



# *CDAPP Sweet Success Guidelines for Care*

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## Chapter 6

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## Exercise



*Sweet  
Success*

California Diabetes and Pregnancy Program

## California Diabetes and Pregnancy Program Sweet Success Guidelines for Care

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# 6 Exercise

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# 6 Exercise

## INTRODUCTION

Regular physical activity should be an important part of every woman's lifestyle.<sup>1,2</sup> Although the physiologic changes that occur during pregnancy may limit some types of exercise activities, low-to-moderate intensity exercise is safe and beneficial. Exercise during pregnancy helps maintain cardio-respiratory and muscular fitness, may help decrease stress, and may alleviate some symptoms of depression.

Exercise provides an additional benefit for pregnant women who have diabetes as it also helps to lower blood glucose.<sup>3</sup> Regular, aerobic activity can be a useful tool for improving glycemic control by increasing insulin sensitivity.<sup>4,5</sup> Therefore, the addition of or change in an exercise program to a woman's self-management plan may affect other aspects of her self-management strategy, such as her meal plan and insulin regimen.

## BENEFITS AND POTENTIAL RISKS OF EXERCISE

Table 1 summarizes both maternal and fetal benefits and potential risks of pregnancy.

	<b>Benefits</b>	<b>Potential Risks</b>
<b>Maternal</b>	<ul style="list-style-type: none"> <li>• Increases insulin sensitivity<sup>6,7</sup></li> <li>• Increases glucose utilization<sup>5</sup></li> <li>• Improves carbohydrate utilization<sup>6</sup></li> <li>• Increases and maintains muscular strength<sup>7</sup></li> <li>• Increases and maintains cardiovascular conditioning<sup>4,7,8</sup></li> <li>• Facilitates recovery<sup>8</sup></li> <li>• Augments a general sense of well-being<sup>1,4,8,9</sup></li> <li>• Fosters positive behavior and lifestyle changes<sup>6</sup></li> <li>• Reduces back pain<sup>8</sup></li> <li>• Improves mild to moderate hypertension<sup>7</sup></li> <li>• May prevent excess weight gain<sup>8</sup></li> <li>• Reduces risk of preeclampsia<sup>10,11</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Increases hypoglycemia<sup>4,8</sup></li> <li>• Blood pressure increases may exacerbate preexisting long term complications<sup>7</sup></li> <li>• Potential for musculoskeletal injuries<sup>7,8</sup></li> <li>• Increases preterm labor in those with a history of preterm births<sup>3</sup></li> </ul>
<b>Fetal</b>	<ul style="list-style-type: none"> <li>• May reduce the risk of delivery of LGA due to GDM<sup>12</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Increases fetal bradycardia<sup>13</sup></li> </ul>

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**PHYSIOLOGICAL  
CHANGES DURING  
PREGNANCY AND  
EXERCISE**

Pregnancy induces a number of cardiovascular, metabolic, musculoskeletal, and thermoregulatory changes.

### **Cardiovascular Changes**

Cardiovascular changes that occur during pregnancy include<sup>8,13,14</sup>:

- ❖ Increased blood volume - blood volume increases progressively starting at 6-8 weeks gestation and reaches a maximum at 32-34 weeks. The average increase in volume at term is 45 - 50%. The increase is needed for extra blood flow to the uterus, extra metabolic needs of the fetus, and increased perfusion of other organs, especially kidneys.
- ❖ Increased stroke volume - the amount of blood pumped by the left ventricle of the heart in one contraction.
- ❖ Decreased systemic vascular resistance - decrease in the resistance the left ventricle must overcome to pump blood through the systemic circulation.
- ❖ Increased cardiac output- cardiac output increases approximately 40% during pregnancy (reaching a maximum at 20- 24 weeks gestation). Cardiac output is very sensitive to changes in body position. This sensitivity increases as pregnancy progresses, presumably because the uterus impinges on the inferior vena cava.

Cardiovascular changes are also influenced by body position. Several studies indicate that the supine position is associated with decreased cardiac output in most pregnant women. Therefore, pregnant women should avoid the supine position in the second and third trimesters in times of physical activity and rest.<sup>13</sup>

#### ❖ **Maternal Blood Flow Changes**

A number of the maternal blood flow changes that occur during pregnancy are exacerbated during exercise. These include a dramatic shift in blood flow due to shunting of blood away from the organs of the gut, including the uterus, to the working muscles, skin and kidneys. These changes are influenced by body position. There is a decrease in total uterine blood flow<sup>8</sup>, a fall in systemic vascular resistance by 8 weeks.<sup>15</sup> Furthermore, several studies indicate supine positioning reduces venous return from the hip to the toes<sup>15</sup> and is associated with decreased cardiac output in most pregnant women.

For a woman with preexisting diabetes, identifying any vascular disease, hypertension, or other complications that may compromise maternal blood flow is important before developing an exercise program.<sup>4</sup>

#### ❖ Fetal Responses to Maternal Exercise

Some studies referenced by Artal and O'Toole have reported a 10-30 beats/per minute increase in fetal heart rate over baseline after a mother has participated in physical activity.<sup>13</sup> On the other hand, bradycardia and heart rate decelerations occurred in 8.9% of those studied. In these studies, it was not reported whether the fetus had any lasting or adverse effects.<sup>13</sup> Likewise, no adverse fetal developmental effects from exercise have been reported in normal and insulin-requiring gestational diabetic pregnancies.<sup>16,17</sup>

### Metabolic Changes

As the uterus expands, it displaces the diaphragm, which often creates discomfort and dyspnea, both at rest and during exercise.<sup>13</sup> During gestation, the expanded uterus displaces the diaphragm causing an increased effort of breathing and a heightened resting oxygen requirement.<sup>13</sup> It is prudent to advise a pregnant woman to stop exercising before the point of exhaustion to remove the detrimental effect of reduced uterine blood flow, increased body temperature and dehydration.<sup>15,18</sup>

A pregnant woman's body compensates for the increased demand of exercise. In the middle of physical activity, plasma is funneled from the capillaries, resulting in an increased concentration of oxygen-laden red blood cells in the circulation. This also increases oxygen availability to the developing infant.<sup>18</sup>

Oxygen consumption during exercise, such as stationary cycling or swimming, is the same or greater in later trimesters as compared with postpartum.<sup>19</sup> After the thirteenth week of pregnancy, daily energy requirements gradually increase to meet the metabolic needs of pregnancy.

Exercise helps to regulate glucose transport and intracellular metabolism, while maintaining insulin sensitivity.<sup>4,14</sup> Blood glucose levels are maintained through balanced nutrient intake and exercise. Some hormones are associated with glucose homeostasis, but the bulk of work is done unconsciously through feedback systems in the body. There are several hormones involved in glucose homeostasis<sup>20</sup>:

- ❖ Growth Hormone stimulates cells to enlarge and divide and facilitates protein production.
- ❖ Thyroxine (T3 and T4) from the thyroid gland, helps regulate metabolism of lipids, proteins and carbohydrates in cells as an energy source.
- ❖ Cortisol, an adrenal hormone, affects glucose metabolism. When the blood glucose drops, cortisol increases the blood glucose level by a process called gluconeogenesis. Basically, the liver makes the new glucose from non-carbohydrate sources, amino acids and glycerol from triglycerides.

- ❖ Glucagon from the pancreas, stimulates the liver to decompose stored glycogen into glucose when blood glucose levels drop. Glycogenolysis helps bring glucose levels back toward normal. Glucagon also helps with gluconeogenesis.
- ❖ Insulin made by the pancreas helps lower the blood glucose levels and affects sugar, protein and fat metabolism.
- ❖ Somatostatin, also made by the pancreas, controls the glucose metabolism by inhibiting secretions of insulin and glucagon.
- ❖ Epinephrine/Norepinephrine from the adrenal glands, helps stimulate cardiovascular, respiratory and nervous systems, and promotes processes to increase blood glucose levels when there is a demand for more energy.

The decrease in blood glucose level is dependent on the level and duration of exercise. Any weight bearing exercise may decrease insulin resistance.<sup>1</sup>

Based on these changes, exercise should be considered a treatment option for pregnant women with diabetes.<sup>1</sup> However, initiation of exercise is not without risk.

For a pregnant woman with diabetes who takes insulin, metabolic changes and exercise can increase the risk of hypoglycemia, especially during long duration activity.<sup>6</sup> The impairment in the mobilization of liver glycogen stores, common during pregnancy<sup>14</sup>, may further compound hypoglycemia. Insulin, meal guidelines, and snack guidelines may require adjustment to meet exercise demands and the needs of metabolic changes of pregnancy.<sup>4,16</sup> Carbohydrates are an important fuel source for maintaining homeostasis during pregnancy. Once a pregnant woman with diabetes achieves a balance between snacks, insulin, and exercise, she protects herself from episodes of hypoglycemia, hypoinsulinemia, and hyperketonemia.

### **Musculoskeletal Changes**

Some of the changes that occur during pregnancy, such as enlargement of the uterus and breasts, result in a shift in the center of gravity for a pregnant woman.<sup>13</sup> These physical changes may make some activities more difficult to perform. Activities that involve significant balance or risk of trauma (cycling, running) may require adjustment or cessation to avoid injury. The following musculoskeletal changes occur during the third trimester of pregnancy and should be considered when planning a pregnancy exercise program:

- ❖ Joint laxity secondary to relaxation of ligaments<sup>13</sup> (particularly in the pubic symphysis and sacroiliac joints)
- ❖ Cartilaginous softening
- ❖ Shifting of the center of gravity resulting in lumbar lordosis and potential balance problems<sup>13</sup>

The postural changes and the joint loosening often result in lower back pain.<sup>13</sup> Women should routinely perform exercises to strengthen the back and abdominal muscles to prevent or relieve symptoms. Artal and O'Toole explain that the “Anatomical and physiological changes during pregnancy have the potential to affect the musculoskeletal system at rest and during exercise.”<sup>13</sup> Due to joint laxity, women should be cautious when stretching to avoid hyperextension of the joint. Non-weight-bearing exercise is of particular benefit to the pregnant woman with diabetes due to the increased use of carbohydrates by the activation of major muscles and the lower risk for impact injuries.<sup>16</sup>

### **Thermoregulatory Changes**

#### ❖ Maternal Thermoregulatory Control

A pregnant woman's core body temperature increases when exercise is intense and/or of long duration.<sup>13,19</sup> It also rises faster in hot and humid environments.<sup>13</sup> Pregnant women who are accustomed to exercise are better adapted to dissipating heat than women who have been sedentary. Bell et al explain that “The level of hydration also affects the increase in temperature during exercise, the increase in core temperature being greater if the exerciser is underhydrated.”<sup>19</sup> Dehydration can also adversely affect blood glucose levels and heart function. Therefore, to maintain adequate heat dissipation, women should be encouraged to maintain adequate hydration, wear appropriate clothing, including appropriate footwear, take frequent breaks and exercise during optimal environmental temperatures.

#### ❖ Fetal Thermoregulatory Control

Data surrounding the issue of fetal temperature in relationship to maternal body heat caused by exercise is scarce. Artal and O'Toole give some light on the topic by explaining that “Fetal body core temperatures are about 1°C higher than maternal temperatures.”<sup>13</sup>

### **Decrease in Exercise Performance During Pregnancy**

Because of the physiologic changes brought about by pregnancy, many women who exercise regularly may notice a slow recession in performance beginning in early pregnancy. This decline is related to changes in aerobic capacity and changes in maternal morphology, pregnancy-related fatigue, nausea and vomiting.<sup>21</sup> Most of these factors are related to cardiovascular, metabolic, musculoskeletal blood flow and heat production changes that occur during the third trimester.

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**PRE-EXERCISE  
EVALUATION**

The pre-exercise evaluation should include<sup>4</sup>:

- ❖ Assessment of glycemic control (A1c and blood glucose patterns)
- ❖ Cardiovascular exam
- ❖ An ECG is recommended for anyone over the age of 40 years with type 1 diabetes or type 2 diabetes of > 10 years in duration
- ❖ Ophthalmologic exam
- ❖ Assessment of placental health

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**EXERCISE  
RECOMMENDATIONS**

An individualized medical assessment must take place before an exercise plan is determined because it requires evaluation of possible risks and a patient's physical capability to be active in a variety of settings. Not-to-mention patient medical and obstetric history must be taken into consideration.<sup>13</sup>

The following section discusses exercise guidelines for a pregnant woman with diabetes during preconception, antepartum and postpartum.

**Preconception**

Exercise should be individually prescribed and monitored for a woman with preexisting diabetes who is attempting to conceive.

If a woman is just starting an exercise program, she should be provided education regarding medication changes, specifically insulin or oral hypoglycemic agents, and a review of the meal and snack plan necessary to meet exercise and blood glucose goals.

If a woman has been exercising regularly, the health care provider should complete an assessment of her knowledge about insulin and medication changes, food changes, use of snacks to meet exercise requirements and appropriate treatment of exercise-induced hypoglycemia.

If a woman utilizes exercise as part of a preconception weight loss program, as her weight loss progresses, a decrease in insulin dosage or oral hypoglycemic agent rather than an increase in calories to prevent hypoglycemia will likely be needed to maintain or achieve optimum weight.

Table 2 summarizes general preconception exercise guidelines for a woman with preexisting diabetes.

<b>Table 2. GENERAL PRECONCEPTION EXERCISE GUIDELINES FOR A WOMAN WITH PREEEXISTING DIABETES*</b>	
Type	<ul style="list-style-type: none"> <li>• Suggest aerobic activities that use large muscle groups suited to the individual patient<sup>13</sup> including light exercises and/or calisthenics to improve muscular strength and tone (Refer to <i>Appendix A</i>).</li> <li>• Avoid high intensity exercise, competitive activities or exercise in hot, humid environments<sup>13</sup> if conception is suspected.</li> <li>• For weight loss, encourage low impact activities. Choose or modify exercise based on complications, if present.</li> </ul>
Frequency	<ul style="list-style-type: none"> <li>• Encourage exercise 4-6 days a week (or every day if low or moderate intensity) on at least 3 non-consecutive days for improved glycemic control.<sup>22</sup></li> </ul>
Duration	<ul style="list-style-type: none"> <li>• 20 - 60 minutes total time per workout of either continuous movement or accumulated sessions of at least 10 minutes at a time.<sup>22</sup></li> </ul>
Intensity	<ul style="list-style-type: none"> <li>• Aim for 50 - 80% of heart rate reserve.</li> <li>• The “talk test” and Borg’s Rating of “perceived exertion” are useful tools for monitoring and maintaining optimum exercise intensity.<sup>2</sup> For example, a woman with autonomic neuropathy may not experience increased heart rate with increased activity. Subjective signs such as the ability to talk while exercising should be used to monitor the determined level of activity for this woman.<sup>23</sup></li> <li>• Strength and flexibility training are also an important aspect of a complete fitness program and should be incorporated into a weekly fitness program.</li> </ul>
Resistance Training	<ul style="list-style-type: none"> <li>• Resistance training should be encouraged in the absence of complications with a frequency of 2 - 3 days per week. Each exercise session should consist of 2 - 3 sets of 8-12 repetitions with at least 48 hours separating the exercise sessions.<sup>22</sup></li> </ul>
*after medical clearance	

### Exercise During Pregnancy

A pregnant woman with preexisting diabetes or one who develops GDM can exercise with appropriate education and planning.<sup>12</sup> It is recommended that a pregnant woman with diabetes be provided an individualized exercise plan.<sup>13,19</sup> Individualizing an exercise program includes:

- ❖ An assessment of her current health and physical fitness
- ❖ Development of a program specific to her ability and motivation
- ❖ Recommendations for fluid and food intake
- ❖ Information about activity limitations, contraindications and warning signs<sup>13</sup>

Most pregnant women with diabetes, whether it is type 1 diabetes, type 2 diabetes or GDM, can continue to exercise throughout pregnancy. For pregnant women with diabetes, *Appendices A and B* outline suggested strengthening exercises, appropriate modes of exercise, recommendations for exercise success, strength training recommendations and how a little change can make a big difference.

Table 3 addresses general guidelines for prenatal exercise for a woman with diabetes.

<b>Table 3. PRENATAL EXERCISE GUIDELINES FOR A WOMAN WITH DIABETES*</b>	
<b>Type</b>	<ul style="list-style-type: none"> <li>• Davies et al suggest that “Women should choose aerobic activities that will minimize the risk of loss of balance and fetal trauma.”<sup>2</sup> Some great examples are stationary bike, easy strolling, cross-country skiing, swimming and arm mobility for an upper body workout.<sup>2</sup> Avoid high impact or excessively jarring exercises and contact sports.<sup>2</sup></li> <li>• Exercise in the supine position should be avoided after the first trimester (individual differences may apply).<sup>2</sup></li> <li>• Both aerobic and strength conditioning exercises are promoted in all pregnant women who are without complications as this is part of a balanced and healthy lifestyle.<sup>2</sup></li> <li>• Before becoming pregnant, if a woman exercises consistently, she can usually continue her regimen after becoming pregnant, keeping in mind the necessary precaution and safety considerations mentioned throughout this chapter.<sup>2</sup></li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>• ACOG recommends that pregnant women participate in 30 minutes or more of modest physical activity most days if not every day.<sup>24</sup></li> <li>• For previously sedentary women, start with at least 15 minutes of continuous exercise 3 times per week. Slowly increase each workout from 15 minutes to 30 minutes 4 times a week.<sup>2</sup> A good goal is to reach a total of 150 minutes per week.</li> </ul>
<b>Duration</b>	<ul style="list-style-type: none"> <li>• Do not exercise to exhaustion.<sup>18</sup> A single exercise session should incorporate both a warm-up and a cool-down lasting about 5-10 minutes each.<sup>4,22</sup></li> </ul>
<b>Intensity</b>	<ul style="list-style-type: none"> <li>• Moderate activity is appropriate. Additionally, women can maintain their regular level of aerobic activity, provided there are no contraindications or risk of pregnancy complications and that they consult regularly with their healthcare provider.<sup>25</sup></li> </ul>
*In type 1 diabetes, exercise does not always improve glycemic control. <sup>4</sup>	

Exercise can play a significant role in improving glycemic control during pregnancy, particularly for women with GDM and is generally recommended.<sup>3,16</sup> At the end of this section we will summarize precautions and contraindications. Based upon the physiologic changes previously outlined, the exercise intensity may have to be decreased during pregnancy. Exercise for a woman with GDM is an extremely useful intervention for maintaining normoglycemia.<sup>3,16</sup>

Exercise also helps to control weight gain in a woman with GDM.<sup>1</sup> Moderate exercise, such as walking before or after a meal, or swimming before a meal, can effectively lower blood glucose levels. Exercise can be used during times of the day when blood glucose levels are problematic. Moderate exercise for twenty to thirty minutes is often of sufficient duration to impact blood glucose values. A woman who requires insulin should follow the guidelines in Table 4.

Table 4 describes blood glucose values and carbohydrate needs for physical activity during pregnancy.

<b>Table 4. BLOOD GLUCOSE VALUES AND CARBOHYDRATE NEEDS FOR PHYSICAL ACTIVITY DURING PREGNANCY FOR WOMEN WITH PREEXISTING DIABETES</b>	
<b>Blood Glucose Level</b>	<b>RECOMMENDED TREATMENT</b>
> 250 mg/dL	Check urine ketones. If positive do not exercise until ketones are Negative. <sup>7</sup> Call doctor for advice.
100 - 250 mg/dL	No extra food; blood glucose above 130 mg/dL at 1 hour after a meal is outside CDAPP Sweet Success goals. <sup>7</sup> Call doctor for advice.
<100 mg/dL	Eat a pre-exercise carbohydrate snack. <sup>7</sup>
< 70 mg/dL	Treat for hypoglycemia; start exercise after blood glucose is at target level. <sup>26</sup>

### Exercise Considerations

Warm-up and cool-down exercises are especially important in pregnancy. A warm up period of 5 - 10 minutes should include low intensity calisthenics or a planned aerobic activity at a lower intensity. This increases circulation and raises body temperature, preparing the skeletal muscles, heart, and lungs for a progressive increase in exercise intensity. A 10-minute cool-down allows the breathing and heart rate to return slowly to pre-exercise levels. Stretching for at least ten minutes is recommended and can follow the warm-up or cool-down session.<sup>22</sup>

The use of insulin or oral hypoglycemic agents (OHA) to control blood glucose levels requires additional planning for exercise. Women who use these medications are more vulnerable to exercise-related hypoglycemia, primarily because of the uncertain effects of previously injected insulin or already ingested OHA.<sup>3,27</sup> Education aimed at helping the woman make adjustments to the insulin or OHA dose and meal plan, based on blood glucose testing, can help prevent exercise-induced hypoglycemia and provide information on how exercise affects blood glucose levels.<sup>27</sup>

CDAPP Sweet Success goals for blood glucose control during pregnancy are<sup>28,29</sup>:

- fasting 60-89 mg/dL
- one hour postprandial 100-129 mg/dL (plasma values)

If a woman is having blood glucose values outside these targeted goals before, during, or after exercise, the treatment team should be consulted to help make appropriate adjustments. Self-monitoring of blood glucose should be incorporated into the exercise program to provide feedback on the necessity of adjusting diet or insulin dosage.<sup>27,30</sup>

The following information is provided to assist the treatment team when making adjustment recommendations.

❖ **When to Exercise/When to Avoid Exercise**

A woman with GDM on insulin therapy should be encouraged to exercise after eating a meal. This may help to blunt the postprandial glucose response provided blood glucose values are within target range.<sup>31</sup>

Activities that require much balance and have the potential for falling or activities that have the potential for abdominal trauma should be suspended during pregnancy. The American College of Obstetricians and Gynecologists (ACOG) gives a few examples of these such as horseback riding, gymnastics and racquet sports. Additionally, contact sports like basketball, ice hockey or soccer should also be suspended. The mother and her unborn child are at a heightened risk for trauma during contact sports and therefore they should be avoided. Scuba diving should be discontinued during pregnancy.<sup>24</sup> Refrain from exercising in extreme weather conditions like high humidity, heat or very cold temperatures. Likewise, refrain from exercise when insulin action peaks.<sup>4</sup>

❖ **Special Considerations for Women Using Insulin**

- Some considerations are especially warranted for a pregnant woman on insulin who exercises.
- The abdomen is the preferred insulin injection site. If another site is used, avoid using a leg or arm if it will be exercised heavily within 60-90 minutes of the injection.
- Keep a fast-acting carbohydrate source close at hand.
- Drink water before, during and after exercise to remain hydrated.

- ❖ **Balancing Snacks, Insulin, and/or Oral Hypoglycemic Agents**  
Snacks are often needed during exercise to prevent exercise-induced hypoglycemia. In pregnancy complicated by diabetes, the blood glucose goals are closely controlled and snacks may be needed even for light to moderate activity. Snacks provide additional kilocalories and carbohydrates to be utilized during the exercise period.

Table 4 on page 9 indicates when carbohydrates are needed based on blood glucose values. It is important for the health care team to know if blood glucose values rise greater than 250 mg/dL or if ketones are present in the urine. The presence of ketones in the urine may indicate that the woman is insulin deficient and exercise will not improve blood glucose control under these circumstances. In this case, treatment should be aimed at improving glycemic control before implementing an exercise program. However, physical activity does not need to be suspended solely due to the presence of hyperglycemia as long as blood and/or urine ketones test negative and the individual is in good health.<sup>32</sup>

Women utilizing an insulin pump have more options in relation to exercise. Rather than adding carbohydrate to feed the insulin on board, a woman with an insulin pump may decrease her pre-meal bolus if exercising within 60 to 90 minutes of a meal. She also has the option of reducing her basal rate. As a starting point, a reduction of 20% of the basal rate is recommended with light exercise. Light exercise includes walking or leisurely bicycling for 30 minutes. With moderate exercise, she may need a reduction from 50% or more of the basal rate. Moderate exercise includes playing tennis, jogging or cycling for 30 minutes. It is recommended that a minimal basal rate be continued. Suspending pump basal infusion longer than 1 hour is not recommended due to the accelerated ketone production of pregnancy. Women utilizing an insulin pump should adjust their basal rate according to their personal experience with exercise and insulin requirements.

The duration of the pregnant woman's exercise will dictate the amount of carbohydrate required. Snacking in the following way before and during prolonged exercise can prevent hypoglycemia.

- Make sure to have a meal 1-3 hours prior to any physical activity.<sup>7</sup>
- In women taking insulin, extra carbohydrate should be ingested if pre-exercise blood glucose levels are < 100 mg/dL.<sup>32</sup>
- If an exercise routine is lengthy (> 60 minutes) and strenuous, ingest a supplemental carbohydrate (about 20-25 g) every 30 minutes.<sup>7</sup>
- After prolonged exercise (> 60 minutes) decrease in blood glucose levels may occur several hours after exercise or may remain lowered for 12-18 hours. This may require a decrease in intermediate-acting insulin or additional snacks several hours later.<sup>7</sup>

### **Precautions and Safety Considerations**

Women should be evaluated by their healthcare provider to determine whether an exercise program is appropriate. The risks may outweigh the benefits of exercise for women with chronic, severe medical conditions or history of poor pregnancy outcomes.<sup>13,24</sup> Many well controlled conditions are not obstacles to regular physical activity.

A pregnant woman should be advised to stop exercising immediately and call her doctor if she experiences cramping, contracting or uterine bleeding, alterations in consciousness, severe cardiorespiratory symptoms or decreased fetal movement.<sup>2,13,24</sup>

A pregnant woman should never participate in physical activity following diagnosis of significant pregnancy complications (e.g. preterm labor, pregnancy-induced hypertension, second or third trimester bleeding).<sup>2,13,24,33</sup> As with all exercise programs, careful supervision by the healthcare provider is necessary to minimize risks.

### Postpartum Exercise

An exercise program for postpartum and beyond is helpful for blood glucose control and is appropriate for healthy weight maintenance. The health care team should work with the woman to develop an exercise plan based on her medical condition and take the following factors into account:

- ❖ A woman should resume exercise at low intensity and gradually increase to preconception levels based on her physical capacity. After delivery it often takes 4-6 weeks for morphologic and physiologic changes that come from gestation to stabilize.<sup>13,34</sup>
- ❖ The exercise program should be modified to prevent excessive fatigue, taking into account the increased demands of breastfeeding and motherhood.<sup>2</sup> In addition, it should work with other aspects of her self-management plan to promote optimal blood glucose control.
- ❖ A woman on insulin needs to be aware of decreased insulin needs postpartum and during breastfeeding to prevent hypoglycemia.<sup>35</sup>
- ❖ A woman using oral hypoglycemic agents may need decreased medication to prevent exercise-induced hypoglycemia.
- ❖ Exercise in an adequately nourished woman, should not negatively impact breastfeeding or a woman's milk supply.<sup>1,2</sup>

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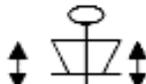
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Appendix A

Suggested Strengthening Exercises for a Pregnant Woman with Diabetes

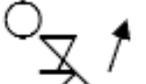
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Overhead Press - Both arms push up to meet overhead from about shoulder level. Return to start. Repeat.
- 

Shoulder Raise - With arms down by your side, raise to about shoulder level then return to your sides and repeat.
- 

Upright Row - Hold weights\* together, arms extended down. Lift weights up to just under your chin with elbows higher than hands. Lower and repeat.
- 

Chest Crossover - Hold arms at shoulder level with elbows slightly bent. Bring arms together in front of your body, crossing forearms one over the other. Return to start and repeat.
- 

Low Row - Begin with arms close to your sides, elbows bent at 90. Pull both arms back simultaneously until hands are at your sides then push arms out in front. Repeat.
- 

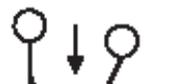
One Arm Bendover Row - Lean forward supporting upper body on your leg (or a chair back or table). With one arm pull weight\* up and back, leading with your elbow. Lower weight and repeat.
- 

Biceps Curl - With arms extended, palms up, bring weights up to your shoulders, keeping elbows close to your sides. Lower and repeat.
- 

Triceps - Hold one weight in both hands overhead. Lower weight behind your head and slowly raise up extending overhead. Keep elbows close to your head. Repeat.
- 

Seated Leg Lift - Seated with feet flat on floor, extend (straighten) one leg at a time with toes pointed up. Lower and repeat with other leg.
- 

Standing Leg Curl- Stand facing a wall (or chair back for support). Lift one foot up to buttocks, bending at the knee. Lower and repeat with other leg.
- 

Wall Sit - With back to a wall, assume a seated position, feet out and apart, knees bent. Hold 3 seconds. Stand then repeat.
- 

Standing Squat - With feet flat on floor, shoulder width apart, hold head up, back erect. Slowly lower hips until thighs are parallel to floor. Return to standing position. Repeat.

Adapted from A Turner, MS. Handout for clients, 2000. Used with permission.

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**Appendix B**
**Appropriate Modes of Exercise for Pregnancy Complicated by Diabetes:**

- Walking
- Water aerobics
- Low impact aerobics
- Bicycling (only in early pregnancy)
- Dancing
- Light weight training
- Step aerobics (until uterus blocks vision of step)
- Treadmill walking
- Swimming
- Stepping Machine (including elliptical)
- Stationary bicycling
- Yoga

**Recommendations for Exercise Success:**

- Exercise with a partner whenever possible
- Know signs and symptoms of hypoglycemia
- Carry source of carbohydrate
- Wear supportive clothing
- Carefully select footwear for optimal fit and comfort
- Avoid exercise in hot or humid weather
- Drink water liberally
- Set realistic goals
- Schedule exercise (specific days and time)
- Choose convenient location
- Go slow in the beginning; exercising too hard or too fast may result in injury
- Choose activities that are fun and enjoyable
- Vary exercise routine

**Strength Training Recommendations:**

- Perform all exercises with good posture and proper technique (if possible, have woman review proper technique with a skilled professional)
- Start with light weights
- Use slow and controlled movements: 2 seconds lifting and 2-4 seconds lowering
- Never hold breath
- Breathe out during each lifting movement and breathe in during each lowering movement
- Add more repetitions as each exercise becomes easier
- Increase weight only when an exercise becomes very easy
- Perform strength exercises every other day
- Stop at any signs of discomfort

\*Weight size should be governed by the mother's level of fitness. Beginners should use 1-3 lb weights. Those who have some level of fitness should use 3.5-5 lb. weights.

*For more information:*

California Department of Public Health, Center for Family Health,  
Maternal Child and Adolescent Health Division,  
California Diabetes and Pregnancy Program (CDAPP) Sweet Success  
(916) 650-0300

<http://www.cdph.ca.gov/programs/CDAPP>

or

California Diabetes and Pregnancy Program (CDAPP) Sweet Success  
Resource and Training Center  
Tracy Esquivel, BA  
(714) 921-9755

<http://www.CDAPPSweetSuccess.org>

