

ADVANCED PRACTICE PROCEDURE PROTOCOL

CARDIAC STRESS TESTING (ADULT)

I. Definition

The patient undergoing a cardiac stress test via pharmacologic infusion or exercise (treadmill or bike). The patient will be monitored with a continuous 12 lead ECG, blood pressure device, pulse oximetry and may include Echocardiogram or Nuclear imaging. The purpose of cardiac stress testing is utilized for the following:

- Detection of coronary artery disease (CAD) in patients with chest pain (chest discomfort) syndromes or potential symptom equivalents
- Evaluation of the anatomic and functional severity of CAD
- Prediction of cardiovascular events and all-cause death (risk stratification)
- Evaluation of physical capacity and effort tolerance
- Evaluation of exercise-related symptoms
- Assessment of chronotropic competence, arrhythmias, and response to implanted device therapy
- Assessment of the response to medical interventions

II. Background Information

A. Setting:

The setting (inpatient vs outpatient) and population for the Advanced Practice Provider (APP) is determined by the approval of the privileges requested on the APP Privilege Request Form.

B. Supervision:

The necessity of this protocol will be determined by the Advanced Practice Provider in collaboration with the supervising physician or his/her designee. Designee is defined as another attending physician who works directly with the supervising physician and is authorized to supervise the Advanced Practice Provider. Direct supervision will not be necessary once competency is determined, as provided for in the protocol. The Advanced Practice Provider will notify the physician immediately upon being involved in any emergency or resuscitative event or under the following circumstances:

- Patient decompensation or intolerance to the procedure
- Outcome of the procedure other than expected

C. High Risk Patients:

All patients are assessed by an Advanced Practice Provider (APP) pre-testing. After completing an initial assessment, any patient falling into a high-risk group (see listings

below) or otherwise considered higher risk by the APP will be discussed with an attending physician before proceeding with the test. Patients known to fall into a high-risk group should be preferentially scheduled at the Parnassus Heights testing site. The risks and benefits of proceeding with the study will be discussed between the attending physician and APP, in addition to the referring provider as needed. If the APP feels the test is out of his or her scope of practice, then proceeding with the test is at the attending's discretion and noted in the patient's assessment.

The following are clinical situations identified as higher risk based on clinical safety criteria:

- Moderate to severe aortic stenosis in an asymptomatic or questionably symptomatic patient
- Moderate to severe mitral stenosis in an asymptomatic or questionably symptomatic patient
- Hypertrophic cardiomyopathy: risk stratification and exercise gradient assessment
- History of malignant or exertional arrhythmias, sudden cardiac death
- History of exertional syncope or presyncope
- Intracardiac shunts
- Genetic channelopathies
- Within 7 days of myocardial infarction or other acute coronary syndrome
- NYHA class III heart failure
- Severe left ventricular dysfunction (particularly patients whose clinical status has recently deteriorated and those who have never undergone prior exercise testing)
- Severe pulmonary arterial hypertension
- Broader context of potential instability resulting from non-cardiovascular comorbidities, (e.g., frailty, dehydration, orthopedic limitations, chronic obstructive lung disease)

The Circulation consensus document recommends on-site physician supervision (defined as physical presence in the room) for these groups, based largely on judgment rather than data (Level of Evidence C), but also acknowledges the criteria for tests requiring direct physician supervision may vary depending on the individual interpretation of the patient's risk status. Ultimately, it is the attending physician's responsibility to provide an appropriate level of supervision and to be available should an immediate response or patient need arise. ([Circulation, 2014; 130: 1014-1027](#))

D. Indications:

To rule out cardiac ischemia, arrhythmias, evaluate exercise tolerance, patient symptoms, and medical and device therapies, as determined by the attending physician.

E. Precautions:

<http://www.onlinejacc.org/content/accj/30/1/260.full.pdf>
[Supervision of Exercise Testing by Nonphysicians. Circulation.htm. Circulation. September 16, 2014, Volume 130](#)

III. Stress Test

A. Pre-treatment evaluation:

1. Obtain brief history. Check as to appropriateness of ordered test. Read baseline ECG, note any baseline abnormalities and compare with previous ECG. If patient has prior cardiac stress test, obtain for comparison. Perform heart and lung exam, and document vital signs. Consult with attending physician as needed.
2. Inpatients/ ER/CDU patients must have 2 negative or down-trending troponins within the first 24 hours from the onset of chest pain if being evaluated for unstable angina/ACS.
3. ER or CDU patients must have at least 1 negative troponin if onset of CP is over 12 hours prior to arrival.

B. Procedure: <http://www.onlinejacc.org/content/accj/30/1/260.full.pdf>

C. Emergency Procedures:

Though not common, serious adverse reactions that may occur during stress testing are:

- Cardiopulmonary Arrest
- Ischemia
- Hypotension
- Life Threatening Arrhythmias
- Bronchospasm

1. Cardiopulmonary Arrest:

Follow the “CODE BLUE” procedure in the nursing policy and procedure manual. Depending on the physical location of the stress lab, overhead call a “Code Blue” or dial 911.

2. Ischemia:

If patient develops chest pain and/or ischemia during the test:

- a. For nuclear treadmill stress tests, inject the isotope before stopping exercise. If injecting a pharmacologic agent, administer the isotope before reversing with Aminophylline IV (up to 3mg/kg).
- b. For echo stress tests, may obtain echo imaging as long as patient’s vital signs are stable.
- c. If chest pain and/or ischemia does not improve in 5 minutes, apply oxygen at 2-4 liters via nasal prongs and start an IV.
 - i. If patient’s systolic blood pressure is greater than 110 mmHg, administer Nitroglycerine 0.4mg SL and page the attending physician. May repeat Nitroglycerine up to 3 times within 10-15 minutes if blood pressure is stable.
 - ii. For ST elevation, administer Aspirin 325mg if patient has no contraindications.
 - iii. Continue to monitor patient until the attending physician arrives. Patient may require Morphine Sulfate IV and/or admission to the Emergency Department to rule out ACS per the attending physician.

3. Hypotension:
 - a. Place the patient flat in bed or in Trendelenburg position and start an IV line. Administer 250ml bolus of normal saline. Treat cause of hypotension if known.
 - b. Page the attending physician.
 - c. Treat tachyarrhythmias or bradycardias per protocol below or per attending physician's recommendations.
4. Life Threatening Arrhythmias:
 - a. Ventricular Fibrillation: Follow "CODE BLUE" protocol.
 - b. Sustained Ventricular Tachycardia:
 - i. Stop test and have patient perform vagal maneuvers while lying flat in bed.
 - ii. Have technician page attending physician STAT and bring "Crash Cart" into room.
 - iii. Obtain blood pressure and start an IV line. Give 250 ml bolus of normal saline.
 - iv. If still in VT, follow ACLS protocol.
 - v. If patient is hypotensive, prepare for cardioversion.
5. Bronchospasm during nuclear pharmacologic stress test:

Reverse with Aminophylline IV per protocol and apply 2-4 liters of nasal cannula as needed.

D. Post-procedure:

1. For nuclear stress tests, the nuclear techs remove IV after entire test is completed. All items contaminated by the isotope are placed in the appropriate container.
2. The test is terminated after symptoms, ECG, and vital signs return to baseline.
3. The stress test report is written by the performing provider and will be confirmed by the attending physician.

IV. Documentation

A. Electronic medical record:

1. Document the assessment, history, and evaluation in the patient's medical record.
2. Record the consent, procedure, outcome, patient tolerance, medications given, and plan of care in the note.
3. All abnormal or unexpected findings are reviewed with the supervising physician and documented. Document that referring provider was notified if applicable.

V. Competency Assessment

A. Initial Competence:

1. The Advanced Practice Provider will be instructed on the efficacy and indications of this therapy and demonstrate understanding of such.
2. The Advanced Practice Practitioner will demonstrate knowledge of the following:
 - a. Medical indication and contraindications of cardiac stress testing, as well as the emergency procedures during stress testing
 - b. Risks and benefits of the procedure
 - c. Related anatomy and physiology
 - d. Consent process
 - e. Steps in performing the procedure
 - f. Documentation of the procedure
 - g. Ability to interpret results and implications in management
3. Advanced Practice Provider will observe the supervising physician/APP perform each procedure 5 times and perform the stress test for a total of **200** times under direct supervision. These would be 50 vasodilator and 150 exercise studies including CPETs and HCM populations.
4. Supervising physician/ supervising APP will document Advanced Practice Provider's competency prior to performing procedure without direct supervision.
5. The Advanced Practice Provider will ensure the completion of competency documents and provide a copy for their personnel record and a copy to the medical staff office for their credentialing file.
6. The Advanced Practice Provider may provide a signed copy of prior proctoring from another institution where competency for independent practice had previously been established to bypass the requirement of initial observed studies, at the discretion of the supervising physician. Alternatively, with prior experience may be modified at preceptor's discretion to be 100 exams, 50 vasodilator and 50 exercise.

B. Continued proficiency:

1. The Advanced Practice Provider will demonstrate competence by successful completion of the initial competency.
2. Demonstration of continued proficiency shall be monitored through the annual evaluation with 50 being the minimal requirement. (treadmill and nuclear)
3. A clinical practice outcomes log is to be submitted with each 2-year reappointment cycle of credential and privileges review. It will include the number of procedures performed per year and any adverse outcomes. If an adverse outcome occurred, a copy of the procedure note will be submitted.

VI. RESPONSIBILITY

Questions about this procedure should be directed to the Chief Nursing Officer and Patient Care Services Officer at 353-4380.

VII. HISTORY OF POLICY

Approved October 2019 by the Executive Medical Board and Governance Advisory Council

Revised October 2019 by the Committee on Interdisciplinary Practice

Reviewed 2016 by the Committee on Interdisciplinary Practice

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Revised February 2012 by Subcommittee of the Committee for Interdisciplinary Practice

Reviewed February 2012 by the Committee on Interdisciplinary Practice

Prior revision May 2009

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