Point of Care Ultrasound in Homeless Medicine: A Practice Changing, Patient Centered Tool

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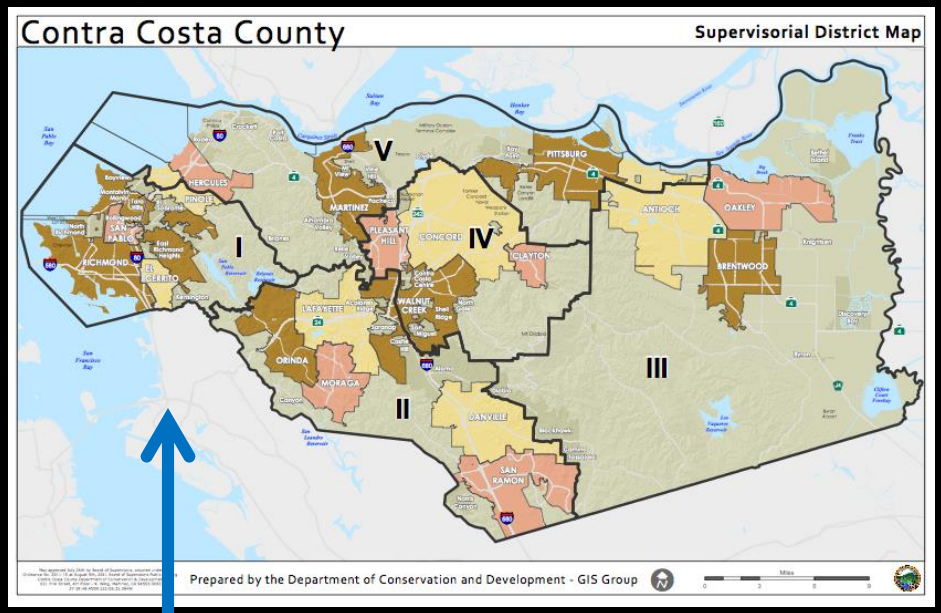
Disclosure

Neither presenter has any actual or potential conflict of interest in relation to this presentation

Health Care for the Homeless
Contra Costa County, CA



OAKLAND

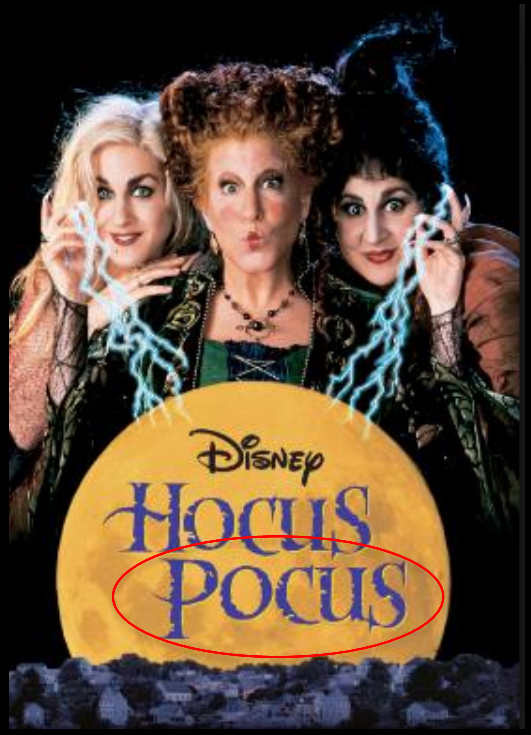
Health Care for the Homeless Mobile Outreach

Oakland Street Team Outreach Medical Program (STOMP)

ROOTS community health center

Outline

- Historical Perspectives
- What is Point of Care Ultrasound (POCUS)?
- Why should I care about POCUS?
- Supporting data
- Cases
- Practicalities



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PHILIPS

Stanford 25 → UCI 30

Stanford Medicine 25	UCI 30
1. Fundoscopic exam	
• Visualize condition of retinal blood vessels—indicative of condition of vessels throughout body • Potential diagnosis of neurologic problems • Clues to systemic diseases	• Additional information obtainable on retinal detachment, detached vitreous bodies, lens dislocation, globe ruptures, foreign bodies, optic neuritis, and widened optic nerve sheath in setting of increased intracranial pressure[12]
2. Pupillary responses	
• Examine pupillary constriction and dilation in response to light • Can reveal eye trauma, neurological disease, other conditions	• Imaging of pupil constriction under a closed eyelid • Assess for relative afferent pupillary defect
3. Thyroid exam	
• Feel thyroid gland by palpating neck • Helps diagnose thyroid disease	• Directly visualize thyroid lobes • Detect much smaller tumor[13,14a] • Differentiate between solid tumors and cysts with high sensitivity and specificity[15b] • For patients with hyperparathyroidism: ◦ as sensitive and specific as MIBI in localizing parathyroid adenomas ◦ noninvasive, cost-effective screening modality[16]
4. Neck veins	
• Visualize jugular venous pulse • Can aid in diagnosis of cardiac conditions	• Noninvasive measurement of central venous pressure[17c] • Visualization of waveforms consistent with cardiac conditions
5. Pulmonary exam	
• Determine lung's boundaries by tapping the chest • Detection of fluid or pneumonia • Auscultation to detect pleural effusion, alveolar consolidation, and alveolar-interstitial syndrome	• Detection of various lung pathologies considerably better than auscultation or even chest x-ray[18,19] • Safe, rapid, cost-effective alternative to thoracic computed tomography
6. Point of maximal impulse and parasternal heave	
• Feel the beating heart and impulses originating in heart or large vessels • Detection of heart and lung problems	• Precisely locate point of maximal impulse • Increased diagnostic capabilities • Differentiate various forms of cardiomyopathy and assess dyskinesia through visualization of atrial and ventricular walls
7. Examination of liver	
• Percussion to approximate liver size • Feel liver edge, gallbladder tenderness, and gallbladder inflammation	• Trace edges of liver • Screen liver for small masses, nodularity, hepatitis, inflammation • Measure liver volume, and detect and measure hepatic masses[20] • Measure thickness of gallbladder wall and assess for inflammation, obstruction • Measure bile flow and can estimate cholelithiasis[21]
8. Examination of the spleen	
• Palpate spleen to detect various illnesses: infection, tumor, leukemias, liver disease	• Visualize spleen in entirety and accurately measure • Visualize splenic masses and characterize as cystic or solid
9. Musculoskeletal system: common gait abnormalities	
• Observe person's walk to detect nervous system and musculoskeletal problems and conditions	• Visualize musculoskeletal system: joints, tendons, and muscles • Differentiate between hip fluid collection and proximal femoral fracture • Accurately guide needle into joint space for fluid aspiration
10. Deep tendon (ankle jerk) reflex	
• Hammer used to strike Achilles tendon above the heel to detect ankle jerk reflex	• Diagnosis of partial and complete tears of Achilles tendon[22]

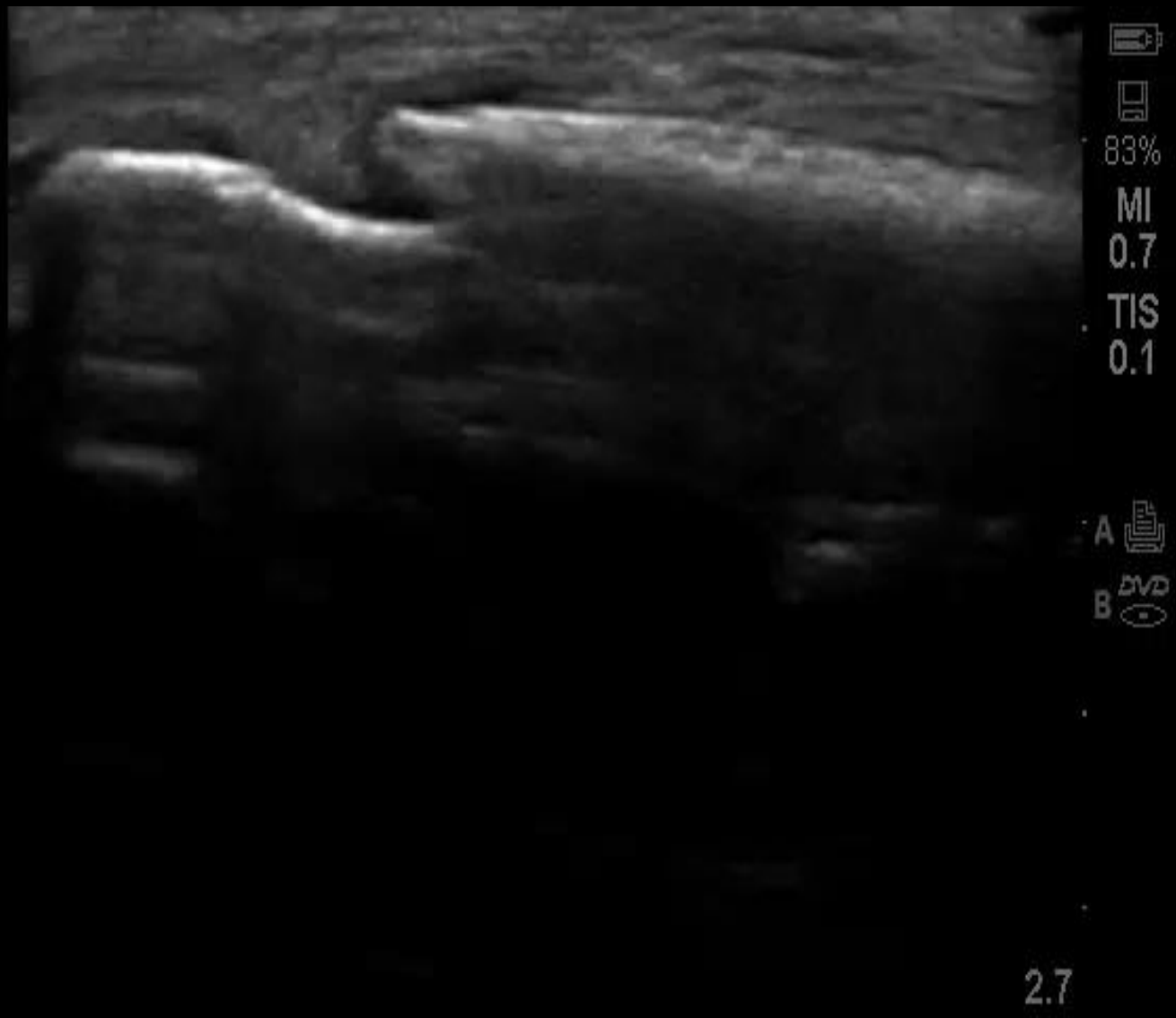
Interested? A Case…

HPI: At the weekly needle exchange night clinic a gentleman presents with stated fall from bike 4 days ago with persistent hand pain, difficulty grasping objects

-Social Hx: homeless, living in a tent. Recycles daily for living expenses

PE: ttp over 3rd and 4th metacarpal heads

What do you do next?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Changing management

- Direct urgent referral to orthopedics (Cast placed days later)
- Splint placed following POCUS on mobile clinic
- Pain management informed
- 10 day medical respite arranged
- Connected to services in medical respite

What is Point of Care Ultrasound?

- AKA - “Limited,” “Focused,” “Clinician performed”
- Use of portable ultrasound at the point of patient encounter for diagnostic or therapeutic purposes
- Real time application of imaging modality
- Extension of the physical exam adding anatomic, functional, and physiologic information
- NOT COMPREHENSIVE STUDY

What Point of Care Ultrasound is NOT?

- Comprehensive
  - Provider orders
  - Tech acquires images
  - Radiologist reads
  - Provider incorporates results into patient care
- Point of Care
  - You are the provider
  - You are the technologist
  - You are the radiologist
  - Real time application

Comparisons

- Comprehensive
  - Time-consuming
  - Information loss
  - Extraneous information
- Point Of Care
  - Immediate
  - Clinical correlation
  - Focused information can be used in algorithms
  - **Yes/No dichotomous questions**

Yes/No questions

- Are there gallstones in the gallbladder?
- Is the ejection fraction normal?
- Is there is a fracture?
- Is there free fluid in the abdomen?
- Is there fluid in the lungs?
- Are the kidneys obstructed?
- Is there an abscess?
- Is there a blood clot?
- Is there an abdominal aortic aneurysm?

Why should I use POCUS?

- Patient Centered
  - Improved patient satisfaction
  - Improved diagnostic accuracy
  - Safer, more accurate procedures
- Decreased time to decision making
- Reduces Cost
- Safe
- Portable
- Diverse applications

POCUS applications

- Echocardiography
  - Pericardial effusion
  - Ejection fraction
  - Chamber assessment
  - Valvular disease
- Obstetrics
  - IUP
  - Intrauterine masses
  - IUD placement
- AAA screening
- Liver/Biliary
  - Cholelithiasis/choledocholithiasis
  - Cholecystitis
  - Hepatic masses
  - ascites
- Spleen
- Urinary Tract
  - hydronephrosis
  - PVR
- Procedural guidance
  - Joint injections
  - Foreign body removal
  - Abscess incision and drainage
- DVT
- Soft-Tissue
  - Cellulitis vs abscess
- Musculoskeletal
  - Ligament/tendon pathology
  - Fractures
  - Dislocations
- Thoracic
  - Consolidation (PNA)
  - Pulmonary edema
  - Pleural effusion
- Ocular
  - Retinal detachment
  - Lens dislocation
- Testicular
  - Testicular mass
  - Hydrocele
  - epididymitis
- Thyroid
- Breast
- FASH exam
  - Extrapulmonary tuberculosis

Why POCUS in Homeless health care?

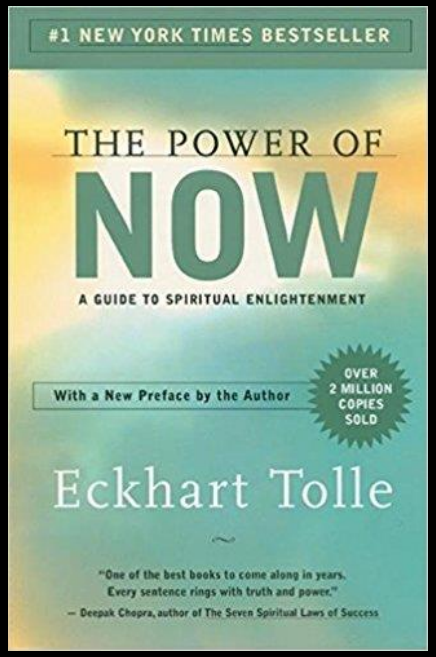
- Patient centered
  - Performed by trusted care team
  - Deepen relationship with patient
  - Improves patient satisfaction
  - Diagnostic and therapeutic accuracy
- Portable into the field or in a clinic
- High image quality
- Easily Reproducible
- Safe
- Low cost
- Diverse applications

Barriers to diagnostic imaging in the homeless

- Basic needs prioritization, aka "*the hustle*"
- Lack of transportation
- Lack of identification
- Lack of insurance and associated cost
- Lack of trust
- Schedule adherence
- Anxiety regarding reading or writing forms
- Self consciousness (appearance and hygiene)

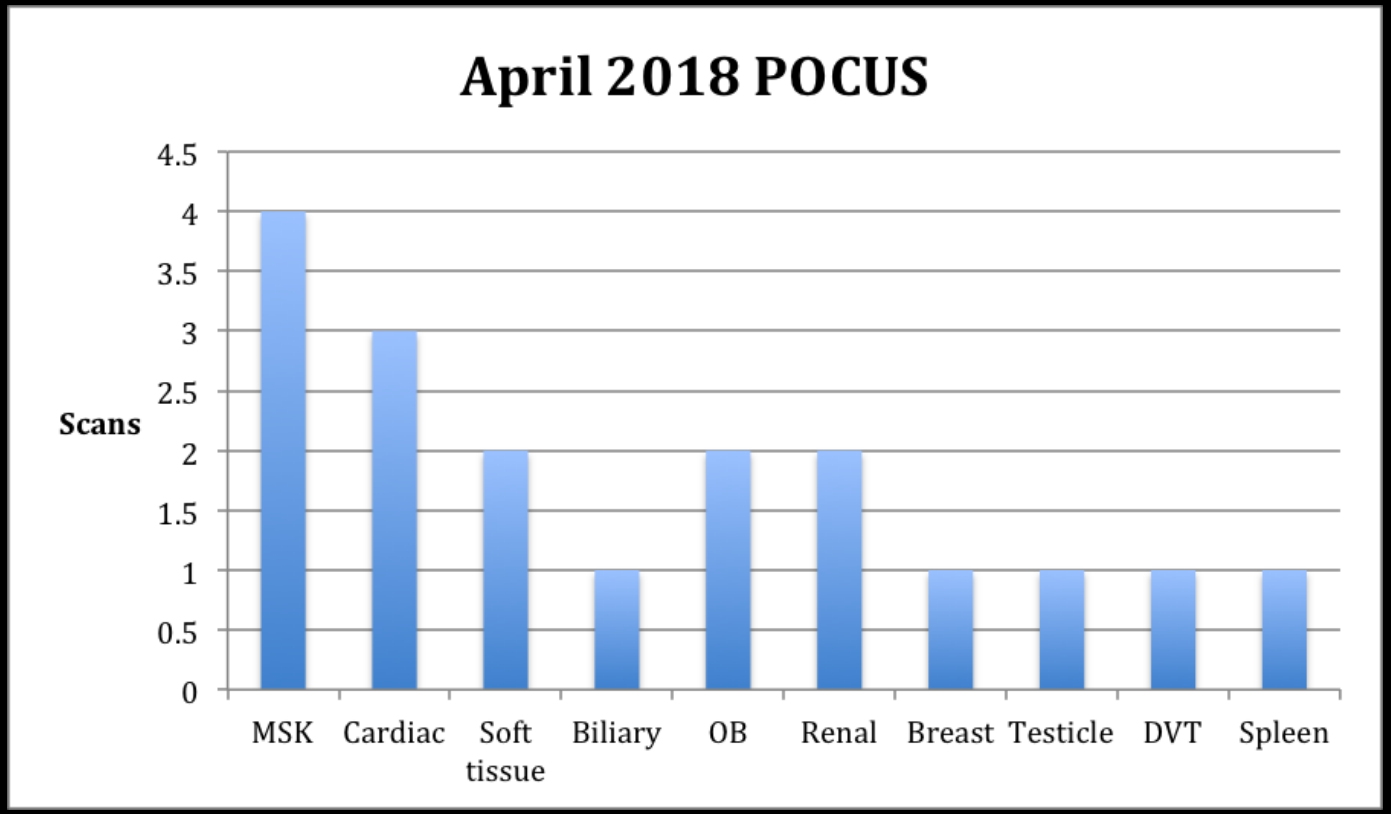
Truthfully….

How many of your patients complete imaging referrals?



April 2018 Data

- 164 patients
- 18 scans
- 11% rate



2 choices

Relationships build trust

But I thought only Radiologists could use ultrasound

- AMA Resolution 802 (2010)
  - All medical specialties have the right to use ultrasound according to specialty specific standards
- ACEP US guidelines
- AAFP POCUS Curriculum Guidelines (2017)

I don’t have time for a fellowship

- Becoming part of residency training
- Basic Skills take little time to learn
- Can be learned at any stage of training

My Physical Exam is Accurate Enough

We send so many patients to the hospital because, “what if that venous stasis is a DVT?”

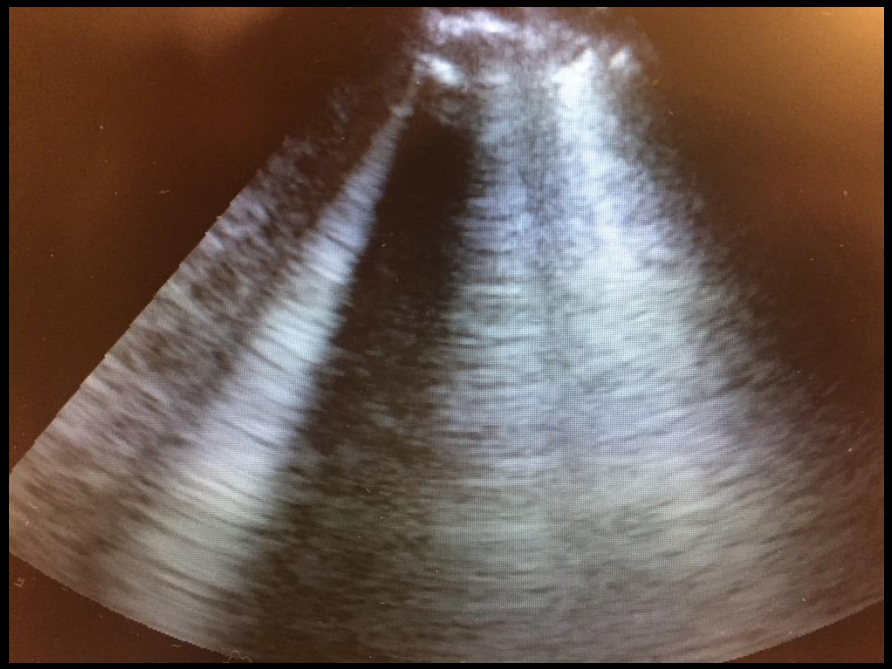
TABLE 2

Point-of-care ultrasound: How accurate? How much training?

Protocol	Sensitivity	Specificity	Training requirement	Time required to perform protocol
Evaluation for left ventricular systolic function (compared with expert sonography)[20,21,23]	69%-94%	91%-94%	8 hours of training or 20 practice exams	*
Evaluation of IVC to determine volume status and predict readmission for CHF[26,27]	81%	72%	4 hours of training and 20 practice exams	*
Evaluation for pleural effusion (compared with CT or expert sonography)[32,33]	94%	98%	3 hours of training	*
Evaluation for pneumonia (compared with x-ray or CT)[38,39,41]	90%-96%	88%-93%	3 hours of training	*
Evaluation for pulmonary edema (compared with final diagnosis by blinded chart review)[44,48]	86%-100%	92%-98%	5 practice exams	*
Screening exam for AAA (compared with expert sonography)[55-57]	100%	100%	50 practice exams	<4 minutes
Evaluation for proximal leg DVT (compared with expert sonography)[63-65]	95%	96%	10 minutes to 5 hours of training	<4 minutes

AAA, abdominal aortic aneurysm; CHF, congestive heart failure; CT, computed tomography; DVT, deep vein thrombosis; IVC, inferior vena cava.

*Time required to perform was not evaluated for these protocols in the literature that was reviewed.



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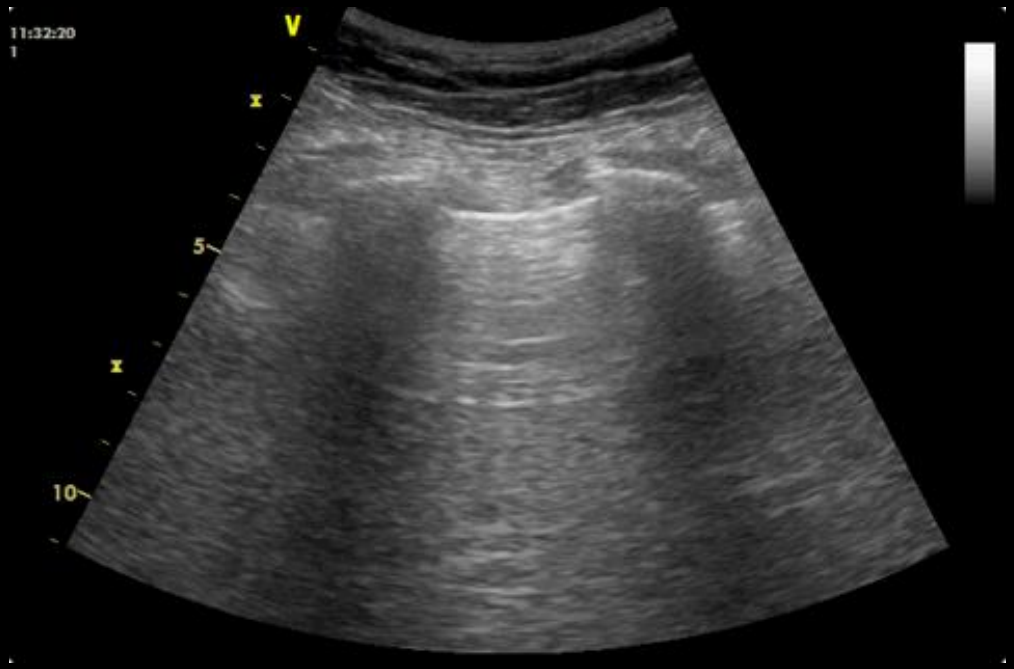

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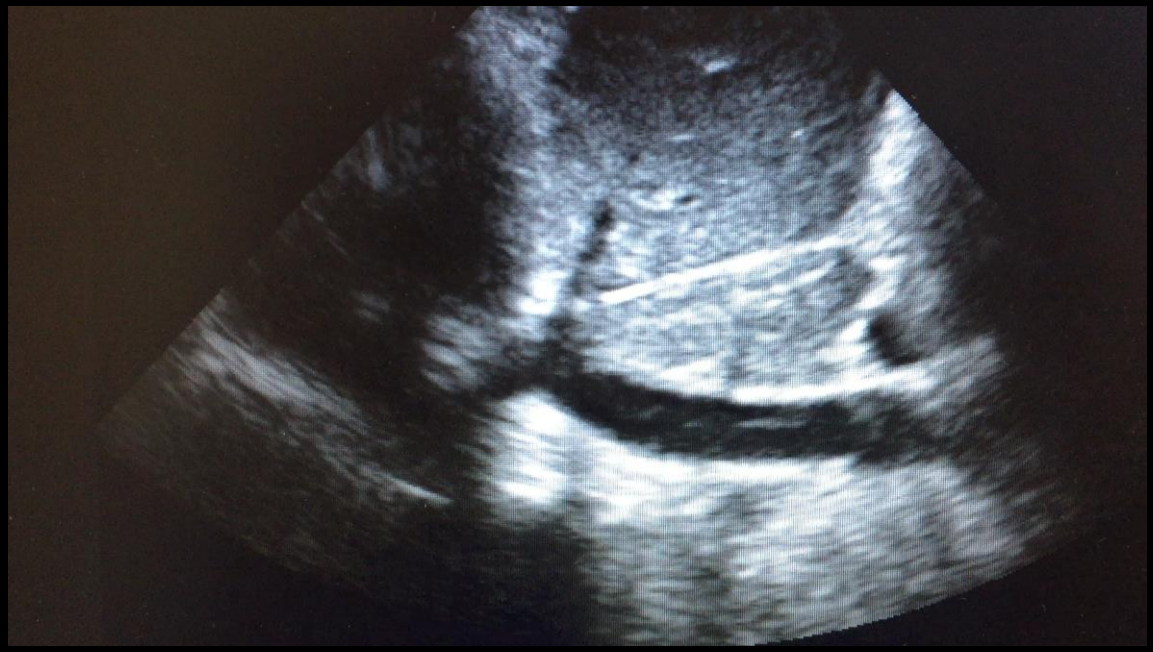

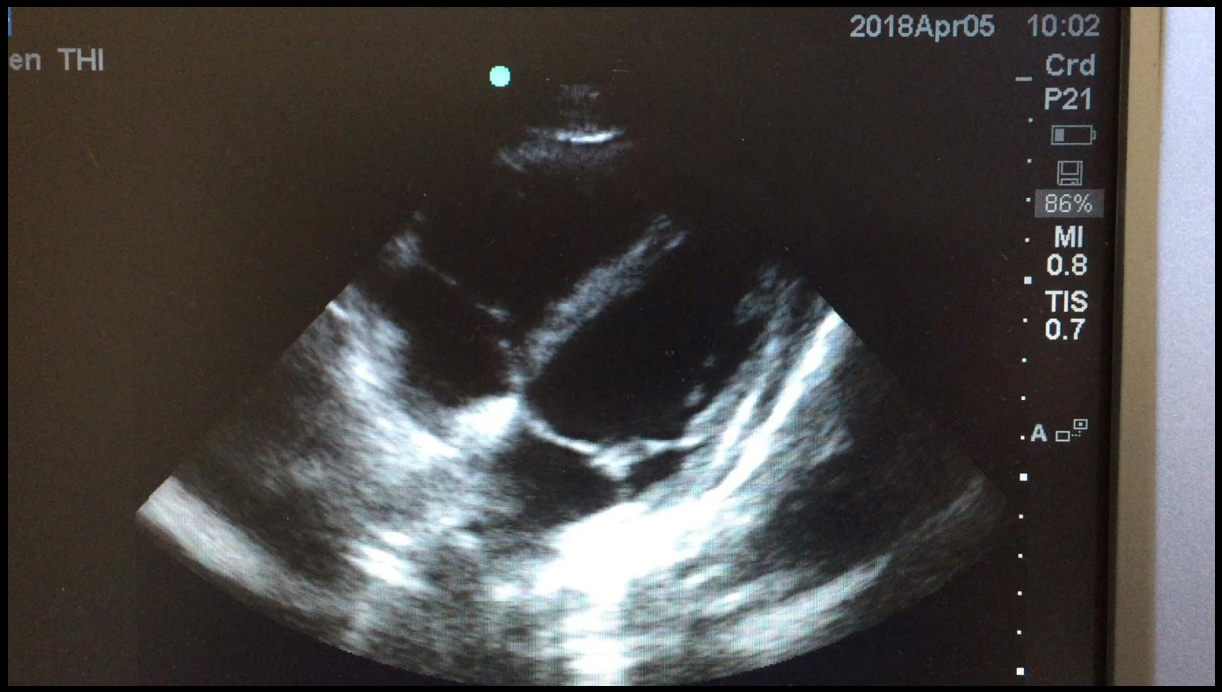
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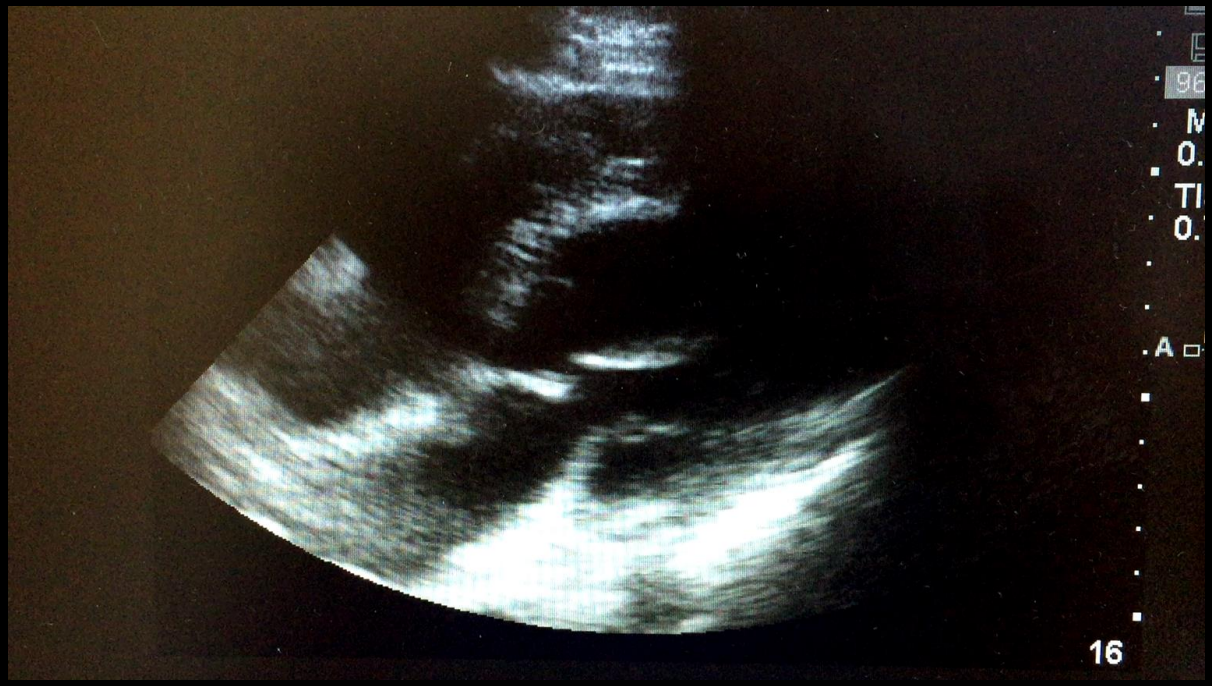
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Guide
Dual


Dual

Case

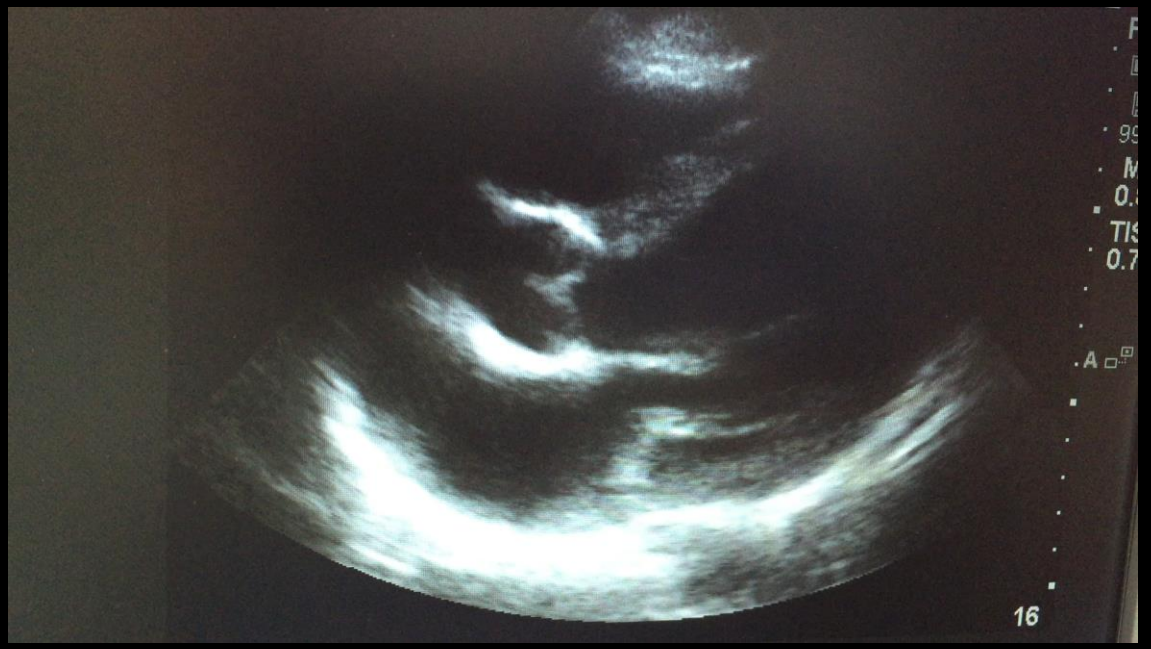
52 yo M seen at street outreach

Noted that he has had SOB with minimal activity and difficult to sleep at night.

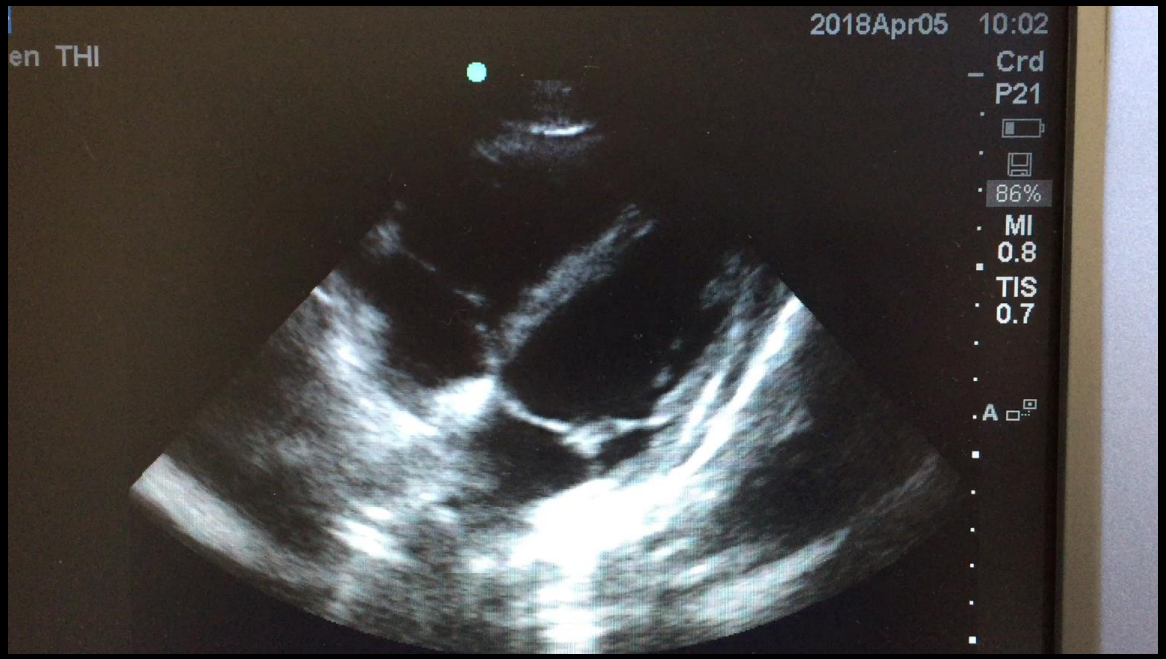
IV heroin and methamphetamine use

BP 180/110 HR 81 T97.9F SaO2 98%

Patient’s POC Echo



Normal POC Echo



Did Ultrasound Change Management?

- New diagnosis of Systolic CHF confirmed
- Prescribed lasix, lisinopril and metoprolol
- Likely avoided ER visit
- Followed up with patient in 1 week, feeling better
- Started on buprenorphine
- Working on meth cessation

Case

- 53 yo F presented to our HCH clinic c/o lump in right breast for several months. Patient living on the street. Daily methamphetamine use.
- Nervous to come to clinic, rarely accesses medical care.

Patient’s Breast US

Normal Breast US

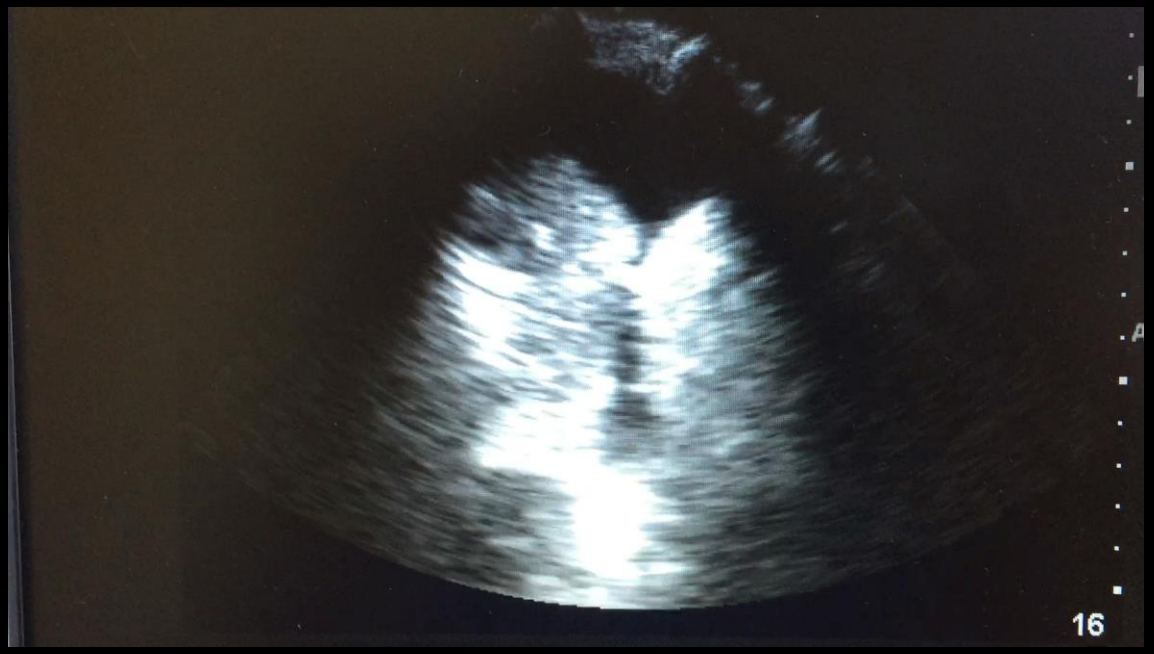
Did Ultrasound Change Management?

- Patient referred for same day mammogram and formal US showing mass concerning for neoplasm
- AWOL for several days from shelter
- Returned 4 days later to HCH shelter clinic, US-guided core needle bx done in clinic by our NP
- Pt seen by oncology 1 week later and began treatment
- Obtained medical respite bed

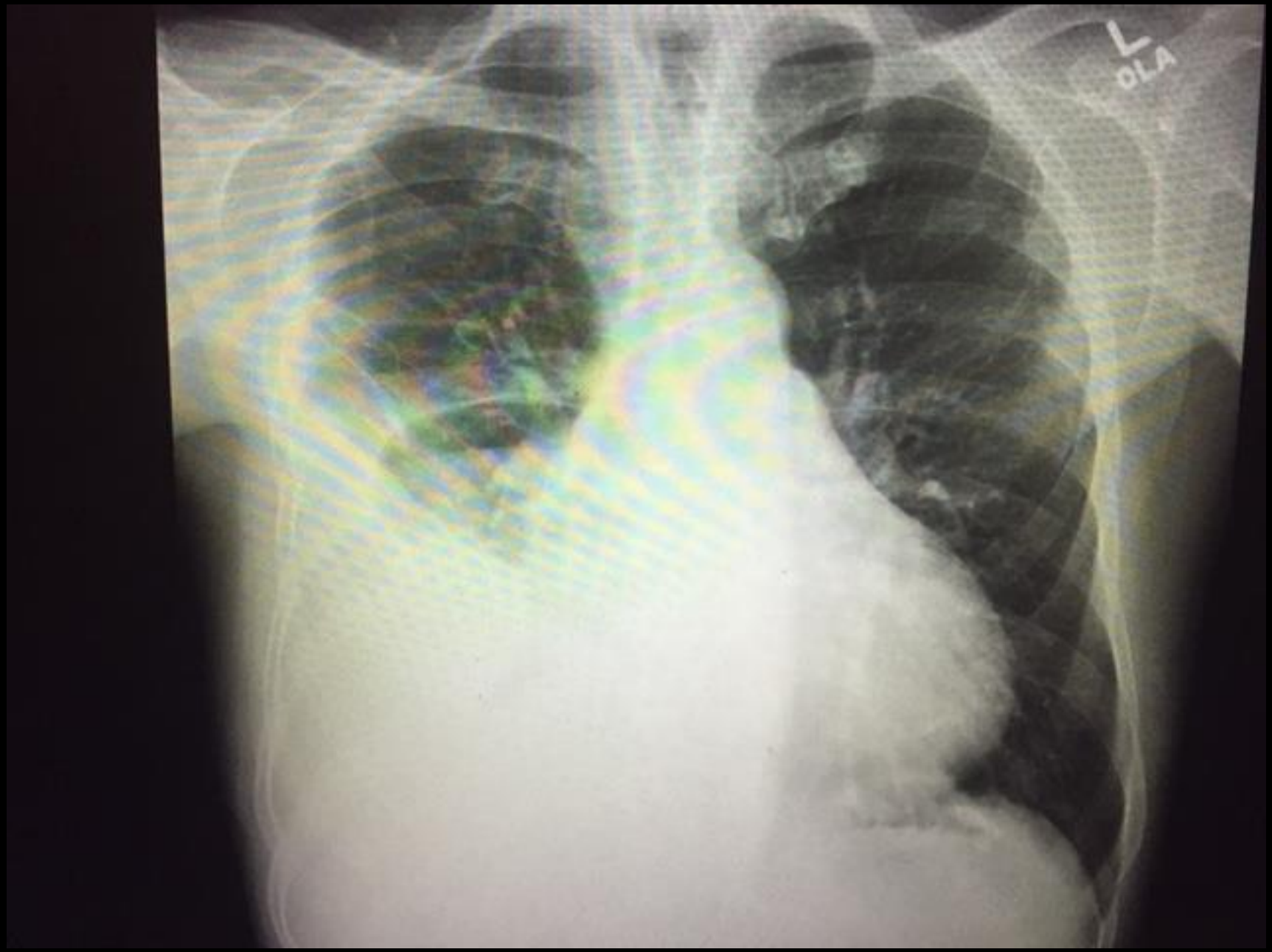
CASES

- 52 yo M h/o CHF, active daily meth use seen in field with SOB, LE edema for several months, worse past week. Off meds.
- Started back on lasix, referred to clinic for follow up check in 1 week.
- Pt reports increased urination, no improvement in respiratory symptoms.

Patient’s Lung US



Normal Lung US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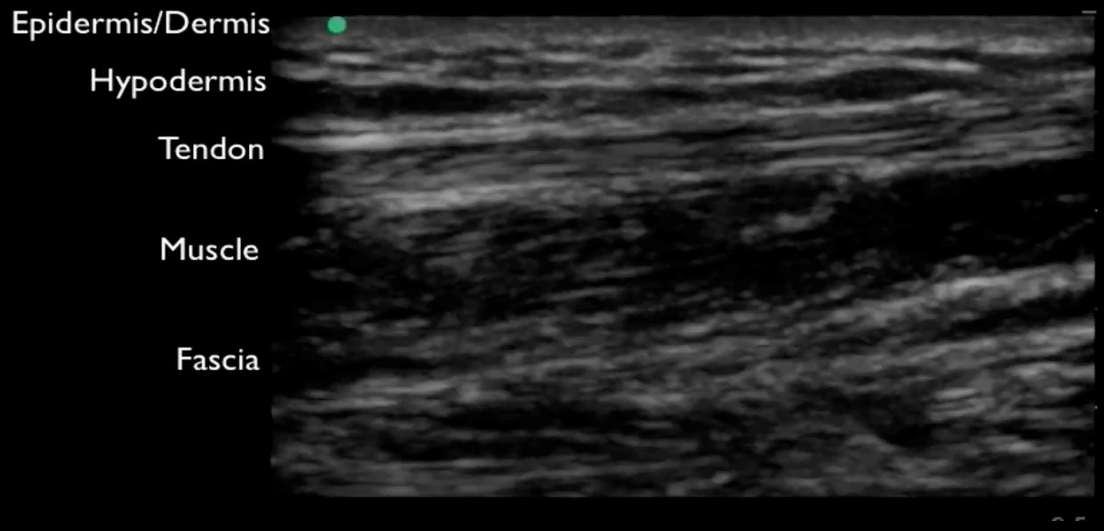
Did Ultrasound Change Management?

- Pt sent directly to ED for CXR, admission, thoracentesis
- Expedited diagnosis of large pleural effusion
- Able to engage patient in treatment plan and give real-time information
- Patient subsequently transferred to medical respite, about to be housed.

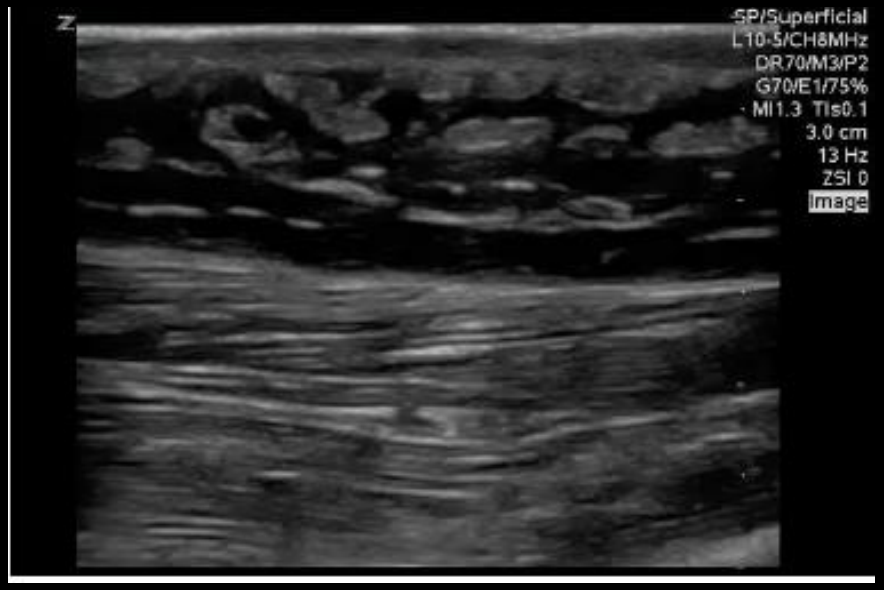
Case

Patient's Soft Tissue US

Normal Soft Tissue US



Abscess



Cellulitis

Did ultrasound alter management?

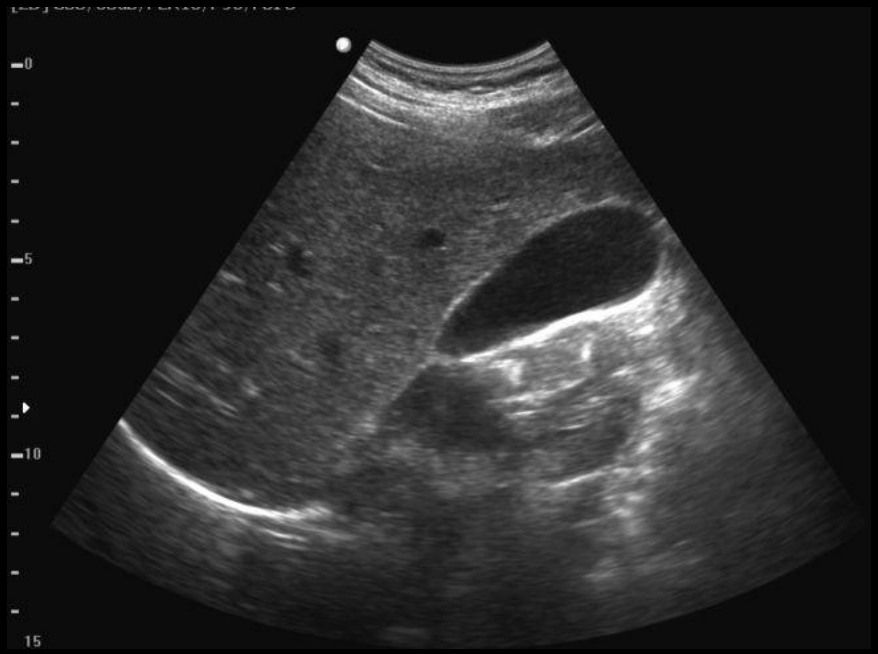
- Abscess identified
- No Color flow seen
- I&D done safely based on US images
- ER visit saved
- **Patient buy-in to provider-patient treatment plan**

Case

- 44 yo F with no pmhx presents to health van from her encampment.
- Two days nausea, severe epigastric/RUQ pain after eating a burrito. Reports this happens every couple months.
- Vitals: HR 80, BP 138/79, T98.2F, SaO2 99%
- Very TTP in RUQ on exam

Patient’s RUQ US

Normal RUQ US



Did ultrasound change management?

- Outpatient labs done same day, all normal
- Pain managed, diet triggers reviewed
- Patient referred to gen surg as outpatient, had elective cholecystectomy
- Avoided ER visit, immediate diagnosis of cholelithiasis

Case

- 35 y F h/o cocaine dependence and schizophrenia living in encampment.
- Presents to outreach c/o suprapubic pain, ongoing nausea for two months.
  - Urine dip negative for UTI
  - Urine preg positive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Did ultrasound change management?

- On-site dating and confirmation of IUP with +FHT
- Likely avoided ER visit
- Accurate date-based options counseling provided on site
- **Patient buy-in to provider-patient treatment plan**

Practicalities

- Cost
- Billing
- Archiving
- Training
- Credentialing

Cost

- Price point has dropped in last decade with increasing POCUS
  - High end portable ultrasound → $20,000+
  - Quality budget units → $7000+
  - Monthly plans: $200/month


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Modes

Archiving

- Developing field – general recommendations
- All images should be archived
  - Medical record
  - External archive
- Electronic or printed
- Medical record – written report
  - Limited vs complete

Billing

- **Yes, it is possible**
- Limited vs complete ultrasound coding
- cannot bill for both limited and complete pertaining to single work-up
- Check with each individual insurer for regulations
  - Medicare requires documented training or CME, competency

Trainings

- Focused
  - **Weekend courses – CME certified**
    - **General POCUS**
    - Musculoskeletal
  - Didactic Material
    - Podcasts
    - Books
- Longitudinal
  - 1 year academies - online
  - Residency curriculums
  - Medical school curriculums

2 day course schedule

DAY 2

830am- **Brief review/Pass the pointer** (Kendra Johnson)

850am- **OB 1st trimester , rule out ectopic** (Kendra Johnson)

910am- **OB 1st trimester lab**

1000am- **Soft Tissue US & Nerve Block** (Neil Jayasekera)
Abscess, Foreign Body evaluation, Nerve Block

1020am- **Procedural US** (Neil Jayasekera)
Arterial line, Venous access, Thoracentesis, Paracentesis

1040am- **Soft Tissue, Nerve Block, Procedural US lab**

1200-100pm **LUNCH**

100pm- **Pulmonary US** (Jason Reinking)

120pm - **Pulmonary US Lab**

150pm- **Musculoskeletal** (Jason Reinking)

210pm **Musculoskeletal lab**

310pm- **RUSH - Rapid Ultrasound for Shock & Hypotension** (Neil Jayasekera)

330pm- **RUSH lab**

430pm- **Overview of advanced applications** (Neil Jayasekera)

500pm- **Adjourn**

DAY 1

800am- **Introduction** (Neil Jayasekera)

815am- **"The Basics" -US terminology, Physics & knobology** (Jason Reinking)

845am- **Trauma: FAST and eFAST** (Neil Jayasekera)

905am- **FAST and E-FAST Lab**

1015am- **Abdominal US -- Gallbladder and Aorta** (Jason Reinking)

1035am- **Abdominal US Lab**

1145pm- **Pass the Pointer** (Jason Reinking)
Review of Basics, FAST, and Abdominal US

1200-100pm **LUNCH**

100pm- **Basic Cardiac Echo** (Jason Reinking)

120pm **Basic Cardiac US Lab**

240pm- **Abdominal US- Kidney & Bladder** (Jon Powell)

300pm- **Abdominal US- Lab**

340pm **DVT US** (Jon Powell)

400pm- **DVT US lab and/or Open Lab**

500pm- **Adjourn**

Competency

- Accuracy highly dependent on skill of practitioner
- Training, assessment, quality assurance
- Each system develops its own guidelines
- In general…
  - 150-300 total scans
  - 25-50 scans for specific exam
  - 5-10 scans for ultrasound guide procedures

Be an ultrasound champion

- Repurposing…
- Build a program

Questions

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