Algorithm 1: Initial Evaluation and Management

**Symptoms of Possible ACS**
- Chest pain / discomfort with or without radiation to the arm(s), jaw, or epigastrium
- Shortness of breath
- Weakness / lightheadedness / severe fatigue
- Diaphoresis
- Nausea
- Cardiac Arrest (after Return of Spontaneous Circulation)

**Atypical**
*(Note: Females may have more atypical symptoms)*

**Females**
- Fatigue
- Pain between shoulder blades or epigastric area
- Jaw pain

**Diabetics**
- May only be short of breath

**Activate Early Recognition Team (ERT) for Inpatients**

**ACS Assessment**
- Order immediate 12 lead Electrocardiogram (ECG).
  - Goal: ECG done and physician to read within 10 minutes of symptom onset or ED arrival
- Establish IV access
- Measure vital signs, including pulse oximetry

**ACS General Treatment** *(To be done while waiting for ECG interpretation)*
- Supplemental oxygen only with oxygen saturation less than 90%, respiratory distress, or other high-risk features for hypoxemia
- Nitroglycerin – initially 0.4mg sublingual.
  - Consider starting infusion if chest pain persists
  - Acceptable reasons for not ordering nitroglycerin: symptomatic hypotension, phosphodiesterase inhibitor (sildenafil, tadalafil, vardenafil, avanafil), and riociguat
- Aspirin 81 mg x 4 (chew) - *Unless aspirin allergy*

**ECG Interpretation**
- No ST-Elevation
  - See Page 3
- ST-Elevation or ST depression ≥ 2 precordial leads (V1–V4)
  - May indicate transmural posterior injury
  - See Page 2
Algorithm 2: Management for STEMI (ST Elevation Myocardial Infarction)

Does ECG meet one of the following criteria for STEMI?
- > 1 mm ST elevation in ≥ 2 contiguous limb leads
- > 2 mm ST elevation in ≥ 2 contiguous precordial leads
- New left bundle branch block (LBBB)
- ST segment depression in ≥2 precordial leads (V1 – 4) suggestive of transmural posterior injury

YES

NO

See Page 3 for Algorithm 3: Management for NSTEMI

Call STEMI Hotline: 6-8111 and identify if ED patient or inpatient
(Nurse Practitioner or Physician Assistant may call if the physician is not available)

ED patient
STEMI Alert activated
Only Interventional Cardiologist or ED physician can determine need for STEMI Alert

Inpatient
STEMI Hotline calls Interventional Cardiologist

Additional Medications (unless contraindicated)
- Ticagrelor 180* mg oral preferred OR Clopidogrel 600 mg oral
- Heparin 60 units/kg bolus (max dose of 4,000 unit bolus)
- If patient requires further pain control, can consider a one time dose of up to 4 mg of Morphine IV prior to cardiac catheterization

Potential Adjunctive Medications that may be given in the Cath Lab:

Abciximab
- 0.25 mg/kg IVP bolus (max dose 20 mg)
- Initiate infusion at 10 mcg/min

Eptifibatide
- 180 mcg/kg IVP bolus (max dose 20 mg)
- Within 10 minutes, may repeat second bolus of 180 mcg/kg (max dose 20 mg)
- For CrCl > 50 mL/min, initiate infusion at 2 mcg/kg/min (max infusion of 20 mL/hr)
- For CrCl ≤ 50 mL/min, initiate infusion at 1 mcg/kg/min (contraindicated if end stage renal disease or on dialysis) (max infusion 10 mL/hr)

Bivalirudin
- 0.75 mg/kg IVP bolus
- For CrCl ≥ 30 mL/min, initiate infusion at 1.75 mg/kg/hr
- For CrCl < 30 mL/min but not on dialysis, initiate infusion at 1 mg/kg/hr
- For Dialysis, initiate infusion at 0.25 mg/kg/hr

*Do not use Ticagrelor with any history of intracranial hemorrhage or use of thrombolytics within the last 24 hours.

Use with caution in severe hepatic impairment, bradycardia, or a need for oral anticoagulants.

Do not delay transport to Cath Lab to administer medications

Goal
Patient in Cath Lab < 30 minutes from onset of symptoms
Algorithm 3: Management for Unstable Angina (UA) / Non-ST-Elevation Myocardial Infarction (NSTEMI)

**Focused H&P**
- Contraindication to anticoagulation/antiplatelet
- Possible alternate diagnosis

**Diagnostic Tests**
- CBC, Chem 7, INR, Troponin
- Chest X-ray
- Serial ECGs

**Medications (unless contraindicated)**
- **Ticagrelor** 180 mg oral preferred OR **Clopidogrel** 600 mg oral
- Oral beta-blocker** in all patients without contraindications in first 24 hours
- **Heparin** 60 units/kg (max dose 4,000 unit bolus) IVP then 12 units/kg/hr
- **Routine use of opioids, including morphine is not recommended.**

**MODERATE/HIGH RISK ONLY** *(Only if approved by Interventional cardiology attending):*

- **Eptifibatide**
  - 180 mcg/kg IVP bolus (max dose 20 mg)
  - Within 10 minutes, may repeat second bolus of 180 mcg/kg (max dose 20 mg)
  - For CrCl > 50 mL/min, initiate infusion at 2 mcg/kg/min (max infusion 20 mL/hr)
  - For CrCl ≤ 50 mL/min, initiate infusion at 1 mcg/kg/min (max infusion 10 mL/hr)
  - (contraindicated if end stage renal disease or on dialysis)

**NOTE:** Some alternative diagnoses to consider are:
- Aneurysm
- Pneumothorax
- **Pulmonary Embolism**
- Pericardial Effusion
- Gastroesophageal Reflux Disease

*Do not use Ticagrelor with any history of intracranial hemorrhage or use of thrombolytics within the last 24 hours.*

Use with caution in severe hepatic impairment, bradycardia, or a need for oral anticoagulants.

**Administer beta-blockers if none of the following are present:**
- Signs of heart failure or evidence of low output state
- Risk factors for shock with beta-blockers including: Age > 70 years, Systolic Blood Pressure < 120 mm Hg, Heart rate > 110 bpm or < 60 bpm
- PR interval >0.24 seconds
- Second- or third-degree heart block without a pacemaker
- Active asthma or reactive airway disease

**ED**
Admit to Cardiology

**Inpatient**
Call Cardiology Fellow
Contact Cardiology

<table>
<thead>
<tr>
<th>Patient Status</th>
<th>Plan of Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEMI</td>
<td>• Call STEMI Hotline 6-8111</td>
</tr>
<tr>
<td>UA / NSTEMI</td>
<td>• Consult Cardiology</td>
</tr>
</tbody>
</table>

Acute Coronary Syndrome Management

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Plan of Care</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasive Evaluation</td>
<td>• Angiography</td>
<td></td>
</tr>
<tr>
<td>Post-Angiographic Management Strategy</td>
<td>• Coronary Artery Bypass Graft (CABG) Surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Percutaneous Coronary Intervention (PCI)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Medical therapy</td>
<td></td>
</tr>
<tr>
<td>Cardiac Catheterization Hydration</td>
<td>• See Iodinated <a href="#">Contrast Media-Induced Toxicity Guideline</a> for hydration</td>
<td>• Prevent Contrast-Induced Nephropathy</td>
</tr>
<tr>
<td>Assessment of Ejection Fraction</td>
<td>• If EF &lt; 35%, consider lifevest and short-term follow up for Internal Cardiac Defibrillator (ICD)</td>
<td></td>
</tr>
<tr>
<td>Antiplatelet / Anticoagulant Therapy</td>
<td></td>
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<tr>
<td>Discharge based upon treatment</td>
<td></td>
<td></td>
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<tr>
<td>See OSUWMC’s <a href="#">Management of Antiplatelet Therapy in Patients with Arterial Stents</a> guideline</td>
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<td></td>
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<tr>
<td>Medical Therapy:</td>
<td></td>
<td></td>
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<tr>
<td>Antiplatelet / Drug-eluting stent:</td>
<td>• Aspirin 81 mg daily life-long <a href="#">plus</a></td>
<td></td>
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<tr>
<td></td>
<td>• Ticagrelor 90 mg twice daily OR clopidogrel 75 mg daily for at least 12 months</td>
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</tr>
<tr>
<td>Discontinue NSAIDS other than aspirin due to the increased risk for major adverse cardiovascular events.</td>
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</tr>
<tr>
<td>Bare metal stent or Drug-eluting stent:</td>
<td>• Aspirin 81 mg daily uninterrupted life-long <a href="#">plus</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ticagrelor 90 mg twice daily, prasugrel 10 mg daily, OR clopidogrel 75 mg daily for a minimum of 12 months</td>
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<tr>
<td></td>
<td>*Consult cardiologist if patient requires interruption of therapy for any reason</td>
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</tr>
<tr>
<td>Blood Pressure</td>
<td></td>
<td>&lt; 130/80 mmHg</td>
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<tr>
<td></td>
<td>• Beta-blockers</td>
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<tr>
<td></td>
<td>• Angiotensin Converting Enzyme Inhibitors / Angiotensin II Receptor Blockers</td>
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<tr>
<td></td>
<td>• Aldosterone Antagonists</td>
<td></td>
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<tr>
<td>Diabetes Management</td>
<td></td>
<td>Pre-prandial glucose &lt; 140 mg/dL</td>
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<tr>
<td></td>
<td>• See Inpatient Diabetes Guideline for details about consulting:</td>
<td>Random Glucose &lt; 180 mg/dL</td>
</tr>
<tr>
<td></td>
<td>o Inpatient Endocrinology - Diabetes</td>
<td>Hgb A1c &lt; 7% (Goal may be individualized)</td>
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<tr>
<td></td>
<td>o Diabetes Educator</td>
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<tr>
<td></td>
<td>o Nutrition</td>
<td></td>
</tr>
<tr>
<td>Lipid Management</td>
<td></td>
<td>LDL-C &lt; 100 mg/dL, consider LDL-C &lt; 70 mg/dL</td>
</tr>
<tr>
<td></td>
<td>• High-intensity statin (atorvastatin 40-80 mg or rosvustatin 20-40 mg)</td>
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<tr>
<td></td>
<td>• Moderate-intensity statin may be considered in patients 75 years or older</td>
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<tr>
<td>Considerations</td>
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<td>Goals</td>
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</tbody>
</table>
| Daily Physical Activity | • Walk at a moderate pace 20-30 min/day  
• STOP if symptoms present, breaks are recommended  
• Start cardiac rehab program before attempting more vigorous exercise | • 150 min/week of moderate intensity exercise  
• Start Cardiac Rehab Program 1 – 2 weeks post discharge |
| Weight Management    | • Lower sodium diets: 2300 – 4000 mg per day  
• Lower caffeine intake: 2 – 3 cups (16 – 20 ounces) of caffeinated drinks per day  
• Lean meats, chicken, turkey, or fish preferred over beef and pork  
• Fruits and vegetables: 6 – 8 cups per day; fresh and frozen are preferred over canned | • BMI 18.5 to 24.9 kg/m²  
• Waist circumference:  
  • Women: < 35 in. (89 cm)  
  • Men: < 40 in. (102 cm) |
| Influenza Immunization | • Annual influenza vaccination for patients with cardiovascular disease | |
AMI Quality Measures

- 30-day AMI mortality
- 30-day readmission
- Risk-adjusted bleeding
- Acute kidney injury
- Prescriptions for guideline-directed medical therapy upon discharge (i.e. aspirin, P2Y12 inhibitor (e.g Clopidogrel, Prasugrel, Ticagrelor), beta-blocker, ACEI or ARB, aldosterone antagonist, SL nitroglycerin, and statin) or clear documentation of reasoning for not ordering

Risk Assessment Tools

- TIMI Risk Score
- Heart Score for Major Cardiac Events

Order Sets

- ED Acute Coronary Syndrome
- HRT ADM Acute Coronary Syndrome
- ED Chest Pain
- ED STEMI
- ED CDU/OBS ROMI
- HRT DX Chest Pain
- Discharge Core Measures AMI

References


Guideline Authors

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- Danielle Blais, PharmD, BCPS

Guideline Approved


Disclaimer: Clinical practice guidelines and algorithms at The Ohio State University Wexner Medical Center (OSUWMC) are standards that are intended to provide general guidance to clinicians. Patient choice and clinician judgment must remain central to the selection of diagnostic tests and therapy. OSUWMC’s guidelines and algorithms are reviewed periodically for consistency with new evidence; however, new developments may not be represented.

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