Type 2 Diabetes

QOL & Risk of Mortality

- Diabetes Mellitus is an independent risk factor for developing cardiovascular disease and may lead to chronic kidney failure, peripheral neuropathies, and vascular degeneration.
- Blood glucose control is achieved in pre-diabetics and diabetics through pharmaceutical and lifestyle management.
- Both aerobic and resistance exercise have significant and very positive effects on blood glucose levels in diabetics, however a combination of both has most dramatic effect (JAMA 304(20), Nov. 2010)

Type 2 Diabetes

Supporting Documentation

http://www.acsm.org/access-public-information/position-stands
Type 2 Diabetes

Exercise Recommendations – Aerobic
FOCUS: aerobic exercise may cause significant changes in blood glucose levels
- 50–80% peak HR; 11–14/20 on subjective RPE scale
- 4–7 sessions/week, 20–60 min/session
- Recumbent exercise may be indicated for those with peripheral neuropathy or advanced diabetes

Exercise Recommendations – Resistance
FOCUS: resistance training has independent influences on cellular blood glucose uptake; therefore, additional monitoring may be necessary
- Low – moderate resistance, high repetitions until diabetes is well controlled
- High intensity training only with athletes
- 1–3 sets, 12–15 repetitions, 2–3 days/week
- Exercises for all major muscle groups

Safety Considerations
- Monitor for dizziness, lightheadedness, sudden fatigue or fainting during and immediately following exercise
- Exercise with caution if blood glucose is > 300 mg/dl, without ketones present, feeling well, and adequately hydrated
- Exercise is contraindicated if blood glucose is > 250 mg/dl and ketones are present; or if blood glucose is < 70 mg/dl
- Keep a source of glucose (without fat) readily available and adequate hydration is critical
**Type 2 Diabetes**

**Medication Considerations**
- Insulin is prescribed based on release time (rapid - long acting); knowledge of time and dosage is important as blood glucose response may be augmented by exercise.
- Medications may require titration or modified dosing schedules depending on individual exercise responses.
- Clients not using insulin are unlikely to experience hypoglycemia related to exercise; those on insulin should supplement with carbohydrate as necessary to prevent drop in blood glucose < 100 mg/dL during and after exercise.

---

**Cardiovascular disease**

*(Coronary artery disease, hyperlipidemia, hypertension)*

>> Exercise is Medicine®

---

**Coronary Artery Disease**

**QOL & Risk of Mortality**
- Exercise has positive benefits for preventing coronary lesion development and during ongoing rehabilitation following a cardiac event and/or intervention.
- Improved MET capacity is inversely proportional to mortality due to all-cause mortality, including coronary disease as a result of improved metabolic capacity and risk factor reduction.
- Regular exercise has significant and positive benefits in many areas affecting QOL and functional performance.
Coronary Artery Disease

Supporting Documentation

Coronary Artery Disease

Precautions

Must be aware of client’s co-morbidities along with cardiac issues

Define clear exercise parameters based on assessments, physician restrictions, state of coronary disease

Monitor hemodynamic responses to exercise as this can be indicative of cardiovascular stability and screening for acute events
Coronary Artery Disease

Assessments
- Medically supervised GXT is highly recommended prior to any moderate intensity exercise
- Gas analysis (VO2 uptake) may offer additional information, useful for exercise prescription
- 1-10 RM strength testing
- Sit & reach flexibility testing
- 6 minute walk test & other field tests may provide additional useful information

Coronary Artery Disease

Exercise Recommendations – Aerobic
- Early exercise may employ resting HR ± 30 beats/min for coronary bypass (CABG) and percutaneous coronary intervention (PCI) clients
  - Avoid exercises involving arms for CABG patients 6-8 weeks post surgery to avoid injury to sternotomy
- Early exercise may require resting HR ± 20 beats/min for myocardial infarction clients
- Aerobic exercise 3-5 days/week
  - 20–45 min/session as tolerated

Coronary Artery Disease

Exercise Recommendations – Aerobic
- Myocardial infarction: 40-80% HR reserve
- Bypass graft surgery: 40–80% HR reserve
- PCI with stent: 40–80% HR reserve
- 11–15/20 on subjective RPE scale
- FOCUS: review Karvonen HR reserve method
  - ~ 50–70% HR reserve for entry cardiac rehabilitation
  - Exercise intensity should be titrated based on fitness and risk stratification
Coronary Artery Disease

Exercise Recommendations – Aerobic
- All modalities are appropriate as tolerated
- Treadmill, recumbent/stationary/airdnye bike, upper body ergometer, rowing, elliptical, etc.
- Swimming and water exercise programs may be appropriate for select, stable patients
- Include prolonged warm-up and cool down
- Training for competitive participation is possible in stable patients with adequate MET capacities for desired activity

TABLE 7: Guidelines and Statements Regarding Resistance and Flexibility Training

<table>
<thead>
<tr>
<th>Organization/Statement</th>
<th>Population</th>
<th>Sets</th>
<th>Reps</th>
<th>Resistance Training</th>
<th>Flexibility Training</th>
<th>Frequency</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 NHQI Statement</td>
<td>Low, 40% 1 MA, 10-15 reps</td>
<td>2-3</td>
<td>2-3</td>
<td>2-3</td>
<td>Stretching and flexibility exercises</td>
<td>2-3</td>
<td>Stretch the major muscle groups 2-3 times</td>
</tr>
<tr>
<td>2007 AACSM Guideline(+)</td>
<td>Low, 40% 1 MA, 10-15 reps</td>
<td>2-3</td>
<td>2-3</td>
<td>2-3</td>
<td>Stretching and flexibility exercises</td>
<td>2-3</td>
<td>Stretch the major muscle groups 2-3 times</td>
</tr>
</tbody>
</table>

Coronary Artery Disease

Exercise Recommendations – Aerobic
- FOCUS: Low-fit clients may train at 40-50% HR reserve, >70% is appropriate for moderate-higher fit clients
- Monitor for abnormal signs and symptoms
- Intensities approaching 90% HR reserve may precipitate cardiovascular complications
- Select exercises/equipment that may be increased in intensity by 1 MET increments
Coronary Artery Disease

Exercise Recommendations – Resistance
- 12 weeks post bypass grafting for resistance > 1–2lbs.
- 4 weeks post myocardial infarction
- 2 weeks post PCI or stent placement
**FOCUS:** Begin with modest resistance (50–70% 1RM), functional training, and flexibility training
- Progress to higher levels of resistance training based on tolerance (70–90% 1RM)
- Advanced resistance training may be employed safely and effectively for select, stable cardiac clients

Coronary Artery Disease

Safety Considerations
- Common symptoms associated with angina:
  - chest pain, pressure, burning, discomfort
  - left jaw pain
  - arm numbness/discomfort (often only left arm)
  - upper back pain or pressure
  - unusual difficulty breathing with minimal exertion
  - dizziness and unnecessary fatigue
- Exercise should be terminated if any of the above are noted or change during an exercise session
  **Suspected Cardiac Emergencies: Dial 911 and initiate appropriate emergency response**

Coronary Artery Disease

Medication Considerations
- Many common medications prescribed for coronary disease have effects on exercise response, tolerance, and symptomology
- Daily reminders about medications and follow up are necessary as medication timing, dosage, and frequency changes may significantly change hemodynamic response to exercise on a day to day basis.
- Oral nitroglycerine (fast-acting) may be used to relieve exercise-induced chest discomfort (as prescribed); however, if no relief is realized after 1st dosage, terminate exercise and contact cardiologist or primary care physician
Hyperlipidemia

QOL & Risk of Mortality
- Elevated cholesterol or reduced high-density lipoprotein are classified as an independent risk factor for developing cardiovascular disease.
- Exercise has been shown to indirectly reduce total cholesterol by improving HDL profile of patients undergoing treatment for hyperlipidemia.
- No direct influence on exercise response or tolerance.

Hyperlipidemia

Assessments
- GXT may be indicated depending on additional risk factors and patient status.
- All field tests and assessments may be performed without restriction based solely on lipid profile.

Hyperlipidemia

Exercise Recommendations
- Based on general guidelines for exercise prescription.
- Modifications made based on co-morbidities as necessary.
Elevated systolic and/or diastolic blood pressure is classified as an independent risk factor for developing cardiovascular disease.

* Exercise training has been shown to reduce resting blood pressure and acute response to exercise and physical activity, thus lowering chronic stress on arterial walls and reducing risk of damage.
* No direct influence on exercise response or tolerance.

**Assessments**
- GXT may be indicated depending on additional risk factors and patient status.
- All field tests and assessments may be performed without restriction based solely on blood pressure.
- Resting blood pressure measures should be validated on 2 or more occasions.
Hypertension

Exercise Recommendations
- Based on general guidelines for exercise prescription
- Modifications made based on co-morbidities as necessary

Hypertension

Safety Considerations
- Resting blood pressure above 200/110mmHg is a contraindication for exercise participation
- Resistance exercise should not increase blood pressure or myocardial oxygen demands beyond acceptable levels
  \[ SBP \times HR = \text{Rate Pressure Product} \]
- Exercise training and/or testing should be stopped with drop in SBP > 20mmHg or rise above 250/110mmHg

Common Cardiovascular Medications
- Beta Blockers*
- Diuretics
- Ace Inhibitors**
- Calcium Channel Blockers*
- Anticoagulants
- Digitalis
- Nitrates (angina, HTN)
- Aspirin
- Statins (hyperlipidemia)
- Combination Drugs

*Medication classes often prescribed to suppress HR & BP at rest and exercise response; cardio-selective beta blockers may have more dramatic HR suppression than non-selective beta blockers and Ca ++ channel blockers
**Ace inhibiting lower BP at rest and suppress exercise response; have no effect on HR response to exercise
Beta Blockers

- Decrease heart rate at rest and during exercise
- Decrease blood pressure at rest and with exertion
- Decrease ischemic response during exercise (strain on heart muscle due to lack of oxygen)
- May increase risk of heart failure in elderly clients

- ISOLOPROL
- METOPROLOL – LOPRESSOR/TOPIROL XL
- NADOLOL – CORGARD
- SOTALOL
- PROPRANOLOL – INDERAL
- CARVEDILOL – COREG

Diuretics

- No effect on heart rate
- May decrease blood pressure or have little effect
- May show a false positive “ischemic strain” if fluid loss is excessive

- HYDROCHLOROTHIAZIDE
- FUROSEMIDE – LASIX
- TORSEMIDE – DEMADEX
- TRIAMTERENE – DYRENIUM
- SPIRONOLACTONE – ALDACTONE

Ace Inhibitors

- No effect on heart rate at rest or during exercise
- Decreases blood pressure at rest and during exertion
- No ECG effects
- No effect on exercise tolerance, except potentially in symptomatic patients

- BENAZEPRL – LOTENSIN
- CAPTOPRIL – CAPOTEN
- ENALAPRIL – VASOTEC
- LISINOPRIL – ZESTRIL/PRINIVIL
- QUINAPRIL – ACCUPRIL
- RAMIPRIL – ALTACE
Calcium Channel Blockers
- Decreases resting and exercise heart rate
- May slightly decrease resting and exercise blood pressure
- Decreases ischemic response shown on ECG
- May increase exercise tolerance in patients with exertional angina

DILATAZEM – CARDIZEM/DILACOR/TIAZAC
VERAPAMIL – CALAN/ISOTOPIN

Anti-coagulants
- Coumadin/Warfarin is commonly prescribed for patients with clotting risk; atrial fibrillation presents significant risk
- No effect on heart rate and blood pressure

Statins
- No effect on heart rate, blood pressure, or exercise tolerance
- Intended to lower total cholesterol or specific sub–particles of cholesterol (LDL, etc.)
- Most widely prescribed pharmaceutical in the country

LIPITOR – ATORVASTATIN
CRESTOR
TRICOR
ZOCOR – SIMVASTATIN
Nitrates

- Increase resting heart rate and may also increase exercise heart rate
- Decreases resting and exercise blood pressure
- Decreases ischemic ECG response
- Increased exercise capacity in patients with exercise-induced angina

Aging, fall prevention

Exercise is Medicine®

Aging & Fall Prevention

QOL & Risk of Mortality

- Exercise has demonstrated significant improvements in cardiovascular disease risk, functional mobility, metabolic fitness, psychological health, and general health measures in seniors engaged in a regular exercise program
- As previously described improvements in MET capacity confer reduced mortality, including for seniors; exercise improved metabolic capacity
- Exercise delays disability by improving muscular strength and endurance
- Falls account for a significant risk of acute health issues in seniors leading to mortality and should be prevented however possible
Results. Time spent in active activities, even ½ hour/day, resulted in significantly lower (15–35%) mortality risks compared with no time in active activities. Conclusions. Participation in leisure time activities is an important health promoter in aging populations.
Aging & Fall Prevention

Assessments
- Gait may be indicated depending on risk factor profile prior to beginning a moderate exercise program
- 6 minute walk test
- Timed up and go
- Sit to stand
- 10 RM strength assessment
- Standardized fall risk assessment

Aging & Fall Prevention

<table>
<thead>
<tr>
<th>Mode</th>
<th>Intensity</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic exercise</td>
<td>Moderately intense</td>
<td>≥ 5 days</td>
<td>30 min or more</td>
</tr>
<tr>
<td>Aerobic exercise</td>
<td>Vigorously intense</td>
<td>≥ 3 days</td>
<td>20 min or more</td>
</tr>
<tr>
<td>Resistance training</td>
<td>10–15 reps/set</td>
<td>2–3 times</td>
<td></td>
</tr>
<tr>
<td>Flexibility stretch</td>
<td>3–4 times each</td>
<td>Each workout</td>
<td>10–30 sec/stretch</td>
</tr>
<tr>
<td>Balance exercises</td>
<td>No specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity plan</td>
<td>Combo of all</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exercise Recommendations - Resistance

- **To increase strength:**
  - Squeeze sponges or ball newspaper

- **To improve balance:**
  - Stand on one leg, sit on large ball, walking on heels, sideways or crossover walking, stand on balance disc/board
  - FOCUS: Encourage core stability exercise using callisthenic and isometric exercises to improve balance. Use of unstable surface training techniques should be adequately supported to prevent falls

- **To improve reaction time, agility & kinesthetic awareness:**
  - Toss balls of various sizes, shapes & surfaces
  - Challenge visual acuity and hand-eye coordination
Aging & Fall Prevention

Exercise Recommendations
- Adjust for decreased vision, hearing, balance, stamina, strength & flexibility
- Keep exercises simple, safe & enjoyable
- Avoid high impact exercises
- Increase repetitions before resistance
- Encourage pain-free ROM and train for ADLs
- Consider benefits and risks of all weight training modalities

Aging & Fall Prevention

Safety Considerations
- Avoid sudden postural changes, uneven surfaces, and excessive weight/intensity to prevent falls
- Monitor for acute cardiac symptoms, hemodynamic abnormalities, and pain tolerance during exercise progressions and intensity changes
- Incorporate chair/seated exercises, balance bars, and other support for deconditioned and frail individuals

Cancer

Exercise is Medicine®
Cancer
QOL & Risk of Mortality
- Regular exercise during cancer therapy may result in reduced fatigue, greater body satisfaction, body weight maintenance, improved mood, decreased side effect severity (from treatment), and better overall QOL
- Aerobic and resistance exercise programs have the potential to improve bone remodeling and reduce muscle atrophy effects of glucocorticoids that are common in treatment regimens
- Significant improvements in functional tests have been shown in clients who participated in a regular exercise program during treatment

Cancer
Supporting Documentation

Cancer
Precautions
- Easy and premature fatigue is common in cancer patients, especially during exercise and must be considered during exercise program development
- Exercise testing has similar endpoints and considerations as typical parameters
- Clients may be limited by muscle weakness and/or pain from tumor, surgery, or other therapy
- An acute change in general health status is a relative contraindication to exercise testing/training
Cancer

Assessments
- GXT may provide useful insight, however not required for exercise participation
- Functional fitness assessments
- 6 min walk test
- Sit & reach
- 10RM strength assessment
- Sit to stand
- Stair climbing
- Gait analysis

Cancer

Special Considerations
- Assess client’s medical condition prior to each session
- Exercise program should accommodate special needs related to cancer treatment regimen
- Sessions may need to be adjusted on a daily basis based on client’s ability at each session
- Adapt training to client’s treatment schedule
- Modify exercise program based on current status, medical condition, and treatment regimen

Cancer

Exercise Recommendations – Aerobic
- Symptom limited at moderate intensity
- 40 – 60% of HR reserve
- FOCUS: exercise for improved mood, fatigue level, weight management. Daily exercise should be individualized based on acute symptoms and fatigue
- 3–5 days/week; 20–60 min/session
- All cardiovascular modalities are appropriate and increase duration & intensity as tolerated
Cancer

Exercise Recommendations – Resistance
- **FOCUS:** Maintenance of arm, leg, and core strength with consideration for fatigue and any treatment-related areas of weakness
  - 40–60% of RM, increase slowly as tolerated
  - 1–3 sets, 3–5 reps increasing to 8–15 reps
  - 2–3 days/week as tolerated
  - All major muscle groups may be targeted
- **FOCUS:** lymph edema related to breast cancer treatment may be augmented using ROM exercise and lymph drainage techniques

Cancer

Safety Considerations
- Consider risks of cardiovascular co-morbidities, especially anemia
- Exercise should be postponed if:
  - uncontrolled vomiting/diarrhea
  - neutropenic fever (infection-related)
  - bleeding risk is high or unknown
  - acute anemia is suspected
  - abnormal blood counts and levels are present

Cancer

Medication Considerations
- Treatments may effect exercise performance, but unlikely to alter exercise responses
  - Surgery: pain, loss of flexibility, nerve damage
  - Radiation: pain, fatigue, scar tissue & loss of flexibility, premature osteoporosis leading to fracture
  - Chemotherapy: fatigue, nausea, anemia, bone loss, general pain, neuropathy
  - Immunotherapy: fatigue, nerve damage, myopathy
Exercise should be cleared by OBY-GYN prior to participation and avoided during higher risk pregnancies. Exercise improves overall function and may impact delivery and recovery if done safely and effectively.

Supporting Documentation
- Exercise significantly decreases incidence of gestational diabetes and pre-eclampsia.
- Supports general health of both mother and fetus during pregnancy and post-partum.

See ACOG FAQ August 2011
(http://www.acog.org/~/media/ForPatients/FAQs.pdf?d=1&src=201203119850337512)
Precautions
- Avoid exercises for abdominal muscles and supine positions
- Prevent falls and avoid any contact and high impact exercises
- Terminate exercise immediately if any bleeding, unusual nausea, dizziness, or other unexpected symptoms occur
- Avoid vigorous exercise in hot, humid weather conditions and wear comfortable, clothing to remain cool
- Recommend wearing a bra that fits well and provides ample support – sports bra may not be sufficient during pregnancy

Exercise Recommendations – Aerobic
- Exercise is encouraged during first 2 trimesters of pregnancy
- Do not start, stop, and restart exercise during pregnancy
- Consult physician prior to participation
- Avoid high-impact exercises and activities where balance may be compromised
  - FOCUS: progressively increase duration rather than intensity of aerobic training

Exercise Recommendations – Resistance
- Exercise during third trimester should be closely monitored and approved by physician
- Emphasize flexibility, range of motion, and lower body exercise
- Avoid abdominal resistance training
- Avoid exercises with increased risk of falls
- Water exercise may be very beneficial
Pregnancy

Safety Considerations
- Terminate exercise if client becomes dizzy, disoriented, or unusually fatigued
- Discontinue exercise if there are signs of bleeding/spotting, cramping, unusual shortness of breath or other unusual symptoms; consult physician immediately
- Do not start an exercise program with a formerly sedentary client during a pregnancy unless cleared by physician

Conclusions & wrap-up