Acute Coronary Syndrome: Across the spectrum

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Disclosures

• I am from away

• I am a recovering New Yorker
Hospital admission with NSTEMI

Discharge f/u

Risk factor modification

Recurrent ischemic events

CHF

Stage IV HF

Long term health

Outpatient new visit to establish PCP
Objectives

• Definitions

• Diagnosis (History, exam, ECG, biomarkers)

• Risk stratification (Admission vs. Transfer vs. Cardiology Consult)

• Distinguishing Type I from Type II

• Outpatient
  • Prevention
  • Duration of DAPT
  • Triple therapy
  • Lipid management
Type I vs Type II

- Plaque rupture
  - MI Type 1
- Vasospasm or endothelial dysfunction
  - MI Type 2
- Fixed atherosclerosis and supply-demand imbalance
  - MI Type 2
- Supply-demand imbalance alone
  - MI Type 2

Mihatov et al. Trends in CV Medicine. 2017
ACS: the continuum

**Unstable Angina**
- Negative troponin
- Non-specific ECG changes

**NSTE MI**
- Elevated troponin
- ST depression
- T-wave inversion

**STEMI**
- Elevated troponin
- ST Elevation

Type I
Epidemiology

• ~800,000 ACS cases in the U.S. each year
• ~70% are NSTEMI
• Median age = 68
• Male : Female = 3:2
• Women with ACS are less likely to have obstructive CAD
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It starts with the history

- Chest pain
  - Retrosternal can radiate to neck, arms, jaw
- Dyspnea is most common anginal equivalent
- Atypical symptoms in elderly, women
  - GI symptoms, pleuritic chest pain
Atypical symptoms can still be ACS

Multicenter Chest Pain Study:

Acute ischemia was diagnosed in 22% of patients who presented to the ED with sharp or stabbing pain and in 13% of those with pleuritic pain.

7% of patients whose pain was reproduced with palpation had ACS.

NTG responsiveness:

Henrikson et al. Ann Intern Med 2003. NTG relieved pain in 35% of ACS cases and 41% of non-ACS cases.
The physical exam

• Can be normal
• Look for signs of CHF
• Ischemia can cause an S4
• Ischemic MR
• Look for other causes: pericarditis, dissection, PTX
The ECG

• Normal in ~1-6% of cases
• T wave inversions
• ST depression
• Transient ST elevation
• Repeat ECG
• LVH, Bundle branch block, Paced rhythms can mask ischemia
Troponin

- Most sensitive and specific biomarker for NSTEMI
- Troponin T (binds troponin to tropomyosin)
- Troponin I (inhibits the interaction of myosin with actin)
- Troponin C (binding sites for Ca^{2+} that helps initiate contraction)
- Typically check every 6-8 hours; some advocate 3hr, 6hr.
High sensitivity troponin

- Troponin can be detected in almost all people
- Measured in nanograms/L
- FDA approved Jan 2017
- Quicker rule out
- Emphasis on ‘delta’ troponin
- More ‘MIs’
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Assessing risk: NSTEMI (Type I)

Tools:
TIMI-Risk Score (www.timi.org)
GRACE (www.outcomes-umassmed.org/grace/)
CALCULATORS

TIMI Risk Score Calculator for UA/NSTEMI

Age ≥ 65 years?  ✔ Yes (+1)
≥ 3 Risk Factors for CAD?  ✔ Yes (+1)
Known CAD (stenosis ≥ 50%)?  ✔ Yes (+1)
ASA Use in Past 7d?  ✔ Yes (+1)
Severe angina (≥ 2 episodes w/in 24 hrs)?  ✔ Yes (+1)
ST changes ≥ 0.5mm?  ✔ Yes (+1)
+ Cardiac Marker?  ✔ Yes (+1)

Score: 7 points

What does this score mean?
41% risk at 14 days of: all-cause mortality, new or recurrent MI, or severe recurrent ischemia requiring urgent revascularization.
# GRACE Risk Score

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>65 years</td>
</tr>
<tr>
<td>Heart rate/pulse</td>
<td>99 beats/min</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>140 mm Hg</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.5 mg/dL</td>
</tr>
<tr>
<td>Cardiac arrest at admission</td>
<td>No</td>
</tr>
<tr>
<td>ST segment deviation on EKG?</td>
<td>No</td>
</tr>
<tr>
<td>Abnormal cardiac enzymes</td>
<td>No</td>
</tr>
<tr>
<td>Killip class (signs/symptoms)</td>
<td>No CHF</td>
</tr>
<tr>
<td></td>
<td>Rales and/or JVD</td>
</tr>
</tbody>
</table>
To cath or not to cath.....and when to transfer

- Ischemia-guided strategy
- Immediate invasive (within 2h)
- Early invasive (within 24h)
- Delayed invasive (within 25-72h)
Ischemia-guided strategy

• Low risk risk score (TIMI 0 or 1, GRACE < 109)
• Low risk Tn-negative female patients
• Patient or clinician preference in the absence of high risk features
Immediate invasive (within 2 hours)

- Refractory angina
- Heart failure or worsening MR
- Hemodynamic instability
- Recurrent rest symptoms or with low level activity despite intensive medical Rx
- Sustained VT/VF
Early Invasive (within 24hrs)

- GRACE > 140
- Temporal change in troponin
- New ST depression
Delayed invasive (within 25-72h)

- Reduced EF (<40%)
- PCI within prior 6 months
- Prior CABG
- TIMI $\geq 2$; GRACE 109-140
- Renal insufficiency
- DM
Medical therapy

• ASA
• Metoprolol, Statin, Nitrates
• ACE inhibitor (DM, reduced LVEF)
• Heparin
• $\text{P2Y}_{12}$ inhibitor (only Clopidogrel or Ticagrelor pre-cath)
• IIb/IIIa inhibitors (rarely used in current era)
Revascularization

- Lower threshold for revascularization in ACS than in stable angina
- PCI vs CABG
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The “demand” MI

- Can be up to ~30-50% of all MIs in the hospital
- Older, sicker, with more comorbidities
- Increased 6 month and 2 year mortality
- Longer hospital stays
- Treatment is largely extrapolated from ACS recommendations
- Lack of clinical trial data
Management: Type II or Demand NSTEMI

- Can be difficult to distinguish
- Address precipitating factor (i.e. anemia, sepsis, etc.)
- ASA 81mg qd
- Consider beta blocker
- Consider statin therapy
- Echocardiogram
- Reasonable to consider stress testing (inpatient vs. outpatient) depending on context
- Close outpatient follow-up given higher morbidity/mortality
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Determinants of Health

• Smoking
• Unhealthy diet
• Physical inactivity
• EtoH use

These 4 lifestyle factors account for 40% of all deaths
What Makes Us Healthy

- Genetics 20%
- Environment 20%
- Healthy Behaviors 50%
- Access to Care 10%

What We Spend On Being Healthy

- Medical Services 88%
- Healthy Behaviors 4%
- Other 8%

Source: Bipartisan Policy Center, “F” as in Fat: How Obesity Threatens America’s Future (TFAH/RWJF, Aug. 2013)
Diet: a constantly moving target

<table>
<thead>
<tr>
<th>Summary of heart-harmful and heart-healthy foods/diets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evidence of harm; limit or avoid</strong></td>
</tr>
<tr>
<td>Coconut oil and palm oil are high in saturated fatty acids and raise cholesterol</td>
</tr>
<tr>
<td>Eggs have a serum cholesterol-raising effect</td>
</tr>
<tr>
<td>Juicing of fruits/vegetables with pulp removal increases caloric concentration*</td>
</tr>
<tr>
<td>Southern diets (added fats and oils, fried foods, eggs, organ and processed meats, sugar-sweetened drinks)</td>
</tr>
<tr>
<td><strong>Inconclusive evidence; for harm or benefit</strong></td>
</tr>
<tr>
<td>Sunflower oil and other liquid vegetable oils</td>
</tr>
<tr>
<td>High-dose antioxidant supplements</td>
</tr>
<tr>
<td>Juicing of fruits/vegetables without pulp removal*</td>
</tr>
<tr>
<td>Gluten-containing foods (for people without gluten-related disease)</td>
</tr>
<tr>
<td><strong>Evidence of benefit; recommended</strong></td>
</tr>
<tr>
<td>Extra-virgin olive oil reduces some CVD outcomes when consumed in moderate quantities</td>
</tr>
<tr>
<td>Blueberries and strawberries (&gt;3 servings/week) induce protective antioxidants</td>
</tr>
<tr>
<td>30 g serving of nuts/day. Portion control is necessary to avoid weight gain.†</td>
</tr>
<tr>
<td>Green leafy vegetables have significant cardioprotective properties when consumed daily</td>
</tr>
<tr>
<td>Plant-based proteins are significantly more heart-healthy compared to animal proteins</td>
</tr>
</tbody>
</table>

Exercise post MI

Cardiac rehab lowers the risk of death after MI by 20-30% at 5 years
What is CARDIAC REHABILITATION?

1. **Regular Exercise**
   - From supervised activities to a daily walk in the park, the idea is to get moving.

2. **Adopt a Heart Healthy Diet**
   - This includes meals that are low in salt and rich in whole grains, fruits, vegetables, low-fat meats and fish.

3. **Reduce Stress**
   - Learn to control your daily stress through relaxation techniques, recreation, music and other various methods.

4. **Medical Therapy**
   - Follow your doctor’s instructions carefully and take your medications as directed.

5. **Stop Smoking**
   - Most cardiac rehab programs offer methods to help you kick this harmful habit.

For more information, visit [CardioSmart.org/CardiacRehab](http://CardioSmart.org/CardiacRehab)
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Duration of DAPT (Dual Anti-platelet Therapy)

For ACS (STEMI, NSTEMI):

• 1 year of DAPT (ASA + P2Y12 inhibitor)
• Makes no difference if bare metal stent, drug eluting stent, or CABG

For stable coronary artery disease:

• Minimum 1 month of DAPT if bare metal stent
• Minimum of 6 months of DAPT for drug

Glenn N. Levine et al. JACC 2016;68:1082-1115
DAPT: timing of non-cardiac surgery

For Drug eluting stents:

• After 6 months can stop P2Y12 inhibitor (i.e. Clopidogrel)

• In some patients can stop P2Y12 inhibitor after 3 months

For Bare metal stents:

• After 1 month can stop P2Y12 inhibitor

Glenn N. Levine et al. JACC 2016;68:1082-1115
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Statins – after ACS

Moderate to High Intensity Statin

• Atorvastatin 40-80mg QD
• Rosuvastatin 20-40mg QD
Increased LDL receptors \( \rightarrow \) Increased LDL clearance \( \rightarrow \) Lower LDL
PCSK-9 inhibitors in Acute Coronary Syndrome

MACE: CHD death, non-fatal MI, ischemic stroke, or unstable angina requiring hospitalization

HR 0.85
(95% CI 0.78, 0.93)
P = 0.0003

ARR* 1.6%

NNT = 63

*Based on cumulative incidence
PLEASE!

Only you can prevent heart attacks
Thank you!
Triple therapy
Primary Endpoint

Hazard ratio 0.85
(95% CI, 0.79-0.92)
P<0.0001

NNT = 74
### Primary efficacy outcome

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Dabigatran n=877 no. (%)</th>
<th>Placebo n=877 no. (%)</th>
<th>HR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>composite of vascular death and nonfatal MI, non-hemorrhagic stroke,</td>
<td>97 (11)</td>
<td>133 (15)</td>
<td>0.72 (0.55-0.93)</td>
<td>0.012</td>
</tr>
<tr>
<td>peripheral arterial thrombosis, amputation, and symptomatic VTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- There was no significant effect of omeprazole study drug on results of dabigatran primary efficacy analysis (interaction P=0.79)
P-value = 0.012
## Secondary efficacy outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Dabigatran</th>
<th>Placebo</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=877 no. (%)</td>
<td>n=877 no. (%)</td>
<td></td>
</tr>
<tr>
<td>Vascular mortality</td>
<td>52 (6)</td>
<td>64 (7)</td>
<td>0.80 (0.56-1.16)</td>
</tr>
<tr>
<td>All cause mortality</td>
<td>100 (11)</td>
<td>110 (13)</td>
<td>0.90 (0.69-1.18)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>35 (4)</td>
<td>43 (5)</td>
<td>0.80 (0.51-1.26)</td>
</tr>
<tr>
<td>Cardiac revascularization</td>
<td>32 (4)</td>
<td>21 (2)</td>
<td>1.53 (0.88-2.65)</td>
</tr>
<tr>
<td>Non-hemorrhagic stroke</td>
<td>2 (&lt;1)</td>
<td>10 (1)</td>
<td>0.20 (0.04-0.90)</td>
</tr>
<tr>
<td>Peripheral arterial thrombosis</td>
<td>0 (0)</td>
<td>4 (1)</td>
<td></td>
</tr>
<tr>
<td>Amputation</td>
<td>18 (2)</td>
<td>26 (3)</td>
<td>0.70 (0.38-1.27)</td>
</tr>
<tr>
<td>Symptomatic VTE</td>
<td>8 (1)</td>
<td>17 (2)</td>
<td>0.47 (0.20-1.08)</td>
</tr>
<tr>
<td>Rehospitalization for vascular reason</td>
<td>113 (13)</td>
<td>130 (15)</td>
<td>0.86 (0.67-1.11)</td>
</tr>
</tbody>
</table>
A 72 yoF presents to the ED for evaluation of neck and shoulder pain. 2 weeks in duration, occurring with activity, lasting 5-10 minutes and resolving with rest. During the episodes of pain, she notes associated shortness of breath and diaphoresis. She had episodes of yesterday and today; today’s episode occurred at rest and has continued for approximately 30 minutes.  Medical history is significant for **hypertension** and **Type II DM**. Sister underwent CABG at age 62. Medications include ASA, HCTZ, Metformin.

On exam she is afebrile, HR 80 bpm, RR 12/min. Normal carotid upstroke without bruits. Normal JVP, S1S2, no murmurs. Lungs are clear, no peripheral edema.

**Serum troponin I is 2.0 ng/mL.** Other laboratory findings are within normal limits. ECG shows sinus, isolated PVCS, bigeminy, 2 mm **ST depression in leads II, III, AVF**, and no Q waves.