Management of the Chest Pain Patient in the ED in 2016

Management of the Chest Pain Patient in the ED in 2017

Disclosures

• Astra Zeneca – Advisory Board
• Relypsa – Advisory Board
“The best in this kind are but shadows…”

*Shakespeare, Midsummer Night’s Dream*

---

**Conflicts**

My only conflicts are **inner** conflicts

and I don’t care to share them!

---

**Approach to the Patient with Chest Pain in the ED**

- Magnitude of the problem
- Goal of evaluation
- Identification of low risk
- “Confirmatory” tests
- CPU and accelerated diagnostic protocols
Low Risk Chest Pain

- Magnitude of the problem
- Goal of evaluation
- Low risk
- “Confirmatory” tests
- CPU and accelerated diagnostic protocols

Magnitude of the Problem

- >7,000,000 ED visits/yr in US for chest pain
- Minority are for CVD
- Usually no specific diagnosis, no M&M
- Single largest group of patients
  - Anxiety, panic, somatoform disorder

National Trend in Admissions for Chest Pain Evaluation: 2006-2013

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ED chest pain evaluations:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2006 5.4 million</td>
</tr>
<tr>
<td></td>
<td>2013 7.1 million</td>
</tr>
</tbody>
</table>

Spectrum of Patients Presenting to ED with Acute Chest Pain (>7,000,000/yr)

- STEMI: <5%
  - Reperfusion
- Non-STE ACS: 20-30%
  - Antiischemic Rx
- Low Risk Chest Pain: 65-75%
  - Accelerated Dx Protocol (ADP)
Goal

• To exclude acute CVD event

• Not to exclude CAD!!!

• Confirm safety of discharge
  – For outpatient management

Avert:

Inappropriate Discharges

Missed ACS (2.3%, Pope, NEJM 2000)

Medicolegal liability

Inappropriate Admissions

Inefficient resource utilization

Major expense to system
Low Risk Chest Pain

- Magnitude of the problem
- Goal of evaluation
- Low risk
- “Confirmatory” tests
- CPU and accelerated diagnostic protocols

Spectrum of Patients Presenting to ED with Acute Chest Pain

<table>
<thead>
<tr>
<th>Type of Chest Pain</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEMI</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Non-STE ACS</td>
<td>20-30%</td>
</tr>
<tr>
<td>Low Risk Chest Pain</td>
<td>65-75%</td>
</tr>
</tbody>
</table>

Acute CP Evaluation: Low Risk

<5% Probability of ACS
- History – Typical or atypical CP
- Exam – Clinically stable
- ECG – Normal (or unchanged)
- Troponin - Negative (x1-2)

Low Risk Is Not No Risk

“Confirmatory” test to further reduce risk

- Intermediate Risk - >65 yo, DM, CKD, CAD
Acute Chest Pain Evaluation

• Goal of evaluation
• Magnitude of the problem
• Low risk
• “Confirmatory” tests
• CPU and accelerated diagnostic protocols

Scientific Statement of the American Heart Association

“Confirmatory” Tests

• Functional
  – Treadmill Ex-T  >99%
  – MPS (sestamibi, stress) >99%
  – Stress Echo  ~95%

• Anatomic
  – CTCA  >99%
  – (MRI)
“Confirmatory” Tests

• Functional  Neg. Predictive Value
  – Treadmill Ex-T  >99%
  – MPS (sestamibi, stress)  >99%
  – Stress Echo  ~95%

• Anatomic
  – CTCA  >99%
  – (MR)

Treadmill Exercise Testing in CPUs

<table>
<thead>
<tr>
<th>Study</th>
<th>No. Pts</th>
<th>% Pos</th>
<th>Neg PV</th>
<th>Pos PV</th>
<th>Adverse Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsakonis</td>
<td>28</td>
<td>17.8</td>
<td>100%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Kerns et al</td>
<td>32</td>
<td>0</td>
<td>100%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Lewis/Amsterdam</td>
<td>93</td>
<td>13.0</td>
<td>100%</td>
<td>46%</td>
<td>0</td>
</tr>
<tr>
<td>Gibler et al</td>
<td>782</td>
<td>1.2</td>
<td>99%</td>
<td>44%</td>
<td>0</td>
</tr>
<tr>
<td>Gibler et al</td>
<td>100</td>
<td>7</td>
<td>100%</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Zalenski</td>
<td>224</td>
<td>8</td>
<td>98%</td>
<td>16%</td>
<td>0</td>
</tr>
<tr>
<td>Polanczyk</td>
<td>278</td>
<td>4</td>
<td>98%</td>
<td>15%</td>
<td>0</td>
</tr>
<tr>
<td>Kirk et al</td>
<td>212</td>
<td>12.5</td>
<td>90%</td>
<td>4%</td>
<td>0</td>
</tr>
<tr>
<td>Amsterdam et al</td>
<td>1000</td>
<td>13</td>
<td>98%</td>
<td>33%</td>
<td>0</td>
</tr>
</tbody>
</table>

30 d-1 yr

Accelerated diagnostic protocol (ADP)

• Serial ECGs
• Cardiac injury markers (Tn)
• (Confirmatory test)
• LOS 2-12 hrs
Acute Chest Pain Evaluation

• Goal of evaluation
• Magnitude of the problem
• Low risk
• “Confirmatory” tests
• CPU and accelerated diagnostic protocols

Chest Pain Unit

• Physical structure
• “Virtual” Unit (UCDMC)
  – Accelerated diagnostic protocol (ADP)
    • Serial ECGs
    • Cardiac injury markers
    • LOS 2-12hrs

Accelerated Diagnostic Protocol

ED
Clinically Stable
Negative ECG/Markers

Low Risk

CPU

Accelerated Diagnostic Protocol

CPU
Serial ECGs, Markers (1-2 sets)

To exclude ischemia/necrosis at rest
**Accelerated Diagnostic Protocol**

**CPU**
Serial ECGs, Markers (1-2 sets)

if negative

“Confirmatory” test

---

**UCDMC CPU**

- >20 years, >10,000 patients
  - Elderly/young, M/F, +/- CAD, antianginal drugs, DM, CKD
  - TIMI risk score *not applied* in CPU patients

- **ACC/AHA guidelines**
  - ETT
    - If ECG WNL and patient can exercise
    - 1/3 of our patients require a different test
    - Negative Predictive Value 99.7%
    - (No confirmatory test?)
  - At other ctrs - MPS, Stress Echo, CTA
**Early ETT: Exercise-Induced Chest Pain?**

- **N = 318**
- **2.0%**

**Accelerated Dx Protocol in Low Risk Women Presenting with CP**

- **N = 212, <50 yo, no DM/smoking**
- **ED - Clinically stable, normal ECG and markers**
- **ETT or stress imaging - 171, No Confirmatory Test = 41**
- **Neg CPU evaluation in all patients, all directly discharged**
- **5 yr FU 2 fatalities (PPCM, pancreatitis)**
- **Conclusion: All CP patients do not require confirmatory testing**

**Evolving Concepts in CPU Evaluation**

- **“Avoidable Utilization of the CPOU: Evaluation of Very Low Risk Patients”, Mahler et al, CritPathCard 12:59;2013**
- **2 hr ADP, No Predischarge Test**
  - **TIMI score 0, ECG neg, hs-Ti neg at 0 and 2 hr.**
  - **NPV >99.6% at 30 days. Than, Lancet, 2012**
In the current state of our knowledge, it is reasonable to call for a halt to routine cardiac testing in favor of physician discretion in selection of patients for predischARGE testing.

- If low risk criteria fulfilled
  - 40% pts discharged with no confirmatory test
  - LOS in CPU 2-12 hr
  - NPV >99.7% at 30 d. FU (1 event in 1138 pts)
CTA in the ED

- 12 studies (2005-2012)
- N = 5865 pts, 30-81 y.o.
- NPV 96-100% (ED and >1 yr)
- PPV 13-87%
- LOS 7-21 hrs
- Radiation 5-18 mSv

ROMICAT

- ED ETT – 99.7% NPV
- Discharge in <6 hr.
- Cost $1200 (UCMC)

38% of patients did not qualify for CTCA

Radiation

- 10-20 mSv exposure = 1 new Ca for every 500-1000 scans

CTA in ED – Exclusions

<table>
<thead>
<tr>
<th>Condition</th>
<th>CTA</th>
<th>ETT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD, h/o MI, PCI or CABG</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CKD</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>COPD</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Allergy to contrast/ shellfish</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>BMI ≥39 kg/m²</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Contraindication to β-blocker</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Inability to hold breath</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CT imaging within past 48 hours</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Normal CTA/cor angiography in prev year</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Cocaine use within past 48 hours</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Radiographic abnormalities</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>HR &gt;90 bpm</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
CTA in ED

Exclusions

12%  50%  52%

(More than half of studies do not include % exclusions)

Standard of Care?

CTA for Chest Pain Patients in the ED

The gold standard

OR...

The Midas touch?

CTA: Issues

• NPV
  – Equal to (not higher than) usual protocols in low/intermediate risk pts

• LOS
  – Shorter than usual care
  – But longer than No Test protocols and ADPs

• Cost
  – Immediate cost less than usual care
  – But not less than ADPs or No Test protocols
  – Downstream $ may be higher with no benefit

• Radiation
  – Not negligible

• CTA as screening test for low/intermediate risk CP pts
  – Medically and scientifically not justifiable
Summary

• Low/interm risk - ID on presentation

• Goal – Exclude ACS (not exclude CAD)

• Evaluation - ADP, Confirmatory test

• All patients do not require confirmatory test

• CTA – Selected patients only!