Getting to the Heart of the Matter

Emergency Cardiology Literature Update

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(NOT a Cabernet)
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No Financial Disclosures
Outline

We will discuss recent literature pertaining to...

• NSTE-ACS (and cardiac arrest)
• 2 ECG topics
• HPI in chest pain

Questions? → amalmattu@comcast.net
PDF of slides → lectures.umem.org/Mattu
(will be posted for 1 month only)
But first...

Email:
“I told my cardiologist/hospitalist about ___ new practice/drugfinding from the literature and they said they never heard of it and were mad at me for doing ___.”
But first...


- How long does it take for evidence-based findings to be incorporated into clinical practice?
But first...

Translation of ACS Therapies to Practice

• Authors identified 11 Class IA therapies in the ACC/AHA Guidelines
• Looked back at cited evidence for when the pivotal clinical trials (PCTs) were pub’d
• How long before the recommendations were incorporated into clinical practice with at least (70% or) 90% compliance
But first...

Translation of ACS Therapies to Practice

• Results...
  – “The time of PCT publication to meaningful uptake of class IA ACS therapies into clinical practice took a median of ___ years.”
16 years!
But first...

Translation of ACS Therapies to Practice

<table>
<thead>
<tr>
<th>STEMI Tx’s</th>
<th>PCT to Guideline</th>
<th>Guideline to 70% uptake</th>
<th>Guideline to 90% uptake</th>
</tr>
</thead>
<tbody>
<tr>
<td>aspirin</td>
<td>2 yrs</td>
<td></td>
<td>14 yrs</td>
</tr>
<tr>
<td>tPA</td>
<td>8 yrs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UFH</td>
<td>13 yrs</td>
<td></td>
<td>17 yrs</td>
</tr>
<tr>
<td>BBs</td>
<td>4 yrs</td>
<td>10 yrs</td>
<td>15 yrs (pre-2005)</td>
</tr>
<tr>
<td>ACEIs</td>
<td>2 yrs</td>
<td>9 yrs</td>
<td></td>
</tr>
</tbody>
</table>
But first...

- Takehome points:
But first...

• **Takehome points:**
  – Don’t get frustrated!
  – Share the literature with your colleagues upstairs
But first...

- Takehome points:
ILLITERATE?
WRITE FOR FREE HELP.

ILLITERACY FOUNDATION
806 MAIN STREET
Case 1

- 45 yo man presents to the ED with atypical chest pain, wife present
- In room for 20 minutes, then...
- Diaphoretic
Case 1

- 45 yo man presents to the ED with atypical chest pain, wife present
- In room for 20 minutes, then...
- Diaphoretic
- Clutches chest
Case 1

- 45 yo man presents to the ED with atypical chest pain, wife present
- In room for 20 minutes, then...
- Diaphoretic
- Clutches chest
- Unresponsive
Case 1

• 45 yo man presents to the ED with atypical chest pain, wife present
• In room for 20 minutes, then...
• Diaphoretic
• Clutches chest
• Unresponsive
• Monitor...
Case 1

• You do…
  – Good compressions
  – Slow bagging
Case 1

- Patient gets ROSC but still unconscious
- (Pre- or) Post-arrest ECG...
Case 1

- (Pre- or) Post-arrest ECG...
Case 1

• Do you activate the cath lab?? At 1am?
STEMI + Cardiac Arrest


- STEMI patients post-arrest → cath
  - Class IB indication
Case 1...what if...
Case 1...what if...

- ECGs show non-STE-ACS...activate cath lab?
Case 1...what if...

- ECGs show non-STE-ACS...activate cath lab?
NSTE-ACS + Cardiac Arrest

Coronary Angiography Predicts Improved Outcome Following CA

• 241 pts, 40% received cath.
Coronary Angiography Predicts Improved Outcome Following CA (Reynolds, et al. J Int Care Med 2009)

- Improved survival and outcome associated with cath, regardless of...
  - Presenting rhythm
  - Presence of STEMI or new LBBB
  - Neurologic status
- Cath independently associated with good outcome
Recent Advances in CPR
(Ewy, et al. J Am Coll Cardiol 2009)

• Urgent cardiac catheterization
  – The most influential factor in survival
  – Regardless of whether or not STEMI!
Cath all post-arrest survivors?

- Larsen, Resuscitation 2012
- Zanuttini, Am J Cardiol 2012
- Chelly, Resuscitation 2012
- Hollenbeck, Resuscitation 2014

- Post-arrest patients benefit from urgent cath unless there’s an obvious non-cardiac cause
NSTEMI-ACS + Cardiac Arrest

Predictive value of ECG in diagnosing acute coronary artery lesions among patients with OOHCA
(Zanuttini, et al. Resuscitation 2013)

- The ECG after cardiac arrest is a poor detector of acute culprit lesions, therefore do not rely on seeing STE
NSTE-ACS + Cardiac Arrest

NSTE-ACS + Cardiac Arrest


- Urgent/immediate invasive strategy (within 2 hours) is indicated for NSTE-ACS patients that develop hemodynamic or electrical instability, e.g. VT or VF (Class I, level of evidence A)
Cardiac Arrest

Historical advances in Tx of cardiac arrest

- 1980s-1990s → rapid defibrillation
- Early 2000s → therapeutic hypothermia
- 2010s → rapid PCI
ACS + Cardiac Arrest

Takehome points:
• Post-arrest STEMI → cath lab activation (Class I)
• Post-arrest non-STE-ACS → cath lab activation (Class I)
ACS + Cardiac Arrest

Takehome points:
• Post-arrest STEMI $\rightarrow$ cath lab activation (Class I)
• Post-arrest non-STE-ACS $\rightarrow$ cath lab activation (Class I)

• But use your judgment!
• Create the protocol with cardiology before it happens!
WHOEVER IS PRAYING FOR SNOW PLEASE STOP
COMPLAINT DEPARTMENT
PLEASE TAKE A NUMBER
NSTE-ACS Guidelines (Misc. Key Points)

2014 AHA/ACC Non-STE ACS Guidelines
(Amsterdam, et al. Circulation 2014)
ACST-ACS Guidelines (Misc. Key Points)


• ACS with negative TN does still exist!
  – HPI and ECG are still critical
NSTE-ACS Guidelines (Misc. Key Points)

2014 AHA/ACC Non-STE ACS Guidelines
(Amsterdam, et al. Circulation 2014)

- Urgent invasive treatment (“within 2 hours”) recommended for NSTE-ACS if...
NSTE-ACS Guidelines (Misc. Key Points)


- Urgent invasive treatment ("within 2 hours") recommended for NSTE-ACS if...
  - Intractable ischemia
  - Acutely decompensating heart failure
  - Hemodynamic or electrical instability
NSTE-ACS Guidelines (Misc. Key Points)

Urgent cath if refractory ischemia? When?
NSTE-ACS Guidelines (Misc. Key Points)

Takehome points:
- ACS is diagnosed with HPI, ECG, and TNs
Takehome points:
• ACS is diagnosed with HPI, ECG, and TNs
• Urgent cath (within 2 hours) for very high-risk NSTE-ACS (Class I)
  – Refractory ischemia
  – Decompensating CHF
  – Hemodynamic or electrical instability
Case 2

- 58 yo man presents to the ED c/o CP, nausea, and dyspnea
- VS: Afebrile, HR 70, RR 22, 145/90, 97%
- Exam: uncomfortable
  - Normal cardiopulmonary exam
  - ECG...
Question…

- Aside for ASA and NTG, what do you do next?
Aside for ASA and NTG, what do you do next?
1. Activate the cath lab
2. Treat the patient with lytics
3. Start heparin, admit to CCU
4. Do another ECG
5. Discharge home on ibuprofen
Aside for ASA and NTG, what do you do next?
1. Activate the cath lab
2. Treat the patient with lytics
3. Start heparin, admit to CCU
4. Do another ECG
5. Discharge home on ibuprofen
Question…

- Aside for ASA and NTG, what do you do next?
  1. Activate the cath lab
  2. Treat the patient with lytics
  3. Start heparin, admit to CCU
  4. Do another ECG → but why?
  5. Discharge home on ibuprofen
Posterior MI ("inferolateral MI")
Posterior MI

Reperfusion Times and In-Hospital Outcomes Among Patients with an Isolated Posterior MI (Waldo, et al. Am Heart J 2014)

Difficult ECGs in STEMI: Lessons Learned From Serial Sampling of Pre- and In-Hospital ECGs (Ayer, et al. J Electrocardiol 2014)

Pitfalls in Diagnosing ST Elevation Among Patients with Acute Myocardial Infarction (Wei, et al. J Electrocardiol 2013)

Clinical Characteristics and Reperfusion Times Among Patients with an Isolated PMI (Waldo, et al. J Invasive Cardiol 2013)
Posterior MI

- Posterior MIs are the most common type of missed STEMI
  - Often misdiagnosed as just ischemia or NSTE-ACS
  - Only 30% are revascularized within 90 min
Anteroseptal ischemia?
Isolated Posterior MI
Posterior MI

- ST depression in anteroseptal leads
  - Anteroseptal ischemia
  - Posterior STEMI
  - Miscellaneous
    - RBBB
    - Hypokalemia
    - Etc.
Posterior MI

• ST depression in anteroseptal leads
  – Anteroseptal ischemia
  – Posterior STEMI
  – Miscellaneous
    • RBBB
    • Hypokalemia
    • Etc.
Posterior MI

- ECG changes
  - Usually associated with inferior or lateral MI due to RCA or circumflex occlusion but...
  - 4-10% of STEMIIs are isolated PMIs
Posterior MI

• ECG changes
  – Usually associated with inferior or lateral MI due to RCA or circumflex occlusion but...
  – 4-10% of STEMIIs are isolated PMIs
  – Mirror image of septal STEMI in leads V1-V3
## Septal STEMI vs. Posterior STEMI

*ECG Changes in Leads V1-V3*

<table>
<thead>
<tr>
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## Septal STEMI vs. Posterior STEMI

**ECG Changes in Leads V1-V3**

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<td></td>
<td>Ts</td>
<td></td>
</tr>
<tr>
<td>Posterior STEMI</td>
<td>STD</td>
<td>Upright</td>
<td>Tall Rs develop over</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ts (may be</td>
<td>hours</td>
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<td></td>
<td></td>
<td>inverted early)</td>
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Inferior-posterior MI
Inferior-posterior MI (after 2 hours)
Isolated PMI
Isolated PMI

Courtesy Bill Brady, MD
Isolated PMI — Posterior Leads

v1, v2, v3, v4, v5, v6

Precordial Lead Placement
Isolated PMI — Posterior Leads
Isolated PMI — Posterior Leads

Courtesy Bill Brady, MD
Anteroseptal ischemia?
Isolated PMI!
Isolated PMI — Posterior Leads
Anteroseptal ischemia?
Early PMI
Computer: “Possible anterior subendocardial injury”
PMI: V1-5 wrapped around left mid-back
Isolated Posterior MI
Early PLMI — Posterior Leads (V3-V6)
Posterior MI

- 3rd Universal Definition of MI (2012) already recommends consideration of STD in $V_{1-3}$ (or $V_{-4}$) as STEMI equivalent
Posterior MI

- 3rd Universal Definition of MI (2012) already recommends consideration of STD in $V_{1-3}$ (or $V_{4}$) as STEMI equivalent
- Especially if tall Rs, especially if upright Ts
- Posterior leads will increase specificity for PMI
Takehome points:
– ST depression in the anteroseptal leads might represent posterior STEMI
– Get posterior leads!
Summary So Far...

- Be aggressive about cath in high-risk NSTE-ACS...including post-arrest
  - Discuss this literature with your cardiologists
- Always consider posterior STEMI whenever you see ST depression in V_{1-3}
  - Get posterior leads!
- PDF of slides ➔ lectures.umem.org/Mattu (will be posted for 1 month only)
Things I hate:
1. Vandalism
2. Irony
3. Lists.
Case 3

Courtesy Dr. Tareq Al-Salamah

• PG-3, UMMC
Case 3

- 42 yo M presents with chest pain
  - History of HIV, cigarette smoking
  - Developed CP while playing basketball
  - Chest pain, diaphoresis, dyspnea
Prehospital ECG
Case 3

- Patient received ASA and SL NTG x 2
- Symptoms resolved
- ECG...
ECG on arrival
Case 3

- What’s your plan now?
  - Thrombolytics?
  - Activate cath lab?
  - Cardiology consult?
  - Admit for ACS evaluation?
Case 3

- What’s your plan now?
  - Thrombolytics?
  - Activate cath lab?
  - Cardiology consult?
  - Admit for ACS evaluation?
  - Send to WR, go eat your lunch
STE Resolution

Prevalence and Interventional Outcomes of Patients With Resolution of ST-segment Elevation Between Prehospital and In-hospital ECG

(Ownbey, et al. Preshosp Emerg Care 2014)
STE Resolution Between Prehospital and In-hospital ECG

- Compared cases of patients with resolved STE vs. persistent STE at cath
- 22% of cases of STE had resolution by arrival
- Results...
STE Resolution Between Prehospital and In-hospital ECG

Resolved vs. Persistent

- > 95% occlusion: 65% vs. 85%
- > 50% occlusion: 94% vs. 97%
Case 3

- Patient went rapidly to cath lab
  - 90% acute LAD occlusion successfully stented
STE Resolution

STE Resolution Between Prehospital and In-hospital ECG

• Takehome points:
  – Resolved STEMI is still high risk
  – Cath lab activation is reasonable, warranted
Summary So Far...

- Be aggressive about cath in high-risk NSTE-ACS...including post-arrest
- Consider posterior STEMI and get posterior leads whenever you see ST depression in V$_{1-3}$
- STEMI that resolves without much major intervention is still high risk!
- PDF of slides ➔ lectures.umem.org/Mattu (will be posted for 1 month only)
I see you've scratched your pinky toe....It's a good thing you've come to the ER for that. If you could just push that stroke victim out of your way we will operate ASAP

your ecards
someecards.com
Case 4

45 yo man presents with chest tightness this AM while at work (at rest).
- Mild SOB, nausea, lightheaded
- No sweats, radiation, vomiting
- Resolved after 20 minutes, now asymt.
Case 4

45 yo man presents with chest tightness this AM while at work (at rest).

- Mild SOB, nausea, lightheaded
- No sweats, radiation, vomiting
- Resolved after 20 minutes, now asymp.
- History of CAD, “feels like my prior MI”
- ECG: NSJ
Case 4

What’s your plan?
1. Admit for workup
2. Rule out MI and get outpatient stress
3. Rule out MI and discharge
4. Discharge without workup
Case 4

• This patient was admitted, full workup was negative for ACS.

• What historical features are useful??
ACS vs. Non-ACS Presentations

ACS vs. Non-ACS Presentations

Summary of the data for patients with CP:

- Pressure, tightness, squeezing
- Pain occurring at rest
- “Like my prior ischemia”
- Associated SOB
- Associated lightheadedness
- Associated nausea
ACS vs. Non-ACS Presentations

Summary of the data for patients with CP:
- Pressure, tightness, squeezing
- Pain occurring at rest
- “Like my prior ischemia”
- Associated SOB
- Associated lightheadedness
- Associated nausea

All non-specific! No change in LRs
ACS vs. Non-ACS Presentations

4 factors decreased LR for rule-in for ACS
ACS vs. Non-ACS Presentations

4 factors decreased LR for rule-in for ACS

- Pain described as pleuritic
- Pain described as sharp
- Pain described as reproducible
- Pain described as positional

- Note that decrease ≠ rule out!
ACS vs. Non-ACS Presentations

4 factors increased LR for rule-in for ACS
4 factors increased LR for rule-in for ACS

- Pain that radiates
  - Bilateral > right >> left
- Pain with diaphoresis
  - Observed >> reported
- Pain with exertion
- Pain with vomiting (not nausea!)
ACS vs. Non-ACS Presentations

Takehome points:
ACS vs. Non-ACS Presentations

Takehome points:

- You must worry if patient had CP with radiation, diaphoresis, exertion, vomiting
Takehome points:

- You must worry if patient had CP with radiation, diaphoresis, exertion, vomiting
- If considering discharge home, ask about and document pleuritic, sharp, reproducible, positional
  - Document absence of the 4 “worries” also
Summary

- Be aggressive about cath in high-risk NSTE-ACS...including post-arrest
- Posterior leads for ST depression in V$_{1-3}$
- STE that resolves with simple treatment should still make you worry!
- Radiation, diaphoresis, vomiting, pain with exertion $→$ high risk for true ACS!
- PDF of slides $→$ lectures.umem.org/Mattu (will be posted for 1 month only)
Thanks!

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