

GUIDELINE FOR CARDIOVASCULAR STRESS TESTING DURING COVID-19 PANDEMIC

Exercise stress testing with or without imaging is central to the noninvasive evaluation of known or suspected ischemic heart disease. Exercise stress is associated with potential for COVID exposure through sweat, deep/heavy breathing, and close staff contact during the test. Additionally, echocardiographic imaging techniques as adjunct to stress testing require close physical contact. Nuclear imaging before and after stress involves much less contact between imaging staff and the patient.

Pharmacologic stress reduces the risks of infection associated with exercise stress testing with the caveat that imaging is always required as an adjunct to pharmacologic stress techniques. We propose that pharmacologic stress should be preferred over exercise testing for the safety of staff involved.

Computed tomography coronary angiography does not require stress testing and has the highest accuracy of available noninvasive tests for ischemic heart disease. The use of contrast dye requires pre-testing for kidney function and screening for history of contrast dye reactions. The test is fast with brief/intermittent staff contact. Elderly patients or patients with vascular calcifications due to chronic kidney disease may have equivocal imaging findings; the new availability of CT fractional flow reserve (FFR) as an adjunct mitigates this in many cases.

In those circumstances when pharmacologic stress will not adequately replace the clinical information from exercise, such as exercise or functional capacity prior to return to work or participation in cardiac rehab, blood pressure response to effort in valvular heart disease, correlation of symptoms in valvular heart disease, or in patients with contraindications to both pharmacologic stress and computed tomography coronary angiography, we propose proceeding with the stress test only after ruling out COVID-19 infection.

For patients with active infection, cardiovascular testing should generally be deferred until infection clears.

Proposed Pathway:

Exercise Treadmill Test (ETT)

Determine general category of indication for test:

- New Diagnosis of Ischemic Heart Disease:

Consider alternate test. Diagnosis of CAD can be made, often with greater accuracy (sensitivity and specificity) and less need for repeat testing, with CCTA or pharmacologic stress (either DSE or Pharm Nuke)

- **Coronary CT (available at University and Memorial campus);** beta blocker pre-treatment required (ie, metoprolol 25-50mg po night before and again morning of test); relatively contraindicated if eGFR < 25 ml/min or contrast dye allergy. Patients with chronic kidney disease or advanced age may have extensive coronary calcifications that limit visualization of coronary arteries.
- **Pharmacologic SPECT myocardial perfusion imaging;** relatively contraindicated if severe asthma/COPD
- **Dobutamine stress echo (DSE);** available but not preferred due to prolonged staff contact during imaging

If no alternative, test patient for COVID and perform ETT if COVID neg

GUIDELINE FOR CARDIOVASCULAR STRESS TESTING DURING COVID-19 PANDEMIC**- Assessment of Functional Capacity/Return to Work/Cardiac Rehab:**

Test patient for COVID and perform ETT if COVID neg

- Assessment of Symptoms in Valvular Heart Disease:

Test patient for COVID and perform ETT if COVID neg

Treadmill Stress Echocardiogram (TSE)

Determine general category of indication for test:

- New Diagnosis of Ischemic Heart Disease:

Suggest alternate test. Diagnosis of CAD can be made, with less staff exposure risk, with CCTA (if renal function normal) or pharmacologic stress (either DSE or Pharm Nuke)

If no alternative, test patient for COVID and perform ETT if COVID neg

- Known Diagnosis of Ischemic Heart Disease:

Suggest pharmacologic test instead of exercise to reduce staff exposure risks:

- **Pharmacologic SPECT myocardial perfusion imaging;** relatively contraindicated if severe asthma/COPD
- **Dobutamine stress echo (DSE);** available but not preferred due to prolonged staff contact during imaging

If pharmacologic stress contraindicated, test patient for COVID and perform TSE if COVID neg

- Assessment of Valvular Heart Disease:

Test patient for COVID and perform TSE if COVID neg

Dobutamine Stress Echocardiogram (DSE)

- Available but not preferred; prolonged staff contact may carry higher risk of infectivity than other modalities. Consider alternatives if available.

Exercise Stress SPECT Nuclear Imaging

- Prefer pharmacologic nuclear stress to reduce staff exposure.

Pharmacologic Stress Nuclear Imaging

- Proceed with test

Computed Tomography Coronary Angiography

- Proceed with test

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Considerations:

Test	Pros	Cons
<p>Exercise (EKG) Treadmill Test (ETT)</p> <p><i>Patient exercises on treadmill while staff monitor symptoms, vital signs, EKG</i></p>	<ul style="list-style-type: none"> - Allows clinical correlation of symptoms with exertional effort - Assess functional capacity prior to cardiac rehab or return to work - No/limited Prior Authorization burden - No radiation or contrast dye use 	<ul style="list-style-type: none"> - Breathing, coughing, close contact between patient and staff - Lowest sensitivity and specificity for diagnosing CAD, especially if non-cardiac limitations to exercise - Invalid with abnormal resting ECG - Often leads to further testing with imaging due to inconclusive results
<p>Exercise Treadmill Stress Echocardiogram (TSE)</p> <p><i>Patient exercises on treadmill while staff monitor symptoms, vital signs, EKG</i></p> <p><i>Ultrasound images of the left ventricle obtained before and immediately after exercise</i></p>	<ul style="list-style-type: none"> - Exercise stress allows correlation of symptoms with effort - Imaging component allows valid interpretation despite abnormal resting ECGs - No radiation or contrast dye use 	<ul style="list-style-type: none"> - Breathing, coughing, close contact between patient and staff - Moderate sensitivity and specificity for diagnosing CAD - Moderate Prior Authorization burden
<p>Dobutamine Stress Echocardiogram (DSE)</p> <p><i>Patient receives intravenous dobutamine to increase the heart rate in stages</i></p> <p><i>Ultrasound images of the left ventricle obtained at each stage</i></p>	<ul style="list-style-type: none"> - Does not require exercise - Imaging component allows valid interpretation despite abnormal resting ECG - No radiation or contrast dye use 	<ul style="list-style-type: none"> - Resource intensive (staff and time) to perform - Close contact between patient and staff (but less than exercise) - Moderate sensitivity and specificity for diagnosing CAD - Moderate Prior Authorization burden
<p>Exercise Stress SPECT Nuclear Imaging</p> <p><i>Patient exercises on treadmill while staff monitor symptoms, vital signs, EKG</i></p> <p><i>Nuclear scan of the heart</i></p>	<ul style="list-style-type: none"> - Exercise stress allows correlation of symptoms with effort - Imaging component allows valid interpretation despite abnormal resting ECG - No contrast dye use 	<ul style="list-style-type: none"> - Breathing, coughing, close contact between patient and staff - Lengthy (two-step) imaging requires patient to wait on campus 2-3 hours - High Prior Authorization

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<p><i>obtained before and after exercise</i></p>	<ul style="list-style-type: none"> - High specificity for CAD, especially if prior revascularization 	<p>burden</p> <ul style="list-style-type: none"> - Radiation exposure a concern for young patients
<p>Pharmacologic Stress SPECT Nuclear Imaging</p> <p><i>Patient receives brief IV medication to simulate effects of exercise on the heart</i></p> <p><i>Nuclear scan of the heart obtained before and after exercise</i></p>	<ul style="list-style-type: none"> - Does not require exercise - Imaging component allows valid interpretation despite abnormal resting ECG - No contrast dye use - High specificity for CAD, especially if prior revascularization 	<ul style="list-style-type: none"> - Lengthy (two-step) imaging requires patient to wait on campus 2-3 hours - High Prior Authorization burden - Radiation exposure a concern for young patients
<p>Computed Tomography Coronary Angiography (CCTA)</p> <p><i>Patient receives IV contrast dye during a CT scan, timed to see the heart and coronary arteries</i></p>	<ul style="list-style-type: none"> - Highest sensitivity and specificity for new diagnosis CAD; recommended as first line test for CAD in European Guidelines - Not dependent on exercise or ECG - Radiation exposure is less than nuclear stress imaging - Short procedure/imaging time 	<ul style="list-style-type: none"> - Requires contrast and pre-imaging laboratory test for kidney function; relatively contraindicated if eGFR <45 (see Dept of Radiology CKD Guidelines for further details) or - Requires pre-treatment with oral beta blockers (ie, metoprolol 25-50mg po night before and again morning of test) - Highest Prior Authorization burden

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References

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