Mr. Hocus

49 y/o M with no known pmh who p/w R>L LE swelling and erythema. Notes subj fever, chills, and difficulty ambulating x 5 days.

Physical Exam
- AF HR 107 BP 120/60 RR 22 94% RA

Laboratory data:
- WBC 17.4, Lactate 4.3
- Na 127, Cr 5.12
- Trop 0.7
- LFT 72/98/63/5.9

Diagnosed with RLE cellulitis with sepsis, admitted to medicine.
- ED Resident: “Obviously there’s probably more going on here”
Intern:
Do you think he has a DVT and/or PE?

Attending:
Seems pretty unlikely. But let's take a look

DVT POCUS - Evidence

POCUS compression DVT exam is highly accurate

- Sensitivity of 96%
- Specificity of 96%

Pomero et al. Thromb Haemost ‘13
DVT POCUS

Soni et al. Point of Care Ultrasound. Elsevier. 2015

LIVE DEMO - DVT
DVT

What is POCUS

**Attributes**
- Done by MD
- Bedside
- Goal Directed
- Focused
- Easy to learn
- Quick to perform

**Uses**
- SOB
- Hypotension
- Flank Pain
- Leg Pain/swelling
- Chest Pain

Soni, Diagnostic POCUS for Hospitalists. JHM, 2015
How to use POCUS

Back to Mr. Hocus

**Intern:**

With a Cr >5 should we worry about obstruction?

**Attending:**

Seems unlikely, but we can check
Hydronephrosis - Evidence

POCUS is relatively reliable for diagnosing hydronephrosis (in renal colic)

~ 80% sensitive
~ 80% specific

Gaspari et al. Acad Emerg Med '05
Dalziel et al. Emerg Med J. '13
Riddell et al. West J Emerg Med '14

Hydronephrosis POCUS

Soni et al. Point of Care Ultrasound. Elsevier. 2015
LIVE DEMO

Hydronephrosis
Back to Mr. Hocus

- Received 3L IVF in ED
- Lactate downtrended to 2.7
- Ongoing tachycardia to 110s
- Increasingly SOB, O2 89% on RA

Intern:

I’m a little concerned about Mr H’s respiratory status with IVF resuscitation

Attending:

Lets get some more information on his volume status
Volume Status POCUS

- IVC vs IJ
- Pulmonary Edema
- Pleural Effusion
- +/- LV Function

IVC - Evidence

Two meta-analyses

- Cardiovascular Ultrasound, Aug ’16
  - 21 studies, 1400 cases
  - IVC diameter to CVP \( \sim 0.76-0.91 \)
  - IVC collapsibility to CVP \( \sim 0.66-0.93 \)

- Acta Radiologica, Aug ‘16
  - 37 studies, 2800 cases
  - IVC to CVP \( \sim 0.44-0.68 \)
IVC POCUS

LIVE DEMO
Mr. Hocus

JVP - Evidence

- Ann Emerg Med '04
  - IJ height to BNP CC~ 0.67
  - 100% sensitive/specific (only 8 patients)
- J Crit Care '12
  - IJ height
    - Hypervolemic pts ROC 0.73
    - Hypovolemic pts ROC 0.83
- Int J Clin Exp Med '15
  - IJ height to CVP CC~ 0.66
- Med J Malaysia ‘15
  - IJ height to CVP CC ~0.64
JVP POCUS

LIVE DEMO
Mr. Hocus

Pulmonary Edema - Evidence

- Ultrasound as good or better than CXR for pulm edema
- Rapid diagnosis & Dynamic monitoring
- *Academic Emerg Med*, 2014 (systematic review)

94% sensitive, 92% specific for Acute cardiogenic pulmonary edema
Pulmonary Edema POCUS

LIVE DEMO
Mr. Hocus

Pleural Effusion - Evidence

- Ultrasound highly sensitive for pleural effusion - better than CXR, equal to CT
- JAAC, '00
  >90% sensitive for decompensated heart failure
Pleural Effusion POCUS

LIVE DEMO
Mr. Hocus

**Intern:**
Why did he get so overloaded so fast?

**Attending:**
Good question. Let's take a quick look at his cardiac function
Gross LV function – Evidence

- Chest, 2009
- Intensivists in Hennepin County Med Center (Univ of Minnesota)
  - 2hrs didactic + 4hrs hands-on training in LV function
  - Within 2hrs of formal echo, intensivists did “bedside echo”
  - Intensivist dx’d normal vs. mild-mod reduced vs. severely reduced LV fxn

Accuracy 82%

- Two similar studies of EM physicians showed 84-86% accuracy

Pericardial Effusion – Evidence

- Annals of Emergency Medicine, 2001
- Emergency physicians at USC
  - 1hr didactic + 4hrs hands-on training in ultrasound for peric eff

- 515 ED patients c high-risk for peric effusion (>20% had effusion)
  - EM physicians performed cardiac scans and interpreted them
  - Single cardiologist provided final read
  - 93% technically adequate

96% sensitivity/98% specificity
Focused Cardiac POCUS

Soni et al. Point of Care Ultrasound. Elsevier. 2015

LIVE DEMO
Mr. Hocus

Mr. Hocus… resolution

- Took us > 1 hour here, but in real time all of these exams take just a few minutes!!

- **Daily exam**
  - Traditional: cardiac, pulm, LE edema
  - POCUS: IVC, pleural effusion, pulm edema

- **Outcomes:**
  - Potentially avoided DVT US, Renal US
  - Led to more appropriate volume management
  - Got cardiology on board and moved up a formal TTE
  - Potentially decrease readmission?
Why POCUS… really?

- Allows earlier diagnosis and treatment
- Avoids tests/reduces radiation exposure
- Reduces length of stay
- Reduces cost of stay
- Increases patient satisfaction (hands-on)

Potentially

What is the scope of POCUS for hospitalists?
“The larger issue now is to decide whether we believe that building competency in ultrasound among generalist physicians – in this case hospitalists – will enhance patient safety, quality, and value. Personally, I do.”

- BW 2012
The future of physical exam

A generation of physicians will need to be trained to view this technology as an extension of their senses, just as many generations have viewed the stethoscope. That development will require the medical education community to embrace and incorporate the technology throughout the curriculum.

Solomon. Point-of-Care US in Medical Education. NEJM 2014

Major Challenges

- Training
- Credentialing and Privileging
- Hardware
- Research
Questions and how to learn more...

Email us:
- Trevor.Jensen@ucsf.edu
- Nima.Afshar@ucsf.edu

Self learning
- Nilam Soni. Point of Care Ultrasound
- Mallin & Dawson. Intro to Bedside Ultrasound

Take Hospitalist or critical care-targeted POCUS courses
- SHM
- ACP
- SUSME

EM or ICU colleagues