# STANDARDIZED PROCEDURE
# CARDIAC STRESS TESTING-EXERCISE TESTING (Adult, Peds)

*These procedures are intended to describe procedures performed by Nurse Practitioners and/or Certified Nurse Midwives* (depending on the clinical privileges granted to the individual practitioner) *at UC San Diego Health.*

## I. Definition:

During the exercise test, the patient exercises on a bike or treadmill while being monitored with a 12 lead ECG, blood pressure device, pulse oximetry and, if requested, oxygen consumption, Echocardiogram, or nuclear imaging. The test is performed to evaluate patient symptoms and a wide range of dysfunction including arrhythmias, cardiac ischemia, exercise tolerance, oxygen consumption, congenital or valvular heart disease, as well as to evaluate medical and device therapy.

## II. Background Information

**A.** Setting: The setting (inpatient vs outpatient) and population (adults vs pediatrics) for the Advanced Health Practitioner (AHP) is determined by the approval of the privileges requested on the AHP Privilege Request Form. If the procedure is being done on a Pediatric patient, make sure Child Life is involved and use age appropriate language and age appropriate developmental needs with care of children, as appropriate to the situation.

**B.** Supervision**:** The necessity of this protocol will be determined by the Advanced Health Practitioner 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 Health Practitioner.

Direct supervision will not be necessary once competency is determined, as provided for in the protocol. The Advanced Health Practitioner will notify the physician immediately upon being involved in any emergency or resuscitative events or under the following circumstances:

1. Patient decompensation or intolerance to the procedure
2. Outcome of the procedure other than expected

**C.** Indications**:**

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

**D.** Precautions**:**

Although not common, serious adverse reactions that may occur during stress

cardiac testing include life threatening arrhythmias, syncope, myocardial infarction, bronchospasm, and rarely death.

## III. Materials

Equipment and supplies are located in the department.

## IV. Treadmill Test

### Pre-treatment evaluation

- 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 post test. Perform heart and lung exam, and document vital signs. Consult with attending physician as needed.

### Set up

- Confirm with technician that the 12 lead hook-up is correct and that the patient has been instructed as to how to get on and off the exercise equipment.
- Place or check intravenous line for patency if using isotope for nuclear study or contrast for ECHO study.
- Check resting ECHO, spirometry baseline or nuclear images as indicated and assure availability of ECHO technician and/or nuclear medicine technician.

### Patient Preparation

- Do a time out with all appropriate checks prior to procedure.
- Explain procedure to patient and/or parent/guardian. Discuss risks, benefits, and obtain informed consent.

### Procedure

- Begin exercise test, monitoring the 12 lead ECG, vital signs, oxygen saturation, and symptoms throughout the test.
- For nuclear tests, have the isotope injected into the intravenous line at peak exercise as determined by symptoms, ECG changes, or peak exercise. If able, have the patient continue to exercise for about one minute post injection. If performing ECHO with stress test, ECHO images are obtained immediately after exercise is stopped.
- During the recovery period, monitor the patient for 8-10 minutes or until symptoms and/or ECG and vital signs return to baseline.
- If adverse hemodynamic responses occur, significant arrhythmias, ST

depression greater than 2 mm or ST elevation greater than 1 mm occur, stop the test immediately. Perform emergency procedures as noted below. Any adverse effects or complications are reported to the attending physician immediately.

## Emergency Procedures

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

1. Cardiopulmonary Arrest
2. Ischemia
3. Hypotension
4. Life Threatening Arrhythmias
5. Bronchospasm

**Cardiopulmonary Arrest**

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

**Ischemia**

<u>During the treadmill test with or without chest pain.</u>

a. Inject the isotope, if ordered, and stop the test. May obtain ECHO images as long as patient's vital signs are normal.

b. Help the patient to the gurney.

c. If ischemia and/or chest pain does not begin to resolve in 2-3 minutes, begin oxygen at 2-4 L/nasal prongs and start an IV of normal saline. If patient's blood pressure is greater than 110 systolic, give Nitroglycerine 0.4mg SL or 2 sprays and page the attending. May repeat nitroglycerine up to 3 times within ten minutes. If ST elevation occurs, then add 325 mg Aspirin p.o., if patient has not taken any that day. Continue to monitor patient until the Attending physician has arrived. Patient may require Morphine Sulfate and/or admission to the Emergency Department to R/O MI per Attending.

d. **FOR PEDIATRIC PATIENTS:** Apply oxygen 2-4L nasal prongs and give 81mg of ASA p.o. and page the Pediatric Cardiologist STAT. Consider IV Morphine Sulfate 0.05-0.1mg/kg IVP and/or Esmolol for persistent ischemia. Patient may require admission to the ED or Children's Hospital.

<u>During **Dipyridamole/Adenosine/Regadenason** infusion with or without chest pain.</u>

a. Inject the isotope immediately, stop the infusion, if still infusing, and reverse with aminophylline (up to 3mg/kg). Begin oxygen 2-4L/NP as indicated.

b. If the ischemia persists and the blood pressure is greater than 110 systolic, give nitroglycerine 0.4mg SL or 2 sprays and page the Attending. Consider Morphine Sulfate and/or Metoprolol IV. Continue monitoring the patient. May require admission to the hospital.

c. **FOR PEDIATRIC PATIENTS:** Apply oxygen 2-4L nasal prongs and give 81mg of ASA p.o. and page the Pediatric Cardiologist STAT. Consider IV Morphine Sulfate 0.05-0.1mg/kg IVP and/or Esmolol for persistent ischemia. Patient may require admission to the ED or Children's Hospital.

**Hypotension**

a. Place the patient flat on the gurney or in Trendelenberg and start IV line and give 250ml bolus of normal saline.
b. Page the attending physician
c. Treat tachyarrhythmias or bradycardias per protocol below or per attending physician's recommendations.

**FOR PEDIATRIC PATIENTS:** Give 10-20ml/kg normal saline IV bolus. Apply oxygen 2-4L per nasal cannula. Page Pediatric Cardiologist.

**Life Threatening Arrhythmias**

a. Ventricular Fibrillation: Follow "CODE BLUE" or "Code White" procedures in nursing manual.

b. Sustained Ventricular Tachycardia
1. Stop test and have patient cough until lying flat on gurney.
2. Have technician page Attending physician STAT and bring "Crash Cart" into room.
3. Obtain blood pressure and start an IV line and give 250ml bolus of normal saline.
4. If still in VT, give 1-1.5mg/kg Lidocaine slowly IV push
5. If patient is hypotensive, prepare for cardioversion.

**FOR PEDIATRIC PATIENTS:** As above except page Pediatric Cardiologist STAT, give 10-20ml/kg bolus of normal saline. Prepare to give Lidocaine 1mg/kg IV or Amiodarone 5mg/kg slowly IV. Continuously monitor patient and prepare for cardioversion.

c. Supraventricular Tachycardia without Hypotension.
1. Start IV line with normal saline and page the cardiologist.
2. Prepare to give Adenosine 6mg rapid IVP – may repeat with 12mg apid IVP. Metoprolol 1-5 mg IV may also be given to slow the rate.

**FOR PEDIATRIC PATIENTS:** Page Pediatric Cardiologist, start IV with normal saline. Prepare to give adenosine 0.1mg/kg rapid IVP. May double (0.2mg/kg) for second dose. Initial dose is not to exceed 6mg. Maximum dose should not exceed 12mg.

d. Supraventricular Tachycardia with Hypotension.

1. Start IV line and give 250ml bolus normal saline and page the Attending physician.
2. Prepare for possible cardioversion.

**FOR PEDIATRIC PATIENTS:** Page Pediatric cardiologist STAT. Start IV and give 10-20ml/kg normal saline IV bolus. Prepare for cardioversion.

e. Bradycardia with Hypotension.

1. Start IV line and give 250ml bolus normal saline and page the Attending physician.
2. If symptomatic and hypotensive, give 0.5-1mg Atropine IV push. May repeat x1.
3. Prepare external cutaneous pacemaker.

**FOR PEDIATRIC PATIENTS:** Page the Pediatric Cardiologist STAT. Begin oxygen 2-4L nasal cannula. Start IV line and give 10-20ml/kg bolus. If symptomatic and hypotensive, give 0.02mg/kg Atropine IV push. Minimum single does is 0.1mg. Maximum child single does is 0.5mg. Maximum child total dose is 1mg. Maximum adolescent single does is 1mg. Maximum adolescent total dose is 2mg. Prepare external cutaneous pacemaker.

**Bronchospasm due to Dipyridamole/Adensine/Regadenoson.**

a. Immediately reverse the agent with 1mg/kg of Aminophylline up to 3mg/kg. Start oxygen at 2-4L/NP. Page the Attending physician STAT.

b. Begin nebulizer treatment with 2.5mg/3ml Albuterol (0.083%).

**FOR PEDIATRIC PATIENTS:** As above except use 0.05mg/kg, (1.25-2.5mg) in 3ml nebulizer treatment. Page Pediatric cardiologist STAT. Secure crash cart in case intubation is needed.

## V. Post-procedure

1. At the end of the test, the technicians remove the IV. All items contaminated by the isotope are placed in the appropriate container and are disposed of by the nuclear medicine staff.

2. The test is terminated after symptoms, ECG, and vital signs return to baseline.

## VI. Documentation

**A.** Documentation is in the electronic medical record

1. Documentation of the pretreatment evaluation

2. Record the consent, time out, procedure, outcome, patient tolerance, medications given, and the plan in the note.

3. Test is reviewed with the attending physician at the end of the day.

**B.** All abnormal or unexpected findings are reviewed with the supervising physician.

## VII. Competency Assessment

### A. Initial Competence

1. The Advanced Health Practitioner will be instructed on the efficacy and the indications of this therapy and demonstrate understanding of such.
2. The Advanced Health Practitioner will demonstrate knowledge of the following:
   a. Medical indication and contraindications of cardiac stress exercise 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 Health Practitioner will observe the supervising physician perform each procedure three times and perform the exercise stress test **twenty-five** times under direct supervision. A minimum of **twenty** pediatric cardiac stress tests will be performed under direct supervision.
4. Supervising physician will document Advanced Health Practitioner's competency prior to performing procedure without direct supervision.
5. The Advanced Health Practitioner will ensure the completion of competency sign off documents and provide a copy for filing in their personnel file and a copy to the medical staff office for their credentialing file.

### B. Continued proficiency

1. The Advanced Health Practitioner will demonstrate competence by successful completion of the initial competency.

2. Each candidate will be initially proctored and signed off by an attending physician. Advanced Health Practitioner must perform the exercise stress test **twenty-five** times per year. A minimum of **twenty** pediatric cardiac stress tests will be performed each year to maintain proficiency. In cases where this minimum is not met, the attending, must again sign off the procedure for the Advanced Health Practitioner. The Advanced Health Practitioner will be signed off after demonstrating 100% accuracy in completing the procedure.

3. Demonstration of continued proficiency shall be monitored through the annual evaluation.

4. A clinical practice outcomes log is to be submitted with each renewal of credentials. 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.

## VIII. RESPONSIBILITY

Please contact the Advanced Practice Council if you need help. The administrative assistant for the Chief Nursing Officer can direct you. Call; 619-543-3438.

## IX. HISTORY OF POLICY

Revised by the Committee of Interdisciplinary Practices: 2/26/2014, 9/28/2016
Reviewed by the Medical Staff Credentials Committee: 3/5/2014, 10/6/2016
Approved by the Medical Staff Executive Committee: 3/20/2014, 10/7/2016