

## **Obstetric Guideline 10A GESTATIONAL DIABETES**

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### ***INTRODUCTION***

The issue of gestational diabetes (GD) has become controversial. Epidemiological purists argue that until a randomized controlled trial on treatment versus no treatment for women with an abnormal glucose tolerance test (GTT) is undertaken, there will continue to be debate on whether an abnormal GTT by itself is a true marker of perinatal mortality and morbidity. There are many observational and retrospective studies suggesting that control of blood glucose in gestational diabetes does decrease perinatal morbidity and mortality.<sup>1</sup> Another confounder is the different criteria that have been used to make the diagnosis of gestational diabetes. Nevertheless, many clinicians and organizations, including the Canadian Diabetes Association (CDA), support the view that it is worthwhile to screen for abnormal carbohydrate metabolism in pregnancy in an attempt to reduce the incidence of asymmetric macrosomia in the fetus, and hypoglycemia in the newborn. Screening may be either by routine serologic assessment (50 gm. glucose challenge test) or historical risk factors. Since women with gestational diabetes have an increased risk of Type 2 diabetes mellitus (DM) in the future, the positive lifestyle changes made as part of the treatment of gestational diabetes may help in preventing Type 2 DM.

### ***DEFINITION***

Glucose intolerance diagnosed during pregnancy.

### ***RELEVANCE***

Fetal hyperglycemia and hyperinsulinemia may lead to fetal macrosomia, possible traumatic delivery, neonatal hypoglycemia, hypocalcemia, hyperbilirubinemia, and polycythemia. Maternal fasting hyperglycemia has been associated with increased perinatal mortality and congenital anomalies.<sup>2</sup>

### ***INCIDENCE AND RISK FACTORS***

Three to five percent of pregnancies are complicated by gestational diabetes. The incidence of gestational diabetes increases with maternal age and is higher in certain ethnic groups. Risk factors for the development of gestational diabetes include the following:

#### **I. PAST HISTORY**

- Family history of Type 2 or gestational diabetes
- Previous history of:
  - gestational diabetes
  - asymmetrical macrosomia (>4000 grams or >90<sup>th</sup> percentile)
  - unexplained stillbirth

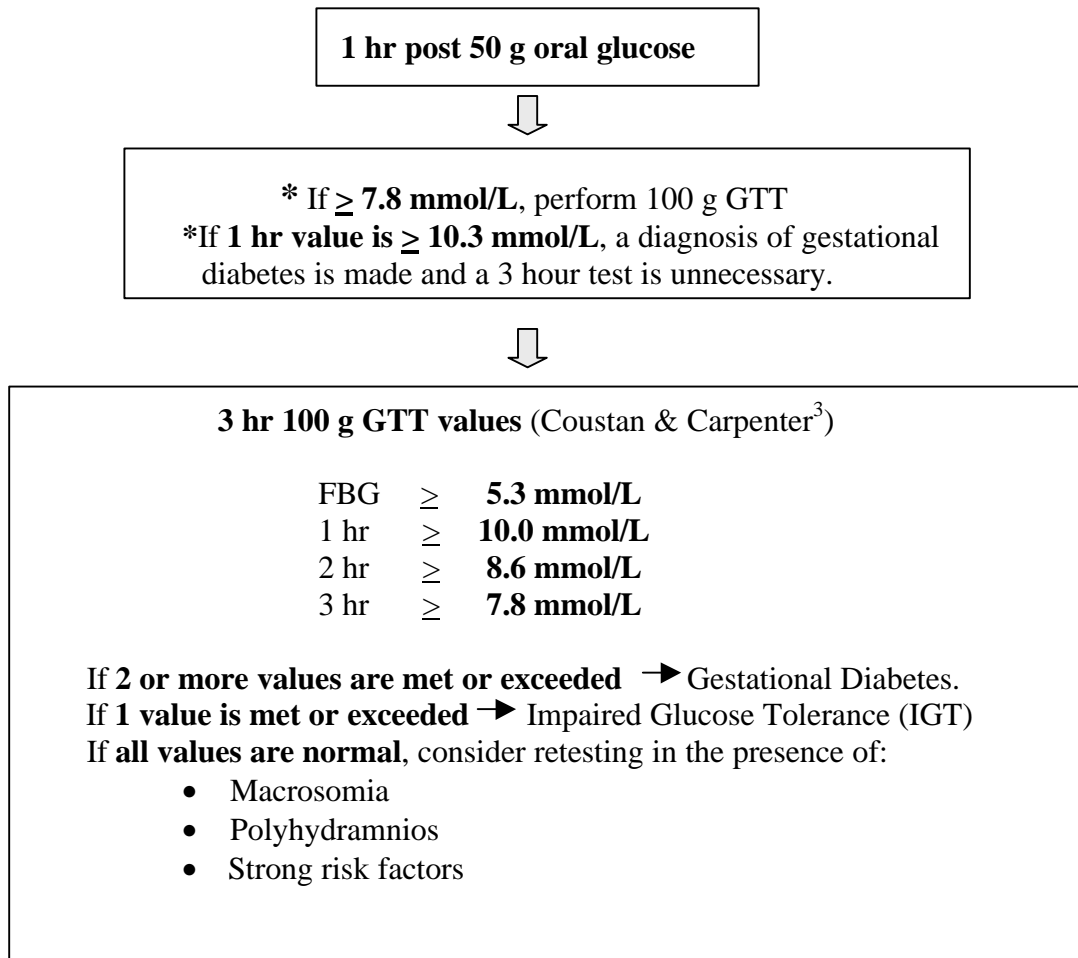
**II. ANTEPARTUM**

- Ethnic predisposition
- Obesity (>20% of ideal body weight or BMI > 27.0)
- Accelerated weight gain
- Maternal age >25years
- Newly detected glycosuria
- Fetal macrosomia (asymmetric trunk growth >90% confirmed on ultrasound)
- Polyhydramnios
- Multiple gestation

**SCREENING**

- I. If identified risk factors, screen in the first or second trimester.
- II. There is controversy around universal screening of all pregnant women between 24-28 weeks. Some believe that low risk women (eg. < 25 years of age, no family history of diabetes, normal weight, etc.) do not need to be screened.

**SCREENING & DIAGNOSTIC ALGORITHM**



**Note:**

- Abnormal GTT results identify a problem but do not predict the intensity of management that may be required.
- There are different GTT criteria used in different parts of the world, but the most common one used in British Columbia are the Coustan & Carpenter criteria.<sup>4</sup>
- Diagnostic approaches in women with previous GD may differ. These women should be tested before 24 weeks gestation and strategies include instituting diet and capillary blood glucose testing without a GTT or using frequent (q 4-6 weeks) 50 gram tests and proceeding to blood glucose testing when it becomes abnormal.
- There are published criteria available for the 75 gm GTT<sup>9</sup>

***MANAGEMENT OF GESTATIONAL DIABETES: ANTEPARTUM***

**I. ASSESSMENT**

**A. Physical/Obstetrical**

- History
- Physical exam
- Repeat ultrasound if suspected:
  - macrosomia
  - polyhydramnios

**B. Nutritional Status** (See Appendix I: Nutritional Management of Gestational Diabetes)

- Weight gain appropriate for dates
- Nutritional history (past/present/ethnic/cultural/financial considerations)
- Vitamin and mineral supplements

**C. Activity Assessment** (See Appendix II: Exercise Management for Gestational Diabetes)

- Physical assessment
- Obstetrical problems limiting activity
- Glycemic control

**II. MANAGEMENT – DEVELOPMENT OF A CARE PLAN**

- Use an integrated team approach consisting of family physician and/or obstetrician, internist/endocrinologist, diabetes nurse educator, dietician, physiotherapist, and social worker.
- Care is directed at balancing diet, activity (and insulin as required) to achieve normal maternal and fetal weight gain, and to achieve and maintain euglycemia.
- Health care providers may consult an appropriate diabetic team at a secondary or tertiary institution.

**A. Nutrition:** See Appendix I: Nutritional Management of Gestational Diabetes

**B. Activity Management:** See Appendix II: Exercise Management for GD

**C. Monitoring**

1) Ketones (urine)

a) Teach

- causes and interpretation
- technique
- recording
- when to contact care provider / team

b) Schedule

- ac Breakfast
- ac Supper

2) Blood Glucose

a) Teach

- technique of capillary blood glucose testing
- scheduling of tests
- record keeping
- interpretation of readouts
- communication (phone calls/visits)

b) Blood Sugar Testing Schedule

Upon diagnosis of gestational diabetes, Schedule 1 is advocated. Once euglycemia is achieved, testing may be decreased. Testing schedules may include testing every other day, 3 days per week, or as per Schedule 2.

**Schedule 1: Test ac meals, 1 hour pc meals, and hs  
Test daily until euglycemia is achieved**

Schedule	Value
ac all meals	< 5.0 mmol/L
1 hr pc all meals	< 7.2 mmol/L
hs (prior to bed time snack, e.g. 2200)	< 5.0 mmol/L
Number of tests/day	7

### Schedule 2: Pattern of Reduced Frequency of Testing

SCHEDULE	Day 1	Day 2	Day 3	Day 4	Repeat Testing Pattern	VALUE
ac all meals	Yes	No	Yes	No	Repeat	< 5.0 mmol/L
1 hr pc all meals	Yes	No	No	No	Repeat	< 7.2 mmol/L
hs	Yes	No	Yes	No	Repeat	< 5.0 mmol/L
Number of Tests/day	7	0	4	0		

### III. INSULIN MANAGEMENT

#### A. Initiation of Insulin

Insulin is started when hyperglycemia persists despite an adequate trial of diet and exercise. Insulin is almost always started based on elevated ac blood glucose values. Rarely, some women have normal ac values but elevated pc values despite diet and activity adjustments. In these women, insulin may need to be initiated to control pc blood glucose. While individual judgment is always required, the following criteria generally apply.

- 1) ac values >5.5 mmol/L or pc values >7.8 mmol/L indicate a need for insulin in almost all women.
- 2) ac values of 5.0 – 5.5 mmol/L or pc values of 7.2 – 7.8 mmol/L may indicate a need for insulin in the following:
  - Presence of complications e.g. asymmetrical macrosomia on ultrasound
  - Early pregnancy i.e. <30 weeks gestation, where the increase in placental hormones will almost certainly produce further elevation in blood glucose levels.

Insulin is usually started using NPH and Regular acB and acS. Some practitioners advocate intensive insulin therapy i.e. Regular ac meals and N at hs. There is a wide range of doses used in pregnancy and there is no formula for predicting what dose a particular woman will need.

## **B. Insulin Adjustments**

The most important requirement is the ability to have frequent contact with the woman so that insulin can be adjusted every 1-2 days. Insulin is adjusted to meet the following objective:

Establish **Target Blood Glucose** range:

- ac <5.0 mmol/L
- 1 hr pc < 7.2 mmol/L

Guidelines for insulin adjustments are as follows:

High acB(Breakfast)  $\Rightarrow$  increase N acS if no nocturnal hypoglycemia

High acL(Lunch)  $\Rightarrow$  increase R acB

High acS(Supper)  $\Rightarrow$  increase N acB

High hs  $\Rightarrow$  increase R acS

- Diet and activity regimen should be well established and adjustments made according to increased gestational age or identification of risk factors.
- Insulin dose may be changed daily when hyperglycemia persists.
- The maximum increase is 2 units for each type of insulin per injection or 10% of present dose.
- Larger increases are decided on an individual basis.
- Some patients may be able to learn some self adjustment with education and support depending on facilities available at the institution.

## **C. Patient Education**

- Storage, preparation and injection of insulin
- Injection schedule
- Action of insulin: onset, peak and duration
- Hypoglycemia symptoms/signs and treatment of
- Importance of adhering to diet and activity plan
- Frequency of monitoring blood glucose and urine
- Accurate recording
- Contact with diabetes team

## **IV. CLINICAL MANAGEMENT**

Ongoing clinical assessment of growth – if large for dates, ultrasound may be useful for verification of macrosomia or polyhydramnios.

## **MANAGEMENT OF GESTATIONAL DIABETES: INTRAPARTUM**

### **I. ASSESSMENT**

- Accuracy of gestational age
- Assessment of fetal lung maturity if consideration being given to early delivery (< 36 weeks)
- Maternal/fetal complications
- Review blood glucose levels prior to admission

### **II. MANAGEMENT**

- Ideally await spontaneous onset of labour. There is no evidence to support the need for early delivery of women with well controlled GD<sup>5</sup>.
- Non-stress testing or biophysical profile may be indicated.

#### **A. Induction** (See BCRCP Obstetrical Guideline 1 – Induction of Labour)

- 1) Prior to day of induction, give usual insulin dose and meals to maintain euglycemia.
- 2) Morning of Induction
  - Do baseline blood glucose on admission and notify physician.
  - If **Prostaglandin** only to be used  $\Rightarrow$  carry on management regimen as usual until labour is well established.
  - If **Oxytocin** is to be used  $\Rightarrow$  ac breakfast dose of insulin is usually withheld. Diet is at the discretion of the physician.
- 3) During the Induction
  - Ideally, blood glucose should be monitored q1h, and minimally q2h in active labour. Approximately 20% of women with gestational diabetes will develop hyperglycemia during active labour and insulin treatment during pregnancy is not a predictor for this<sup>6</sup>. Even brief episodes of maternal hyperglycemia may have adverse implications for the newborn<sup>7</sup>.
  - Those on diet control only often do not need IV support
  - Those on insulin:
    - a) Do not withhold insulin / nourishment until labour is established.
    - b) Monitor blood glucose q2h in early labour and q1h in active labour until delivery. Administer glucose containing solution such as D<sub>5</sub>S or D<sub>5</sub>W @ 125 cc/hr. prn
    - c) Check urine for ketones at least q2h.
    - d) If significant ketonuria, notify physician and change IV to D<sub>10</sub>W at 125 cc/hr until clear.

e) Administer insulin by sliding scale as per physicians order. For example:

8.1 – 11.0 mmol/L	Give 1 unit Regular insulin sc
11.1 – 14.0 mmol/L	Give 2 units Regular insulin sc
>14.0 mmol/L	Give 3 units Regular insulin sc and call physician

NB: Some practitioners use IV insulin in labour.

## **B. Caesarean Section**

- 1) Double snack at hs
- 2) Morning of cesarean
  - NPO from midnight (or allow for clear fluid diet 6 hours prior to surgery)
  - If on insulin, withhold ac breakfast dose

## **MANAGEMENT OF GESTATIONAL DIABETES: POSTPARTUM**

### **I. MANAGEMENT**

**A. Blood glucose monitoring** and insulin schedule as per physician's order (insulin is rarely needed postpartum for GD)

### **B. Nutritional requirements**

- Establish diet for home use (lactating/non-lactating). See Appendix I: Nutritional Management of Gestational Diabetes.

### **C. Activity**

- Establish activity pattern for home use.

### **D. Counseling**

- Management for ideal body weight maintenance
- Potential for overt diabetes<sup>8</sup>:
  - after 8-10 years ~ 15% incidence
  - after 20 years ~ 40% incidence
- Risk factors to be considered:
  - family history of diabetes
  - obesity
  - insulin usage and degree of insulin resistance during pregnancy
- Risk of diabetes in future pregnancies (at least 50%)
- Annual fasting blood glucose evaluation

- Consider testing for diabetes several weeks postpartum. Options would include a fasting blood glucose or formal OGTT (75 gm). ( Canadian Diabetes Association Clinical Practice Guideline # 62).

**E. Referral** to community resources as needed

**F. Newborn Care.** See Newborn Guideline #5 Infants of Diabetic Mothers (IDM)

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## **APPENDIX I**

### **NUTRITIONAL MANAGEMENT OF GESTATIONAL DIABETES**

#### ***GOAL***

To provide nutritional care which assists in achieving:

- Optimal nutritional intake for pregnancy
- An appropriate weight gain for pregnancy considering pregravid weight
- Euglycemia
- Prevention or delay of progression of complications associated with diabetes
- A healthy outcome for mother and baby

#### ***MAJOR RISK FACTORS***

##### **I. NUTRITIONAL**

- Overweight pregravid
- Excessive weight gain during pregnancy

#### ***PREVENTATIVE MEASURES FOR PATIENTS AT HIGH RISK***

##### **I. NUTRITIONAL**

- Achieve healthy weight for height preconception
- Follow general diabetes diet guidelines throughout pregnancy by limiting simple sugar intake and spreading food intake over 3 moderate-sized meals and 3 between-meal snacks
- Avoid excessive weight gain during pregnancy

#### ***MANAGEMENT DURING PREGNANCY***

- I. Refer to registered dietitian for assessment and provision of individualized meal plan. In centres where a dietitian is not available, health care providers may consult with a dietitian at a secondary or tertiary centre.
- II. See attached sample meal plan and general diet guidelines for use with patients waiting to see a dietitian. Sample meal plan should not replace individualized counseling which is based on woman's hunger, caloric requirements, blood glucose values, food preferences, language, and cultural beliefs.

Characteristics of individualized meal plan:

- Nutritionally adequate by meeting Canada's Food Guide for pregnancy

- Adequate in energy to promote normal weight gain and prevent ketonuria
- Low in simple sugars and juices
- Food distributed between 3 small meals and 3 snacks
- Adequate fluid intake (more than 6-8 cups daily)
- Aspartame, Acesulfame-Potassium, and Secralose may be used in moderation. In practice, a limit of 3-4 artificial sweetener containing foods/fluids daily is suggested.

III. Ongoing follow-up by registered dietitian for meal plan adjustment based on blood glucose, ketones, hunger, weight gain, insulin regime (if applicable) and exercise.

#### ***MANAGEMENT DURING LABOUR***

If the woman is able to eat according to meal plan in early labour at home, she may do so. If unable to eat diabetes meal plan, she can switch to easy to digest food/fluids to maintain her energy and hydration. Suggestions include:

- One choice every hour of ½ cup regular pop, juice, or jello, ½ popsicle, 1 cup soup, 1 slice toast, 2 plain cookies, 6 crackers
- Encourage fluids such as one cup of water or soup every hour

#### ***MANAGEMENT POSTPARTUM***

- Encourage breastfeeding
- Encourage maintaining/achieving healthy weight for height for prevention/delay of diabetes later in life or in subsequent pregnancies
- Encourage diabetes type diet early in subsequent pregnancies

## **HEALTHY EATING FOR DIABETES DURING PREGNANCY**

- Eat three small meals and three snacks daily. Have your meals about 4 to 6 hours apart and take snacks mid-morning, mid-afternoon, and just before bedtime. Use the sample day of meals and snacks on the back of this page as a guide.
- Avoid sugar and other sweet foods such as honey, jam, jellies, sweet baked products, candies, chocolate, regular soft drinks and fruit juice.
- Follow the healthy eating guidelines for pregnancy:
  - Enjoy a variety of foods from the four food groups every day.
  - Choose whole grain and enriched breads and cereals, dark green and orange vegetables, and orange fruit more often.
  - Have 3 to 4 servings of milk products daily. Examples of one serving are 1 cup milk,  $\frac{3}{4}$  cup yogurt, or  $1\frac{1}{2}$  ounces cheese.
  - Have 2 to 3 servings of meat, poultry, fish or alternatives daily.
  - Drink 6-8 cups of fluids such as water or milk daily.
  - Limit coffee and strong tea to 2 cups daily.
  - Avoid alcohol.
- Do some light activity, such as walking, after each meal (with your doctor's approval).

**NOTE:** These are general guidelines only. Nutrition counselling by a registered Dietitian is recommended.

**HEALTHY EATING – Sample Day**

**BREAKFAST**

egg, cheese or peanut butter  
1 slice toast  
½ cup cereal (Branflakes, Rice Krispies, oatmeal)  
1 cup milk

**MID-MORNING SNACK**

*Choose one or two of these snacks.  
Limit to one serving of fruit or milk per snack.*

fresh fruit  
1 cup milk  
2 arrowroot or digestive biscuits  
1 slice toast and peanut butter or ½ sandwich  
cheese and 6 small or 3 large crackers

**LUNCH**

*Use Dinner meal as a guide, if you prefer a hot meal.*

sandwich  
green salad  
1 cup milk  
small fresh fruit

**MID-AFTERNOON SNACK**

*Select one or two items from mid-morning snack.  
Limit to one serving of fruit or milk per snack.*

**DINNER**

meat, fish, chicken, tofu, cheese or 1 cup beans or lentils  
1 medium potato, or 1 cup cooked rice or noodles  
raw or cooked vegetables  
1 cup milk  
small fresh fruit

**BED-TIME SNACK**

(Choose one of these snacks)

1 cup milk	or	1 cup milk	or	1 cup milk
½ to 1 sandwich		cheese and		1 cup cereal
		crackers		(Bran flakes,
		(6-12 small or 3-6 large)		Cheerios, Shredded Wheat)

Margarine, butter, salad dressing, gravy or oil in cooking may be used in small amounts with meals or snacks.

*(January 1997)*

## **APPENDIX II**

### **ACTIVITY/EXERCISE MANAGEMENT FOR DIABETES MELLITUS DURING PREGNANCY (TYPE 1, TYPE 2, GESTATIONAL DIABETES)**

An interdisciplinary team approach is needed to integrate activity/exercise goals with the overall management and education plan. It is necessary to provide recommendations for individualized activity. Any contraindications or limitations for exercising should be assessed. Assessment includes:

1. Metabolic
  - hypoglycemia
  - hyperglycemia with ketonuria
2. Physical
  - musculoskeletal and respiratory
  - medical history
  - activity/exercise history: include lifestyle, ability, tolerance, and commitment
3. Obstetrical limitations (as per physician assessment)
  - ruptured membranes
  - antepartum hemorrhage
  - irritable uterus, preterm labour
  - incompetent cervix
  - hypertension
  - any other condition requiring decreased activity
4. Precautional limitations
  - vascular disease, ischemic heart disease
  - nephropathy
  - proliferative retinopathy
  - neuropathy
5. Understanding of the benefits of activity/activity during pregnancy.

#### ***ANTEPARTUM***

##### **I. ACTIVITY MANAGEMENT: NO COMPLICATIONS**

###### **A. Assessment**

- 1) Metabolic control at the onset of exercise
- 2) Timing of meals, exercise type and timing in relation to food and insulin injections
- 3) Site of insulin injections in relation to type of activity
- 4) Effect of exercise, of diet, of insulin

## **B. Patient Education**

- 1) Activity is individualized and reevaluated periodically according to obstetrical status and gestational age: consistency in type, scheduling, duration and intensity of activity is stressed. Activities may include:
  - brisk walks for 20-30 minutes
  - stationary exercise bike for 10-15 minutes
  - upper body exercise
  - housework
  - stairs for 10 minutes in absence of back pain
  - exercise video for pregnancy
- 2) Teach proper foot care and use of supportive shoes for exercise.
- 3) Carry identification.
- 4) Keep a log book recording blood sugars, diet, activity, and insulin
- 5) Previously active women may continue with their pre-pregnancy exercise *as tolerated*
- 6) Nutrition (refer to Appendix I: Nutritional Management for Diabetes Mellitus and Pregnancy)
- 7) Insulin Teaching includes:
  - proper site selection dependent on exercise type and duration
  - importance of adhering to diet and activity plan
  - need to carry fruit or juice to counteract hypoglycemia
  - possible use of small snacks, dependent on time and intensity of exercise
  - monitor glucose level response to exercise daily
  - monitoring for late hypoglycemia (can occur several hours after exercise) which may indicate need for diet/insulin changes in post-exercise period

## **C. Scheduling**

- 1) Exercise type can be varied, but **not the time** of exercise to avoid exercise at the peak of insulin activity
- 2) Exercise immediately (i.e. within 5 to 10 minutes) after meals
- 3) Avoid exercise immediately before the next meal

## **D. Record Keeping**

- 1) Activity chart is necessary to assist the woman and the team in assessing the type and amount of exercise in relation to blood glucose levels
- 2) Record **any** increase in uterine activity
- 3) Monitoring responses to specific exercise routines is helpful for future guidelines

## **II. ACTIVITY MANAGEMENT: OBSTETRICAL COMPLICATIONS**

### **A. Assessment**

- 1) Physician assessment of contraindications/limitations

**B. Appropriate Exercises**

- 1) Relaxation techniques
- 2) Basic arm, leg, and neck range of motion exercises as tolerated, to be done immediately after meals
- 3) If pregnancy complications arise, ensure mother is aware of:
  - any warning signs
  - activity limitations

**III. ACTIVITY MANAGEMENT: MUSCULOSKELETAL COMPLICATIONS**

**A. Assessment**

- Physiotherapy assessment to determine extent of discomfort and dysfunction

**B. Management: Activity Plan**

- Pain management education and techniques
- Body mechanics, posture, gait correction
- Resting positions
- Use of pelvic supports (if appropriate)
- Appropriate exercise/stretching
- Muscle energy techniques, myofascial release
- Re-evaluation to determine changes to activity level

***POSTPARTUM***

- Establish activity pattern for home use with daily monitoring until insulin requirements return to pre-pregnant levels
- Review possible options for an ongoing, long term, enjoyable activity/exercise program
- Discuss benefits of regular exercise and lifestyle changes

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