Point of Care Ultrasound (POCUS)

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Disclosures

• None.
Objectives

• Define POCUS and how it fits into our practice.

• Reveal helpful and practical resources from national organizations.

• Apply important concepts using an actual case as an example.
Quote

• That it will ever come into general use, notwithstanding its value, is extremely doubtful

• Its beneficial application requires much time, and gives a good deal of trouble both to the patient and the practitioner

• Its whole hue and character is foreign, and opposed to all our habits and associations

Forbes
Figure 5. Laënnec and the Stethoscope. Painting by Robert A. Thom (1915-1979), c. 1960.
POCUS

• A goal-directed bedside ultrasound examination.

• Performed and interpreted by a healthcare provider at the point of care.

• Used to diagnose a myriad of conditions, safely guide invasive procedures, as an adjunct to treatment, and to monitor the progress of interventions or changes in a patient’s condition.

• Advances in technology have led to smaller, more portable machines with better image quality and more intuitive user interfaces.
The diagram illustrates the steps involved in a patient care process:

1. **Ask**
   - Bedside physician

2. **Select**
   - Bedside physician

3. **Acquire**
   - Technician

4. **Interpret**
   - Radiologist or cardiologist

5. **Act**
   - Bedside physician

The process involves
- A physical examination
- Point-of-care ultrasound
- Referral ultrasound
# Common POCUS applications for hospitalists

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<th>Cardiac</th>
<th>Pulmonary</th>
<th>Abdominal</th>
<th>Vascular</th>
<th>MSK</th>
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<td>Free fluid</td>
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<td>Pneumothorax</td>
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<td>Chamber hypertrophy</td>
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<td>Spleen size</td>
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<td>Gross valvular abnormalities</td>
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<td>Liver size</td>
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</table>

## Multisystem

Hypotension and shock: cardiac, central venous pressure, pulmonary, DVT, abdominal free fluid

Resuscitation: cardiac, central venous pressure, pulmonary

Dyspnea: pulmonary, cardiac, central venous pressure, DVT

Acute renal failure: renal, bladder, central venous pressure, pulmonary
Diagnostic accuracy by anatomic area
Sensitivity/Specificity

Lung: 92%/95%

Heart: 73%-77%/75%-85%

Kidneys: 82%/99%

Aorta: 100%/100%

Obstetrics: 97%/98%

Broad use: 91%-98%/83%-95%

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Ultrasound-Guided Bedside Procedures

- Abdominal paracentesis
- Arterial catheter placement
- Arthrocentesis
- Central venous catheter placement
- Lumbar puncture
- Thoracentesis

- ABIM diplomates should “know” these procedures but not necessarily “do” them.
- Hospitalists are still expected to do them as core competencies.

J Hosp Med. 2018 Feb 1;13(2):117-125
Equipment
Case

• 71 y.o with stage 4 lung adenocarcinoma s/p cycle 1 of Pemetrexed/Carboplatin a week ago was admitted with increasing dyspnea, orthopnea, & cough.

• PMHx also includes DVT on Enoxaparin.

• V/S on admission: 37.0, 105/70, 95, 22, 95% on 2L

• Labs: Leukocytosis, ARF, and hyperkalemia.
• New moderate R pleural effusion & tiny L pleural effusion.

• Superimposed consolidative process on the R as well as in the L midlung.

• Findings indicate infection or pulmonary edema.
Cardiac tamponade

- A clinical and hemodynamic diagnosis.

- Varying degrees of tamponade physiology are possible.

- The pericardial effusion size correlates poorly with its hemodynamic effect on the heart.

- Rate of accumulation is more important than size of effusion.
Pulsus paradoxus

- Inflate BP cuff until you can’t hear Korotkoff sounds

- Start deflating until you hear sounds intermittently (sounds disappear with inspiration) - Note SBP #1

- Keep deflating until you hear sounds continuously (during inspiration and expiration) - Note SBP #2

- Pulsus paradoxus = SBP #1 – SBP #2
  - Value > 10 mmHg? sens 98%, spec 70%, +LR 3.3, -LR 0.03
  - Value > 12 mmHg? sens 98%, spec 83%, +LR 5.9, -LR 0.03
Ventricular Interdependence

Inspiration

Expiration
Echo findings:

- Moderate to large pericardial effusion

- RA systolic collapse for greater than one-third of systole (sensitivity 94%; specificity 100%)

- RV diastolic collapse (sensitivity 60–90%; specificity 85–100%)

- Reciprocal respiratory changes in RV and LV volumes (septal shifting)

- IVC plethora is sensitive (97%), but nonspecific (40%).
Caveats

- RA collapse may be seen in hypovolemia, however, the IVC in hypovolemic patients will be collapsed.

- RV collapse may not be reliable if the RV is hypertrophied or has significantly increased diastolic pressure (pulmonary hypertension or hypervolemia).

- LA collapse is a specific sign of tamponade and may be the only chamber collapse evident in cases of tamponade with pulmonary hypertension.
ACP Statement in Support of POCUS in Internal Medicine (IM)

ACP plans to:

• establish clinical guidelines regarding the appropriate use of POCUS by all IM physicians including general internists and subspecialists

• define the educational curriculum needed to train residents and internists in the appropriate use of POCUS in IM

• collaborate with SGIM and other professional IM societies to establish a roadmap for implementation of POCUS education and training

• expand ACP’s POCUS training programs to enable more internists to attain competency in POCUS

https://www.acponline.org/meetings-courses/focused-topics/point-of-care-ultrasound-pocus-for-internal-medicine
POCUS Certificate of Completion

Program Requirements

• Attend Ultrasonography: Essentials in Critical Care
• Complete Online Learning Module
• Attend an Approved 2-Day POCUS Course
• Complete Online Portfolio
• Pass a Comprehensive Skills and Knowledge Assessment

https://www.hospitalmedicine.org/clinical-topics/ultrasonography-cert/
Take home points

• POCUS is used to answer a specific diagnostic question or to guide performance of an invasive procedure.

• POCUS requires less time and provides more immediate information for decision making.

• Training is required to achieve competency; the amount of which varies by provider skill and exam type.
Questions and Discussion

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