

GUIDELINES & PROTOCOLS

ADVISORY COMMITTEE

Chest Pain – Evaluation of Acute Coronary Syndromes

Effective Date: November 1, 2003

Scope

Objective: To improve the identification of patients with acute coronary syndromes (ACS): acute myocardial infarction and unstable angina. To reduce the number of patients with ACS sent home in error after initial evaluation. This guideline does not address chronic stable angina.

Target Population: Adults presenting with chest pain in physicians' offices, walk-in clinics and emergency departments.

RECOMMENDATION 1: Selection of patients who may have ACS

Patients presenting with prolonged (more than 10 minutes) acute chest pain suggestive of ACS (see Table 1) should be evaluated by a history and physical examination. If a patient presents in a physician's office or walk-in clinic and no alternative cause can be found, the patient should be sent to the **Emergency Department** for further evaluation and observation. A patient who is suspected of having an acute coronary syndrome should **not** be sent to a laboratory for an ECG or measurement of cardiac markers.

RECOMMENDATION 2: Initial evaluation in emergency department

Patients with chest pain suggestive of acute coronary syndromes (ACS) should be evaluated with a history, physical examination, an electrocardiogram (ECG) and cardiac markers*, preferably troponin.

*The term cardiac markers refers to proteins such as troponin I and T, creatinine kinase MB (CK-MB) and myoglobin, which are released into the blood after heart muscle necrosis. Emergency rooms should have troponin tests available.

RECOMMENDATION 3: Management of high-risk patients

Patients with ST segment elevation and/or definite elevation of cardiac markers should be treated immediately with the intent of opening the infarct-related artery and maintaining perfusion. Patients with a compatible history and a clearly abnormal ECG (without ST elevation), moderately elevated cardiac markers or hemodynamic compromise should be treated for acute myocardial ischemia.

RECOMMENDATION 4: Management of patients without high-risk features

Patients with a compatible history, but without high-risk features should have an ECG and cardiac markers, preferably troponin, performed at 6 or more hours after onset of pain.

Patients with elevated cardiac markers or abnormal ECG at 6 hours should be admitted and treated for acute myocardial ischemia.

Patients without elevated cardiac markers at 6 or more hours and normal ECG should be considered low or intermediate risk according to the accompanying table.

Intermediate risk patients where clinical suspicion remains high but tests at 6 hours are negative should have a stress test (with or without a radionuclide scan) prior to discharge.

Low-risk patients without an obvious alternative explanation for the chest pain should have urgent out-patient physician follow-up, advice to return if the pain recurs and arrangements for an out-patient stress test (with or without radionuclide scan).

Table 1:

Features of persistent chest pain that suggest ACS:

- Cardiac chest “pain” is usually described by the patient as an unpleasant sensation in the chest: “pressing”, “squeezing”, “constricting”, “bursting”, “burning”, “a band around the chest”, “a weight in the centre of the chest”, or a “vise tightening around the chest”. Clenching the fist in front of the sternum (Levine’s sign) is a strong indication of an ischemic origin of the pain.
- It is important to note that the sensation is often **not** described as being severe. The discomfort may radiate or be completely isolated to the neck, jaw, teeth, epigastrium, shoulder or arms (most commonly the left). It is frequently associated with shortness of breath, diaphoresis, weakness, nausea and vomiting, and occasionally associated with gas, belching and “indigestion”.
- The discomfort may be partially or fully relieved by nitro-glycerine, but may not respond to nitro-glycerine at all. There may or may not be a prodrome of the discomfort precipitated by exercise, cold weather, or emotional stress; relieved by rest or nitro-glycerine.
- Chest discomfort that lasts for more than 10 minutes or occurs at rest suggests unstable angina; chest discomfort that lasts for more than 20 minutes suggests acute myocardial infarction. An acute coronary syndrome may present with acute shortness of breath with or without evidence of chest pain.

Features of chest pain that do not suggest ACS:

- Pain or discomfort that is localised to the skin or chest wall and can be reproduced by localised pressure
 - Pain that is localised to a small area of the chest (<3 cm in diameter), or pain that radiates to the right lower chest.
 - Pain that is sharp, stabbing or knifelike and aggravated by deep breathing, or rotating the chest. Pain that is worse in the supine position and relieved by sitting up or leaning forward is suggestive of pericarditis.
 - Pain that lasts for less than 15 seconds is rarely ischemic in origin.
 - Dissection of the aorta often causes pain in the back in addition to the front of the chest.
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Table 2: Risk Stratification

High Risk ACS

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 > 0.5mm
 - 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 markers:
 - Troponin level/CK-MB index-clearly positive with compatible history
- Hemodynamic compromise with ongoing chest pain: heart failure/hypotension

30-day rate of death or myocardial infarction: 12-30%

Intermediate Risk ACS

No high risk features, but one or more of:

- Ongoing chest pain
- Crescendo angina preceding rest pain
- Borderline positive troponin at 6-12 hours post onset of pain (A positive level will depend on the particular method used by your laboratory).
- Previous intervention: percutaneous transluminal coronary angioplasty/coronary artery bypass surgery
- Known coronary disease, two or more risk factors for coronary artery disease (CAD)
- Increased baseline risk: e.g. diabetes, elderly

30 day rate of death or myocardial infarction: 4-8%

Low Risk ACS

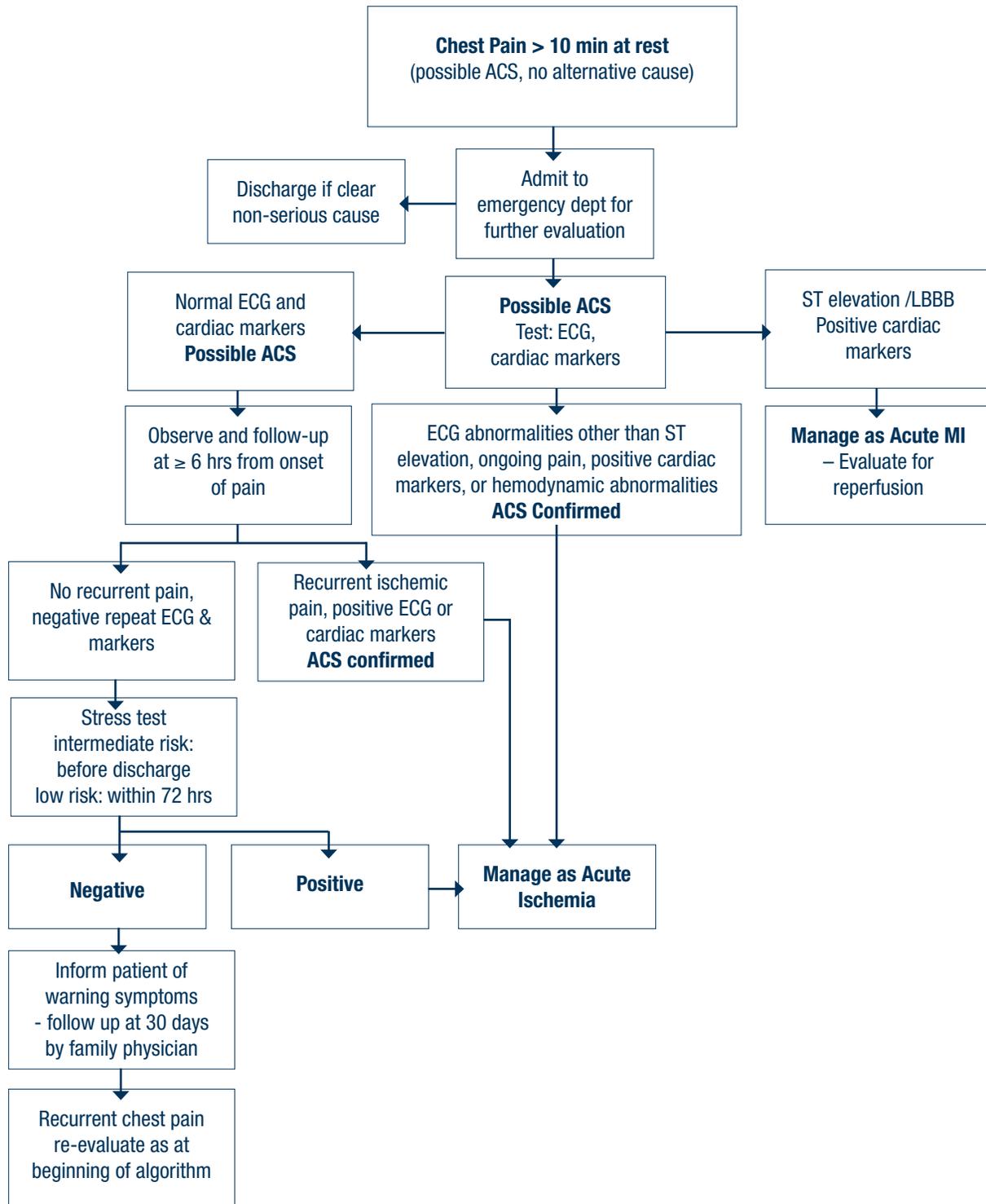
No high-or intermediate-risk features:

- Chest pain: single episode at rest (resolved), crescendo exertional angina
- ECG: normal or non-specific abnormalities or unchanged from previous

30-day rate of death or myocardial infarction: <2%.

Figure 1

Evaluation of Acute Chest Pain



Rationale

The diagnosis of acute coronary syndromes (ACS) among patients with chest pain is easily missed because no single objective test reliably identifies ACS in these patients.¹ Inappropriate discharge can lead to preventable acute myocardial infarction (AMI) or sudden death.² A recent Canada-US study³ showed that 57-99% of patients presenting to an emergency department with chest pain were admitted for further investigation. In the participating Canadian hospitals only 13-51% of admitted patients ultimately proved to have an acute coronary syndrome. Some US centres have established chest pain evaluation units (CPEUs) to limit unnecessary coronary care unit (CCU) admissions. These CPEUs apply 9-12 hour step-wise AMI rule out protocols using observation, serial ECGs and cardiac markers, provocative tests and cardiac imaging. The CPEUs have reported reduced costs and improvements in the identification of ACS compared with facilities that admit all patients to the CCU. Chest pain units are not established in British Columbia partly because their true cost-effectiveness is unknown.

Clinical variables associated with ACS include gender, age, family history, previous angina or AMI, pain characteristics, syncope, response to nitro-glycerine, diaphoresis, nausea and vomiting, blood pressure, rales, jugular venous distensions, heart sounds, descriptive gestures and arrhythmias. Many of the above are strong predictors of ACS but their clinical utility in individual patients is uncertain.⁴ Women, in particular, often do not complain of typical chest pain and present with atypical symptoms.

ECG abnormalities are strong positive predictors but as many as 82% of patients with ACS-related chest pain have normal or near normal ECGs.⁵

Cardiac markers including CK-MB, myoglobin and troponins are released during AMI. The sensitivity of CK-MB assays and troponins improves with serial testing but never reaches levels high enough at the initial assessment to rely on markers alone to rule out AMI or unstable angina.⁶

Stress tests may be dangerous in high risk patients, require skilled interpretation and have limited availability outside major centres.

In a recent ongoing evaluation in two Vancouver hospitals, 4.5% of patients with an AMI and 6.8% of patients with unstable angina were discharged with a non-ACS diagnosis.⁷ Most clinicians consider these rates too high. The need for a clinical decision tool is urgent and there is great potential for improvements in detecting ACS.

Diagnostic uncertainty leaves physicians with a difficult decision: to discharge and risk missing a potentially lethal diagnosis, or to admit for an expensive investigation. The most difficult cases of ACS to identify are those with chest pain but negative ECGs and cardiac enzymes. The American Heart Association (AHA) has recently published a guideline for the management of patients with unstable angina and non-ST elevation myocardial infarction (NSTEMI).⁸ The algorithm from the AHA guideline has been adapted (see Figure 1) to help BC physicians manage patients who present with chest pain in the ambulatory setting. A table of risk features is also provided (Table 1) to aid in diagnosis. This table is adapted from work by Fitchett et al.⁹ who modified the AHA/ACC guideline for the Canadian setting. The objective of this guideline is to reduce the rate of missed cases of myocardial infarction and unstable angina sent home in error.

References:

1. Dagnone E, Collier C, Pickett W, Ali N, Miller M, Tod D and R Morton. Chest pain with nondiagnostic electrocardiogram in the emergency department: a randomized controlled trial of two cardiac marker regimens. *CMAJ* 2000;162(11):1561-6.
2. Lee TH, Rouan GW, Weisberg MC, Brand DA, Acampora D, Stasiulewicz C, et al. Clinical characteristics and natural history of patients with acute myocardial infarction sent home from the emergency room. *Am J Cardiol* 1987;60(4):219-24.
3. Gibler WB, Hoekstra JW, Weaver WD, Krucoff MW, Hallstrom AP, Jackson RE, et al. A randomized trial of the effects of early cardiac marker availability on reperfusion therapy in patients with acute myocardial infarction: The serial markers in acute myocardial infarction and rapid treatment trial. *J Am Coll Cardiol* 2000;36(5):1500-6.
4. Panju AA, Hemmelgarn BR, Guyatt GH, Simel DL. Is this patient having a myocardial infarction? *JAMA* 1998; 280(14):1256-1263.
5. Fesmire FM, Percy RF, Bardoner JB, Wharton DR, Calhoun FB. Usefulness of automated serial 12-lead ECG monitoring during the initial emergency department evaluation of patients with chest pain. *Ann Emerg Med* 1998;31(1):3-11.
6. Antman EM, Tanasijevic MJ, Thompson B, Schactman M, McCabe AH, Cannon CP, et al. Cardiac-specific troponin I levels to predict the risk of mortality in patients with acute coronary syndromes. *NEJM* 1996;335(18):1342-9.
7. Christenson J. Emergency Medicine, St. Paul's Hospital 2001. Unpublished data.
8. Braunwald E, Antman EM, Beasley JW, Califf RM, Cheitlin MD, Hochman JS, et al. ACC/AHA guidelines for the management of patients with unstable angina and non-ST segment elevation myocardial infarction: Executive summary and recommendations. *Circulation* 2000;102(10):1193-209.
9. Fitchett D, Goodman S, Langer A. New advances in the management of acute coronary syndromes: 1. Matching treatment to risk. *CMAJ* 2001;164(9):1309-16.

Sponsors

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Guidelines and Protocols Advisory Committee
PO Box 9642 STN PROV GOVT
Victoria BC V8W 9P1

Phone: (250) 952-1347
Fax: (250) 952-1417

E-mail: hlth.guidelines@gov.bc.ca
Web site: BCGuidelines.ca

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