### Table 2-1. Coronary Artery Disease Risk Factor Thresholds for Use With ACSM Risk Stratification (p 24G)

#### Risk Factors Defining Criteria

**Positive**

- **Family History**
  - Myocardial infarction, coronary revascularization, or sudden death before 55 years of age in father or other male first-degree relative (i.e., brother or son), or before 65 years of age in mother or other female first-degree relative (i.e., sister or daughter)

- **Cigarette Smoking**
  - Current cigarette smoker or those who quit within the previous 6 months

**Negative**

- **High serum HDL cholesterol**
  - >60 mg/dL (1.6 mmol/L)

#### Risk Factors Defining Criteria

**Hypertension**
- Systolic blood pressure of ≥140 mmHg or diastolic ≥90 mmHg, confirmed by measurements on at least 2 separate occasions, or on antihypertensive medication

**Hypercholesterolemia**
- Total serum cholesterol of >200 mg/dL (5.2 mmol/L) or high-density lipoprotein cholesterol of <35 mg/dL (0.9 mmol/L), or on lipid-lowering medication.
  - If low-density lipoprotein cholesterol is available, use >130 mg/dL (3.4 mmol/L) rather than total cholesterol of >200 mg/dL.

**Impaired Fasting Glucose**
- Fasting blood glucose of ≥110 mg/dL (6.1 mmol/L) confirmed by measurements on at least 2 separate occasions (7)

**Obesity†**
- Body Mass Index of ≥30 kg/m² (8), or waist girth of >100 cm (9)

- †Professional opinions vary regarding the most appropriate markers and thresholds for obesity; therefore, exercise professionals should use clinical judgment when evaluating this risk factor.

**Sedentary lifestyle**
- Persons not participating in a regular exercise program or meeting the minimal physical activity recommendations from the U.S. Surgeon General's report (10)
  - Accumulating 30 minutes or more of moderate physical activity on most days of the week vs vigorous exercise
Sum of Positive and Negative Risk Factors

It is common to sum risk factors in making clinical judgments. If high-density lipoprotein (HDL) cholesterol is high, subtract one risk factor from the sum of positive risk factors because high HDL decreases CAD risk.

Example: 3 Positive Risk Factors
1 Negative Risk Factor

Sum of Risk Factors: 2

What other information is important prior to appropriately stratify risk for CAD?

**Signs and Symptoms** of Cardiovascular, Pulmonary or Metabolic Disease

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**Definitions**

- Angina Pectoris – chest pain
- Ischemia – inadequate blood flow which causes insufficient oxygenation
- Dyspnea – difficulty of breathing/labored breathing
- Orthopnea – difficulty breathing except in the upright condition
- Paroxysmal – sudden

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**Definitions**

- Palpate – feeling with the hand
- Palpitations – sensation of rapid or irregular heart beat
- Tachycardia – resting heart rate >100 bpm
- Intermittent – occurring at separated intervals
- Claudication – occlusive arterial disease in limbs
- Syncope – temporary loss of consciousness

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**Box 2-1. Major Signs or Symptoms Suggestive of Cardiovascular and Pulmonary Disease (p 25G)**

- Pain, discomfort (or other anginal equivalent) in the chest, neck, jaw, arms, or other areas that may be due to ischemia
- Shortness of breath at rest or with mild exertion
- Dizziness or syncope
- Orthopnea or paroxysmal nocturnal dyspnea
- Ankle edema
- Palpitations or tachycardia
- Intermittent claudication
- Known heart murmur
- Unusual fatigue or shortness of breath with usual activities

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**Risk Stratification**

- Sum of risk factors
- Signs/symptoms of cardiovascular, pulmonary and metabolic disease
- Known cardiovascular, pulmonary or metabolic disease
  - Cardiovascular disease – peripheral, vascular or cerebrovascular
  - Pulmonary disease – COPD (chronic obstructive pulmonary disease – emphysema), asthma, interstitial lung disease or cystic fibrosis
  - Metabolic disease – Type 1 and 2 diabetes, thyroid disorders, renal and liver disease
Box 2-2. Initial ACSM Risk Stratification (page 26G)

- Low risk
  - Younger individuals who are asymptomatic and meet no more than one risk factor threshold from Table 2-1
- Moderate risk
  - Older individuals (men ≥ 45 years of age; women ≥ 55 years of age) or those who meet the threshold for two or more risk factors from Table 2-1
- High Risk
  - Individuals with one or more signs/symptoms listed in Box 2-1 or known cardiovascular, pulmonary, or metabolic disease

Table 2-2. ACSM Recommendations for (A) Current Medical Examination* and Exercise Testing Prior to Participation and (B) Physician Supervision of Exercise Tests (p 27G)

<table>
<thead>
<tr>
<th></th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submaximal test</td>
<td>NN</td>
<td>NN</td>
<td>R</td>
</tr>
<tr>
<td>Maximal test</td>
<td>NN</td>
<td>R</td>
<td>R</td>
</tr>
</tbody>
</table>

NN = not necessary
R = recommended medical examination and exercise test

Definitions

- Submaximal test - 85% of maximal predicted HR or 70% of heart rate reserve
- Maximal test - to volitional fatigue or symptoms-limited test

Other Variables Which May Predict Heart Disease Risk

Not currently used for risk stratification

Homocysteine

- Homocysteine - amino acid produced in body
- <12-14 umol/L recommended

\[ \text{Homocysteine} \leq \text{20 mg/dL LDL Cholesterol} \]
- Why?
  - Implicated in structural and functional changes in artery wall
  - May affect vessel dilation
  - Increased risk of blood clotting
  - Lower levels - folic acid (400 mcg/d), B6, B12

Update – C Reactive Protein

- CRP - marker of cardiovascular inflammation
- Persons with high CRP levels are twice as likely as those with high cholesterol to die from heart attacks and strokes
- False positives - caution
  - ≥ 3 mg/L - high risk
  - 1-2.99 mg/L - moderate risk
  - <1 mg/L - low risk
**Update – C Reactive Protein**

- 30% of fatal heart attacks occur in people who have what doctors call a “desirable” cholesterol level.
- Highest CRP levels (4 and higher) were twice as likely to suffer heart problems as those with high LDL (over 154) - women.

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**In-class Assignment**

- Page 8 in lab manual
- Review answers in class
- Homework assignment for credit

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**Risks Associated with GXT (G p 6-10)**

- Maximal Tests in a Medical Center - mortality rate 1/10,000 patients
  Mortality and morbidity rate - 4/10,000
- Submaximal Tests - no reported deaths, MIs, or lasting morbid events, pretest screening and tests performed by nurses or ACSM ETT

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**Risk Ratio**

- The likelihood that a person with a risk factor will develop coronary artery disease compared to someone without the risk factor.

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**Cooper Institute for Aerobics Research**

Figure 18-7. Physical fitness and longevity: a little goes a long way. The greatest reductions in death rate risk occurred when going from the most sedentary category to a moderate level of fitness. (From Blair, S.N., et al. Physical fitness and all-cause mortality: a prospective study of healthy men and women. JAMA 262: 2395, 1989.)
Table 1-1. Results of Studies Investigating the Relationship Between Physical Activity and Incidences of Selected Chronic Diseases (p G7)

<table>
<thead>
<tr>
<th>Disease or Condition</th>
<th>Number of Studies</th>
<th>Trends Across Activity or Fitness Categories</th>
<th>Strength of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause mortality</td>
<td>***</td>
<td>↓↓↓</td>
<td></td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>***</td>
<td>↓↓↓</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>**</td>
<td>↓↓</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>***</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>***</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>*</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Type II diabetes mellitus</td>
<td>**</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>**</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>**</td>
<td>→</td>
<td></td>
</tr>
</tbody>
</table>

Table 1-1. Results of Studies Investigating the Relationship Between Physical Activity and Incidences of Selected Chronic Diseases Continued (p G7)

<table>
<thead>
<tr>
<th>Disease or Condition</th>
<th>Number of Studies</th>
<th>Trends Across Activity or Fitness Categories</th>
<th>Strength of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colon</td>
<td>***</td>
<td>↓↓↓</td>
<td></td>
</tr>
<tr>
<td>Rectal</td>
<td>***</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td>*</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>*</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>***</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>*</td>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>Pancreatic</td>
<td>*</td>
<td>→</td>
<td></td>
</tr>
</tbody>
</table>

PAR-Q & YOU

Paraprocordial question is a set of questions that can help you decide whether or not you should participate in a screening program. If you answer yes to any of these questions, please read the information carefully and answer each question honestly.

1. Have you done this before? (Y/N)
2. Do you have any medical conditions that might prevent you from exercising? (Y/N)
3. Are you currently participating in any physical activity programs? (Y/N)
4. Are you taking any medications that could affect your ability to exercise? (Y/N)
5. Do you have a history of heart disease or any other condition that might affect your ability to exercise? (Y/N)
6. Are you pregnant? (Y/N)
7. Are you allergic to any medications used in screening programs? (Y/N)
8. Are you taking any medications that could affect your blood pressure or hormone levels? (Y/N)
9. Are you taking any medications that could affect your blood sugar levels? (Y/N)

Preparticipation Health Screening

- valid
- cost-effective
- time efficient
- find screening appropriate for your clients or target population and staff ability to interpret
- self or staff administered screening
- if medical evaluation recommended - communication with personal physician recommended (need permission)

Screening (G p 23)

- PAR-Q recommended as minimal standard for entry into moderate intensity exercise programs
- if goal of screening is exercise testing, ACSM screening procedure recommended

Documentation

- results of screening
- document communication with healthcare professionals
- physician referral form
- exercise prescription
- emergency procedures
Emergency Policies and Procedures (p283G)
- All staff CPR/AED certified (copies on file), ACLS preferred
- Plan posted with emergency number
- Emergency communication devices working
- Plan practiced quarterly (document)
- Plan reviewed and changed if necessary (document)
- Training for new staff
- Accident report and follow-up
- Maintenance of emergency equipment

Informed Consent vs Waiver
- Full disclosure of relevant facts
- Alternative procedures/options
- Benefits
- Risks
- Documentation of questions and answers
- Valid informed consent - meet conditions

Negligence (p 261-262 G)
- Failure to conform one’s conduct to a generally accepted standard of duty/care (ACSM – way service should be delivered - current standards)
- Liability insurance – protect against financial loss in event of claim or suit