Update in Hospital Medicine

October 13, 2018

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University of Oklahoma School of Community Medicine
Tulsa, OK
No Financial Disclosures
Agenda

- Sepsis
  - Establish an overview of Sepsis Timeline
  - Discuss sepsis definitions, guidelines, and reimbursement
  - Review new evidence

- Myocardial Infarction
  - Discuss 2018 Guideline Updates
  - Review a Chest Pain Protocol
  - List New MI Definitions

- Clostridium Difficile
  - Review 2018 Updated Guidelines
  - Discuss Eosinopenia Prediction Score
Sepsis
Sepsis Facts

- Leading Cause of Death
- 1.5 Million Cases
- 1 case every 20 seconds
- 20% Mortality
- 92% Community Origin
Surviving Sepsis Campaign

- Guidelines

- Sepsis-1, Sepsis-2, Sepsis-3
  - Definitions

- Medicare SEP-1
  - Reimbursement

Sepsis - Organizations
A 32 year-old female presented with nausea, vomiting, +
epigastric pain radiating to her back.
She drinks 1 pint of liquor daily.
+Murphy’s sign.
She is only oriented to person.

VS: T 38.0C     HR 105     RR 32     BP 89/ 50     O2 sat 88% RA

Labs:
Lipase >3x ULN
WBC 32,000 + 8% bands
Lactate 2.4 mmol/ L
Cr 1.6 mg/ dL

It is 2.5 hours since triage, **Do you start antibiotics?**
Sepsis Timeline

SIRS - MOD

- Sepsis-1
- Sepsis-2

EGDT = Usual Care

- Sepsis-3

1L 30 mL/kg

- SIRS

SS 1 SS 2 SS 3

- SOFA

SS 4

- SEP-1

- SEPSIS

Rivers, et al. EGDT (+)

ProCESS ARISE ProMISE

EGDT = Usual Care

Time2Tx

1-hr SS Update
Sepsis Definition
Sepsis Definitions

1991 Sepsis (Bone, Balk et al. 1992)

2001 Sepsis (Rivers, Nguyen et al. 2001)

2015 Severe Sepsis (Rivers, Nguyen et al. 2001)
2015: Definition
Sepsis-3

- SIRS
- Severe Sepsis
- SOFA
**Sepsis-3**

*Sepsis = SEVERE sepsis:*
A life threatening *dysfunction* caused by a dysregulated host response to infection.

**Organ dysfunction:**
SOFA *2 points* increase from baseline

**Septic Shock:**
Requiring Vasopressors with *Lactate >2 + MAP <65*
Absence of Hypovolemia

(Singer et al. 2016, JAMA)
A 32 year-old female presented with nausea, vomiting, + epigastric pain radiating to her back. She drinks 1 pint of liquor daily. +Murphy’s sign. She is only oriented to person.

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It is 2.5 hours since triage, **Do you start antibiotics?**
<table>
<thead>
<tr>
<th></th>
<th>Use</th>
<th>Required</th>
<th>Mortality Risk</th>
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</thead>
<tbody>
<tr>
<td>SIRS</td>
<td>Screen</td>
<td>WBC, HR, T, RR</td>
<td></td>
</tr>
<tr>
<td>SOFA</td>
<td>ICU**</td>
<td>ABG, Tbili, Cr, Plt, BP, GCS</td>
<td>2pts &gt; 10%</td>
</tr>
<tr>
<td>qSOFA</td>
<td>Non-ICU**</td>
<td>GCS, RR, BP</td>
<td>2:/3 Risk X3, 3:/3: Risk X14</td>
</tr>
</tbody>
</table>

SIRS/qSOFA = NON-ICU
SOFA = ICU

(Singer et al. 2016)
# Prognostic Accuracy of the Quick Sequential Organ Failure Assessment for Mortality in Patients With Suspected Infection

## A Systematic Review and Meta-analysis

Shannon M. Fernando, MD, MSc; Alexandre Tran, MD; Monica Taljaard, PhD; Wei Cheng, PhD; Bram Rochwerger, MD, MSc; Andrew J.E. Seely, MD, PhD; and Jeffrey J. Perry, MD, MSc

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>SIRS</td>
<td>88%</td>
<td>26%</td>
</tr>
<tr>
<td>qSOFA</td>
<td>61%</td>
<td>72%</td>
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</table>

qSOFA ICU Specificity = 33%

(Fernando et al. 2018, Ann Intern Med)
Sepsis Guidelines
Sepsis Guidelines

Fluids! Pressors! Blood!

EGDT

SS 1

'01

Rivers, et al.

EGDT (+)

SS 2

'03

SS 3

'08

1L

'12

30 mL/kg

SS 4

'14

EGDT

X

3-hr

1-hr

Time 2 Tx

SS Update

'16

'17

2018

ProCESS

ARISE

ProMISE

EGDT = Usual Care

Gabby

Rory
2013 NY Law
Rory’s Regulations
Sepsis Measures

https://rorystauntonfoundationforsepsis.org/
Gabby’s Law

- 2016 Illinois
- Gabby’s Law
- Sepsis Measures

https://www.sepsis.org/faces/gabriella-galbo/
The Rule of Rescue

“A single death is a tragedy, a million deaths is a statistic”

–J. Stalin

Who killed more than 17 million of his own Russian people
Time to Treatment and Mortality during Mandated Emergency Care for Sepsis

Antibiotics, Antibiotics, Antibiotics!

Mortality increases 14% Antibiotics >3hr

A 3-Hr Bundle

B Administration of Antibiotics

C Initial Bolus of Intravenous Fluids
1 hour bundle
A 32 year-old female presented with nausea, vomiting, + epigastric pain radiating to her back. She drinks 1 pint of liquor daily. +Murphy’s sign. She is only oriented to person.

VS: T 38.0C    HR 105    RR 32    BP 89/ 50    O2 sat 88% RA

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WBC 32,000 + 8% bands
Lactate 2.4 mmol/ L
Cr 1.6 mg/ dL

Guidelines: SIRS
1 hour Bundle!

It is 2.5 hours since triage, **Do you start antibiotics?**
Sepsis Reimbursement
Sepris Reimbursement

CMS

SEP-1

'15

SEP-1: Version 5.4

'18

(Pepper et al. 2018, Ann Intern Med)

3-Hour Bundle
- Blood Cultures
- Broad Spectrum Abx
- 30 mL/kg (hypotension)
- Lactate

6-Hour Bundle
- Remeasure Lactate > 2
- SHOCK
  - 2+ Hypotension - Pressor
  - Specific Bedside PE or
    - 2/4 Advanced Interventions

Severe Sepsis
- 2+ SIRS

Value Based Purchasing
2018 = 2% Medicare Reimbursement

- SBP < 90 Or MAP < 70
- Plt < 100K
- Cr > 2 OR UOP < 0.5
- Tbili > 2
- Lactate > 2
- INR > 1.5 or aPTT > 60s
CMS Hospital Value Programs

**Hospital Value Based Purchasing**
Rewards hospitals for improving the quality of care by redistributing payment among hospitals with higher quality performance than lower performing hospitals.

**Readmission Reduction Program**
Hospitals with excess readmissions receive a negative payment adjustment.

**Hospital Acquired Conditions**
Hospitals that rank in the worst performing quartile based on quality metrics receive a negative payment adjustment.

**Promoting Interoperability**
Electronic quality measures Pay for reporting.
### Affordable Care Act (ACA)

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Value Based Purchasing Program</th>
<th>Hospital Readmission Program*</th>
<th>Hospital Acquired Conditions Program*</th>
<th>Overall Potential Payment Reduction Risk</th>
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</thead>
<tbody>
<tr>
<td>2013</td>
<td>1%</td>
<td>1%</td>
<td>N/A</td>
<td>2%</td>
</tr>
<tr>
<td>2014</td>
<td>1.25%</td>
<td>2%</td>
<td>N/A</td>
<td>3.25%</td>
</tr>
<tr>
<td>2015</td>
<td>1.50%</td>
<td>3%</td>
<td>1%</td>
<td>5.50%</td>
</tr>
<tr>
<td>2016</td>
<td>1.75%</td>
<td>3%</td>
<td>1%</td>
<td>5.75%</td>
</tr>
<tr>
<td>2017</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>2018</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Potential Reduction in Payment by Fiscal Year
A 32 year-old female presented with nausea, vomiting, + epigastric pain radiating to her back. She drinks 1 pint of liquor daily. +Murphy’s sign. She is only oriented to person.

VS: T 38.0C     HR 105       RR 32       BP 89/ 50 O2 sat 88% RA

Labs: Lipase >3x ULN
       WBC 32,000 + 8% bands
       Lactate 2.4 mmol/ L
       Cr 1.6 mg/ dL

Yes!
3 hr bundle
Documentation: SIRS
Severe Sepsis

It is 2.5 hours since triage, **Do you start antibiotics?**
What do we do?

- Evidence Based Medicine
- Hospital Reimbursement
- Patient Outcomes
- Mix?
Students, How do you know you are on a surgery or medicine rotation?

– Fluid Selection
Balanced Crystalloids versus Saline in Noncritically Ill Adults

Wesley H. Self, M.D., M.P.H., Matthew W. Semler, M.D.,
Jonathan P. Wanderer, M.D., Li Wang, M.S., Daniel W. Byrne, M.S.,
Sean P. Collins, M.D., Corey M. Slovis, M.D., Christopher J. Lindsell, Ph.D.,
Jesse M. Ehrenfeld, M.D., M.P.H., Edward D. Siew, M.D.,
Andrew D. Shaw, M.B., Gordon R. Bernard, M.D.,
and Todd W. Rice, M.D., for the SALT-ED Investigators*
## Fluid Components

<table>
<thead>
<tr>
<th></th>
<th>Normal Saline</th>
<th>LR</th>
<th>Plasma-Lyte</th>
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<tbody>
<tr>
<td>Na+</td>
<td>154</td>
<td>130</td>
<td>140</td>
</tr>
<tr>
<td>K+</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ca2+</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Mg2+</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Cl -</td>
<td>154</td>
<td>109</td>
<td>98</td>
</tr>
<tr>
<td>Lactate</td>
<td>0</td>
<td>28</td>
<td>0</td>
</tr>
<tr>
<td>Osmolarity</td>
<td>308</td>
<td>275</td>
<td>294</td>
</tr>
<tr>
<td>pH</td>
<td>5.5</td>
<td>6.75</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>NS</td>
<td>Balanced</td>
<td>P value</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>Hospital Free Days</td>
<td>25</td>
<td>25</td>
<td>0.41</td>
</tr>
<tr>
<td>MAKE-30</td>
<td>5.6%</td>
<td>4.7%</td>
<td>0.01</td>
</tr>
<tr>
<td>AKI (&gt;Stage II)</td>
<td>8.6%</td>
<td>8.0%</td>
<td>0.14</td>
</tr>
<tr>
<td>In-Hospital Death</td>
<td>1.6%</td>
<td>1.4%</td>
<td>0.36</td>
</tr>
</tbody>
</table>

**MAKE - 30:** Major Adverse Kidney Event in 30 days (Death, Renal Replacement, 2x Cr @ Discharge)

**NNT = 111**

**CONFOUNDING:** Single Center
2017: Vitamin C and Sepsis

CITRIS-ALI: Phase 2

- Single Center, unblinded
- MICU + Severe sepsis/ Septic shock + Procalcitonin >2
- IV vitamin C 6g, thiamine, Hydrocortisone 50 q6

41% vs 9% (intervention)

(Marik et al. 2017, CHEST)
Sepsis Review

- Timely Antibiotics!
- Consider LR
- Still Document Severe Sepsis $$$
- Do not use qSOFA in the ICU
Chest Pain
Updates

- Last Updates
  - STEMI 2015
  - NSTEMI 2014
  - DAPT 2016
- Discuss new chest pain scores
- Review Imaging vs Standard Care
- List new MI definition
Chest Pain Facts

- 6% of all ED visits
  - $14 Billion
  - 75% Noncardiac
  - <20% ACS
- Missed ACS largest ED malpractice
- 2-8% misdiagnosed/ discharged
A 55 year-old female with no PMH presented to the ED with substernal chest pain at rest. Worse with exertion, better with nitroglycerin. Non reproducible, No radiation, No diaphoresis Worse with Inspiration

High sensitivity troponin negative at 0h + 6h EKG No changes BMI 40

What prediction scores?
CENTRAL ILLUSTRATION: Performance of the EDACS Versus Modified HEART Score Among Emergency Department Patients With Chest Pain

EDACS & mHEART perform similarly in terms of NPV

EDACS categorizes more patients as low risk

Lower troponin cut-off to define low risk is superior

(Mark et al. 2018, JACC)
A 55 year-old female with no PMH presented to the ED with substernal chest pain at rest. Worse with exertion, better with nitroglycerin. Non reproducible, No radiation, No diaphoresis. Worse with Inspiration.

High sensitivity troponin negative at 0h + 6h
EKG No changes
BMI 40

What prediction scores?

HEART = 4
Intermediate

ED ACS = 2
Low
Out with the Old: Coronary CTA

No Difference

$300 Less

54% Reduction in time to diagnosis

(Bhatt et al. 2017, JACC)
CTA vs Standard Care for Stable Chest Pain

August 2018: Cardiac Imaging

A SCOT-HART Trial - 5 years

- CTA vs Standard Care for Stable Chest Pain

(Newby et al. 2018, NEJM)
### September 2018: CTA vs Stress Echo

No history of CAD
Negative Troponin
Resolution of chest pain

<table>
<thead>
<tr>
<th></th>
<th>CTA</th>
<th>Stress Echo</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization</td>
<td>19%</td>
<td>11%</td>
<td>0.026</td>
</tr>
<tr>
<td>LOS</td>
<td>58h</td>
<td>34h</td>
<td>0.002</td>
</tr>
</tbody>
</table>

No difference in outcomes

(Levsky et al. 2018, JACC)
Shared Decision Making or Usual Care
CTA or Stress

- No significant difference:
  - # ED visits
  - Imaging studies
  - Procedures

- $SDM = 125.6$ few tests/100 patients

(Shaffer et al. 2017)
A 55 year-old female with no PMH presented to the ED with substernal chest pain at rest. Worse with exertion, better with nitroglycerin. Non reproducible, No radiation, No diaphoresis Worse with Inspiration

High sensitivity troponin negative at 0h + 6h EKG No changes BMI 40

Positive at 12 hours BP 212/115

Is this an Type II NSTEMI?
August 2018: 4th Universal MI Definition Revision

5 TYPES NSTEMI
1. Ischemic
2. Demand
3. Sudden Cardiac Death
4. PCI
5. CABG

(Thygesen et al. 2019)
Criteria for type 2 MI

Detection of a rise and/or fall of cTn values with at least one value above the 99th percentile URL, and evidence of an imbalance between myocardial oxygen supply and demand unrelated to coronary thrombosis, requiring at least one of the following:

- Symptoms of acute myocardial ischaemia;
- New ischaemic ECG changes;
- Development of pathological Q waves;
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischaemic aetiology.
A 55 year-old female with no PMH presented to the ED with substernal chest pain at rest. Worse with exertion, better with nitroglycerin. Non reproducible, No radiation, No diaphoresis Worse with Inspiration

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Positive at 12 hours BP 212/115

Is this an Type II NSTEMI? YES: SYMPTOMS
• Could consider EDACS if HEART intermediate
• Still on the fence about Coronary CTA rule out
• Type II NSTEMI now has new criteria!
Clostridium Difficile
2018 C. Diff Guidelines
### IDSA 2017 Update

<table>
<thead>
<tr>
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<th>Treatment</th>
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<tbody>
<tr>
<td><strong>Non Severe</strong></td>
<td><strong>Initial</strong> Vanc 125 po QID x 10</td>
</tr>
<tr>
<td></td>
<td>FDX 200 po BID x10</td>
</tr>
<tr>
<td><strong>Severe</strong></td>
<td><strong>Initial</strong> Same</td>
</tr>
<tr>
<td><strong>Fulminant</strong></td>
<td><strong>Initial</strong> Vanc 500 po QID (Consider Rectal)</td>
</tr>
<tr>
<td></td>
<td>+ Flagyl IV</td>
</tr>
<tr>
<td><strong>1st Recurrence</strong></td>
<td>Vanc taper 2-8 weeks FDX (if van 1st)</td>
</tr>
<tr>
<td><strong>2nd Recurrence</strong></td>
<td>Vanc Taper FDX Fecal Transplant</td>
</tr>
</tbody>
</table>

**Severe:**
- WBC >15,000 OR Serum Cr >1.5

**Fulminant:**
- Hypotension, Shock, Ileus, or Megacolon

(McDonald et al. 2018, IDSA Guideline)
2018: Eosinophil Prediction

WBC >15K had no significance

(Kulaylet et al. 2018, JAMA Surgery)
Patiently Waiting.....

Community Acquired Pneumonia
Questions?


