

PRE EXERCISE EVALUATION

Pre exercise screening is used to identify people who may have medical conditions which put them at higher risk during physical exercises or activities. Pre exercise evaluation serves as a bridge between risk stratification, the fitness and clinical exercise testing concept.

The extent of medical evaluation necessary before exercise testing depends on the assessment of risk. For many persons, especially those with atherosclerotic cardiovascular disease (CVD) and other cardiovascular disorders, the exercise test and accompanying physical examination are critical to the development of a safe and effective exercise program.

A comprehensive pre-exercise test evaluation in the clinical setting generally includes a medical history, physical examination, and laboratory tests.

MEDICAL HISTORY

- The pre-exercise test medical history should be thorough and include both past and current information. Appropriate components of the medical history may include the following:
- **Medical diagnosis.** Cardiovascular disease, including myocardial infarction and other acute coronary syndromes; percutaneous coronary artery procedures, including angioplasty and coronary stent(s); coronary artery bypass surgery; pacemaker and/or implantable cardioverter defibrillator; presence of aortic aneurysm; ablation procedures for dysrhythmias; symptoms of angina pectoris; heart failure; peripheral vascular disease; hypertension; diabetes; metabolic syndrome; obesity; pulmonary disease, including asthma, emphysema, and bronchitis; cerebrovascular disease, including stroke and transient ischemic attacks; anemia and other blood dyscrasias (e.g., lupus erythematosus); phlebitis, deep vein thrombosis or emboli; cancer; pregnancy; osteoporosis; musculoskeletal disorders; emotional disorders; eating disorders.
- **Previous physical examination findings.** Murmurs, clicks, gallop rhythms, other abnormal heart sounds, and other unusual cardiac and vascular findings; abnormal pulmonary findings (e.g., wheezes, rales, crackles); plasma glucose, hemoglobin A1c, serum lipids and lipoproteins, or other significant laboratory abnormalities; high blood pressure; edema.
- **History of symptoms.** Discomfort (e.g., pressure, tingling, pain, heaviness, burning, tightness, squeezing, numbness) in the chest, jaw, neck, back, or arms; light-headedness, dizziness, or fainting; temporary loss of visual acuity or speech, transient unilateral numbness or weakness; shortness of breath; rapid heart beats or palpitations, especially if associated with physical activity, eating a large meal, emotional upset, or exposure to cold (or any combination of these activities).
- Recent illness, hospitalization, new medical diagnoses, or surgical procedures.
- Orthopedic problems, including arthritis, joint swelling, and any condition that would make ambulation or use of certain test modalities difficult.
- Medication use, drug allergies.
- Other habits, including caffeine, alcohol, tobacco, or recreational (illicit) drug use.
- **Exercise history.** Information on readiness for change and habitual level of activity: type of exercise, frequency, duration, and intensity.

- Work history with emphasis on current or expected physical demands, noting upper- and lower-extremity requirements.
- Family history of cardiac, pulmonary, or metabolic disease, stroke, or sudden death.

PHYSICAL EXAMINATION

Components of the Pre-exercise Test Physical Examination

Appropriate components of the physical examination may include the following:

- Body weight; in many instances, determination of body mass index (BMI), waist girth, and/or body composition (percent body fat) is desirable
- Apical pulse rate and rhythm
- Resting blood pressure, seated, supine, and standing
- Auscultation of the lungs with specific attention to uniformity of breath sounds in all areas (absence of rales, wheezes, and other breathing sounds)
- Palpation of the cardiac apical impulse, point of maximal impulse (PMI)
- Auscultation of the heart with specific attention to murmurs, gallops, clicks, and rubs
- Palpation and auscultation of carotid, abdominal, and femoral arteries
- Evaluation of the abdomen for bowel sounds, masses, visceromegaly, and tenderness
- Palpation and inspection of lower extremities for edema and presence of arterial pulses
- Follow-up examination related to orthopedic or other medical conditions that would limit exercise testing
- Tests of neurologic function, including reflexes and cognition (as indicated)
- Inspection of the skin, especially of the lower extremities in known diabetes patients

LABORATORY TESTS

- Fasting serum total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides
- Fasting plasma glucose, especially in individuals ≥ 45 years old and younger individuals who are overweight (BMI ≥ 25 kg·m⁻²) and have one or more of the following risk factors for type 2 diabetes: a first-degree relative with diabetes, member of a high-risk ethnic population
- Thyroid function, as a screening evaluation especially if dyslipidemia is present

Patients with known or suspected cardiovascular disease (high risk)

- Preceding tests plus pertinent previous cardiovascular laboratory tests (e.g., resting 12-lead ECG, Holter monitoring, coronary angiography, radionuclide or echocardiography studies, previous exercise tests)
- Carotid ultrasound and other peripheral vascular studies
- Consider measures of Lp(a), high-sensitivity C-reactive protein, LDL particle size and number, and HDL subspecies (especially in young persons with a strong family history of premature CVD and in those persons without traditional coronary risk factors)
- Chest radiograph, if heart failure is present or suspected

- Comprehensive blood chemistry panel and complete blood count as indicated by history and physical examination

Patients with pulmonary disease

- Chest radiograph
- Pulmonary function tests
- Other specialized pulmonary studies (e.g., oximetry or blood gas analysis)

BLOOD PRESSURE

Measurement of resting blood pressure (BP) is an integral component of the pre-exercise test evaluation. Subsequent decisions should be based on the average of two or more properly measured, seated BP readings recorded during each of two or more office visits.

The relationship between BP and risk for cardiovascular events is continuous, consistent, and independent of other risk factors. For individuals 40 to 70 years of age, each increment of 20 mm Hg in systolic BP or 10 mm Hg in diastolic BP doubles the risk of cardiovascular disease across the entire BP range from 115/75 to 185/115 mm Hg. According to JNC7, persons with a systolic BP of 120 to 139 mm Hg or a diastolic BP of 80 to 89 mm Hg should be considered as prehypertensive and require health-promoting lifestyle modifications to prevent cardiovascular disease.

LIPIDS AND LIPOPROTEINS

The Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III, or ATP III) outlines the National Cholesterol Education Program's (NCEP's) recommendations for cholesterol testing and management.

BLOOD PROFILE ANALYSES

Multiple analyses of blood profiles are commonly evaluated in clinical exercise programs. Such profiles may provide useful information about an individual's overall health status and ability to exercise and may help to explain certain ECG abnormalities. Because of varied methods of assaying blood samples, some caution is advised when comparing blood chemistries from different laboratories.

One should pay particular attention to liver function tests such as alanine transaminase (ALT), aspartate transaminase (AST), and bilirubin as well as to renal (kidney) function tests such as creatinine, glomerular filtration rate, blood urea nitrogen (BUN), and BUN/ creatinine ratio in patients on such medications. Indication of volume depletion and potassium abnormalities can be seen in the sodium and potassium measurements.

PULMONARY FUNCTION

Pulmonary function testing with spirometry is recommended for all smokers older than age 45 years and in any person presenting with dyspnea (shortness of breath), chronic cough, wheezing,

or excessive mucus production. Spirometry is a simple and noninvasive test that can be performed easily.

Spirometry test, the most commonly used include the forced vital capacity (FVC), the forced expiratory volume in one second (FEV1), and the FEV1/FVC ratio. Results from these measurements can help to identify the presence of restrictive or obstructive respiratory abnormalities.

Contraindications to Exercise Testing

Absolute

- A recent significant change in the resting ECG suggesting significant ischemia, recent myocardial infarction (within 2 days), or other acute cardiac event
- Unstable angina
- Uncontrolled cardiac dysrhythmias causing symptoms or hemodynamic compromise
- Symptomatic severe aortic stenosis
- Uncontrolled symptomatic heart failure
- Acute pulmonary embolus or pulmonary infarction
- Acute myocarditis or pericarditis
- Suspected or known dissecting aneurysm
- Acute systemic infection, accompanied by fever, body aches, or swollen lymph glands

Relative

- Left main coronary stenosis
- Moderate stenotic valvular heart disease
- Electrolyte abnormalities (e.g., hypokalemia, hypomagnesemia)
- Severe arterial hypertension (i.e., systolic BP of >200 mm Hg and/or a diastolic BP of >110 mm Hg) at rest
- Tachydysrhythmia or bradydysrhythmia
- Hypertrophic cardiomyopathy and other forms of outflow tract obstruction
- Neuromuscular, musculoskeletal, or rheumatoid disorders that are exacerbated by exercise
- High-degree atrioventricular block
- Ventricular aneurysm
- Uncontrolled metabolic disease (e.g., diabetes, thyrotoxicosis, or myxedema)
- Chronic infectious disease (e.g., mononucleosis, hepatitis, AIDS)
- Mental or physical impairment leading to inability to exercise adequately

Informed Consent

Obtaining adequate informed consent from participants before exercise testing and participation in an exercise program is an important ethical and legal consideration. Information present in the informed-consent process to ensure that the participant knows and understands the purposes and risks associated with the test or exercise program.

Informed Consent for an Exercise Test

1. Purpose and Explanation of the Test

You will perform an exercise test on a cycle ergometer or a motor-driven treadmill. The exercise intensity will begin at a low level and will be advanced in stages depending on your fitness level. We may stop the test at any time because of signs of fatigue or changes in your heart rate, ECG, or blood pressure, or symptoms you may experience. It is important for you to realize that you may stop when you wish because of feelings of fatigue or any other discomfort.

2. Attendant Risks and Discomforts

There exists the possibility of certain changes occurring during the test. These include abnormal blood pressure, fainting irregular, fast or slow heart rhythm, and in rare instances, heart attack, stroke, or death. Every effort will be made to minimize these risks by evaluation of preliminary information relating to your health and fitness and by careful observations during testing. Emergency equipment and trained personnel are available to deal with unusual situations that may arise.

3. Responsibilities of the Participant

Information you possess about your health status or previous experiences of heart-related symptoms (e.g. shortness of breath with low-level activity, pain, pressure, tightness, heaviness in the chest, neck, jaw, back, and/or arms) with physical effort may affect the safety of your exercise test. Your prompt reporting of these and any other unusual feelings with effort during the exercise test itself is very important. You are responsible for fully disclosing your medical history, as well as symptoms that may occur during the test. You are also expected to report all medications (including nonprescription) taken recently and, in particular, those taken today, to the testing staff.

4. Benefits to Be Expected

The results obtained from the exercise test may assist in the diagnosis of your illness, in evaluating the effect of your medications or in evaluating what type of physical activities you might do with low risk.

5. Inquiries

Any questions about the procedures used in the exercise test or the results of your test are encouraged. If you have any concerns or questions, please ask us for further explanations.

6. Use of Medical records

The information that is obtained during exercise testing will be treated as privileged and confidential as described in the Health Insurance Portability and Accountability Act of 1996. It is not to be released or revealed to any person except your referring physician without your written consent. However, the information obtained may be used for statistical analysis or scientific purposes with your right to privacy retained.

7. Freedom of Consent

I hereby consent to voluntarily engage in an exercise test to determine my exercise capacity and state of cardiovascular health. My permission to perform this exercise test is given voluntarily. I understand that I am free to stop the test at any point if I so desire.

I have read this form, and I understand the test procedures that I will perform and the attendant risks and discomforts. Knowing these risks and discomforts, and having had an opportunity to ask questions that have been answered to my satisfaction, I consent to participate in this test.

Date

Signature of Patient

Date

Signature of Witness