

Stress Test Guidelines for Observation Chest Pain Patients

Emory Healthcare

GUIDELINES FOR STRESS TESTING OBSERVATION UNIT CHEST PAIN PATIENTS

The purpose of stress testing CDU chest pain patients is to identify those with severe coronary artery stenosis, or unstable angina (USA). Initial ECG or cardiac markers in this population do not adequately detect USA. Subendocardial myocardial infarction, or "NSTEMI" must first be ruled out before a stress test can be performed safely. This is done with ECGs and serial cardiac marker testing.

1. **The ACC/AHA Guidelines for the Management of Patients with Unstable Angina/Non-ST-Elevation Myocardial Infarction** are most recently updated in 2011 and recommend certain goals of care. Patients in whom Acute Coronary Syndrome (ACS) is considered to be probable or possible, an admission to an observation unit is acceptable in those with a non-diagnostic EKG, negative cardiac biomarkers, and a history of present illness that is not highly suggestive of ACS. Stress testing and imaging at all locations is done in accordance with ACC/AHA guidelines for stress testing and imaging. Stress imaging (nuclear, echo, MRI, coronary CTA) will be interpreted by those trained and credentialed to interpret each modality in accordance with hospital standards and national guidelines for each imaging modality.
2. **Chest Pain Protocol** - the ACC/AHA Guidelines recommend serial EKG's, and serial cardiac biomarkers for appropriate low risk patients. For selected low risk patients, it is acceptable to discharge them with arrangements for a stress test within 72 hours. When this occurs, strict patient instructions should be given for when to return to the ED, along with aspirin therapy if not contraindicated .
3. **Vasodilator stress injections (dipyrimadole or lexiscan)** – may be performed by associate providers (NP or PA) who have completed training in this area and have performed at least 10 supervised injections. This includes compliance with persantine / lexiscan patient selection, monitoring and documenting patient condition during drug infusions, identifying and treating both minor and major vasodilator side effects, coordinating testing with other departments, understanding imaging results which are reported by nuclear cardiology. Credentialing in this area will be renewed each year based on performance skills and knowledge in this area. These injections will be supervised by the attending physician working with the associate provider.
4. *The following variables are considered in choosing an appropriate stress test*
 - a. **What is available**
 - b. **Patient characteristics:**
 - i. Initial probability of acute coronary ischemia in the patient (Bayes' theorem) –higher probability of disease warrant a more sensitive test, lower probability patients benefit from a less sensitive test (i.e. where the false positive rate is less than disease prevalence).
 - ii. The patients' ability to exercise.
 - iii. Contraindications to various stress tests (Persantine - severe asthma; cCTA - high BMI/CRF/CAD; cCTA/MPI – child bearing age females (radiation - relative issue)).
 - c. **Test characteristics**
 - i. Sensitivity and specificity of the stress test – More sensitive tests produce more false positives. More specific tests may yield more false negatives.
 - ii. PET – ideal for high BMI, known CAD/prior MI
 - iii. DSE or MRI – ideal for child bearing age females
 - d. **The cost of the stress test**

Why stress imaging after MI has been ruled out?

We do stress imaging determine if the patient's symptoms (ie chest pain) are due to unstable angina once AMI has been ruled out. In other words, we are asking if there is >70% coronary occlusion (by plaque or ruptured plaque + clot) causing myocardial ischemia. Stress testing with imaging identifies 3/5 of true positive ACS cases in this population, while serial markers and ECGs identify only 1/5 of cases. Stress testing / imaging options can be broken down as follows:

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1. Non-stress imaging – Coronary CTA (anatomy) or rest sestimibi imaging (physiology)
2. Stress Imaging – usually a combination of:
 - a. A stress modality -2 options: ischemia induction or vasodilators
 - b. An imaging modality:
 - i. Echo
 - ii. Nuclear [SPECT camera isotopes (thallium or technecium) and PET camera isotope (Rubidium)]
 - iii. MRI

All stress imaging modalities have reported sensitivities of roughly 85-90% in this population. Exercise stress test without imaging has a role in very low risk patients, but has sensitivities of only about 75% and problems with indeterminate test results (sub-maximal heart rate, etc). Below is a visual summary of this:

Overview: Non-stress Imaging Modalities

- Coronary CTA = Anatomy



- Rest sestimibi Imaging = Physiology



Overview – Stress Testing and Imaging:

<u>Stress Modalities:</u>	<u>Stress Imaging:</u>
<ul style="list-style-type: none"> • <u>Ischemia Induction</u> <ul style="list-style-type: none"> - Graded Exercise Stress Test - Dobutamine ST • <u>Vasodilators</u> <ul style="list-style-type: none"> - Adenosine - Dipyridazole (Persantine) - Regadenoson (Lexiscan) 	<ul style="list-style-type: none"> • <u>Echo</u> – rest / stress • <u>Nuclear</u> <ul style="list-style-type: none"> - SPECT (Camera) <ul style="list-style-type: none"> • Thallium • Technecium (To 99m) <ul style="list-style-type: none"> - To Sestimibi (Cardiolyte) - To tetrofosmin (Myoview) - PET (Camera) <ul style="list-style-type: none"> • Rubidium • <u>MRI</u>

Stress Testing and Imaging Combinations

<u>Stress Modalities:</u>	<u>Stress Imaging:</u>
<ul style="list-style-type: none"> • <u>Ischemia Induction</u> <ul style="list-style-type: none"> - Graded Exercise Stress Test - Dobutamine ST • <u>Vasodilators</u> <ul style="list-style-type: none"> - Adenosine - Dipyridazole (Persantine) - Regadenoson (Lexiscan) 	<ul style="list-style-type: none"> • <u>Echo</u> – rest / stress • <u>Nuclear:</u> <ul style="list-style-type: none"> - SPECT (Camera) <ul style="list-style-type: none"> • Thallium • Technecium (To 99m) <ul style="list-style-type: none"> - To Sestimibi (Cardiolyte) - To tetrofosmin (Myoview) - PET (Camera) <ul style="list-style-type: none"> • Rubidium • <u>MRI</u>

Source: Emory Healthcare, Atlanta, GA; Cardiovascular Roundtable interviews and analysis.

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1. Hospital, Stress test, Location, and Supervision of Patient Condition During Test

EUH

Hospital	Test	Location	Coverage (MD and Associate Provider)
EUH	Lexcian Technetium SPECT ¹	Emory Clinic (Nuclear Medicine) ¹	Cardiology (Emergency) ¹
EUH	Dobutamine Stress Echo	Emory Clinic	Cardiology
EUH	Adenosine MRI	MRI	Cardiology
EUH	Coronary CTA	Emory Clinic	Cardiology ⁴

1 - The Emergency Department Physician is responsible for patients during weekend SPECT₁ at which time it is performed by the ED CDU Associate Provider in the Radiology department.

EUHM

Hospital	Test	Location	Coverage (MD and Associate Provider)
EUHM	Lexcian Technetium SPECT ¹	Cardiac Imaging	Cardiology
EUHM	Dobutamine Stress Echo or GXT	Cardiac Imaging	Cardiology
EUHM	Adenosine MRI	Cardiac Imaging	Cardiology
EUHM	Coronary CTA	Cardiac Imaging	Radiology

GRADY

Hospital	Test	Location	Coverage (MD and Associate Provider)
Grady	Persantine / Lexiscan Tc SPECT	Nuclear Medicine ² CDU	Cardiology ² ED - Associate Provider
Grady	Dobutamine or GXT Stress Echo	Echo / stress lab	Cardiology
Grady	Rest Sestimibi	Nuclear Medicine	Nuclear Medicine
Grady	Coronary CTA	Emory Clinic	Cardiology ⁴

2 - Cardiology / nuclear medicine performs and supervises vasodilator stress and Tc injections when they have open slots. Otherwise vasodilator stress and Tc injections are done and supervised in the CDU, then the patient is sent to nuclear medicine for imaging. All SPECT (Tc) imaging is done and supervised in and by nuclear medicine.

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2. How do we select a stress test with imaging?:

Based on the above, here is the breakdown of what is available and where -

Emory University Hospital CDU

- Emory University Hospital CDU Weekdays, 7AM – 5PM
 - Male any age, or Female >55; no renal failure:
 - BMI <30, no known CAD:
 - Lexiscan technecium SPECT
 - Dobutamine stress echo
 - Exercise stress echo – if able to exercise
 - Coronary CTA
 - BMI>30, known CAD, or no available SPECT isotopes:
 - Lexiscan Rubidium PET
 - Lexiscan technecium SPECT
 - Female <55:
 - Dobutamine echo
 - Exercise Stress echo
 - Adenosine MRI
 - Severe Asthma / COPD; renal failure:
 - Dobutamine echo
 - Dobutamine SPECT (rest / stress sestimibi)
 - Lexiscan Rubidium PET
- Emory University Hospital CDU Weekends until 2PM
 - Lexiscan SPECT (rest / stress sestimibi) – by CDU Associate Provider

Component	Status	Details
<input type="checkbox"/> ECHO CARD		Stat. Reason: Chest Pain
<input type="checkbox"/> Moderate risk of ACS, no active wheezing, unable to exercise, BMI > 35, no other stress imaging available (weekends)		
<input type="checkbox"/> NC Myocard Perf Rest +Stress SPECT Multi		
<input type="checkbox"/> PET Dept - MF 8am-3pm		
<input type="checkbox"/> PET Cardiovascular Stress Test		Stat. Reason: Chest Pain
<input type="checkbox"/> Moderate risk of ACS, unable to exercise, (+) history of asthma/wheezing		
<input type="checkbox"/> ECHO Dept - MF 8am-3pm - To schedule outpatient echo on weekend call Transfer Service 8-4930		
<input type="checkbox"/> ECHO Stress w/ Dobutamine CARD		Stat. Reason: Chest Pain, HISTORY OF ASTHMA/COPD
<input type="checkbox"/> Low risk, able to exercise, controlled hypertension, no aortic stenosis, no active heart failure		
<input type="checkbox"/> NC Myocard Perf Rest +Stress SPECT Multi(NC Cardiovaso...		
<input type="checkbox"/> ECHO Stress w/ Exercise CARD		Stat. Reason: Chest Pain
<input type="checkbox"/> CT Cardio Dept - MF 8am-3pm ""PHONE CALL Required for CTA"" Call 8-4591 to arrange for CTA Procedures.		
<input type="checkbox"/> For Triple RVD, MUST be noted in the order and clinical exclusion criteria should be followed		
<input type="checkbox"/> CT Cardio CTA, Colon w/Calc Scan		
<input type="checkbox"/> CT Cardio CTA, Colon w/o Calc Scan		

Source: Emory Healthcare, Atlanta, GA; Cardiovascular Roundtable interviews and analysis.

Stress Test Guidelines for Observation Chest Pain Patients (Cont.)

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Emory Midtown Hospital CDU – 7/2011

- Emory University Midtown Hospital CDU Weekdays 7AM – 5PM:
 - Male any age, or Female >55:
 - BMI <30, no known CAD:
 - Lexiscan technecium SPECT
 - Dobutamine stress echo.
 - Exercise stress echo - if able to exercise
 - BMI>30, known CAD, or no available SPECT
 - Lexiscan Rubidium PET
 - Lexiscan technecium SPECT
 - Female <55:
 - Dobutamine echo
 - Exercise Stress echo
 - Adenosine MRI
 - Severe Asthma / COPD, or Renal Failure:
 - Dobutamine echo
 - Dobutamine SPECT (rest / stress sestimibi)
 - Lexiscan Rubidium PET

- Emory University Midtown Hospital CDU Weekends - Saturday 7AM -12 noon, Sunday until 2PM
 - Lexiscan Rubidium PET
 - Lexiscan technecium SPECT

Component	Status	Details
CDU Chest Pain, EURM Chest Pain Diagnostics (Initiated Pending)		
Diagnostic Tests		
<input type="checkbox"/> ECHO CARD		Stat, Reason: Chest Pain
<input checked="" type="checkbox"/> Moderate risk of ACS, no active wheezing, unable to exercise, BMI >35, no other stress imaging available [weekends]		
<input checked="" type="checkbox"/> PET Cardiac Perf Multi CARD		Not available for the facility of the active encounter
<input checked="" type="checkbox"/> Moderate risk of ACS, unable to exercise - order one of these tests		
<input checked="" type="checkbox"/> NC Myocard Perf Fst+Sr SPECT Multi CARD		Not available for the facility of the active encounter
<input checked="" type="checkbox"/> Moderate risk of ACS, unable to exercise, (+) history of asthma/wheezing - order one of these tests		
<input checked="" type="checkbox"/> ECHO Stress Hours 7:30am-4pm M-F		
<input type="checkbox"/> ECHO Stress w/ Dobutamine CARD		Stat, Reason: Chest Pain, HISTORY OF ASTHMA/COPD
<input checked="" type="checkbox"/> Low risk, able to exercise, controlled hypertension, no aortic stenosis, no active heart failure		
<input checked="" type="checkbox"/> NC Cardiovascular Stress Test CARD		Not available for the facility of the active encounter
<input type="checkbox"/> ECHO Stress w/ Exercise CARD		Stat, Reason: Chest Pain

Source: Emory Healthcare, Atlanta, GA; Cardiovascular Roundtable interviews and analysis.

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Grady Memorial Hospital CDU – 2/2014

- Grady Memorial Hospital CDU Weekdays 7AM – 2PM:
 - BMI <30, no known CAD:
 - Exercise Treadmill (ETT) – if able to exercise
 - Coronary CT Angiogram (cCTA)
 - Must be currently in sinus rhythm (no Atrial fibrillation/flutter)
 - Resting HR <80 (must be below 60 after beta blockers)
 - Able to get IV dye
 - No dye allergy
 - GFR > 50
 - 18 or 20g AC or forearm IV
 - No Beta-blocker allergy
 - No active wheezing or history of COPD
 - No history of CHF (EF > 45%)
 - BMI >30, known CAD, or not candidate for cCTA or ETT
 - Persantine or Adenosine Technetium SPECT
 - Persantine if performed in CDU
 - Adenosine if performed in Stress lab
 - Consider Cardiology consult for recs on stress vs cath/admission
 - Severe Asthma / COPD:
 - Regadenoson (Lexiscan®) technetium SPECT
-
- Grady Memorial Hospital CDU Weekends - Saturday and Sunday until 2PM
 - Persantine/Lexiscan technetium SPECT

Stress Test

CARDIAC STRESS TEST WITH NUCLEAR IMAGING (CV STRESS AND 1HM STRESS) PANEL

BOTH STRESS AND NUCLEAR COMPONENTS MUST BE ORDERED

CV Stress Test, Exercise w/IM Imaging
Routine, DRG TAG First occurrence Today at 11:32

AND

PER CARDIAC Multiple SINGS and PHAT
Routine

Cardiac perfusion Single Rest or Stress
STAT

CTA Beta Blocker Protocol

CTA Beta Blocker Protocol 1 of 1 selected

CTA Beta-Blocker protocol

CT-Angio Head IV 3D Image
STAT

metoprolol (LOPRESSOR) tablet 50 mg

50 mg, Oral, EVERY 20 MIN FOR 10 MIN AND (ASBESTOSIS) CONTRAINDICATIONS TO beta-blocker see below. If above, Starting Today at 12:31, For 2 doses

Step 1: Check vitals. If HR <60, proceed to scanner without beta. If HR >60, give 1st dose and metoprolol 50 mg, unless patient has contraindications to beta-blocker (see below). Recheck vitals in 30 mins in those who get oral metoprolol. If HR >60, AND no contraindications present to beta, (SBP is not <100, patient not having any wheezing or asthma or other problem), then give a second dose of oral metoprolol 50 mg. Wait another 20 mins then go to CT scanner. **CONTRAINDICATIONS TO BETA-BLOCKERS** - look for these before giving first dose metoprolol - HR <60 already - SBP <100 - Known prior allergy or intolerance to beta-blocker - Decompensated heart failure - Severe Asthma or COPD on daily beta agonist therapy, unless an MD orders giving a beta-blocker - Active bronchospasm "Other medication from CT-Angio Panel"

Metoprolol Tablet (LOPRESSOR) Injection 5 mg

5 mg, Intravenous, EVERY 15 MIN FOR, If HR >60 and no contraindications (SBP is not <100, patient not having any wheezing or asthma or other problem), Starting Today at 12:31, For 2 doses

Step 2: If HR >60, proceed to step 3. Otherwise look as follows to give 1st dose before scanning. - Upon arrival to CT scanner, If HR >60 and no contraindications (SBP is not <100, patient not having any wheezing or asthma or other problem), give 1 mg IV Metoprolol. - Wait 5 mins and recheck vitals. If HR >60 and no contraindications (SBP is not <100, patient not having any wheezing or asthma or other problem), give another 1 mg IV Metoprolol. Recheck vitals. Further doses only if given by direct MD order. If HR <60, scan. If HR >60, consider aborting scan. "Obtain medication from CT-Angio Panel"

INIVOLYCEIN (L, INTRIOCTAN) 3.4 mg

3.4 mg, Sublingual, STAT, Chest pain, see administration, Starting Today at 12:31, For 1 dose

This is a "Sound-Alike, Look-Alike" drug. Confirm you have selected the correct drug.

Step 3: Screen for contraindications to this class of medication after or while the beta-blocker medication is last 40 hours, SBP <110, prior intolerance of contrast. If no contraindications, then administer sublingual inivolycein 3.4 mg tablet. If any contraindication, then scan without inivolycein. Practice breath hold technique and then scan 3.0 mins after 1st to 1.5 min. "Obtain medication from CT-Angio Panel"

Source: Emory Healthcare, Atlanta, GA; Cardiovascular Roundtable interviews and analysis.