Evaluation of Ischemia: When is it warranted?

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The Ohio State University Wexner Medical Center

- 62 year old male with a history of HTN presents with a 1 month history of worsening chest pain. The chest pain is worse with exertion, but also can come on at rest. Nothing makes it better or worse.
- He is fairly active, able to walk 2 miles briskly without stopping.
- Exam is unremarkable
- Baseline ECG is normal.

Objectives:
- Identify reasons to get ischemic assessment
- Discuss pros and cons of guidelines in assisting with clinical decision making
- Determine what info is needed prior to deciding on ischemic assessment
- Determine what ischemic assessment is appropriate for different clinical scenario

Who needs an ischemic assessment?
- Depends on what the clinical question is
**What question needs answering?**

- Diagnose or exclude CAD
- Risk assessment/classification
- Evaluate therapeutic impact of drug/intervention
- Assist in other clinical decision making (arrhythmias, syncope, CHF, chronotropic response to exercise)

Adapted from ACC AUC cardiac testing document; 2013

**Guidelines, Performance Measures, AUC. What should we be following?**

- Clinical guidelines: exhaustive review of literature, all inclusive, best practice ‘should do, should not do’
- Performance measures: more focused and easily measurable: “must do’
- Appropriate Use Criteria: More selective, pointed indications based on guidelines with clinical scenarios as backdrop ‘reasonable to do’

**Appropriate Use Criteria:**

- Consensus document that helps define when to do/how often to do
- Based on scientific evidence
- But also takes into account economic factors
- Not a substitute for sound clinical judgment

**AUC:**

- Great way to assess in real world situations what is ‘reasonable’
- A = appropriate care
- M = Maybe appropriate care
- R = Rarely appropriate care
Clinical information needed:

• Symptoms
• Risk factors
• Exercise capacity/ability
• Baseline ECG – interpretable for a stress
• Prior history, procedures

Adapted from ACC AUC cardiac testing document; 2013

Chest pain/symptoms

<table>
<thead>
<tr>
<th>Typical</th>
<th>Atypical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substernal heaviness/burning/tightness</td>
<td>Pleuritic/sharp/“knife-like”</td>
</tr>
<tr>
<td>Radiates to shoulder/neck/jaw/epigastrium</td>
<td>Positional, reproducing with palpation, radiation of pain unpredictable</td>
</tr>
<tr>
<td>Predictably with exertion</td>
<td>Random onset</td>
</tr>
<tr>
<td>3-15 minutes in duration</td>
<td>Lasts seconds, hours, days</td>
</tr>
<tr>
<td>Improves with nitro/rest</td>
<td>No significant change with nitro</td>
</tr>
</tbody>
</table>

*20% of patients may have atypical symptoms with CAD

Risk factors:

• HTN
• DM
• HLD
• Family history
• Age
• Obesity
• Gender
• Smoking

Exercise capacity:

• Can the patient exercise maximally? (Can the patient achieve target heart rate)
• No contraindications (AS, HOCM, severe aortic dilation)
• Orthopedic/neurologic barriers
Uninterpretable/difficult to interpret ECG:

- LBBB
- Paced rhythm
- HOCM/LVH
- Baseline ST deviation

Prior history and procedures

- Stress
- Echo
- Cath
- CABG/PCI

Now that we have all the information we need on our patient, what do we do with it?

<table>
<thead>
<tr>
<th>Pretest Probability</th>
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<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>&lt;39</td>
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<tr>
<td>40-49</td>
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We have now formulated a pre-test probability. This, along with patient’s ECG and exercise capacity, we can determine what options are ‘reasonable’

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Content is owned and provided courtesy of the American College of Cardiology.
The patient with chest pain...

Symptomatic Patient

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• Low pre-test probability of CAD*ECG interpretable AND able to exercise

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• High pre-test probability of CAD*ECG interpretable AND able to exercise

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Asymptomatic patients:

- Hard to make an asymptomatic patient feel better
- So need to have a compelling reason to look for ischemia (change your medical management to improve mortality, risk assessment, etc)
Preoperative patients:

- New 2014 guidelines
- More in depth, more specifics than previous guidelines – but also more room for clinical judgment
### Preoperative Assessment

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<tr>
<td>Intermediate risk surgery ≤ 1 Clinical Risk Factor</td>
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<tr>
<td>Vascular / High Risk Surgery ≤ 1 Clinical Risk Factor</td>
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<tr>
<td>Kidney Transplant</td>
<td>M A A M R R M</td>
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<td>Liver Transplant</td>
<td>M A A M R R M</td>
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Other symptoms/considerations:

- Symptomatic and/or pre-op patients most common to be stressed, there are other special situations

### New Diagnosis of CHF, no prior CAD assessment

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<tbody>
<tr>
<td>New diagnosis: Systolic Heart Failure</td>
<td>M A A A R</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>R</td>
<td>A</td>
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<tr>
<td>New diagnosis: Diastolic Heart Failure</td>
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### Evaluation of Arrhythmia, no prior CAD assessment

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</tr>
</thead>
<tbody>
<tr>
<td>Sustained VT</td>
<td>A A A A R</td>
<td>M</td>
<td>M</td>
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<tr>
<td>Widecomplex VT</td>
<td>A A A A R</td>
<td>M</td>
<td>M</td>
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<td>M</td>
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<tr>
<td>Frequent PVC's</td>
<td>A A A A M</td>
<td>R</td>
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<tr>
<td>Infrequent PVC's</td>
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### Syncope, no prior CAD assessment

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Low Global CAD Risk

No Global CAD Risk

Adapted from ACC/AUC cardiac testing document, 2013 (as mentioned in previous slides above)
Choosing a cardiac stress test

Pharmacologic cardiac stress testing

Medical Management of Stable Ischemic Heart Disease

Kavita Sharma, MD
Clinical Director of the Lipid Management Clinics
Assistant Professor
Division of Cardiovascular Medicine
The Ohio State University Wexner Medical Center
• Management of Stable ischemic heart disease, as opposed to unstable angina or ACS

Risk Factor Modification (Class 1)

- Lifestyle modifications including daily physical activity and weight management are strongly recommended for all patients with stable ischemic heart disease
- Dietary therapy for all patients should include reduced intake of saturated fats (to < 7% of total calories), trans fatty acids (to < 1% of total calories) and cholesterol (to < 200 mg/d)
**Blood pressure management (Class 1)**

- In stable ischemic heart disease, with BP > 140/90 after lifestyle, begin antihypertensives
- Specific medications for high BP should be on patient characteristics (ACE/beta-blockers/possible thiazide/calcium channel blockers)

---

**Diabetes (Class IIa)**

- Most appropriate goal level for HgbA1c for patients with diabetes has not been established by clinical trials
- A goal HgbA1c < 7%, a level approximating that achieved in the intensive therapy arms of clinical trials, is reasonable for many younger patients.
- Treatment to achieve a HgbA1c < 7% might not be safe for some patients, and factors such as life expectancy, advanced microvascular or macrovascular complications, cognitive function, co-morbidities and risk of hypoglycemia should be considered in every patient before intensifying therapy
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**Physical Activity (Class I)**

- For all patients, risk assessment with physical activity history and/or exercise testing is recommended to guide progress and prescription.
- Medically supervised programs (cardiac rehabilitation) and physician-directed, home-based programs are recommended for at-risk patients at first diagnosis.
- Class IIa- It is reasonable for the clinician to recommend complementary resistance training for at least 2 days a week.
Physical Activity (Class 1)

- For all patients, risk assessment with physical activity history and/or exercise testing is recommended to guide progress and prescription.
- Medically supervised programs (cardiac rehabilitation) and physician-directed, home-based programs are recommended for at-risk patients at first diagnosis.
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Regular exercise reduces mortality in patients with ischemic heart disease.
- 2004 meta-analysis examined 8940 patients, median intervention of 3 months, median duration of follow up 15 months, which resulted with exercise training resulting in a 20% reduction in all-cause mortality and 26% reduction in total cardiac mortality, favorable but nonsignificant trends in nonfatal MI, CABG, and percutaneous coronary revascularization procedures.

Cardiac rehabilitation (Class 1)

- All eligible patients with ACS or whose status is immediately post-CABG or post-PCI should be referred to a comprehensive outpatient cardiovascular rehabilitation program either prior to hospital discharge or during the first follow up visit
- All eligible outpatients with the diagnosis of ACS, CABG, or PCI, chronic angina, and/or peripheral artery disease within the past year should be referred to a comprehensive outpatient cardiovascular rehabilitation program.

Cardiac rehabilitation (Class IIa)

A comprehensive exercise-based outpatient cardiac rehabilitation program can be safe and beneficial for clinically stable outpatients with a history of heart failure.
Weight management (Class I)

- The initial goal of weight loss therapy should be to reduce body weight by approximately 5% to 10% from baseline.
- Increased BMI associated with ischemic cardiac events¹
- “Obesity paradox”²
  - In some chronic medical conditions, obesity is protective; ie heart failure, post-MI, post-PCI

¹ Bogers et al. Arch Inten Med 2007;167:1720-8

Author: CDC/Debora Cartagena
Smoking cessation

- (Class 1) Follow-up, referral to special programs, and pharmacotherapy are recommended, as is a stepwise strategy for smoking cessation.
- Smokers who quit reduce their excess risk of a coronary event by 50% within the first 2 years after cessation, with much of the gain in the first few months.
- This period is followed by a more gradual decline, with the risk of former smokers approaching that of never smokers after 3 to 5 years.

Influenza vaccination (Class 1)

- Patients with cardiovascular disease should have an annual vaccination.
Antiplatelet therapy (Class 1)

- Treatment with aspirin 75mg to 162 mg daily should be continued indefinitely in the absence of contraindications in patients with stable ischemic heart disease
- Treatment with clopidogrel is reasonable when aspirin is contraindicated in patients with SIHD

Beta-blocker therapy (Class 1)

- Beta-blocker therapy should be started and continued for 3 years in all patients with normal LV function after MI or ACS
- Beta-blocker therapy should be used in all patients with LV systolic dysfunction (LV EF < 40%) with heart failure or prior MI, unless contraindicated. (Use should be limited to carvedilol, metoprolol succinate or bisoprolol, which have been shown to reduce risk of death.)

- Meta-analysis revealed that aspirin reduces serious vascular events by 37%, with a 46% decrease in the risk for unstable angina and 53% decrease in the risk of requiring coronary angioplasty

1. BMJ 2002;324:71-86
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<th>Beta-blocker therapy (Class IIa)</th>
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<td>• It is reasonable to continue beta-blockers beyond 3 years as chronic therapy in all patients with normal LV function who have had MI or ACS</td>
<td>• (Class IIb) Beta-blockers may be considered as chronic therapy for all other patients with coronary or other vascular disease</td>
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Beta-blockers significantly reduce deaths and recurrent MIs in patients who have suffered a MI. Data from the Coronary Heart Disease Policy Model suggest that implementing beta blocker therapy in all first-MI survivors annually during 20 years would prevent 62,000 MIs and result in 72,000 fewer CHD deaths. However, no large trials have assessed effects of beta blockers on survival or coronary events in patients with stable ischemic heart disease.


Renin-Angiotensin-Aldosterone Blocker Therapy (Class 1)

ACE inhibitors should be prescribed in all patients with SIHD who also have hypertension, diabetes mellitus, LV systolic dysfunction, or CKD, unless contraindicated. ARBs are recommended for patients with SIHD who also have hypertension, diabetes mellitus, LV systolic function less than 40%, or CKD.

**Renin-Angiotensin-Aldosterone Blocker Therapy (Class 1)**

- ACE inhibitors should be prescribed in all patients with SIHD who also have hypertension, diabetes mellitus, LVEF 40% or less, or CKD, unless contraindicated.
- ARBs are recommended for patients with SIHD who have hypertension, diabetes mellitus, LV systolic dysfunction, or CKD and have indications for but are intolerant of ACE-inhibitors.
- (Class IIa) Treatment with an ACE inhibitor is reasonable in patients with both SIHD and other vascular disease.

**Aldosterone Blockade (Class 1)**

- Use of aldosterone blockade in post-MI patients without significant renal dysfunction or hyperkalemia is recommended in patients who are already receiving therapeutic doses of an ACE-inhibitor and beta-blocker, who have a LV EF ≤ 40% and who have either diabetes or heart failure.

**Renin-Angiotensin-Aldosterone Blocker Therapy (Class 1)**

- ACE inhibitors should be prescribed in all patients with SIHD who also have hypertension, diabetes mellitus, LVEF 40% or less, or CKD, unless contraindicated.
- ARBs are recommended for patients with SIHD who have hypertension, diabetes mellitus, LV systolic dysfunction, or CKD and have indications for but are intolerant of ACE-inhibitors.
- (Class IIa) Treatment with an ACE inhibitor is reasonable in patients with both SIHD and other vascular disease.

- With ace-I, clinical studies have demonstrated significant reductions in the incidence of MI, unstable angina, and the need for coronary revascularization in patients after MI with LV dysfunction, independent of etiology¹, ²
- Benefits extend to patients without LV dysfunction.

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• Benefits extend to patients without LV dysfunction.


**Lipid Management: 2013 ACC/AHA guidelines**

• Decide if the patient falls into one of four statin benefit groups
  – Clinical ASCVD
  – LDL > 190
  – Diabetes (age 40-75)
  – ASCVD risk score > 7.5% and age 40 to 75

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**Statin dose**

• Decide high intensity vs moderate intensity
  – High intensity if age < 75 and clinical ASCVD, LDL > 190, diabetes and 10 year risk score > 7.5%
  – Moderate intensity if age > 75 and clinical ASCVD, diabetes and 10 year risk score < 7.5%
  – In those with ASCVD risk score > 7.5% and age 40-75, consider moderate to high intensity statin

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**ASCVD Risk Benefit Groups**

- Adults > 21 years and able to tolerate statins
  - Clinical ASCVD
    - YES -> Age < 75 years; High Intensity statin
    - NO -> LDL > 190 mg/dL
      - YES -> Age > 75 years; Moderate Intensity statin
      - NO -> Diabetes
        - NO -> Moderate intensity statin
        - YES -> ASCVD risk score is > 7.5%; High Intensity statin
  - ASCVD risk score > 7.5% and age 40-75
    - YES -> Moderate to high intensity statin
    - NO -> Moderate to high intensity statin

ASCVD risk benefit of statins may be less clear in other groups.
Key Points

1) They recommend new risk calculators, gender and race-specific

2) They don't recommend counting risk factors anymore in patients that don't have known disease- instead, go straight to the risk score

3) LDL > 160, FH of early CAD, CRP > 2, CAC score > 300 or > 75th percentile, ABI < 0.9 or elevated lifetime risk of ASCVD may revise the risk score up

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Key Points

4) They don't recommend treating to a LDL or non-HDL target; instead, they recommend getting patients on high or moderate dose statins.

5) Primary prevention patients with risk of 7.5% or greater should be on a statin, with an optional group for 5% or higher.

6) They don't recommend non-statin therapy in high risk individuals who are already on high intensity statins, even if their LDL is not < 70.

7) In the statin-intolerant patient, non-statin drugs may be considered.
4) They don’t recommend treating to a LDL or non-HDL target; instead, they recommend getting patients on high or moderate dose statins.

5) Primary prevention patients with risk of 7.5% or greater should be on a statin, with an optional group for 5% or higher.

6) They don’t recommend non-statin therapy in high risk individuals who are already on high intensity statins, even if their LDL is not < 70.

7) In the statin-intolerant patient, non-statin drugs may be considered.

8) Risk score estimates ASCVD, defined as nonfatal MI, or CHD death, or fatal or nonfatal stroke, in 10 years.
How Well Does Medical Therapy for Stable Ischemic Heart Disease Work?

- COURAGE trial; NEJM 2007
- Randomized over 2000 patients with known, stable coronary artery disease and objective evidence of ischemia to the best medical therapy with or without routine stenting
- Although the intervention group had 1444 lesions treated with stents, at a follow up of 4.6 years, there were no differences in a composite of death, myocardial infarction and stroke

Boden et al. NEJM 2007;356:1503-16
FAME 2

1220 patients with stable coronary artery disease underwent FFR assessment of all stenoses. Patients in whom at least one stenosis was functionally significant (FFR < 0.8) were randomly assigned to FFR-guided PCI versus optimal medical therapy.

The composite endpoint of death, MI or urgent revascularization was lower in the PCI arm.

Driven almost entirely by urgent revascularization.

De Bruyne et al. NEJM 2012; 367:991-1001
How Well Are We Doing?

• REGARDS population
• Population of 3167 participants with self-reported CAD
• Only 16% met goals for BP, aspirin use and LDL

Brown et al. JACC 2014;63:1626-33

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Conclusions

• Optimal medical management of stable ischemic heart disease
  – Diet
  – Exercise
  – Nonsmoking
  – Medications