Papers from 2017 That Changed My Practice: *Inpatient Edition*

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Disclosures

- No financial disclosures
- Off-label use of FDA-approved devices
- Bias to High Value Care
Case 1

- 59 yo man with severe, right-sided pleuritic chest pain with scanty hemoptysis 3 weeks after repair of a patellar tendon rupture
- **PMH**: DLBCL (stage IIA), doxorubicin cardiomyopathy (EF 15%), CKD3 (eGFR 40)
- **Meds**: Lisinopril, metoprolol, torsemide, spironolactone
- 101.9, 112/70, HR 106, RR 30
- Crackles RLL, 2+ BLE edema w/o redness, knee immobilizer
- WBC 24,000 (85% segs), Cr 2.3, eGFR 35
What is the best strategy at this point?

A. Empiric anticoagulation for 3 months
B. Lower extremity venous duplex scans
C. Ventilation-perfusion scan
D. CT pulmonary angiography
E. Antibiotics for pneumonia
## Wells' Criteria for Pulmonary Embolism

Objectifies risk of pulmonary embolism.

<table>
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<tr>
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<th>When to Use</th>
<th>Pearls/Pitfalls</th>
<th>Why Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical signs and symptoms of DVT</td>
<td>No 0</td>
<td>Yes +3</td>
<td></td>
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<tr>
<td>PE is #1 diagnosis OR equally likely</td>
<td>No 0</td>
<td>Yes +3</td>
<td></td>
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<tr>
<td>Heart rate &gt; 100</td>
<td>No 0</td>
<td>Yes +1.5</td>
<td></td>
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<tr>
<td>Immobilization at least 3 days OR surgery in the previous 4 weeks</td>
<td>No 0</td>
<td>Yes +1.5</td>
<td></td>
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<tr>
<td>Previous, objectively diagnosed PE or DVT</td>
<td>No 0</td>
<td>Yes +1.5</td>
<td></td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>No 0</td>
<td>Yes +1</td>
<td></td>
</tr>
<tr>
<td>Malignancy w/ treatment within 6 months or palliative</td>
<td>No 0</td>
<td>Yes +1</td>
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</table>

**7.0 points**

High risk group: 40.6% chance of PE in an ED population.
Risk of Acute Kidney Injury After Intravenous Contrast Media Administration

Jeremiah S. Hinson, MD, PhD*; Michael R. Ehmann, MD, MPH, MS; Derek M. Fine, MD; Elliot K. Fishman, MD, FACR; Matthew F. Toerper, BS; Richard E. Rothman, MD, PhD; Eili Y. Klein, MS, PhD

- Older studies
  - Predate widespread use of low- and iso-osmolar agents
  - Extrapolate data from arterial angiography
  - Inadequate control groups
- No RCTs
- Single-center propensity-matched case-control design
- 2 control groups (unenhanced CT, no CT)
- 80-120 mL of iohexol (low) or iodixanol (iso)
Exclusions

- Cr >4.0
- Hx of renal transplant or dialysis
- CT within previous 6 months
- Additional contrast-enhanced CT(s) within 72 hours of ED departure
Results

• 16,801 patients
  – 7201 CT w/ contrast
  – 5499 CT w/o contrast
  – 5234 No CT

• **No increased risk of CIN** by AKIN/KDIGO/CIN criteria, before or after Propensity Score Matching, regardless of baseline eGFR or Cr
14 studies, >5000 patients
• “CTA not associated with statistically significant increase in risk of AKI in patients with stroke, even those with known chronic kidney disease”

Stroke. 2017 Jul;48(7):1862-1868
5758 patients
- 1538 with CKD 1-2
- 2899 with CKD 3
- 1321 with CKD 4–5

AKI, dialysis, and mortality were not higher in contrast group compared with the noncontrast group for all CKD subgroups.
Pearls

• AKI happens in ill patients
• In ED patients with serum Cr <4.0, administration of IV contrast for CT enhancement does not appear to be associated with AKI or subsequent CKD or need for dialysis
• When indicated, the benefits of contrast-enhanced CT probably outweigh potential risks
Case 2

- 72 yo man with very severe COPD admitted with an acute exacerbation in the setting of acute influenza A
- **PMH:** FEV1 24% in 2012, HTN
- **Meds:** umeclidinium, fluticasone/vilanterol, montelukast, benazepril
- Moderate distress, suprasternal retractions, diffuse wheezes, irregularly irregular rhythm, trace leg edema
- Soon after admission develops Afib with rate 146, BP 156/80, RR 24, T 101.3
- Cr 1.2, TSH normal, ECHO without valvular lesions
In addition to adding diltiazem, what is the best *initial* plan for the AFIB?

A. No anticoagulation  
B. Heparin infusion  
C. Therapeutic LMWH  
D. DOAC  
E. Amiodarone load
Secondary AF is common
- 6% of ACS, severe sepsis
ACC/AHA: anticoagulation recommended in setting of ACS with CHA2DS2-VASc ≥2
US, European & Canadian guidelines do not make specific recommendation for acute pulmonary disease or sepsis
Anticoagulant Use and Risk of Ischemic Stroke and Bleeding in Patients With Secondary Atrial Fibrillation Associated

- Retrospective cohort study (N=2304), age ≥65, Quebec, 1999 - 2015
- Secondary AF associated with:
  - Acute pulmonary disease (1,375)
    - COPD (557)
    - Pneumonia/influenza (731)
    - PE, pleural effusion
  - ACS (827)
  - Sepsis
- Exclusions:
  - Afib, VKA, DOAC in prior year
  - Recent cardiac surgery
- Primary outcomes: ischemic stroke & bleeding
- Follow-up: ~3 years
Anticoagulant Use and Risk of Ischemic Stroke and Bleeding in Patients With Secondary Atrial Fibrillation Associated With Acute Coronary Syndrome, Acute Pulmonary Disease, and Sepsis

**Figure 1**

Stoke:
- ACS: OR 1.22, LCL 0.65, UCL 2.27
- APD: OR 0.97, LCL 0.53, UCL 1.77
- Sepsis: OR 1.98, LCL 0.29, UCL 13.5

Bleeding:
- ACS: OR 1.42, LCL 0.94, UCL 2.14
- APD: OR 1.72, LCL 1.23, UCL 2.39
- Sepsis: OR 0.96, LCL 0.29, UCL 3.21

FAVOURS ANTICOAGULATION

DOES NOT FAVOUR ANTICOAGULATION
Pearl

- The benefit of anticoagulation in secondary AF associated with acute pulmonary diseases, sepsis, or ACS is not strong and appears to be associated with a higher risk of bleeding in patient with acute pulmonary diseases.
Case 3

• 55 yo man with cellulitis refractory to oral TMP-SMX for 3 days. Increasing erythema, warmth, pain and fevers
• **PMH:** obesity, OSA, HTN, CKD 3
• **Meds:** Lisinopril, amlodipine, furosemide
• **BP** 142/80, HR 96, RR 16, T 100.8
• No distress. RLE red and hot distal to knee. No furuncles, carbuncles, abscess or crepitus. Bilateral tinea pedis.
• **WBC** 14,000 with 12% bands
What is the best *initial* plan?

A. Obtain blood cultures  
B. Image the RLE to rule out abscess  
C. Start dicloxacillin PO  
D. Start cefazolin IV  
E. Start vancomycin and piperacillin/tazobactam IV
NONPURULENT
Necrotizing Infection / Cellulitis / Erysipelas

MANAGEMENT OF SSTIs

PURULENT
Furuncle / Carbuncle / Abscess

Severe

Mild

Severe

Moderate

Moderate

Mild

EMERGENT SURGICAL INSPECTION / DEBRIEMENT
- Rule out necrotizing process

EMPIRIC Rx
- Vancomycin PLUS Piperacillin/Tazobactam

INTRAVENOUS Rx
- Penicillin or
- Ceftriaxone or
- Cefazolin or
- Clindamycin

C & S

ORAL Rx
- Penicillin VK or
- Cephalexin or
- Clindamycin

I & D

EMPIRIC Rx
- Vancomycin or
- Daptomycin or
- Linezolid or
- Televancin or
- Ceftaroline

EMPIRIC Rx
- TMP/SMX or
- Doxycycline

DEFINED Rx (Necrotizing Infections)
Monomicrobial Streptococcus pyogenes
- Penicillin PLUS Clindamycin
- Clostridial sp.
  - Penicillin PLUS Clindamycin
- Vibrio vulnificus
  - Doxycycline PLUS Ceftazidime
- Aeromonas hydrophila
  - Doxycycline PLUS Ciprofloxacin

Polymicrobial
- Vancomycin PLUS
- Piperacillin/Tazobactam

DEFINED Rx MRSA
- See Empiric
- MSSA
  - Nafcilin or
  - Cefazolin or
  - Clindamycin

DEFINED Rx MSSA
- TMP/SMX
- Dicloxacillin or
- Cephalexin

\(^1\) Since daptomycin and televancin are not approved for use in children, vancomycin is recommended; clindamycin may be used if clindamycin resistance is <10-15% at the institution.

IDSA Practice Guidelines for SSTIs • CID 2014:59 (15 July) • e11
Yield of routine blood cultures in cellulitis is very low (<5%, *CID* 1999; 29:1483–8)
- Not routinely recommended by IDSA
- Still ordered often

Indications for blood cultures include:
- Sepsis
- Febrile neutropenia, immunocompromised
- Immersion injuries
- Necrotizing infections
Low yield of blood and wound cultures in patients with skin and soft-tissue infections

Jesus Torres, Nathaniel Avalos, Lamarr Echols, Jillian Mongelluzzo, Robert M. Rodriguez *

Department of Emergency Medicine, University of California, San Francisco, CA, United States

- 734 consecutive patients in an urban ED (UCSF)
- 246 (33%) required admission
  - 41% of these were IVDU, 9% HIV
  - 35% had blood cultures obtained
  - 1 patient had endocarditis

<table>
<thead>
<tr>
<th>Patients</th>
<th>Blood culture yield</th>
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<tbody>
<tr>
<td>All</td>
<td>7%</td>
</tr>
<tr>
<td>Fever &gt;38 (100.4)</td>
<td>3.5%</td>
</tr>
<tr>
<td>IVDU</td>
<td>8.7%</td>
</tr>
</tbody>
</table>
Pearl

• Routinely obtaining blood cultures in patients with uncomplicated cellulitis (inpatient or outpatient, febrile or not) is very low yield, not recommended, and uncommonly affects empiric antibiotic regimens.
Case 4

• 62 yo man with 2 weeks of severe atraumatic central back pain with recent fevers. Never had before. No radiation or bowel/bladder changes.

• **PMH:** Ischemic cardiomyopathy with a legacy biventricular ICD, EF 25%, T2DM, CKD3

• **Meds:** sacubitril/valsartan, carvedilol, spironolactone, furosemide, insulin

• BP 108/70, HR 70, RR 24, T 102.3

• Very uncomfortable. Lungs CTA. No ICD pocket infection. 2/6 HSM at apex. No stigmata of endocarditis. TTP mid-back

• WBC 24 000, ESR 127, CRP 12, Cr 1.8, eGFR 40, T and L-spine XR unremarkable
After obtaining blood cultures, what is the next best step?

A. Empiric vancomycin
B. Echocardiography
C. Bone scan
D. CT thoracic and lumbar spine with/without contrast
E. MRI thoracic and lumbar spine with/without contrast
Safety of Magnetic Resonance Imaging in Patients with Cardiac Devices

Saman Nazarian, M.D., Ph.D., Rozann Hansford, R.N., M.P.H.,

- Patients often denied MRIs
  - Many have indications
  - Many small studies report safety
  - CMS: access to MRI improves outcomes for patients with MRI-conditional devices
- Prospective, 1509 patients (2103 MRIs) with “legacy” devices (pacemaker 58%, ICD 42%)
- **1.5 Tesla**
- Outcomes
  - Adverse events
  - Changes in device parameters
Exclusions

1. Device placed in last 4 weeks
2. Pacing dependent + ICD without asynchronous pacing capability
3. Surgical epicardial leads
4. Subcutaneous ICD system
Protocol

- Electrophysiology RN on-site for device programming
  - Immediate access to EP
  - Standard MRI protocols
- Devise parameters measured before/after
  - **Pacing-dependent** (HR <40): asynchronous mode
  - **All others**: demand mode
- Reprogrammed to original settings after scan
- Interrogation at 6 months
MRIs

Number of scans

- 1 (79%)
- 2 (13%)
- 3 (4%)
- 4 (2%)
- 5 (1%)
- 6 or more (1%)

320 patients underwent multiple scans; 18 had 6 or more

Scan region

- Head/neck (52%)
- Abdo/pelvis (27%)
- **Thorax (12%)**
- Arm/leg (9%)
Results

- No long-term clinically significant adverse effects
- 9 resets to backup mode (8 transiently)
- 6 MRIs aborted
  - 1 “pulling sensation”
  - 1 HR <40 (protocol violation/improper programming)
  - 1 non-sustained VT (scheduled for VT ablation)
  - 3 image artifact (futility)
- 1 device could not be reprogrammed after the 5th MRI and was replaced (<1 month battery life left before scan)
- Immediate: ↓ in P wave amplitude (1%)
- **Long-term:**
  - ↓ P wave amplitude (4%)
  - ↑ Atrial capture threshold (4%)
  - ↑ RV (4%) & LV (3%) capture thresholds
- No device reprogramming or revision required
Assessing the Risks Associated with MRI in Patients with a Pacemaker or Defibrillator

Robert J. Russo, M.D., Ph.D., Heather S. Costa, Ph.D., Patricia D. Silva, M.S.,

• MagnaSafe registry
• Similar to Nazarian, et al., except no thoracic studies
• 1500 scans
  – 75% were brain or spine
  – 1 patient had 11 scans
• No appropriately screened/reprogrammed patient had device or lead failure
Pearl

• 1.5 T MRI in patients with legacy implanted cardiac devices appears to be safe when an appropriate protocol is followed and may improve patient care when MRI is the recommended imaging modality
Case 5

- 34 yo woman with 1 day of severe right flank pain (8/10), nausea, refractory vomiting, fevers and dysuria
- **PMH**: Treated HCV
- **Meds**: etonorgestrel subdermal
- Non-smoker; alcohol 2-3 drinks nightly
- Urinalysis: >100 WBC/HPF
What is the most rational analgesic?

A. Acetaminophen 1000 mg PO
B. Ibuprofen 600 mg PO
C. Ketorolac 10 mg IV
D. Ketorolac 30 mg IV
E. Morphine 4 mg IV
Several studies have suggested an analgesic ceiling with ketorolac, despite the IV doses 3-6 times higher than the oral dose.

- NSAID adverse effects are dose-related.
Comparison of Intravenous Ketorolac at Three Single-Dose Regimens for Treating Acute Pain in

- Randomized, double-blind trial, N=240
- 3 doses of IV ketorolac (10 mg, 15 mg, 30 mg)
- Primary outcome: pain score (30 min)

**Inclusions**
- Age 18-65, Pain ≥5/10
- **Acute (<30 d) flank, abdo, MSK, headache** pain

**Exclusions**
- >65
- Pregnant
- Active PUD or acute GI bleeding
- Renal, liver disease
• No difference in analgesic efficacy for moderate-severe pain from diverse causes in the ED
• No difference in rescue analgesia with morphine (~5%)
Pearl

- The 10 mg IV ketorolac dose should be the preferred dose for nongeriatric adult ED patients with acute (<30 d) moderate-severe pain who are unable to tolerate oral medication
Summary: 2017 Papers That Changed My Practice

1. The risk of IV iodinated contrast is likely overstated
2. Eschew blood cultures and empiric MRSA coverage in uncomplicated non-purulent cellulitis
3. Anticoagulation does not appear to benefit patients with secondary AFIB in the setting of acute pulmonary diseases and is associated with increased bleeding
4. 1.5 tesla MRIs with appropriate programming appears to be safe in patients with implanted cardiac devices
5. Low-dose IV ketorolac appears to be as effective as higher doses
Thank you!
jmsweet@carilionclinic.org