

# C01: Acute Coronary Syndrome

Mike Sugimoto

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## Introduction

Acute coronary syndrome (ACS) represents a spectrum of diseases resulting from insufficient blood flow through the coronary arteries culminating in a wide range of presentations.

## Essentials

- Rapid identification of ST segment elevation myocardial infarction (STEMI) to facilitate timely reperfusion strategies is the primary goal in out-of-hospital management. Consider ACP intercept for ECG acquisition and interpretation if not available at the scene.
- Antiplatelet therapy should be initiated as early as possible in all patients with suspected coronary ischemia.
- Reduction of myocardial oxygen demand should be accomplished wherever and whenever possible (e.g., management of nausea, pain, and limiting patient exertion).

## Additional Treatment Information

- Acetylsalicylic acid (ASA) is the out-of-hospital antiplatelet drug of choice. Emergency medical dispatch will instruct patients to chew and swallow ASA 320 mg and patients may have taken their own prior to paramedic or EMR/FR arrival. Unless otherwise contraindicated, ASA should be administered to bring the total dose, for this event, to at least 160 mg orally.
- Nitroglycerin, 0.4 mg sublingually, may be given to alleviate pain in cases of angina. Systolic blood pressure must be monitored prior to and during nitroglycerin therapy. Nitroglycerin has not been demonstrated to change outcomes in ischemic chest pain and may in fact worsen myocardial ischemia under some circumstances. The on-going use of nitroglycerin in patients who have not experienced symptom relief following the first few doses is unlikely to produce any benefit.
- To minimize handover delays in suspected STEMI and to facilitate angiography and fluoroscopy, place therapy electrodes anterolaterally with wires positioned cephalad (toward the head) prior to initiating conveyance.
- All patients with suspected coronary ischemia should have vascular access established with running intravenous fluid. When selecting a site for access, use of the distal third of the right arm is relatively discouraged (particularly in the setting of anticipated percutaneous coronary intervention). Do not delay conveyance to obtain vascular access.

## General Information

- ACS exists on a spectrum, from angina through to STEMI:
  - Angina is pain resulting from a temporary increase in myocardial oxygen demand. This may be the result of reduced blood flow in the coronary arteries due to arterial narrowing, or spasm in the arterial wall.
  - Non-ST segment elevation myocardial infarction (NSTEMI) is the result of an incomplete occlusion of a coronary artery, either by a thrombus alone or in concert with vasospasm. ECGs generally show ST segment depression or T wave inversion, though transient ST segment elevation may also be observed.
  - STEMI occurs when a coronary artery is completely occluded by a thrombus. The diagnosis is dependent on ST segment elevation in two or more anatomically contiguous leads.
- Common presentations include chest pain, "heaviness", or discomfort associated with shortness of breath, nausea, and/or diaphoresis. Be aware that although these are common findings, certain populations – in particular, women, the elderly, those with a history of diabetes, and younger individuals – may present differently. Atypical ACS presentations can include weakness or fatigue, syncope/presyncope, abdominal pain, and nausea.
- The presence of palpable chest wall pain does not exclude ischemic origins. Paramedics and EMRs/FRs should maintain a high suspicion of ischemic-origin pain in cases of chest pain without a clear history of trauma.
- Patients presenting with symptoms consistent with ACS should be managed as such, regardless of ECG findings,

up to and including a clinical pathway selection.

- Contraindications to ASA therapy include known hypersensitivity or a recent history of upper or lower gastrointestinal bleeding. Patients on oral anticoagulant therapies are often told by their physician to avoid ASA. In the setting of suspected or known ACS, the antiplatelet activity of ASA is of more importance than the temporary rise in INR. Consult with ClinicaCall if unsure.

## Interventions

### First Responder

- Keep the patient warm and protect from further heat loss
- Place the patient in a position of comfort, as permitted by clinical condition; in general, limit patient movement
- Provide supplemental oxygen where indicated
  - → [A07: Oxygen Administration](#)
- Conduct ongoing assessment and gather collateral information, such as medications and identification documents
- Establish ingress and egress routes from the patient's location
- Communicate patient deterioration to follow-on responders

### Emergency Medical Responder – All FR interventions, plus:

- Oxygen as required to maintain SpO<sub>2</sub> ≥ 94%
  - → [A07: Oxygen Administration](#)
- [Acetylsalicylic acid](#) chew and swallow, if not already done
- [Nitroglycerin](#) spray if systolic blood pressure ≥ 110 mmHg and heart rate within range of 50-150 beats/minute
  - [ClinicaCall consultation required](#) prior to nitroglycerin administration if no prior prescription or if more than 3 doses are required.
- Consider [nitrous oxide](#) as required for pain
  - → [E08: Pain Management](#)
- Convey with early notification; consider intercept with additional resources

### Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access with running intravenous fluid
  - → [D03: Vascular Access](#)
- [Nitroglycerin](#) spray every 4-5 minutes if systolic blood pressure ≥ 110 mmHg and heart rate is between 50-150 beats/minute
  - [ClinicaCall consultation required](#) prior to nitroglycerin administration if no prior prescription or if more than 3 doses are required.
- Consider [dimenhydrinate](#) for nausea
  - → [E07: Nausea and Vomiting](#)
- Obtain and transmit 12-lead ECG.
  - → [PR16: 12-Lead ECG](#)
  - The LifePak 15 may be used to acquire a 12-lead ECG if:
    - Paramedics have completed the online and face-to-face training and required EMALB endorsement,
    - The patient is over 18 years of age,
    - The patient presents with active, recent onset (< 12 hours) non-traumatic chest pain that is suspicious for acute coronary syndrome, and
  - Clinical judgment will be required to establish the optimal timing of ECG acquisition. In general, paramedics should minimize scene time wherever possible. Refer to the [standard operating procedure for out-of-hospital use of the LifePak 15](#) for additional information.
- If STEMI criteria are met, and a local PCP STEMI pathway to primary percutaneous coronary intervention has been developed:
  - Request ACP intercept where available.
  - Attach therapy electrodes (place pads anterior-lateral, wires cephalad)
    - Transmit ECG to receiving hospital, and follow the appropriate STEMI pathway provided transport time

is less than 60 minutes.

- [Kelowna General Hospital Area STEMI Pathway \(PCP\)](#)
- [Sea to Sky STEMI Pathway \(PCP\)](#)
- [South Island STEMI pathway \(PCP\)](#)
- If STEMI criteria are met, and a local PCP STEMI pathway **has not been developed**:
  - Request ACP intercept where available.
  - Notify receiving hospital as soon as practicable.

#### Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Obtain and interpret 12-lead ECG (plus additional precordial leads as required)
  - [→ PR16: 12-Lead ECG](#)
- In cases of STEMI:
  - Select and activate local reperfusion strategy, including early hospital notification
    - Consider eligibility for out-of-hospital reperfusion pathways:
      - [→ PR51: Prehospital fibrinolysis](#)
- Attach therapy electrodes (place pads anterior-lateral, wires cephalad)
- Consider [fentaNYL](#) as required for pain
- Manage dysrhythmias as necessary
  - [Atropine](#) as necessary for symptomatic bradycardia
    - [→ C02: Bradycardia](#)
  - [→ C03: Narrow Complex Tachycardia](#)
  - [→ C04: Wide Complex Tachycardia](#)

#### Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

Oxygenation/ Ventilation

(Not routinely used but should be considered for presenting cases of cardiogenic pulmonary edema or cardiogenic shock)

- NIPPV
  - CPAP
  - High-flow oxygen
  - BiPAP
- IPPV
  - Mechanical ventilation

Antiplatelet

- P<sub>2</sub>Y<sub>12</sub>
  - [Ticagrelor](#)
  - [Clopidogrel](#)
- Consider Gp IIb/IIIa
  - [Eptifibatide](#)

Nitrates

- [Nitroglycerin](#) IV
- [Nitroglycerin](#) Topical

Opioids (recognize the reduction in P<sub>2</sub>Y<sub>12</sub> effectiveness. Routine use should be avoided)

- [Morphine](#)
- [Fentanyl](#)
- [Hydromorphone](#)

Anticoagulants (age and renal function dependant)

- [Heparin](#)
- Low molecular weight heparin
  - [Enoxaparin](#)
  - Lovenox
  - Fondaparinux

Beta blockade

- [Metoprolol](#)
- [Atenolol](#)

Consider Calcium channel blocker (patients unable to take Beta blocker)

- [Verapamil](#)
- [Diltiazem](#)

Statin

- Atorvastatin

ACE inhibitor (administered in the first 24 hours for refractory hypertension)

- [Ramipril](#)

ARB

- For patient's intolerant of ACE inhibitors

Consider Fibrinolytic therapy (> 90 minutes to a PCI center)

- [Call ETP prior to thrombolytic administration.](#)
- [TNK](#)
- tPA
- rPA

Bleeding or anemia

- Consider pRBC's for patients with a Hgb < 100

Hyperglycemia (stress induced in diabetics)

- Consider [insulin](#)

Consider correction of electrolytes

- Mg<sup>+</sup>
- K<sup>+</sup>

## Evidence Based Practice

ACS/Suspected Cardiac Origin

### Supportive

- [12-Lead ECG](#)
- [Anti-platelet \(other\)](#)
- [ASA/Aspirin](#)
- [Bypass/Direct to PCI](#)
- [Drip and ship](#)
- [Fibrinolysis](#)

- [Nitrates](#)
- [RIC \(remote ischemic conditioning\)](#)
- [Advanced Notice/Cath Lab Activation by EMS](#)
- [Pharmacoinvasive approach](#)
- [Ketamine](#)
- [PAI-ASA](#)

### Neutral

- [Beta Blockers](#)
- [GIK \(Glucose-Insulin-Potassium\)](#)
- [Heparin](#)
- [Lidocaine](#)
- [Magnesium](#)
- [Nitrous Oxide](#)
- [HEMS](#)
- [Morphine](#)
- [Point of Care Troponin](#)

### Against

- [Fentanyl](#)
- [Oxygen-high flow](#)
- [Oxygen-titrated](#)

## References

1. Kawakami S, et al. Time to reperfusion in ST-segment elevation myocardial infarction patients with vs. without pre-hospital mobile telemedicine 12-lead electrocardiogram transmission. 2016. [\[Link\]](#)
2. Welsford M, et al. Part 5: Acute coronary syndromes: 2015 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. 2015. [\[Link\]](#)
3. Reeder GS, Awtry E, Mahler SA, (2021). Initial evaluation and management of suspected acute coronary syndrome (myocardial infarction, unstable angina) in the emergency department, UpToDate. Retrieved August 10, 2021, from <https://www.uptodate.com/contents/initial-evaluation-and-management-of-suspected-acute-coronary-syndrome-myocardial-infarction-unstable-angina-in-the-emergency-department>
4. [Mahler SA,, Breall JA. \(2021\). Overview of the acute management of non-ST elevation acute coronary syndromes. UpToDate. Retrieved August 10, 2021, from https://www.uptodate.com/contents/overview-of-the-acute-management-of-non-st-elevation-acute-coronary-syndromes](#)

## Practice Updates

15 July 2023: Updated STEMI Clinical Pathway Links for PCP and ACP

