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# Chest Pain in the Office

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Putting the Guidelines into Practice



# Sources

- American College of Cardiology / American Heart Asso./ American College of Physicians – American Society of Internal Medicine: Chronic Stable Angina Guidelines JACC 50: 2264-27724, Nov 2007
- 2008 British Columbia Guidelines



# Overview of Chest Pain

A. History and Physical

B. Associated Conditions

C. Noninvasive Testing

1. ECG / CXR
2. Exercise ECG for Diagnosis
3. Echocardiography (Resting)
4. Stress Imaging Studies: Echo, Nuclear, MRI
5. Coronary CT Angiogram

D. Invasive Testing: Angiography



# HISTORY/Physical Examination

- Its (almost) ALL ABOUT THE HISTORY

## Recommendations

Class I: In patients presenting with chest pain the following should be performed

- Detailed symptom history
- Focused physical examination
- Directed risk-factor assessment

With this information, the clinician should estimate the probability of CAD



# Definition of Angina

- *Typical* angina (definite)
  - 1) Substernal discomfort w. a characteristic quality and duration this is
  - 2) provoked exertion or emotional stress
  - 3) relieved by rest or NTG
- *Atypical* angina (probable)
  - Meets 2 of the above characteristics
- *Noncardiac* chest pain
  - Meets 1 or none of the typical characteristics



# Angina and CAD

- Significant CAD
  - defined angiographically as CAD  $\geq 70\%$  diameter stenosis of  $\geq 1$  major epicardial artery segment or  $\geq 50\%$  diameter stenosis of the left main coronary artery
- Lesion with less stenosis can cause angina
  - have much less prognostic significance



# Estimate probability of disease

- Low, intermediate or high
- Framinghamheartstudy.org (2 year/10 year Risk)
- Reynolds Risk Score
- Diamond and Forrester:
  - Able predict probability CAD based Hx & Exam
    - Age, gender, pain type most powerful
- Studies at Duke and Stanford support & added RF:
  - Smoking, Q-wave/st-t change, DM, high chol.

**Table 10.** Comparing Pretest Likelihoods of CAD in Low-Risk Symptomatic Patients With High-Risk Symptomatic Patients—Duke Database (41)

Age Years	Nonanginal Chest Pain		Atypical Angina		Typical Angina	
	Men	Women	Men	Women	Men	Women
35 yr	3–35	1–19	8–59	2–39	30–88	10–78
45 yr	9–47	2–22	21–70	5–43	51–92	20–79
55 yr	23–59	4–25	45–79	10–47	80–95	38–82
65 yr	49–69	9–29	71–86	20–51	93–97	56–84

Each value represents the percent with significant CAD. The first is the percentage for a low-risk, mid-decade patient without diabetes, smoking, or hyperlipidemia. The second is that of the same age patient with diabetes, smoking, and hyperlipidemia. Both high- and low-risk patients have normal resting ECG's. If ST-T-wave changes or Q waves had been present, the likelihood of CAD would be higher in each entry of the table.



# Physical Exam

- Blood Pressure (Look for Hypertension, Urgency, Emergency, Hypotension, Check both arms)
- Pulse/HR –  
Regular/Irregular/Tachycardia/Bradycardia/Pulse Deficit/Rad-femoral delay
- Chest : Lung fields/Crackles/Decrease Breath Sounds
- Heart Sounds: Murmurs/Rubs
- JVP : CHF
- Skin/MSK: Signs of trauma to chest



# Diferential DX

- Cardiac: Ischemia, Small vessel disease, vasospasm pericarditis, aortic dissection
- Non Cardiac: Respiratory, GI, MSK
- Respiratory: Pneumothorax, PE, Pneumonia, Effusion
- GI: GERD, esophageal spasm, perforated viscus, peptic ulcer disease, cholecystitis
- MS: chest wall, arthritis, trauma



# What lab tests do I order TODAY?

- EKG
- TROPONIN
- LDL
- HGB
- CFR/GFR
- Others?



# Initial Labs

- Initial Laboratory Tests for Risk Stratification
- Class I
  - 1. Hb (C)
  - 2. Fasting glucose (C)
  - 3. Lipid panel (Total, HDL, LDL, Trigly) (C)



# ACC guidelines ECG/CXR

- Class I
  1. Rest ECG if typical or atypical CP (B)
  2. Rest ECG during episode CP (B)
  3. CXR w/ signs / symptoms CHF, Valvular HD, pericardial dis., aortic aneurysm (B)
- Class IIa
  - CXR w/ signs or symptoms pulm. dis. (B)
- Class IIb
  - CXR all others



# Rest ECG

- Rest ECG
  - Everyone should have one but will be normal in >50% patients with chest pain
- Items which increase probability
  - LVH
  - ST-T changes consistent with ischemia
  - Q-waves
  - Afib, VT, AV block
  - LAHB, LBBB, RBBB
  - all of these non-specific



# ECG with Chest Pain

- Common
  - Tachyarrhythmias (VT, AF, SVT, etc)
  - Bradyarrhythmias (AV Block)
- Quite specific
  - ST- segment elevation or depression
- Other
  - Conduction abnormalities also increase risk
  - T wave changes



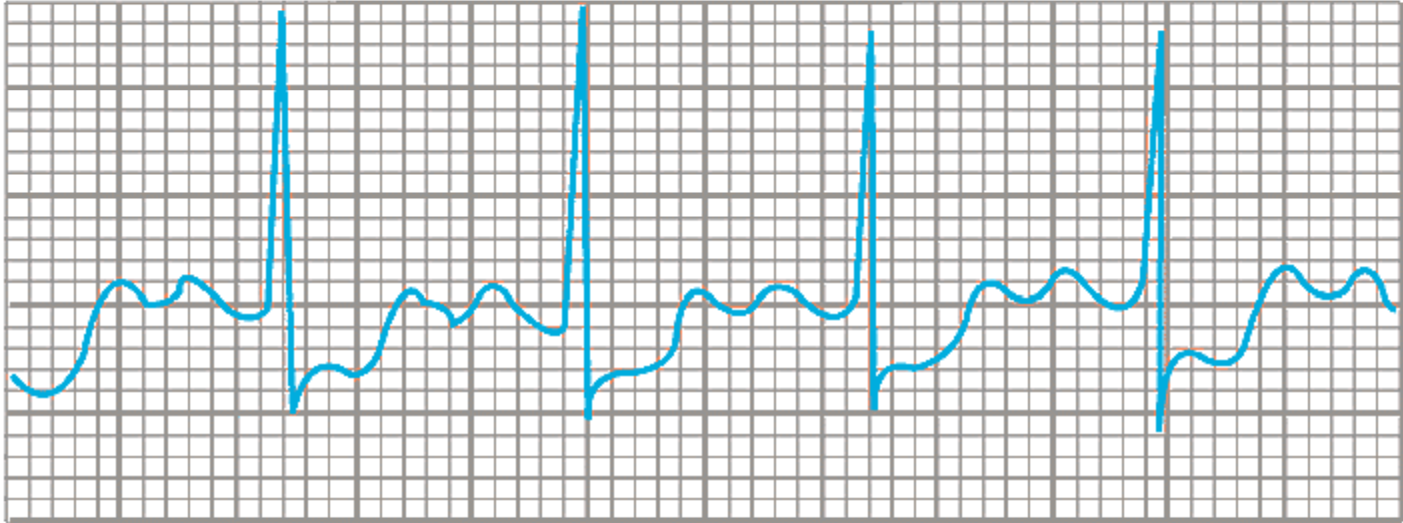
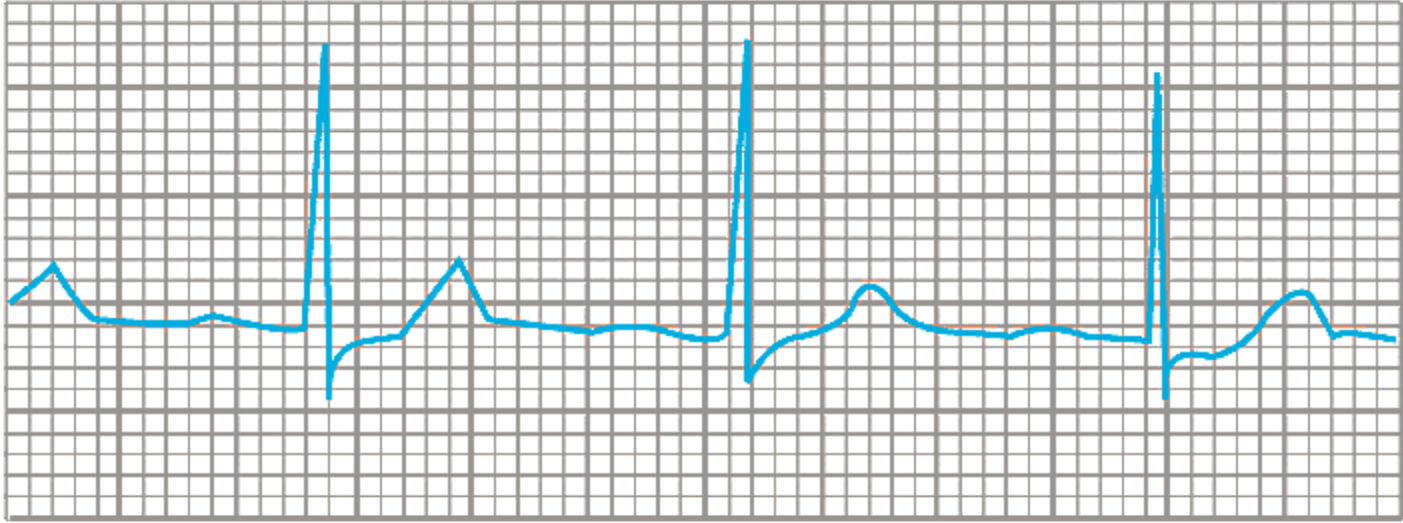
# Non-Invasive Tests

- Exercise Stress, Stress Echocardiogram, Nuclear Stress Test, Coronary CT Angiogram
  - All work best with intermediate probability patients (10-90%)
  - Although broad range many fall outside it (especially at extremes of age)
- Each test
  - Has own specificity and sensitivity



# Exercise Testing

- Tests body's response to graduated dynamic exercise
- Establishes a diagnosis
- Provides a rate pressure product that correlates with myocardial  $\text{VO}_2$
- Estimates prognosis
- Detects HTN
- Can detect arrhythmias
- Detects ventricular failure (ischemic)





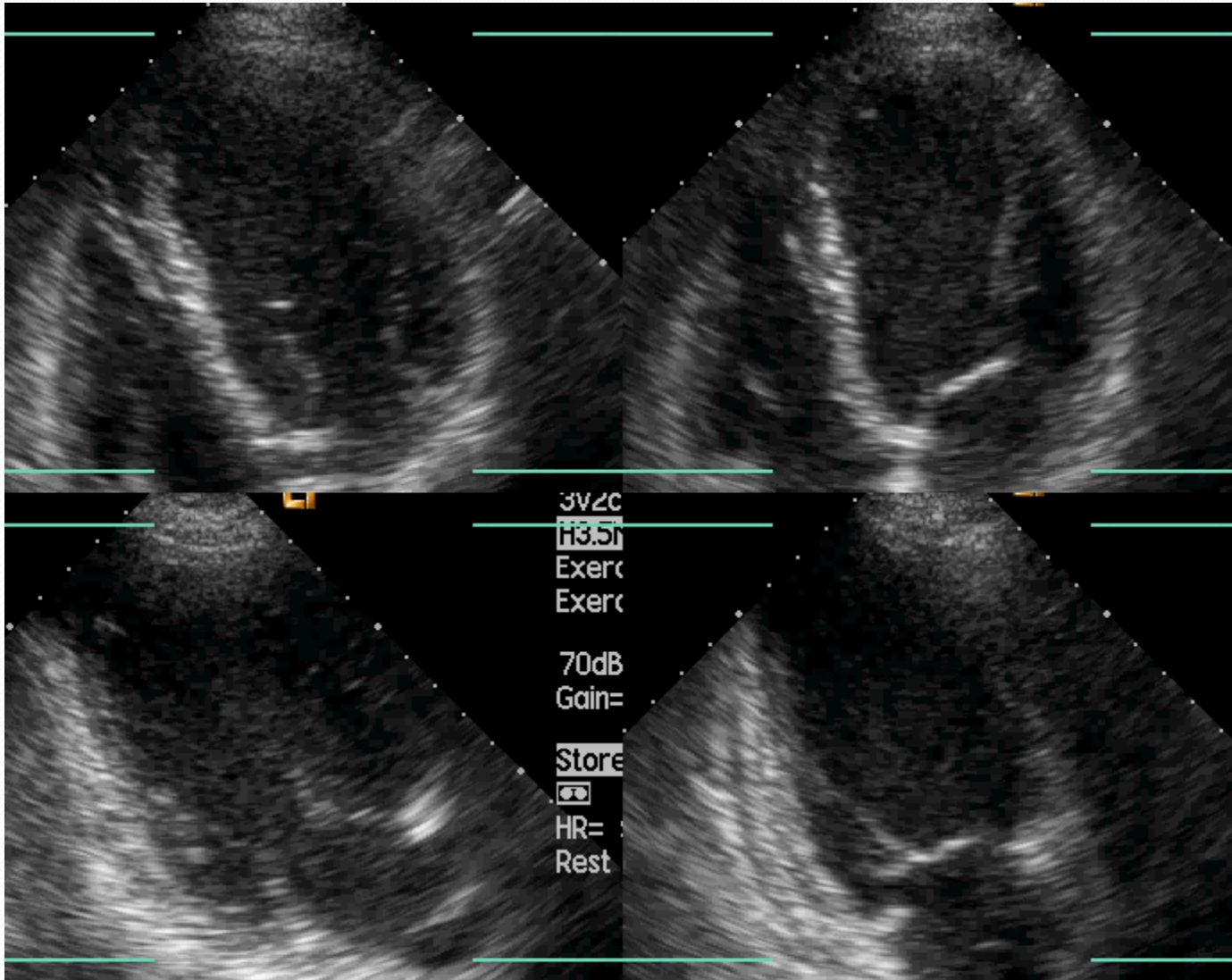
# Echocardiogram

- Is very useful in confirming an old MI when history or ECG is not diagnostic
- Rules out transmural infarction by detection of normal LV function
- Is very useful in detecting and quantifying left ventricular aneurysm, papillary muscle dysfunction, VSD, LV thrombus, mural scar, systolic and diastolic dysfunction, and valvular or congenital abnormalities



# Stress Echocardiography

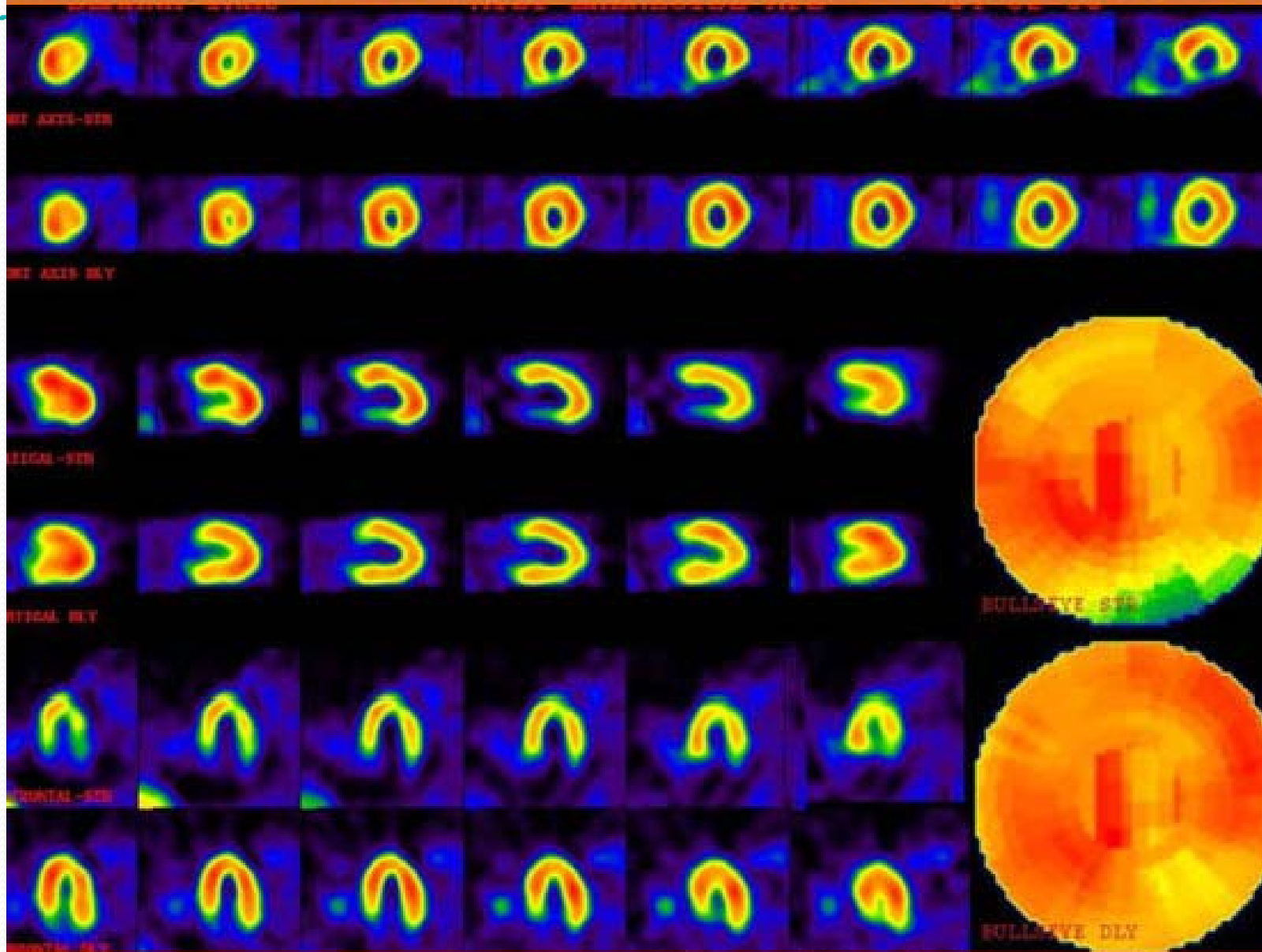
- Detects changes in wall motion in response to increased workload stress induced by treadmill exercise or cycle ergometer exercise, pharmacologic stress, dipyrimidole or adenosine, and dobutamine
- Sens 89%, spec 80% and PPV 87%
- Indicators ischemia
  - Failure segments to become hyperdynamic
  - New or worsened wall motion abnormality
  - Typical pain or ST changes, >10% fall EF





# Nuclear Perfusion Testing

- Uses thallium-201 or sestamibi single photon emission computed tomography imaging
  - Sens. 91%, Spec. 90%
- Uses quantitative planar thallium-201 or sestamibi scintigraphy (sens. 80%, spec. 80%)
- Is useful because high risk images are
  - Multiple reversible defects
  - Large perfusion defects
  - Increased lung uptake indicating low cardiac output or elevated LVEDP
  - Transient LV dilatation post-exercise
  - Low ejection fraction







# Angiogram

- Angina inadequately controlled
- Stress ECG positive
- Stress echocardiogram positive
- Stress myocardial perfusion positive
- CT Angiogram shows significant stenosis



# Chest pain with PREVIOUS ACS

- MUCH Higher risk
- Need to discuss with consultant SOON
- Need differential diagnosis and estimated probabilities
- Need action PLAN



# WHO HAS TO GO TO EMERG NOW?

- Chest pain with suggestive features more than 10 minutes at rest or worsening symptoms
- Chest pain similar to previous ACS presentations
- Hemodynamically unstable ( HR and BP) in office



## High-Risk ACS (2001)

- Prolonged chest pain either > 20 minutes or ongoing, with one or more of the following high-risk features:
  - Acute myocardial infarction within the past 4 weeks
  - Pain with ST abnormalities on the ECG
  - ECG:
    - transient ST-segment elevation or depression > 0.5 mm
    - sustained ST-segment depression > 0.5 mm
    - T-wave inversion > 1 mm in > 5 leads
    - deep (e.g. > 5 mm) T-wave inversion
    - recurrent myocardial ischemia with ECG ST-segment shift with or without pain
  - Positive cardiac biomarkers:
    - troponin level or CK-MB index is clearly positive with compatible history
  - Hemodynamic compromise with ongoing chest pain: heart failure/hypotension
- 30-Day Rate of Death or Myocardial Infarction: 12-30 %
- CMAJ 2001; 164(9) 1309-1316

# Acute Chest Pain - Evaluation and Triage

Effective Date: November 10, 2008

## B. Initial evaluation in the Emergency Department

- Patients with chest pain suggestive of ACS need further evaluation with a history, physical examination, ECG and cardiac biomarkers, preferably troponin (Appendix B).
- Consider other life threatening causes of chest pain, such as aortic dissection, pulmonary embolism, perforated viscus and pneumothorax.
- This guideline does not cover the diagnosis of these conditions.



## B. Management of patients with possible ACS BC Guidelines 2008

- i. It is recommended that patients with a compatible history and a non-diagnostic initial ECG and cardiac biomarkers, be observed in the ED and be re-assessed at six or more hours after the initial testing with an ECG and cardiac biomarkers. Earlier and more frequent testing (ECGs and cardiac biomarkers) may be necessary in patients with recurrent or ongoing chest pain.
- ii. The status changes from “possible” to “definite” ACS in patients with a compatible history who develop elevated cardiac biomarkers or ischemic ECG changes or hemodynamic compromise at any time (see Management of patients with definite ACS above).
- iii. Patients with a compatible history without elevated cardiac biomarkers at 6 or more hours, and an ECG not diagnostic of ischemia are considered to be at a low or intermediate short-term risk for non fatal MI or death (Appendix B).



# Intermediate-Risk of ACS (2001)

- recommendations are for functional assessment within 48hrs
- No high-risk features, but one or more of:
  - Ongoing chest pain
  - Crescendo angina preceding rest pain
  - Previous intervention: percutaneous transluminal coronary angioplasty/coronary artery bypass surgery
  - Known coronary disease, two or more risk factors for coronary heart disease (CHD)
  - Increased baseline risk: e.g. diabetes, elderly
- 30-Day Rate of Death or Myocardial Infarction: 4-8 %
- CMAJ 2001

# LOW and Intermediate risk in ER

## BC Guidelines 2008

- For **low-risk patients** without an obvious alternative explanation for the chest pain **an out- patient stress test within 72 hours** and out-patient physician follow-up is recommended.
- When possible, discuss **intermediate-risk patients** with an internist or cardiologist. **A stress test prior to discharge is recommended.**
- For both low and intermediate risk groups:
  - If the patient's resting ECG is abnormal (see Appendix C), a routine stress test will be non- diagnostic. In this scenario, stress myocardial perfusion imaging or stress echocardiography is required to detect ischemia. Therefore, referral to a facility capable of stress myocardial perfusion imaging or stress echocardiography is recommended for such patients.
- Advise patients to return to the ED immediately if the pain recurs.



# Plan of Action

- If having Chest Pain refer to ER for evaluation
- If history;
- Referral to a cardiologist
- Consider non-invasive testing
- ASA
- Nitroglycerin Spray prn
- If Typical Angina: Beta Blocker
- Assessment of Cardiac Risk Factors

### Appendix C Evaluation and management of patients suspected of having ACS

