

### INTRODUCTION

Over the past decade there have been several advancements made in the pre-hospital care of patients complaining of chest pain, in particular those of acute coronary syndrome (ACS) etiology. Treatments once considered only in the domain of the hospital ED and CCU are now becoming standard of care for pre-hospital providers.

Half of the patients who die of ACS do so before reaching the hospital. Public awareness of the signs and symptoms of ACS and early activation of EMS, are crucial steps in the development of better care.

### SAFETY

Some causes of chest pain are respiratory in nature and may be caused by infectious diseases such as tuberculosis or pneumonia. Clinicians should wear appropriate personal protective equipment when etiologies such as these are suspected.

During administration of nitroglycerin, the clinician should be careful that they do not come in contact with the spray. Side effects can include headache and a decrease in blood pressure, both which could affect the clinician's ability to provide appropriate care.

### ASSESSMENT

Chest pain presents a diagnostic challenge, with multiple etiologies having similar presentations. Assessment begins by looking at the general appearance of the patient, such as position, level of distress (if any), and skin condition.

In patients presenting with chest pain, a detailed symptom history, focused physical examination, and directed risk factor assessment should be performed. Critical components of the chest pain assessment include:

- Time of symptom onset
- Detailed assessment of the pain (OPQRST)
- Current medications, specifically those that may impact care (e.g. Viagra)
- Cardiac risk factors
  - Smoking
  - Hypertension
  - Dyslipidemia
  - Diabetes
  - Family history of coronary artery disease (CAD)
  - Crack/Cocaine use

- Urgent 12-lead ECG within 10 minutes of patient contact
- Serial 12-lead ECGs if ongoing or evolving symptoms

With this information, the paramedic should estimate the probability of ACS secondary to CAD (low, medium, high).

### Differential Diagnoses

A detailed history and physical assessment involves ruling out the most serious causes: ACS, thoracic aortic dissection, tension pneumothorax, ruptured esophagus (previous vomiting then occurrence of chest pain), and pulmonary embolism. By elimination or confirmation of the most serious causes, further assessment can be done to determine the potential origin of the pain. See Figure 1 for differential diagnoses of chest pain.

Always have a high index of suspicion that any chest pain is cardiac in origin. Signs and symptoms suggestive of ACS include:

- Chest discomfort spreading to the shoulders, neck, arm(s), jaw, back or between the shoulder blades
- Unexplained sudden shortness of breath
- Uncomfortable pressure, fullness, squeezing, heaviness or pain in the center of the chest lasting more than a few minutes
- Chest discomfort with light-headedness, dizziness, fainting, sweating, nausea, or vomiting
- Exertional chest pain

Remember that ACS patients do not necessarily present with 'chest pain'. Women, people with diabetes and the elderly often have atypical presentations such as indigestion, back pain, syncope and/or chest wall pain.

Many causes of cardiovascular-related chest pain show changes on the 12-lead ECG. Myocardial infarction may show ST segment elevation, but ischemia or infarction can also demonstrate ST segment depression, T-wave inversion, biphasic T-waves, peaked T-waves or a new Left Bundle Branch Block. Pericarditis can also cause ST segment elevation, but it is often more wide-spread throughout all the leads on a 12-lead.

15-lead ECGs can also be obtained if further tracings are required to determine if there is right ventricular and/or posterior involvement.

Other conditions that can cause ST segment changes on a 12-lead include hypertrophy, bundle branch blocks, myocardial contusions, aneurysms, arrhythmias, hyperkalemia, pulmonary embolism, pulmonary hypertension, electrocution, and certain medications. Obtaining a good patient history will allow the clinician to make a more informed decision regarding management of the symptoms.

Pain that changes on inspiration or palpation is typically not cardiac in nature, rather signs of a musculoskeletal or pulmonary concern. It is important however not to rule out cardiac right away during assessment.

*Musculoskeletal-type pain* often feels sharp and stabbing, and it gets worse with movement and/or palpation of the area. These patients usually have an identifiable mechanism. Costochondritis typically presents with intermittent dull and sharp pain in the middle on the chest, with increasing pain on palpation, movement, and inspiration.

*Pleuritic-type pain* is often stabbing in nature, one-sided, and is worse on inspiration. If the pleuritic pain is due to infection, the patient may have a productive cough, chills and/or an elevated temperature. Patients with chest infections typically have good colour with warm, sweaty extremities, whereas patients with cardiovascular related chest pain are often pale with cool, sweaty extremities.

A *pulmonary embolism* (PE) will classically present with pleuritic chest pain and/or shortness of breath. Risk factors for PE are based on the Well's Criteria, including recent immobility for extended periods of time, active cancer, and/or history of DVT, PE, or hemoptysis. The clinician should also look for swelling and/or pain of the lower extremities (indicative of a DVT).

*Pericarditis* pain increases with lying down and gets better when leaning forward.

Keep in mind that chest pain may be secondary to abdominal etiologies. Be sure to assess the abdomen for patient's complaining of chest pain.

### MANAGEMENT

Successful management of chest pain requires knowledge of treatment options, and clinical competence to provide appropriate care.

#### Cardiovascular Chest Pain

#### Ischemic causes

General care of ischemic chest pain includes the administration of:

- ASA (**PEP 1 supportive**)
- Nitroglycerin prn (**PEP 3 supportive**)
- Morphine prn (**PEP 1 supportive**)
- Oxygen to maintain SpO<sub>2</sub> between 94-99% (**PEP white**)
- Plavix (if going direct-to-PCI or receiving pre-hospital fibrinolysis) (**PEP 1 supportive**)

The primary goals of therapy for ACS are:

- Identify patients with STEMI for possible early reperfusion therapy
- Relieve ischemic chest discomfort
- Treat acute, life-threatening complications of ACS (e.g. unstable arrhythmias and cardiogenic shock)

With these goals in mind, there have been various initiatives put in place in the pre-hospital field, such as 12-lead ECG interpretation, direct-to-PCI directives and pre-hospital fibrinolysis, to help diagnose and treat ACS.

#### STEMI-Specific Care

Once it is determined that a patient meets the criteria for reperfusion therapy, follow the STEMI Reperfusion Worksheet.

There are two reperfusion options for STEMI care in Nova Scotia to be considered in consult with the Charge Physician at the Regional Hospital.

#### Option A: Direct-to-PCI (**PEP 1 supportive**)

The goal is to have the patient arrive at the QEII within 60 minutes from the diagnostic ECG, in order to obtain an ECG to balloon time of less than 90 minutes.

#### Option B: Early Fibrinolysis (**PEP 1 supportive**)

If the direct-to-PCI option is not obtainable due to geography or other circumstances, the goal is to administer TNK within 30 minutes from diagnostic ECG. Lovenox is also administered to these patients. When in close proximity to an emergency department, consider rapid transport for in-hospital fibrinolysis as an alternative.

STEMI patients with cardiogenic shock, as seen by hypotension and pulmonary edema, fare better with PCI than fibrinolysis. Consider activating Air Medical Transport (AMT) if the patient is located further than 60 minutes from the QEII. AMT may not make a scene landing, but can begin the process of planning

a coordinated transfer. In these cases, continue with the process of fibrinolysis in consultation with the appropriate Regional Hospital.

### Non-ischemic causes

The pre-hospital treatment of many non-ischemic causes of chest pain includes oxygen (**PEP white**) and pain management as necessary with transport to the ED for further assessment and treatment. Some of the non-ischemic causes of chest pain may be due to trauma, and therefore should be treated according to trauma guidelines. Arrhythmias may cause or complicate chest pain and should be treated as per the Arrhythmia Clinical Practice Guideline. Remember that all patients with chest pain require constant cardiac monitoring, including serial 12-lead acquisition.

### Non-Cardiovascular Chest Pain

Treatment of patients in this group will be specific to the origin of the pain, and may be supportive and/or corrective based on the patient's presentation and needs.

- Place patient in position of comfort
- Provide oxygen to maintain SpO<sub>2</sub> between 92-99%
- Maintain BP>90 systolic with fluids as needed
- 12-lead ECG
- Consider analgesia
- Continuous monitoring of vitals and ECG

### Transport Decision

As chest pain can be caused by a wide-variety of potentially serious conditions, most of which cannot be ruled out in the field, patients should be transported to a hospital as soon as possible. Some treatments, such as the administration of TNK may increase scene time.

Patients with chest pain are at high risk for poor outcome if not transported. Consult with appropriate online support if a patient does not want to be transported by ambulance.

### TRANSFER OF CARE

- Early notification of ED staff via ECG transmission and radio patch is essential to ensure the continuum of care during patient transfer from prehospital to ED management of the chest pain patient.
- All ECGs, checklists, and list of medications administered pre-hospitally must accompany the patient to the ED.

### CHARTING

In addition to the mandatory fields it is important to document the following in the ePCR text fields:

- ✓ Any deviations from treatment modalities
- ✓ Patient's response to treatment
- ✓ Treatments rendered prior to EMS arrival
- ✓ The reperfusion checklist (if applicable)
- ✓ Attach all 12-lead ECGs to ePCR

### Key Points – Chest Pain

**Maintain a high index of suspicion that chest pain is cardiac in origin**

Determine the time of symptom onset

Consider the potentially serious non-cardiac causes of chest pain

Early (and serial) 12-lead ECG acquisition is crucial

**Caution** when using nitrates, maintain BP>90 systolic

ECG changes are not always present in ACS patients

### KNOWLEDGE GAPS

It is not always possible to update all local documents regarding acute coronary syndrome at the same rate at which international guidelines are changed. Please refer to current AHA guidelines for the most up-to-date information on best practices.

### EDUCATION

Formal certification in ACLS will enable improved ACS care. Practitioners are encouraged to maintain ACLS certification. Ongoing practice in scenario management can improve the care that you provide to the ACS patient.

Continuous practice with rhythm and ECG interpretation is important in order to remain proficient.

### QUALITY IMPROVEMENT

STEMI is a time sensitive emergency therefore recording accurate time stamps on the ePCR is needed in order to review and improve door-to-needle and door-to-balloon times.

If ECG transmission issues occur for any reason, it is important to complete and send in an occurrence form so the concern can be tracked and managed appropriately. Only through proper tracking, can system changes be made.

<http://emergency.medicine.dal.ca/ehsprotocols/protocols/toc.cfm>

### REFERENCES

Emergency Health Services Nova Scotia  
EHSNS protocols 6228/6229/6317/6318  
[www.gov.ns.ca/health/ehs/paramedics/EBP.asp](http://www.gov.ns.ca/health/ehs/paramedics/EBP.asp)

Alberta Health Services, Provincial Medical Protocols, Suspected Acute Coronary Syndrome, STEMI-Reperfusion Strategy, December 1, 2010, [protocols@ahsems.com](mailto:protocols@ahsems.com)

Part 10: Acute Coronary Syndromes: 2010 American heart Association Guidelines for Cardiovascular Resuscitation and Emergency Cardiovascular Care; *Circulation* 2010; 122:S787-S817

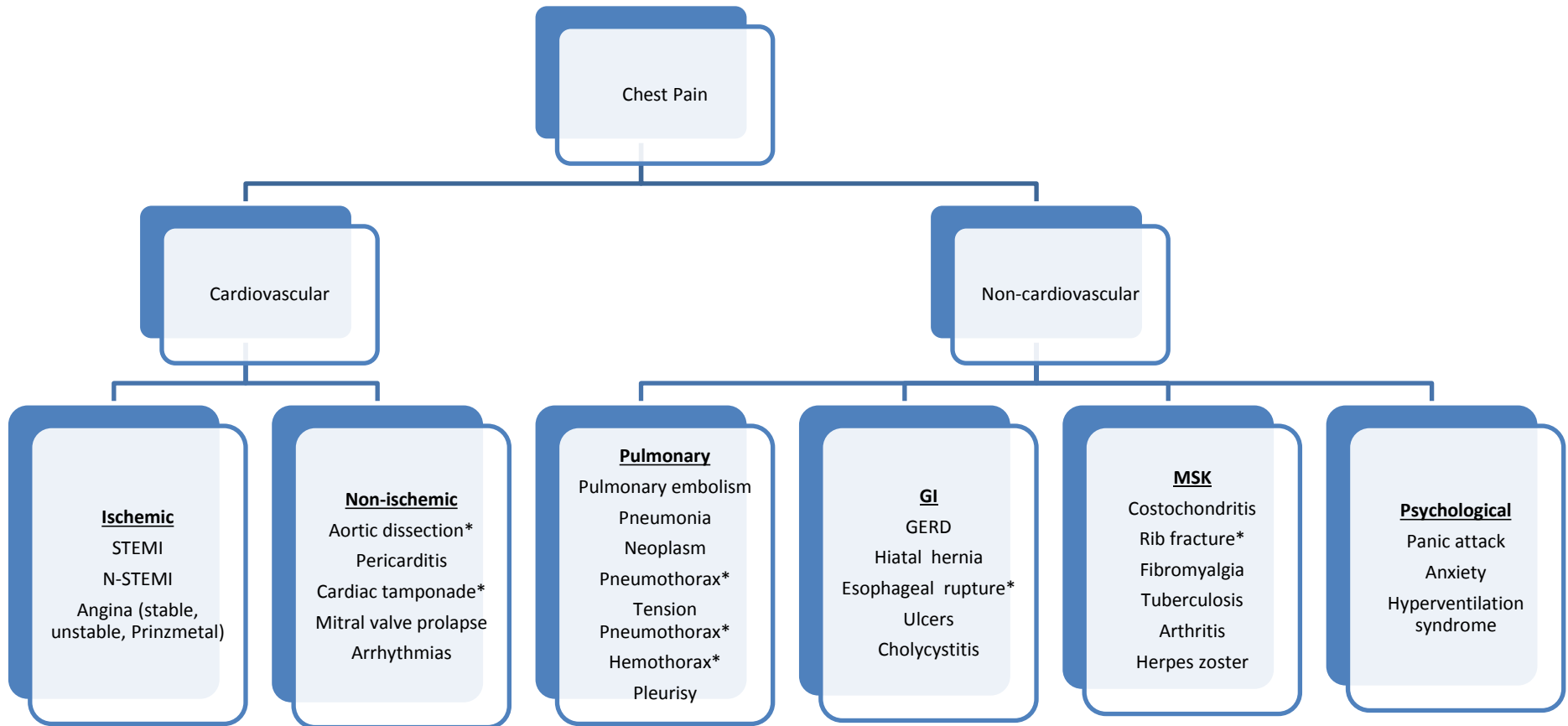


Figure 1: Differential diagnoses of chest pain

\*If the chest pain is of a suspected traumatic etiology, see the Thoracic Trauma Clinical Practice Guideline

## PEP 3x3 TABLES for CHEST PAIN

Throughout the EHS Guidelines, you will see notations after clinical interventions (e.g.: **PEP 2 neutral**). PEP stands for: the Canadian **P**rehospital Evidence-based **P**rotocols Project.

The number indicates the Strength of cumulative evidence for the intervention:

**1 = strong evidence exists**, usually from randomized controlled trials;

**2 = fair evidence exists**, usually from non-randomized studies with a comparison group; and

**3 = weak evidence exists**, usually from studies without a comparison group, or from simulation or animal studies.

The coloured word indicates the direction of the evidence for the intervention:

**Green = the evidence is supportive** for the use of the intervention; **Yellow = the evidence is neutral**; **Red = the evidence opposes** use of the intervention; **White** = there is no evidence available for the intervention, or located evidence is currently under review.

PEP Recommendations for Chest Pain Interventions, as of 2013/03/06. PEP is continuously updated. See:

<http://emergency.medicine.dal.ca/ehsprotocols/protocols/toc.cfm> for latest recommendations, and for individual appraised articles.

### Chest Pain NYD

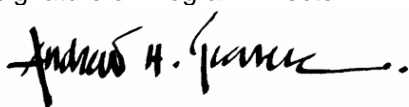
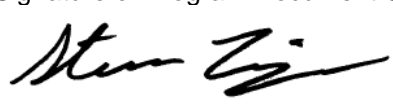
Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)				• Oxygen
	2 (fair evidence exists)				
	3 (weak evidence exists)				

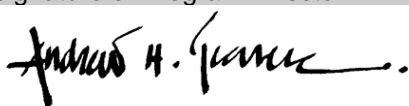
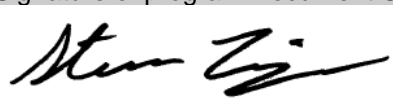
### Suspected Cardiac Origin

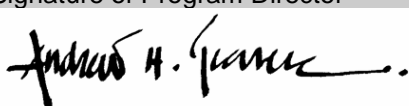
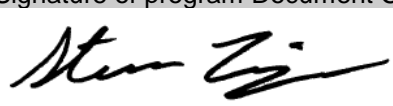
Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)	<ul style="list-style-type: none"> <li>• 12-Lead ECG</li> <li>• Analgesia (iv narcotic)</li> <li>• Anti-platelet</li> <li>• ASA/Aspirin</li> <li>• B Blockers</li> <li>• Direct to PCI</li> <li>• Thrombolysis</li> </ul>	<ul style="list-style-type: none"> <li>• Heparin</li> <li>• Lidocaine</li> <li>• Magnesium</li> </ul>		• Oxygen
	2 (fair evidence exists)				
	3 (weak evidence exists)	• Nitrates			

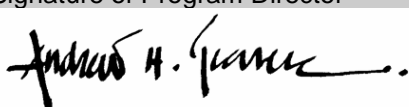
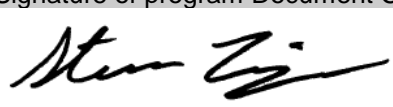


## Program Document Number Management System


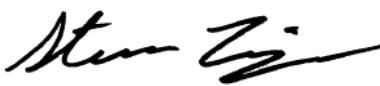
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<b>Effective Date:</b> April 3, 2013	<b>Revision Date:</b>	
<b>Approval Date:</b> March 6 2013 2013	<b>Revision Date:</b>	
<b>Review Date:</b> April 1 2013	<b>Revision Date:</b>	
<b>Replaces:</b> 6228.01, 6229.06, 6317.01	<b>Revision Date:</b>	
Signature of Program Director 	Signature of Program Document Coordinator 	


<b>PDN:</b> 6288.99.01.01	<b>Title:</b> RESTORE	<b>Type:</b> Field Guide
<b>Effective Date:</b> April 2 2013	<b>Revision Date:</b>	
<b>Approval Date:</b> March 6, 2013	<b>Revision Date:</b>	
<b>Review Date:</b> April 1, 2013	<b>Revision Date:</b>	
<b>Replaces:</b> 6318.01	<b>Revision Date:</b>	
Signature of Program Director 	Signature of program Document Coordinator 	

<b>PDN:</b> 6288.99.02.01	<b>Title:</b> PCI Destination	<b>Type:</b> Field Guide
<b>Effective Date:</b> April 2 2013	<b>Revision Date:</b>	
<b>Approval Date:</b> March 6, 2013	<b>Revision Date:</b>	
<b>Review Date:</b> April 1, 2013	<b>Revision Date:</b>	
<b>Replaces:</b> 6318.01	<b>Revision Date:</b>	
Signature of Program Director 	Signature of program Document Coordinator 	

<b>PDN:</b> 6288.99.03.01	<b>Title:</b> STEMI Reperfusion Worksheet	<b>Type:</b> Field Guide
<b>Effective Date:</b> April 2 2013	<b>Revision Date:</b>	
<b>Approval Date:</b> March 6, 2013	<b>Revision Date:</b>	
<b>Review Date:</b> April 1, 2013	<b>Revision Date:</b>	
<b>Replaces:</b> 6318.01	<b>Revision Date:</b>	
Signature of Program Director 	Signature of program Document Coordinator 	

<b>PDN:</b> 6288.99.04.01	<b>Title:</b> CDHA PCI Algorithm	<b>Type:</b> Field Guide
<b>Effective Date:</b> April 2 2013	<b>Revision Date:</b>	
<b>Approval Date:</b> March 6, 2013	<b>Revision Date:</b>	
<b>Review Date:</b> April 1, 2013	<b>Revision Date:</b>	

<b>Replaces:</b> 6318.01	Revision Date:
Signature of Program Director 	Signature of program Document Coordinator 

<b>PDN:</b> 6288.99.05.01	<b>Title:</b> Ischemic Chest Pain	<b>Type:</b> Field Guide
<b>Effective Date:</b> April 2 2013	Revision Date:	
<b>Approval Date:</b> March 6, 2013	Revision Date:	
<b>Review Date:</b> April 1, 2013	Revision Date:	
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