Acute Coronary Syndromes

Michael M. Braun, DO, FAAFP, RFPHM

ACTIVITY DISCLAIMER

The material presented here is being made available by the American Academy of Family Physicians for educational purposes only. Please note that medical information is constantly changing; the information contained in this activity was accurate at the time of publication. This material is not intended to represent the only, nor necessarily best, methods or procedures appropriate for the medical situations discussed. Rather, it is intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations.

The AAFP disclaims any and all liability for injury or other damages resulting to any individual using this material and for all claims that might arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by a physician or any other person. Physicians may care to check specific details such as drug doses and contraindications, etc., in standard sources prior to clinical application. This material might contain recommendations/guidelines developed by other organizations. Please note that although these guidelines might be included, this does not necessarily imply the endorsement by the AAFP.
DISCLOSURE

It is the policy of the AAFP that all individuals in a position to control content disclose any relationships with commercial interests upon nomination/invitation of participation. Disclosure documents are reviewed for potential conflict of interest (COI), and if identified, conflicts are resolved prior to confirmation of participation. Only those participants who had no conflict of interest or who agreed to an identified resolution process prior to their participation were involved in this CME activity.

All individuals in a position to control content for this session have indicated they have no relevant financial relationships to disclose.

The content of my material/presentation in this CME activity will not include discussion of unapproved or investigational uses of products or devices.

Disclaimer

The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Department of Defense.
Michael M. Braun, DO, FAAFP, RFPHM

Chief, Inpatient Medicine, Department of Family Medicine, Madigan Army Medical Center (MAMC), Tacoma, Washington; Director of the Medical Wards, MAMC, Tacoma, Washington

Dr. Braun earned his medical degree at the Philadelphia College of Osteopathic Medicine, Pennsylvania, and completed his residency in family medicine at Womack Army Medical Center, Fort Bragg, North Carolina. At Madigan Army Medical Center, he has served as family medicine and internal medicine residency faculty for nine years. He has been a practicing hospitalist for seven years. He earned the Recognition of Focused Practice in Hospital Medicine (RFPHM) from the American Board of Family Medicine (ABFM) and the American Board of Internal Medicine (ABIM).

Learning Objectives

1. Implement evidence-based secondary prevention recommendations in post-ACS patients.

2. Recognize the atypical presentation of ACS in women.

3. Use evidence-based criteria in determining safe and effective medications to prescribe at discharge post-ACS.

4. Counsel patient to address concerns in the period immediately following discharge for ACS, with an emphasis on assessing and monitoring for psychosocial issues that may impact post-ACS outcomes.
Audience Engagement System

Step 1

Step 2

Step 3

Definitions

• ST-Elevation Myocardial Infarction (STEMI)
  • ST-segment elevation of 1mm or more of two contiguous limb or precordial leads except leads V2 and V3
  • ST-segment elevation of 1.5mm (women) and 2.0mm (men) or greater in V2 and V3
  • New or presumed new LBBB
  • Posterior wall MI ST-segment depression of >2mm in V1 through V4 with commonly seen ST-segment elevation in lateral leads
Definitions

• Non-ST-Elevation Acute Coronary Syndrome (NSTE-ACS)
  • Elevated troponinT without meeting ECG criteria for STEMI

• Unstable Angina
  • Ischemic symptoms suggestive of ACS and no elevation in troponins, with or without ECG changes indicative of ischemia
  • UA and NSTE-ACS are frequently indistinguishable at initial evaluation

Types of MI

• Type 1: MI caused by acute atherothrombotic coronary artery disease and usually precipitated by atherosclerotic plaque disruption (rupture or erosion).
• Type 2: MI consequent to a mismatch between oxygen supply and demand.
• Type 3: Patients with a typical presentation of myocardial ischemia/infarction, such as presumed new ischemic electrocardiographic (ECG) changes of ventricular fibrillation, with unexpected death before blood samples for biomarkers could be drawn or before their appearance in the blood.
• Type 4a: MI associated with percutaneous coronary intervention (PCI)
• Type 4b: A subcategory of PCI-related MI is stent/scaffold thrombosis.
• Type 5: Coronary artery bypass graft surgery (CABG) MI
Diagnosis

Poll Question 1

64 yo M with CP presents with the following EKG. What is the diagnosis?

A. Ischemia  
B. Posterior Wall MI  
C. Inferior Wall MI  
D. Both B and C
Biomarkers

- Troponin T (Fourth generation)
  - Recommended
  - SN 80-88% SP 88-97%
- Troponin I (Fourth generation)
  - Recommended
  - SN 70-83% SP 93-95%
  - Multiple assays
- Creatinine Kinase and CK-MB
  - No longer recommended
- Myoglobin
  - No longer recommended

hs-cTnt Protocol (Fifth Generation)

- DOD Example protocol
- One-hour protocol
  - hs-cTn measure at presentation and one hour later
- Two-hour protocol
  - Hs-cTn measure at presentation and then two hours later
- Three-hour protocol
  - hs-cTn measured at presentation and three hours later
ALL PATIENTS (Example)

Possible ischemic presentation

Immediate* 12-lead electrocardiogram

ST elevation present
- Activate STEMI team

ST elevation absent
- Continue down ACS algorithm

* - Immediate is within 10 minutes of arrival

Patients presenting ≥3hrs from onset of pain
(Example)

Patients presenting ≥3 hours from the onset of pain with a non-ischemic ECG and possible ischemic presentation

Baseline hs TnT

Undetectable (<6ng/L)
- Not ACS, continue to outpatient algorithm

6ng/L ≥ hs TnT <52ng/L
- Continue to 1 hour rule out protocol

≥52ng/L
- Consider immediate cardiology consultation if clinical suspicion for an acute coronary syndrome is high*

* Ongoing chest pain, abnormal ECG suggestive of ischemia without injury pattern, etc
1hr protocol for <3hrs presentation or detectable initial (Example)

1-hour sample

- hsTnT < 12ng/L and change < 4ng/L
  - Not ACS, continue to outpatient algorithm
- hsTnT ≥12ng/L
  - Change of ≥4
- Hs TnT ≥52ng/L
  - Consider immediate cardiology consultation if clinical suspicion for an acute coronary syndrome is high*
  - Acute myocardial injury (ACS)
    - Admit to CCU

"Gray-zone"
Clinical judgement. Consider repeat troponin, risk scoring systems, admission for further assessment, CCTA

Change of <6ng/L
Change of ≥6ng/L*
Chronic myocardial injury or possible late MI, NOT NSTEMI

*N for patients with baseline elevated cardiac biomarkers a relative change around 20% is a reasonable threshold to suggest ischemia rather than a raw value (6ng/L). At lower values, a relative change around 50% is more suggestive of ischemia.

NSTEMI ruled out (Example)

- NSTEMI ruled out
  - Calculate HEARTSCORE (may consider TIMI, EDACS and/or GRACE at facility preference)
  - Low risk
  - Intermediate risk
  - High risk
  - Primary Care: Assess for non-cardiac causes, if appropriate calculate ASCVD and perform aggressive risk factor modification
  - ED: Consider CCTA vs GXT
    - Primary care: Same as low risk. Consider outpatient GXT vs CCTA or cardiology consultation
    - ED: Consider cardiology consult or admission to sister service with cardiology consultation
HEART SCORE

Low risk – 0-3
Intermediate risk – 4-6
High risk – 7-10

Ann Intern Med. 2017 May 16;166(10):689-697

TIMI risk score

Low risk – 0-2
Intermediate risk – 3-4
High risk – 5-7

**Poll Question 2**

A 57 yo M with h/o HTN and HLD presents to the ED with substernal chest pain for 45 min. BP 110/60 HR 90 RR 18 and oxygen sat of 96% RA. Labs show elevated troponin I. EKG shows 2-mm ST-segment elevation in leads II, III, and aVF. CXR is normal. Patient is given ASA, clopidogrel, and heparin. Transport to a PCI capable hospital would take 4H. Which of the following is the most appropriate?

A. Full dose reteplase  
B. Start abciximab  
C. Nitroprusside  
D. Oxygen
Treatment

NSTE-ACS vs STEMI

**NSTE-ACS**
- PCI considered
- ASA
- P2Y12 inhibitors
- Anticoagulation
- Beta blockers
- ACEI/ARBs
- Lipid therapy
- Morphine
- Oxygen
- Nitro

**STEMI**
- Immediate PCI or reperfusion
- ASA
- P2Y12 inhibitors
- Anticoagulation
- Beta blockers
- ACEI/ARBs
- Lipid therapy
- Morphine
- Oxygen
- Nitro
- Aldosterone antagonists
Antiplatelet Medications

Aspirin

- Recommended in all patients with ACS
- ASA reduces recurrent MI and death
- Loading dose is 162-325mg chewed
- Avoid Enteric coated ASA on initial presentation
P2Y12 inhibitors

• Should be given to all patients with ACS
• Clopidogrel
  • NSTE-ACS: Oral loading dose of 300-600 mg followed by 75 mg daily
  • PCI: Loading dose of 600 mg followed by 75 mg/day
• Ticagrelor
  • NSTE-ACS: loading dose of 180 mg followed by 90 mg BID for at least 12 months
• Prasugrel
  • ACS: loading dose of 60 mg; maintenance dose of 10 mg/day for at least 12 months
• Crangrelor
  • IV: 30 mcg/kg bolus prior to PCI followed immediately by an infusion of 4 mcg/kg/minute continued for at least 2 hours or for the duration of the PCI

Anticoagulation
Anticoagulation

• IV anticoagulation is recommended in all patients with ACS
• Decreases the risk of MI and death
• STEMI undergoing primary PCI should be treated with unfractionated heparin (UH) or bivalirudin.
• Enoxaparin (LMWH) may be used in patients with NSTE-ACS, with or without PCI
• Patients not undergoing primary PCI, UFH, LMWH, or fondaparinux can be used

Oral Anticoagulation

• Rivaroxaban given after ACS
• Dose rivaroxaban at 2.5 mg twice daily for 12 months
• Consider in patients with low risk for bleeding
• Rivaroxaban and DAPT lowered cardiovascular death, MI, stroke, stent thrombosis, and all-cause mortality over 13 months
• Increased bleeding risk three-fold.
Anti-angina Medical Therapy

Beta Blockers

• Initiated in all patients with ACS within the first 24 hours
• Cls include cardiogenic shock, acute heart failure, bradycardia, and heart block
• BBs should be given orally
• Can be given IV if unable to tolerate PO or patients with tachyarrhythmia or hypertensive emergency
• Reduce overall mortality
• HFrEF should utilize metoprolol succinate, carvedilol, and bisoprolol
Nitroglycerin

• Relieves myocardial ischemia and should be used in patients with ACS unless contraindicated

• Give IV in patients with persistent hypertension, hypertensive emergency, or heart failure

• Dose of 0.4 mg every five minutes for a total of three doses

• No reduction in morbidity or mortality

Lipid Lowering Therapy
Statins

• Patients with ACS should be placed on high-intensity statin therapy for secondary prevention
• High-intensity statin therapy initiated prior to discharge decreases mortality by 25% at one year post-MI
• Reduces recurrent MI, stroke, and the need for revascularization
• Low density lipoprotein cholesterol (LDL-C) should be reduced by at least > 50%
• Reasonable to target LDL-C < 70 mg/dL

Ezetimibe

• Ezetimibe combined with simvastatin

• Significantly lower cardiovascular death, MI, revascularization, and stroke compared to statin therapy alone in patients with ACS.
Poll Question 3

A 75 yo M with h/o HTN, HLD, and IDDM presented 5 hours ago for NSTE-ACS. VSS. He is currently on 3L of oxygen. PE reveals bilateral crackles in his lung fields, JVD, and LE edema. Labs show normal Cr and K. CXR shows pulm edema b/l. ECHO shows LVEF of 35%. He was started on atorvastatin, ASA, clopidogrel, and furosemide. Which of the following is the most appropriate treatment?

A. Carvedilol
B. Diltiazem
C. Hydralazine-isosorbide dinitrate
D. Lisinopril

Other Treatments
ACE Inhibitors and ARBs

• ACEIs are reasonable for all patients with ACS
• Decrease mortality in both STEMI and NSTE-MI patients
• Early initiation of ACEIs within the first 24 hours has been shown to reduce mortality in STEMI patients, especially those with an anterior MI, heart failure, or an ejection fraction (EF) ≤ 40%

Oxygen

• Supplemental oxygen should be given to all patients with ACS and an arterial oxygen saturation < 92%.
• Reasonable to give all STEMI patients supplemental oxygen for the first six hours
• Reassess oxygen need after 6H
• Supplemental oxygen with normal baseline oxygen saturation is not beneficial and may actually be harmful
Morphine

- Morphine is the drug of choice for the management of chest pain in ACS
- Morphine is often under-dosed
- Should be avoided since patients are in a hyperadrenergic state which increases vasoconstriction and workload of the heart
- Patients with pain relief from narcotics should not be mistaken as having successful reperfusion either
- No morbidity or mortality benefit
- Don’t give NSAIDS

Poll Question 4

A 68 yo F with h/o HTN is evaluated in the ED for chest pain and dyspnea that began 1H ago. Closest PCI center is 10 min away. Patient is confused with BP of 80/40, HR 122bpm, and O2 sat at 90%. Patient is noted to have crackles on exam. EKG shows ST segment elevations in the V2-V5 and ST segment depressions in II, III, aVF. ASA is given. What is the most appropriate management?

A. Immediate PCI
B. Thrombolytics
C. SL nitroglycerin
D. IV metoprolol
Revascularization and Reperfusion Therapy

Thrombolytics
Fibrinolytic therapy and STEMI

- Fibrinolytic therapy is preferred if primary PCI is not available or will be delayed > 120 minutes
- Fibrinolysis should be given within 12 hours of symptoms
- Fibrinolytics can also be given within 12-24 hours if the patient is still having symptoms or continued ST segment elevation
- Achieves its maximal benefit within the first hour
- Mortality reduction in patients with STEMI
- Fibrin specific agents such as alteplase, reteplase, and tenecteplase are preferred over streptokinase

NSTE-ACS and Fibrinolysis

- Fibrinolytic therapy is not recommended in patients with NSTE-ACS as it has not been shown to be beneficial
Percutaneous Coronary Intervention (PCI)

PCI and STEMI

- Primary PCI is recommended as the treatment of choice for all patients with STEMI
- Patients with < 12 hours of symptoms should undergo revascularization within 90 minutes of presentation to a PCI capable facility or within 120 minutes of presentation to a non-PCI capable facility
- PCI decreases the risk of death, stroke, and non-fatal re-infarction as compared to fibrinolytics.
- Drug eluding stents are preferred over bare metal stents
PCI and NSTE-ACS

- Invasive strategy with primary PCI within 72 hours should be considered in patients with NSTE-ACS
- Urgent or immediate invasive strategy <2h is recommended in hemodynamic instability, new decompensated heart failure, new or worsening mitral regurgitation, ventricular arrhythmias, or refractory angina despite maximal medical therapy
- Invasive strategy within 24 hours is recommended in high risk patients with GRACE score > 140 (TIMI score >5), significant increase in troponin, or new or worsening ST segment depressions

Coronary Artery Bypass Grafting (CABG)
CABG

• CABG should be considered in patients with > 50% left main stenosis or 3-vessel coronary artery disease, unsuccessful PCI, complicated PCI, or mechanical complications of MI, such as papillary muscle or free wall rupture
• For non-emergent CABG, P2Y12 inhibitors should be discontinued for at least 5 to 7 days prior to surgery
• Approximately 5-10% of patients with NSTE-ACS will require revascularization with CABG

Practice Recommendations

• Primary PCI should be performed in patients with STEMI, posterior wall MI, or new LBBB if symptom onset is < 12 hours and it can be performed in a timely manner (< 90 minutes in a PCI capable facility or < 120 minutes if being transferred to a PCI capable facility) (LOE A)

• Aspirin should be given to all patients with ACS (LOE A)

• P2Y12 inhibitors, in addition to ASA, are recommend in all patients with ACS (LOE A)

• Beta blockers in all patients with ACS without contraindications (LOE B)
Practice Recommendations

- ACEI/ARBS in all patients with ACS and EF <40% (LOE A)
- Anticoagulation should be given to all ACS patients (LOE B)
- Statins should be given to all ACS patients unless CI (LOE A)
- Thrombolytics can be used in place of PCI if PCI is not available within 120 min (LOE A)

Contact Information

- Michael M. Braun
- Michael.m.braun.civ@mail.mil
Questions

References


References


References

References


