

STANDARDIZED PROCEDURE
CARDIAC STRESS TESTING MYOCARDIAL PERFUSION –
PHARMACOLOGICAL INFUSION WITH A2a AGONIST AGENTS:
ADENOSINE, DIPYRIDAMOLE, & REGADENOSON (Adult, Peds)

I. Definition:

This protocol covers the task of cardiac stress testing by an Advanced Health Practitioner to rule out ischemia. The purpose of this standardized procedure is to allow the Advanced Health Practitioner to safely do cardiac stress testing when needed.

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 determine if cardiac ischemia is present.

D. Precautions:

A2a receptors agonists can cause bronchospasm, especially in patients with uncontrolled asthma or active wheezing. Currently, ONLY Dipyridamole is used in children under the age of 18 years.

III. Materials

Materials available in the Stress test lab.

IV. Procedure

A. Pre-treatment evaluation

Obtain brief history. Check to the appropriateness of ordered test. If patient has history of asthma or other pulmonary problems, consider consulting with the attending physician. Read the baseline ECG and note any abnormalities and compare the ECG with prior tracings. Perform heart and lung exam. Assess vital signs. Consent the patient or parent/guardian as to the risks/benefits of the test and expected symptoms. Check the

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resting nuclear images. Consult with ordering physician or cardiologist as needed.
Perform a time out prior to start of procedure.

B. Set-up

1. Assure the IV is patent and that the isotope and nuclear medicine tech is available.
2. Prepare the drug for infusion
 - a. Adenosine: 140mcg/kg over a 4-6 minute infusion. Mix drug in a 60ml syringe with the Adenosine and normal saline up to 50ml total volume. Insert the syringe into the infusion pump and begin the infusion. Inject isotope at 2-3 minutes after infusion has begun. Continue infusion 2-3 minutes after isotope has been injected.
 - b. Dipyridamole: 0.56mg/kg over 4 minute infusion. Mix drug in a 60 ml syringe with the Dipyridamole and normal saline up to 48ml total volume. Insert the syringe into the infusion pump and begin infusion. Inject isotope 2-3 minutes after the infusion is complete.
 - c. Regadenoson: Comes prepackaged. All adult dosage is 0.4mg IVP. Prepare normal saline flush of 10ml. Inject the Regadenoson over 10 seconds followed by a 10ml flush over 10 seconds. Inject isotope at 40 seconds after the start of the drug.

C. Patient Preparation

1. Do a time out with all appropriate checks prior to the procedure

D. Procedure

1. Monitor and document the patient's vital signs, oxygenation, 12 lead ECG and symptoms during the procedure.
2. Aminophylline IV, 1mg/kg, is used to reverse the effects of A2a agonists. May use up to 3mg/kg, if needed.
3. If patient develops wheezing, ST depression greater than 2mm, or ST elevation greater than 1mm, inject the isotope and immediately reverse with the Aminophylline.
4. Continue to monitor the patient for at least 2-3 minutes after the Aminophylline has been injected or until the ECG and symptoms return near baseline.
5. In the event of adverse and/or continued symptoms (see Emergency Procedures below), page the attending for consultation.

E. Emergency Procedures

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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

1. 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.

2. Ischemia—ST Elevation or Significant ST Depression

During the **treadmill** test with or without chest pain.

- 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 1-2 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, Metoprolol 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.

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

- 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 1-2 sprays and page the Attending. Consider Morphine

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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.

3. 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.

4. 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.

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2. Prepare to give Adenosine 6mg rapid IVP, may repeat with 12mg rapid IVP. Metoprolol 1-5mg 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.

5. 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.

F. Post-procedure

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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.

V. Documentation

- A.** Documentation is in the electronic medical record.
 1. Documentation of the pretreatment evaluation
 2. Record the time out, procedure, the outcome, patient tolerance, medications given, and the plan in the progress note
- B.** All abnormal or unexpected findings are reviewed with the supervising physician.

VI. Competency Assessment

A. Initial Competence

1. The Advanced Health Practitioner will be instructed on the efficacy and the indications of cardiac testing and will demonstrate understanding of such.
2. The Advanced Health Practitioner will demonstrate knowledge of the following:
 - a. Medical indication and contraindications of A2a agonists
 - 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 **five** times and perform the pharmacological stress test using different A2a agonists **twenty-five** times under direct supervision. For the Advanced Health Practitioner providing Pediatric cardiac stress testing, a minimum of **five** tests will be performed under direct supervision.
4. Supervising physician will document Advanced Health Practitioner's competency prior to performing procedure without direct supervision.

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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. The Advanced Health Practitioner will perform the pharmacological stress test **twenty-five** times per year. A minimum of **five** pediatric pharmacological cardiac stress tests will be performed each year.
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.

VII. RESPONSIBILITY

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

VIII. HISTORY OF POLICY

Revised February 2012 by Subcommittee of the Committee for Interdisciplinary Practice

Reviewed February 2012 by the Committee on Interdisciplinary Practice

Previous revisions May 2009

Approved February 2012 by the Executive Medical Board and the Governance Advisory Council.

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