What are the purposes of a clinical exercise test?

Diagnostic
Prognostic
Therapeutic

Diagnostic Testing for CAD

- Most useful in persons with an “intermediate” probability of CAD
  - Asymptomatic, <10% will have positive result
  - Symptomatic, assesses extent of disease

CAD Risk Factors and Stress Testing

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Typical Definite</th>
<th>Atypical/Probable</th>
<th>Nonanginal</th>
<th>Asymptomatic</th>
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<tbody>
<tr>
<td>30–39</td>
<td>Men</td>
<td>Intermediate</td>
<td>Intermediate</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td>Women</td>
<td>Intermediate</td>
<td>Very low</td>
<td>Very low</td>
<td>Very low</td>
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<td>40–49</td>
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<td>Intermediate</td>
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<td>Low</td>
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<td>50–59</td>
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<tr>
<td>60–69</td>
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<tr>
<td></td>
<td>Women</td>
<td>High</td>
<td>Intermediate</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Am Coll. Cardiol. and AHA guidelines for exercise testing: rating scale (1993)

- **Class 1** = consensus exercise is necessary
- **Class 2** = frequently used but divergence of opinion regarding justification for exercise testing
- **Class 3** = agreement that exercise testing is of little value, inappropriate, or contraindicated.
Guidelines for Exercise Testing, cont.

- **Class 1**
  - Diagnosis of men with signs/symptoms of CAD
  - To evaluate functional capacity
  - To assess prognosis
  - To evaluate patients with suspected exercise-induced arrhythmias

- **Class 2**
  - Diagnosis of women with chest pain
  - Diagnosis of patients on digoxin or right bundle branch block
  - To evaluate functional capacity and response to drugs
  - To evaluate variant angina
  - To serially follow patients with CAD

- **Class 3**
  - To evaluate patients with PVCs
  - To diagnose CAD in patients with WPW syndrome or left bundle branch block

When not to Exercise Test

- **Class 3**
  - To evaluate patients with PVCs
  - To diagnose CAD in patients with WPW syndrome or left bundle branch block

Exercise Testing in Apparently Healthy Individuals

- **Class 1**
  - None

- **Class 2**
  - To evaluate symptomatic males over 40 (special occupations, > 2 risk factors, start vig. exercise)

- **Class 3**
  - Asymptomatic men and women with no risk factors or chest discomfort not thought to be cardiac

Other diagnostic conditions for exercise testing

- To assess children for congenital heart disease
- Early detection of labile hypertension
- Evaluation of arrhythmias that occur only during exercise
- Determination of when to replace damaged valves

Exercise Testing to Assess Prognosis

*Prognosis* = the probable outcome of an attack of a disease

(Dorland’s Medical Dictionary)

Exercise Functional Capacity as a Prognostic Predictor

- Symptoms, functional capacity, and myocardial ischemia considered together are useful in the evaluation of persons with known or suspected CAD.
  - Symptoms: recorded at rest and during exercise
  - Functional capacity = METs achieved before symptoms appear
  - Myocardial ischemia = assessed by ST segment changes and symptoms
Clinically Significant METs for Maximal Exercise Capacity

- < 5 METS = poor prognosis
- 10 METS = prognosis with medical therapy as good as coronary bypass surgery
- 13 METS = excellent prognosis regardless of other exercise responses
- 18 METS = elite endurance athletes
- 20 METS = world class athletes

Robergs et al. 97

Exercise testing to assess when to return to work

Occupational Testing

- Used to help assess when patients can return to work or perform strenuous activities
  - 8-hr energy expenditure requires ≤ 50% peak METs
  - Peak energy expenditure < 80% peak METs (brief exposures)

Therapeutic Exercise Testing

Therapeutic = pertaining to or effective in the treatment of disease

Dorland’s Medical Dictionary

Exercise Testing is sometimes used to assess the effectiveness of various medical therapies:

- drug interventions
- dietary interventions
- surgical interventions
Therapeutic Conditions for Exercise Testing

- To evaluate prognosis and functional capacity in uncomplicated MI patients
- To evaluate coronary artery bypass graft and percutaneous transluminal coronary angioplasty patients

Types of Stress Testing

- GXT (treadmill, cycle)
- Upper body testing
- Pharmacological testing

Exercise Testing Special Cases

- Modified stress testing to simulate work conditions if work requires weight-carrying or lifting, assess EKG during a similar activity

Arm Ergometry

- Patients who can’t exercise with legs
- Patients with symptoms only during arm work
- Arm ergometer GXT
  - Work increments of ~ 10 W
  - > 60 rpm
- HR, BP, Ve, lactate
- VO2pk ~ 20-35% lower than leg ergometry
- Poor correlation with leg VO2pk

Pharmacological Stress Tests

- Used for patients who cannot exercise
- Dobutamine: stimulates cardiac β-receptors and increases NE release from sympathetic nerve endings in the heart.
  - Simulates exercise response
  - Used with echocardiography to assess cardiac wall motion
- Adenosine: coronary vasodilator
  - Used with coronary imaging to locate blocked arteries
Summary

- Why do you perform clinical exercise testing?
  - diagnosis, prognosis, therapeutic
- How do you perform clinical exercise testing?
  - standard procedures, special cases
- What if you can’t exercise a patient?
  - pharmacological stress test