

# How do I choose the Right Stress Test for my patient?

## Choose Wisely<sup>(R)\*</sup> by asking the following:

Question 1: Is my patient **Asymptomatic OR Symptomatic**?

Question 2: What is my patient's **Pretest Likelihood of CAD**?

(based on age, gender, +/- symptoms: typical angina, atypical angina, nonanginal chest pain, asymptomatic)

Age (yrs)	Gender	Typical Definite Angina	Atypical Probable Angina	Nonanginal Chest pain	Asymptomatic
30-39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40-49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50-59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
60-69	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

Adapted from  
Diamond & Forrester, N Engl J Med.  
300:1979:1350-1358.

Question 3: Is my patient **able to exercise or not**?

Question 4: Is the baseline rest **ECG Normal or Abnormal**?

Question 5: Do I want to **make a "Diagnosis"** of Ischemic Heart Disease (IHD) or **determine "Prognosis"**?

### Consider Exercise Stress Test (NO perfusion imaging):

#### To detect IHD in patients with

**Symptoms + LOW pretest likelihood of CAD + ABLE to exercise  
+ NORMAL rest ECG**

#### To determine Prognosis In Asymptomatic or Symptomatic patients who can exercise:

Assess adequacy of therapy in known stable CAD  
Assess exercise capacity  
Assess HR and BP response to exercise  
Assess fitness to exercise  
Assess for exercise-induced dysrhythmia

### Consider MPI Stress Test (stress test with perfusion imaging):

#### To detect IHD in patients with

**Symptoms + INTERMEDIATE to HIGH pretest likelihood of CAD  
+ ABLE or UNABLE to exercise + NORMAL or ABNORMAL rest ECG**

#### To determine Prognosis In Asymptomatic or Symptomatic patients who can or cannot exercise:

Assess volume/burden of Myocardial Ischemia  
Assess size of Myocardial Infarction / Viability / Left Ventricular systolic function/Size  
Assess adequacy of therapy in known stable CAD  
Assess Global Risk of Cardiac events  
Pre-operative Risk Stratification



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[www.choosingwisely.org](http://www.choosingwisely.org)

## **Stress Testing Detailed Q and A**

### ***Q. When do I order a regular cardiac Treadmill Stress Test vs. a Myocardial Perfusion Imaging (MPI / Thallium) Stress Test?***

A. Anytime a cardiac stress test is considered for a patient, the referring MD must ask him/herself the following fundamental questions:

- Am I looking to diagnose or rule out Ischemic Heart Disease (IHD)?

And / OR

- Do I want to determine the Prognosis and risk of cardiac events?

### ***Q. What is the “utility” of a regular Treadmill Stress Test for the above?***

A. Historically the sensitivity (40-70%) and specificity (70-80%) of a regular stress test alone (without cardiac imaging) varies significantly depending on the patient's underlying risk of developing myocardial ischemia under stress. The higher values might be achievable in higher risk individuals with multivessel coronary artery disease. However, even then an unacceptably high percentage of exercise stress tests may underdiagnose the presence of IHD (*reflecting low sensitivity*), particularly for only single and sometimes double vessel IHD, or overdiagnose (*reflecting low specificity*) particularly in women and younger persons.

### ***Q. What are some of the more common “Appropriate use criteria” for a regular Treadmill Stress Test?***

A. A regular stress test is very limited in its appropriateness criteria and in its applicability to certain patient populations being assessed for IHD. Unfortunately this test is often mistakenly ordered to diagnose or rule out IHD in the wrong populations. Some more appropriate uses are as follows:

- Assess for IHD as the cause of chest pain or dyspnea in a patient with very low or low likelihood of coronary artery disease and with a completely normal resting ECG. Bear in mind many of these patients may not require any exercise testing and reassurance regarding their low risk may be best.

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- Assess for exercise-induced dysrhythmia
- Assess efficacy of anti-ischemic medical therapy, PCI, or CABG in controlling typical symptoms
- Assess exercise capacity, heart rate, and blood pressure responses to exercise
- Assess fitness and suitability for exercise
- Prescribe an exercise program

**Q. What is the utility of an MPI / Thallium Stress Test?**

A. MPI will provide >90% sensitivity and 85-90% specificity and thus can significantly increase accuracy in ruling out or diagnosing IHD disease. It also provides a powerful and non-invasive prognostication tool by combining coronary flow images with stress test results. However, although it is a “better test” compared to exercise stress testing alone, in low risk persons, any abnormal findings are more likely to represent false positives. With the newest CZT camera technologies incorporating CT based coronary calcium assessment into the MPI studies the diagnostic and prognostication power of MPI has increased even more immensely. This elevates the utility of MPI studies performed on these cameras beyond the traditional cameras.

**Q. What are some of the more common “Appropriate use criteria” for MPI / Thallium Stress Test? – please see the requisition form for a complete listing**

- Assess for IHD as the cause of chest pain or dyspnea in a patient with intermediate to high risk of coronary artery disease, with or without a normal resting ECG.
- Rule out IHD as the cause of abnormal ECG, or dysrhythmia such as VT, PVC's or Atrial fibrillation
- Assess efficacy of medical therapy, PCI or CABG in controlling symptoms related to IHD
- Risk stratification post MI
- Assess for IHD post cardiac transplant
- Assess for IHD in heart failure or cardiomyopathy
- Assess for adequacy of revascularization following PCI and / or CABG

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- Assess for residual ischemia following incomplete revascularization
- Assess an equivocal or abnormal regular stress test result
- Follow up of progression of IHD in patients with significant vascular risks
- Pre-op risk assessment for non-cardiac surgery or vascular surgery, particularly with unknown functional capacity
- Assess viability and LV ejection fraction and volumes

***Q. When do I choose Exercise vs. Pharmacologic MPI / Thallium Stress Testing?***

A. The top three reasons (not in any particular order) for requesting a pharmacologic stress MPI vs. exercise MPI are:

- Inability to perform a reasonable symptom-limited level of exercise appropriate for the patient's age and gender
- Left bundle branch block (LBBB) on a resting ECG
- A ventricular paced rhythm at rest (regular pacemaker or ICD)

***Q. Should I consider a Viability MPI / Thallium (Rest Only, No stress test) study?***

A. Even if there is occlusion of a coronary artery the muscle may be viable by means of collateral vessels and hibernation (a state of very low metabolic activity). A viability study simply assesses the volume and extent of permanent damage (infarction) to the heart for example several weeks or months following a heart attack when any possible recovery has already occurred. This is a test that is used mostly by cardiologists to assess if revascularization by angioplasty or CABG might improve the left ventricular systolic function.

***Q. What are the relative costs of a regular Treadmill Stress Test vs. MPI / Thallium Stress Test in relation to the type and value of information each provides? (i.e. cost effectiveness and cost efficacy).***

A. An MPI is approximately twice as expensive as a cardiology consultation and an exercise stress test. This additional cost is highly cost-effective in intermediate- and high-risk patients as a direct consequence of the improved diagnostic and prognostic information. In general, the most cost-effective testing strategy is the one that refers most low risk patients for the less expensive test (i.e., simple

exercise stress testing) and most intermediate and high risk patients for MPI of course after a thorough history and physical examination.

**Q. For MPI / Thallium Stress Tests, what are the relative risks of ionizing radiation vs. the benefits and improved sensitivity and specificity of this test?**

A. MPI has a very long track record of safety and efficacy as utilized in many populations. However, all tests carry risks that should always be balanced against the potential benefit that can be obtained by their utilization. MPI of course uses radiation to measure the blood flow and hence muscle perfusion. The easiest way to ensure that the risks are minimized and benefits maximized is by applying the appropriateness criteria when making a referral. The risks can be further reduced by ensuring that the test is applied to the right population at the right time (e.g. a low risk case of chest pain syndrome in a 33 year old woman with minimal or no risk factors, vs. an intermediate risk case of atypical chest pain in a 57 year old man with hypertension and dyslipidemia). The radiation dose range for an MPI using older technology has traditionally been in the range of 10-20 mSv (millisievert). Newer technologies have allowed us to perform the test with less than half of this dose and in a far shorter image acquisition time. TotalCardiology has acquired this latest CZT technology which is also in keeping with the newest CCS consensus guidelines for radiation safety in cardiac imaging.

As a matter of general information Health Canada (<http://www.hc-sc.gc.ca/>) provides the following information regarding background radiation:

*The total average dose from all sources of radiation in Canada is about 2 – 3 mSv per year. On average, 80% of exposure (2.4 mSv) is due to naturally-occurring sources, 19.6 % (almost 0.600 mSv) is due to the medical use of radiation and the remaining 0.4% (around 0.010 mSv) is due to other sources of human-made radiation such as medical isotope production. For reference, a long, cross-country flight could expose a person to about 0.030 mSv of radiation, diagnostic procedures such as a dental X-rays may provide 0.010 mSv of radiation, and CT scans may deliver an approximate radiation dose of 5 – 30 mSv depending on the type of CT machine and the region studied (abdomen and chest CT usually cause the most exposure).*

*Health Canada's Radiation Protection Bureau monitors radiation levels across Canada 24/7 using two networks of radiation monitoring stations. They provide regular updates on doses of background radiation exposure in a variety of Canadian cities. These can be reviewed at their website.*

## ***Choosing Wisely<sup>(R)</sup>***

“Choosing Wisely<sup>(R)</sup>” is a concept that is promoted by a number of world-wide cardiology expert groups and associations in order to ensure that resources are allocated properly and the patients truly receive the best cardiac care possible. The related series of documents are available online under the title “Choosing Wisely” and provide a framework for the patient to ask the right questions from their doctors and other health care professionals.

TotalCardiology strongly endorses the use of “appropriate” testing and utilization of guidelines for choosing the right test for the right patient. As Cardiologists we have additional expertise in this area and we are happy to help you decide.

**Need help deciding on the most appropriate test for your patient?**

**You can call us to obtain a Rapid Telephone Consultation or simply refer for a Rapid Cardiology Clinical Consultation.**

**Go to [TotalCardiology.ca](http://TotalCardiology.ca) for more information.**