Description of Diabetes Mellitus

Type 2 diabetes accounts for ~90–95% of individuals with diabetes. As obesity and inactivity are the major modifiable risk factors for type 2 diabetes, that is the focus of this document. Additional information on diabetes in all forms and related resources can be found at www.apta.org/pfsp.

Screening for Metabolic Syndrome and Type 2 Diabetes

Metabolic syndrome (MetS) is a constellation of characteristics that place an individual at risk for CVD and type 2 diabetes. The following national or international characteristics (3 of 5) can be used in screening for MetS:

1) Elevated waist circumference
   - National: ≥ 40 in / 102 cm for all males
   - National: ≥ 35 in / 88 cm for females
   - International: ≥ 94 cm (37.0 in) in Non-Hispanic white males
   - International: ≥ 90 cm (35.4 in) in Mexican American males
   - International: ≥ 80 cm (31.5 in) in all females

2) Triglycerides ≥ 150 mg/dL
3) HDL < 40 mg/dL for males or < 50 mg/dL for women
4) HTN with SBP ≥ 130 and/or DBP ≥ 85 mm Hg and/or pharmacological treatment
5) Elevated fasting blood glucose ≥ 100 mg/dL and/or pharmacological treatment

If screening indicates elevated waist circumference and hypertension as noted above, contact the patient’s medical provider regarding a blood test to confirm or rule out MetS and coordinate management.

Medications That Can Be Major Risk for Immediate and Delayed Hypoglycemic Event

- Insulin
- Sulfonylureas such as Amaryl® (glimepiride), DiaBeta® (glyburide), Diabinese® (chlorpropamide), Glucotrol® and Glucotrol XL® (glipizide), Glynase PresTab® (glyburide), Micronase® (glyburide), Orinase® (tolbutamide), Tolinase® (tolazamide)

*expert consensus

This document is not intended for use as a patient/client handout.

Selected Readings


A complete list of citations and additional information are available at www.apta.org/pfsp.
**For individuals who meet criteria for ECG-monitored exercise testing, but for whom it is not available, exercise may safely be initiated at an intensity comparable to a brisk walk, provided there are no signs or symptoms of intolerance, and the HR is within 20 beats above the standing RHR. Subjective rating scales for effort or dyspnea may be used to define individual tolerance for the activity.**

### Absolute Contraindications to Exercise

- Ingesting alcohol 3 hours prior to exercise
- Hypoglycemia < 70 mg/dL. Symptoms include:
  - Shakiness
  - Pale skin color
  - Dizziness
  - Behavior changes
  - Sweating
  - Clumsy/jerky movements
  - Hunger
  - Seizure
  - Headache
  - Tingling sensations around the mouth
- Hyperglycemia > 300 mg/dL with ketones.
- Shortness of breath
- Nausea and vomiting
- Breath that smells fruity
- A very dry mouth

### Relative Contraindications Requiring Closer Monitoring - Based on Blood Glucose

<table>
<thead>
<tr>
<th>Blood Glucose</th>
<th>What to do</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>70–100 mg/dL</td>
<td>Snack</td>
<td>15g carb every hour of moderately intense activity</td>
</tr>
<tr>
<td>100–300 mg/dL</td>
<td>Proceed with exercise program</td>
<td></td>
</tr>
<tr>
<td>&gt; 300 mg/dL and on oral meds</td>
<td>Try 10–15 minutes of activity</td>
<td>If BG rises: stop</td>
</tr>
<tr>
<td>&gt; 300 mg/dL and on insulin</td>
<td>Should be checked for ketones* (via urine dip stick or Precision Xtra® glucose meter)</td>
<td>If (+) ketones: avoid activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If (-) ketones: participate with close BG monitoring</td>
</tr>
</tbody>
</table>

### Relative Contraindications Requiring Close Monitoring - For Those Without a Graded Exercise Test With ECG.

- Age > 40 yrs, w/ or w/o CVD risk factors other than diabetes
- Age > 30 yrs and any one or more of the following:
  - Type 2 diabetes of > 10 yrs duration
  - Cigarette smoking
  - Dyslipidemia
  - Proliferative or preproliferative retinopathy
  - Nephropathy, including microalbuminuria
- Any of the following, regardless of age:
  - Known or suspected CAD, CVD, and/or PVD
  - Autonomic neuropathy
  - Advanced nephropathy with renal failure

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**Screening/Risk Factors for Type 2 Diabetes**

Important for all individuals > 45 yrs of age and at 3-year intervals thereafter.

<table>
<thead>
<tr>
<th>History/Interview:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of diabetes</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Obesity</td>
<td>Dyslipidemia</td>
</tr>
<tr>
<td>High risk ethnic or racial group (African American, Latino, Native American, Asian American, Pacific Islander)</td>
<td>Gestational diabetes</td>
</tr>
<tr>
<td>Delivery of a baby &gt; 9lb/4kg</td>
<td>Sedentary lifestyle</td>
</tr>
<tr>
<td>History of impaired glucose tolerance</td>
<td>Polycystic ovarian syndrome</td>
</tr>
<tr>
<td>History of vascular disease</td>
<td></td>
</tr>
</tbody>
</table>

**Symptoms of Type 2 Diabetes**

Polyuria, polydypsia, and glucosuria.

### Exercise for Individuals With Type 2 Diabetes

#### Criteria for an Exercise Test with ECG

Any of the following:
- Initiating exercise (> 60% max HR or > brisk walking)
- 35 yrs and older
- Type 2 DM > 10 yrs
- CAD risk factors such as: BP > 140/90, smoking, dyslipidemia or family H/O premature CAD
- Any complication of diabetes (eg nephropathy, retinopathy, neuropathy)
- Peripheral vascular disease
- Autonomic neuropathy (potentially indicated by resting HR > 100 bpm, orthostasis, no increase in heart rate during physical activity, undesirable exercise-induced elevation of blood pressure)

#### Activity/Exercise Prescription

A specific exercise prescription leading to optimal outcomes is best determined using a sign or symptom limited maximal exercise test. The following general criteria may be used:

**Aerobic Training**
- Intensity: Determined by Karvonen’s formula (HR reserve): [(HRpeak–HRrest) x (40–70%)] + HRrest
- Duration: 20–30 minutes, with additional 5–10 minute warm-up and cool-down
- Frequency: 4–7 days per week, or every other day

**Resistance Training**
- 8–10 repetition max weight, begin with 1 set, progress to 3 sets
- Include 8–10 major muscle groups
- 2–3 days per week
References for Pocket Guide: Physical Fitness and Type 2 Diabetes


