated with higher complication rates, or achieving a middle ground in which the evidence for benefit is mixed. A patient who has achieved fasting glucose levels in the 95–105 mg/dL range and postmeal glucose values in the 130–150 mg/dL range exemplifies this dilemma, as there is as much evidence to support intensifying therapy as there are data to support continuation of diet and exercise alone.[9]

The diabetes care team must work with the patient's primary care providers to maintain consistent advice to the patient concerning the desired frequency of home glucose monitoring, exercise recommendations, and whether she should test at 1 or 2 hours after meals. The team should also agree on parameters for success in glycemic control, as patients in the "middle ground" become confused and frustrated if they believe their caregivers cannot even agree on an optimal level of glycemic control to strive for. The Fifth International Congress on Gestational Diabetes Mellitus has proposed that fasting blood sugar levels be maintained between 90 and 99 mg/dL, that 1-hour postprandial targets be set at <140 mg/dL and that 2-hour

postprandial values should not exceed 120–127 mg/dL.[3] Maintaining these levels will minimize the occurrence of macrosomia and neonatal metabolic complications.[10] However, these improvements are also associated with an increased risk for undergoing induction of labor and delivering by cesarean section.[11]

## VI. Early Pregnancy Concerns about Diabetes

The case of Y.L. highlights additional concerns when gestational diabetes is diagnosed early in pregnancy. For those diagnosed very early in pregnancy, it is likely that poor glycemic control was present at the time of conception. Fasting sugars in excess of 120 mg/dL, or HbA1c values greater than 7.5%, have been associated with increased risks for miscarriage and major congenital malformations.[12] Patients with preexisting diabetes may also have end organ damage or be on medications that further exacerbate the risks for pregnancy complications. Women with preexisting hypertension or renal disease are at particularly high risk and should be evaluated for the severity of their comorbidities early. Preconception recognition of diabetes and attaining good glycemic control before conception significantly decreases the risk for these complications.[13] Medications such as angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) increase the incidence of fetopathy and fetal nephrotoxicity.[14] They can cause significant fetal and neonatal toxicity when used in the last half of pregnancy, but any risk from exposure in the first trimester still requires further study. Ironically, these agents are being prescribed more frequently to women with diabetes due to their protective effects on kidney function. Exposure to ACE or ARB medications during pregnancy has tripled since the late 1990s.[15] These medications should be replaced when the patient decides to attempt conception. However, at least 50% of pregnancies are unplanned in the United States and lack of adequate access to primary medical care provides further barriers to preconception evaluation. Patients with a history of gestational diabetes will often develop type 2 diabetes. The postpartum examination at the completion of that pregnancy represents the last true opportunity to review the risks and speak with the patient about prevention and planning for the future pregnancies. Patients diagnosed before the second trimester are also at increased risk to develop urinary tract infections and preterm labor. In the early third trimester, insulin resistance peaks. Patients who have been able to maintain good glycemic control until this time may experience frustration as glycemic control deteriorates even under conditions of continued compliance. Deterioration of glycemic control can be dramatic, occasionally requiring hospitalization. Criteria to consider for hospitalization to initiate insulin therapy include the identification of a very early gestation with very poor glycemic control, lack of rapid access to outpatient diabetes care providers, a risk for development of diabetic ketoacidosis, or third trimester fasting blood glucose values in excess of 140 mg/dL.

## VII. Addition of Medical Therapy

It is clear from the random blood glucose value of 196 mg/dL and the 3-pound weight gain that Y.L. will not be able to achieve good glycemic control on a program of diet

and exercise alone (Figure 1). Although insulin alone has been the mainstay of therapy for gestational diabetes for decades, there is now an expanded array of choices available. Patients with mild-to-moderate degrees of hyperglycemia and in the third trimester of pregnancy are good candidates to achieve glycemic control on oral medications. Because the primary defect causing gestational diabetes is increased insulin resistance, the increased need for insulin during pregnancy can be met in three ways—administration of exogenous insulin, increasing insulin secretion, or improving insulin sensitivity. The sulfonylureas effectively increase insulin secretion and are well tolerated in pregnancy,[16] with the majority of patients being able to maintain good glycemic control. While sulfonylureas do cross the placental barrier, neonates born to women treated with glyburide have not been shown to experience hypoglycemia or other neonatal metabolic complications.[17] It should be noted that if the use of glyburide is extended into populations with more severe forms of hyperglycemia, a significant number of patients will fail to achieve glycemic control.[18] There is also a concern about the long-term consequences of forcing the beta-cell into "overdrive," possibly hastening the process of beta cell apoptosis. Thus, the use of glyburide should be restricted to women who develop a need for additional therapy in the third trimester and whose fasting sugars are consistently below 110–115 mg/dL.

Insulin sensitivity–enhancing medications, such as metformin, act by reversing the pregnancy-induced effects on insulin resistance so that a given amount of insulin secretion is more effective in maintaining euglycemia. This may help to preserve beta cell function over time and may delay the eventual apoptosis. Metformin has found extensive use in the arena of infertility treatment. Its ability to restore ovulatory func-

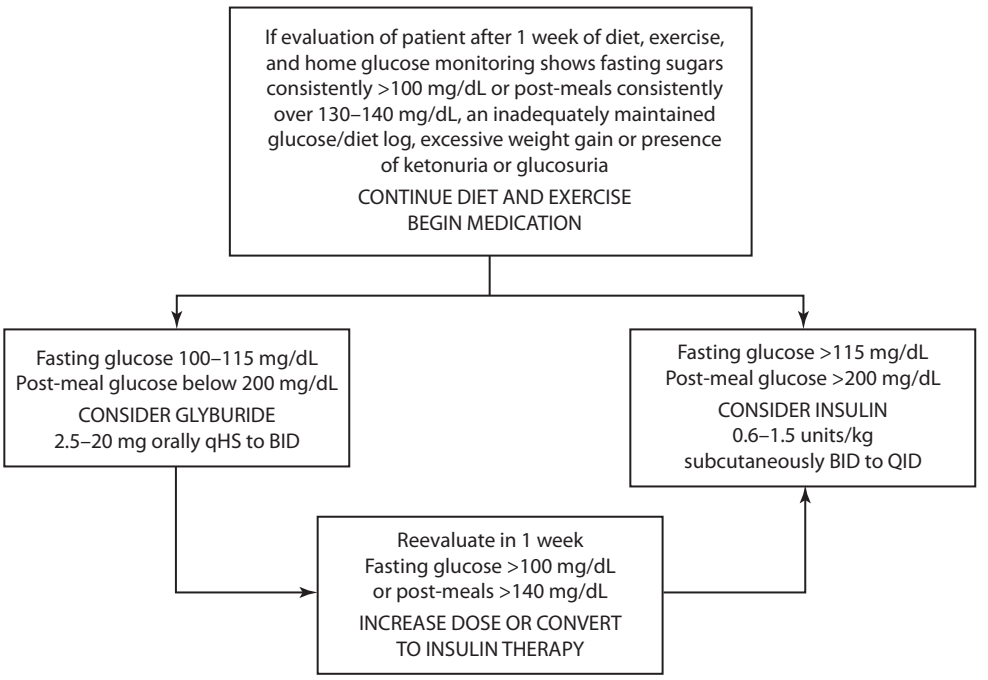


**Figure 1.** Third Trimester Initiation of Medical Therapy for Patients Unable to Achieve Good Glycemic Control Using Diet and Exercise Alone.

tion in patients with polycystic ovarian disease is due to a reversal of insulin resistance. There are no contemporary large randomized reports of use of metformin for treatment of gestational diabetes. Most reports in the literature focus on the pregnancy outcomes in patients with polycystic ovarian disease who conceived while on metformin therapy.[19,20] One small retrospective study showed an increased risk for the development of preeclampsia and stillbirth in the metformin group compared to groups treated with sulfonylureas or insulin.[21] The use of metformin as a primary agent for treating gestational diabetes during the third trimester should, therefore, await the results of a large prospective trial currently under way.[22] It is appropriate to use metformin as adjunctive therapy for patients who have been unable to achieve adequate glycemic control despite using massive amounts of insulin daily (300–400 units). Insulin therapy can be initiated using both short- and long-acting insulin types to achieve glycemic control rapidly and precisely. With the exception of lispro, which appears to be safe,[23] there is little data available concerning the use of insulin analogs during pregnancy. Inhaled insulin preparations are not recommended for use during pregnancy. The effects of pregnancy on lung permeability and insulin absorption have not been studied. There is additional concern that use of inhaled insulin products may induce the formation of insulin antibodies, which could cross the placenta.[24] For these and other reasons, inhaled insulin has been removed from the U.S. market.

Patients are usually begun on a twice- or three times daily regimen and prepare a customized mix of the two types in order to achieve glycemic control. Prepared concentrations of mixed insulins do not provide the flexibility needed to respond to variations in glycemic control induced during pregnancy. Insulin needs vary widely and increase significantly as the pregnancy progresses. Historically, insulin needs have been calculated in a range of 0.6–0.9 units/kg daily. This total dose is then divided to administer two thirds of the dose before breakfast and one third before dinner. Long-acting insulin forms two thirds of the prebreakfast dose and half of the predinner dose in this standard regimen. However, patients with body mass indexes in the 40–60 range have significantly higher needs for insulin. For these patients, insulin doses at the end of pregnancy may be in the range of 300–400 units a day.

## VIII. PATIENT CASE (PART 4): SURVEILLANCE FOR THIRD TRIMESTER COMPLICATIONS

Y.L. is begun on insulin subcutaneously administered twice a day. After 2 weeks of therapy she is noted to have achieved good glycemic control. She continues to receive ongoing support for dietary compliance and is seen frequently to adjust insulin doses. Because of the ongoing risks for stillbirth and the development of preeclampsia, she begins twice-weekly visits at 34 weeks' gestation. Fetal surveillance is performed twice weekly and remains reassuring. At approximately 38 weeks' gestation, the estimated fetal weight is 4000 grams (8 pounds 14 ounces). Her cervical examination is unfavorable for the induction of labor.

## IX. Timing and Route of Delivery

Fear of stillbirth, macrosomia, and preeclampsia lie at the heart of discussions concerning route and timing of delivery. Historically, the risk for stillbirth vied with the risk for neonatal death due to premature delivery. Contemporary advances in pregnancy dating, antepartum fetal surveillance, and the use of home glucose monitoring devices have combined to significantly decrease the risk of stillbirth. Antepartum monitoring is generally begun at 32–34 weeks' gestation and proceeds twice weekly until the completion of the pregnancy. There are many protocols that provide adequate surveillance and achieve a risk of stillbirth lower than that in the general population. Whichever protocol is most suited for the local practice pattern is acceptable, as long as there is a clearly defined requirement for immediate contact with the primary care provider for follow-up of abnormal results (Table 4).

The most vexing issue for obstetricians these days concerns the safe delivery of the infant of a diabetic mother. Macrosomic infants are known to have higher risks to experience shoulder dystocia and are prone to develop neonatal complications once delivered. There is little tolerance in the medicolegal arena for the occurrence of a shoulder

**Table 4. Protocols to Decrease Risk for Stillbirth in Women with Diabetes: Antepartum Fetal Monitoring Tests**

| Test Description | Initiate at | Frequency of Testing | Result |
|---|---|---|---|
| Nonstress testing evaluation of fetal heart rate pattern over 20–30 min | 32–34 wk for patients on medication or with comorbidities<br>40 wk for all other patients | Twice weekly | Reactive<br>Reactive with variable or late deceleration*<br>Nonreactive* |
| Modified biophysical, full biophysical profile | As above | Modified BPP twice weekly<br>Full BPP weekly | Modified BPP: Amniotic fluid volume and NST result<br>Full BPP: Scores of 0 or 2 for each of the 5 parameters<br>Abnormal: BPP <8* |
| Observation of fetal heart rate, tone, movement, breathing, and amniotic fluid volume | — | — | |
| Contraction stress test | 34 wk for patients on medication; contraindicated in patients with placenta previa or prior classical cesarean section | Weekly; contractions are induced using breast stimulation or Pitocin administration until there are three contractions in a 10-min time period | Reactive<br>Nonreactive*<br>Negative: No decelerations<br>Equivocal: Decelerations with <50% of contractions*<br>Positive: Decelerations with ≥50% of contractions* |

BPP = biophysical profile, NST = nonstress test.
*Indicates an immediate need for further evaluation of fetal well-being.

dystocia, even though relatively few of these deliveries result even in temporary birth injury. It has been estimated that even if a policy offered cesarean section only to women with gestational diabetes and estimated fetal weight more than 4500 grams, 443 women would have to undergo cesarean section to prevent one case of permanent brachial plexus palsy.[25] The cohort of women undergoing cesarean section will experience collateral injuries, including infection, incidental damage to bowel or bladder, deep vein thrombosis, and hemorrhage. There is also an increased risk for uterine rupture and hysterectomy in subsequent pregnancies for women who have undergone cesarean delivery. Estimation of birth weight is imprecise and only one of many factors to consider when choosing the route of delivery. Clinical pelvimetry, knowledge of the patient's obstetric history, the presence or absence of comorbidities, and cervical preparedness must also be considered.[26] Shoulder dystocia drills should be practiced routinely and teams prepared to handle the emergency should it occur. A purely elective induction of labor or delivery by cesarean section should never occur before 39 completed weeks of gestation. For every week before 39 completed weeks' gestation that the elective delivery occurs, the neonate experiences increasing risk to need NICU admission and treatment.[27]

Labor and delivery units performing induction of labor for women with insulin-requiring diabetes should have protocols for glycemic management during labor. Because labor is akin to prolonged exercise, many patients will have little need for insulin during the normal processes of labor. Neonatal complication rates are linked closely to glycemic control in labor, however, so adequate surveillance of maternal glycemic values and hydration status during labor must be carried out. Maternal glucose values should be checked at 2–4 hour intervals and ideally kept between 80 and 130 mg/dL.[28] Ketonuria is to be avoided. While most women will go through labor with little or no need for insulin, there will be some who will need either continuous or bolus administration of insulin. Protocols for managing these needs depend on the local level of pharmacy support and nursing skill level.

## X. PATIENT CASE (PART 5): THE POSTPARTUM PERIOD

Y.L. undergoes induction of labor at 39½ weeks' gestation. She delivers a male infant weighing 3700 grams without difficulty. The infant is noted to have hypoglycemia shortly after delivery, which resolves after a day. She is discharged home after 2 days. She is instructed to discontinue insulin and discontinue home glucose monitoring. She is asked to maintain her current diet and exercise regimen. She has established breastfeeding despite the short-term separation from her baby and returns to your office 5 weeks after delivery for further evaluation.

### XI. Postpartum Period

Neonatal metabolic complications will occur 10%–15% of the time after delivery, even under circumstances of good third trimester glycemic control. Most are mild, as

they were in the case of Y.L.'s son. However, any length of NICU stay disrupts the initiation of breastfeeding. When the average hospital stay after a vaginal delivery is about 48 hours, it can be difficult even for an experienced mother to obtain the support she needs to breastfeed successfully. An additional barrier to breastfeeding exists for type 2 diabetic patients who may wish to discontinue insulin and switch back to oral hypoglycemic agents. Several classes of oral agents have been studied and found to be compatible with breastfeeding.[29] It should be noted that once the placenta is delivered, insulin sensitivity begins to rebound rapidly. Glycemic control should not be excessively "tight" during this time, as the arrival of a newborn will interrupt meal schedules and make the patient prone to develop hypoglycemia. Fasting glucose below 120 mg/dL and postmeals below 180 mg/dL will suffice for the majority of patients in the first week or two after delivery. Patients who began the pregnancy on insulin with good glycemic control can usually revert to their prepregnancy regimen. If that regimen cannot be recalled, then calculate an insulin dose about one third of that used just before delivery. Patients with gestational diabetes should be rescreened at the postpartum visit to determine whether they have reverted to normal glucose tolerance. The counseling at this visit is exceptionally important; it represents perhaps the last opportunity for a physician to counsel the patient concerning her risks to develop type 2 diabetes and the strategies she can employ to prevent the complication from occurring. The information should be presented in a positive context, emphasizing that the patient has already achieved compliance with the recommendations. She has already begun to form new dietary habits and should be encouraged to continue with her new lifestyle. She should be given a sense of empowerment over her medical condition and recognize that she has control over her own medical future. Diet and weight loss should be discussed extensively. If a patient is a candidate for gastric bypass surgery, it should be discussed and recommended. Options for birth control should be explained thoroughly. Patients should hear an emphasis on planning for future pregnancies, not just a plan to avoid pregnancy. Continued future screening for the development of type 2 diabetes should be recommended.[3] When possible, information should be forwarded to the patient's primary care physician so that the dialogue concerning her medical future can continue uninterrupted. Hopefully, when Y.L. returns for her next pregnancy, she will have retained some ability to deal with these issues and be prepared and confident to take control of her own medical issues.

## XII. Summary

Gestational diabetes is a condition heralding probable development of type 2 diabetes in later life. As the pregnant population ages and grows more overweight, gestational diabetes occurs more frequently and more severely. Screening strategies should be directed at identifying the patient at high risk to develop gestational diabetes as soon as she presents for prenatal care. Once gestational diabetes has been identified, a diabetes education and treatment team should see the patient promptly. Recommendations should be transmitted expeditiously to the patient's physician, as authorizations for continued care must be coordinated by that office, in most cases. Initial treatment should consist of diet, exercise, and home glucose monitoring. Some patients will be discovered to have very poor glycemic control and require insulin administration or even hospitalization to ini-

tiate care. Patients should be seen 1 week after initiating therapy to review the rationale for therapy and to determine whether additional medications are required. Should she require medication, a choice between insulin and glyburide must be made. Due to the increased risks for stillbirth and preeclampsia, the patient who requires medication to achieve glycemic control should start a program of fetal surveillance no later than 34 weeks' gestation. Timing of purely elective delivery should always be after 39 completed weeks' gestation. Postpartum visits should include screening to confirm the resolution of impaired glucose tolerance and an extensive discussion of the future health risks, prevention strategies, and future pregnancy planning.

## XIII. Guidelines and/or Position Statements

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## QUESTIONS AND ANSWERS

1. Which of the following conditions must be present for a woman to be considered at low risk to develop gestational diabetes?

   a. under the age of 25

   b. at or near ideal body weight

   c. no first-degree relatives with diabetes

   d. no glucosuria present

   e. all of the above

2. For women who have undergone gastric bypass, what screening strategy is preferred?

   a. use of the "one-step" method

   b. use of the "two-step" method

   c. no screening indicated due to massive weight loss

   d. use of mixed meal challenge tests or fasting glucose levels

3. Nutritional counseling should be:

   a. completed in a single comprehensive session

   b. culturally appropriate and tailored to include strategies for making healthy choices in many dining situations

   c. offered on a case-by-case basis

   d. discontinued once medical therapy has been initiated

4. Match the test results in the left column to the appropriate intervention in the right column.

| | |
|---|---|
| a. All fasting glucose <100 mg/dL | 1. Begin insulin therapy |
| b. Poorly maintained glucose log, random blood sugar 160 mg/dL | 2. Continue diet and exercise, consider decreasing frequency of HGM |
| c. Fasting blood glucose >120 mg/dL | 3. Review therapeutic goals, continue diet and exercise therapy for another week |
| d. Fasting glucose 100–115 mg/dL at 32 weeks' gestation | 4. Add glyburide to therapeutic regimen |

5. Postpartum counseling should include:

   a. discussion of risk for future development of type 2 diabetes and the need for ongoing screening

   b. discussion of the effects of unrecognized or uncontrolled diabetes at conception

   c. discussion of strategies to delay or prevent development of type 2 diabetes

   d. discussion of planning for future pregnancies

   e. all of the above

**Answers:**

1. e; 2. d; 3. b; 4. a-2, b-3, c-1, d-4; 5. e