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Utilization of MSK Ultrasound on the Sideline

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Disclosures

Nothing to disclose

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Goals

- Understand basics of ultrasound and its capabilities and limitations in evaluating athletes
- Review the common applications for ultrasound in the emergency setting
- Get creative with novel uses of ultrasound on the sidelines

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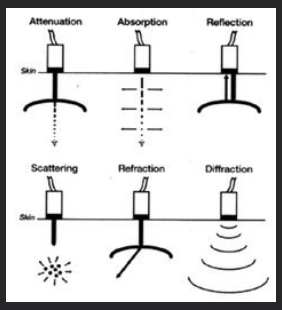
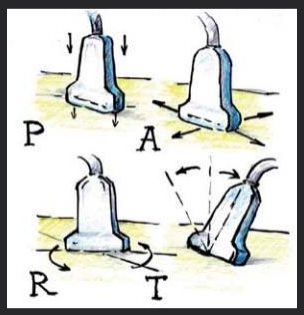
Ultrasound Basics

- Sound waves transmitted in arrays, used to generate images
- 2D picture of plane directly beneath probe
- Tissue properties determine behavior of sound waves in body, which then determines images generated





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Ultrasound Basics

Different probe types produce different images

Higher frequency:

- More resolution

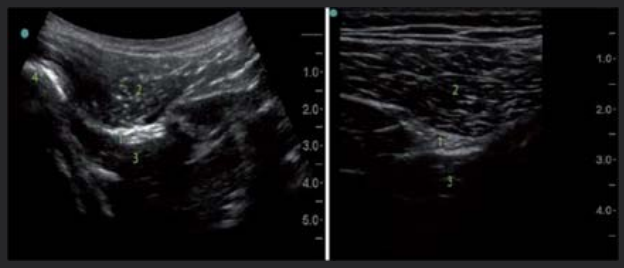
- Less penetration

Lower frequency:

- Less resolution

- Deeper penetration

Linear vs Curved



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Ultrasound Basics

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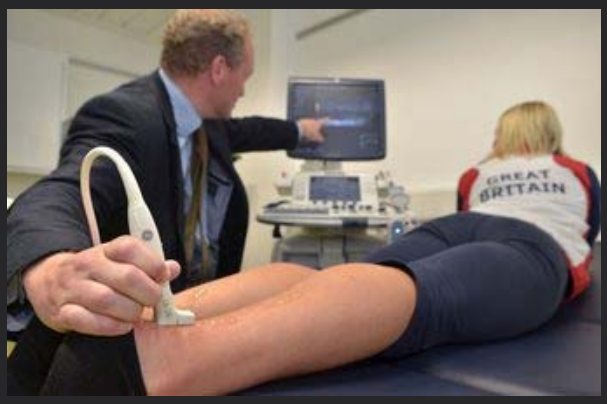
Ultrasound Basics

- **Pros:**
  - Excellent for evaluation of superficial structures, fluid collections
  - Real-time, portable
- **Cons:**
  - Cost
  - Operator-dependent



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Sideline Ultrasound Uses

- **Trauma evaluation**
  - FAST and E-FAST exams
  - Fracture and soft-tissue injury diagnostics
- **Treatment**
  - Ultrasound-guided injections
  - Peripheral nerve blocks
  - Ultrasound-guided IVs
- **Other?**

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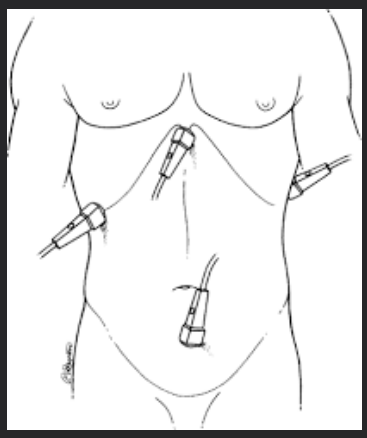
FAST Exam

Focused Assessment with Sonography for Trauma

- Four primary views
  - Subxiphoid
    - Cardiac
  - Right Upper Quadrant
    - Liver, Kidney, Morrison's Pouch
  - Left Upper Quadrant
    - Spleen, Kidney
  - Suprapubic
    - Bladder



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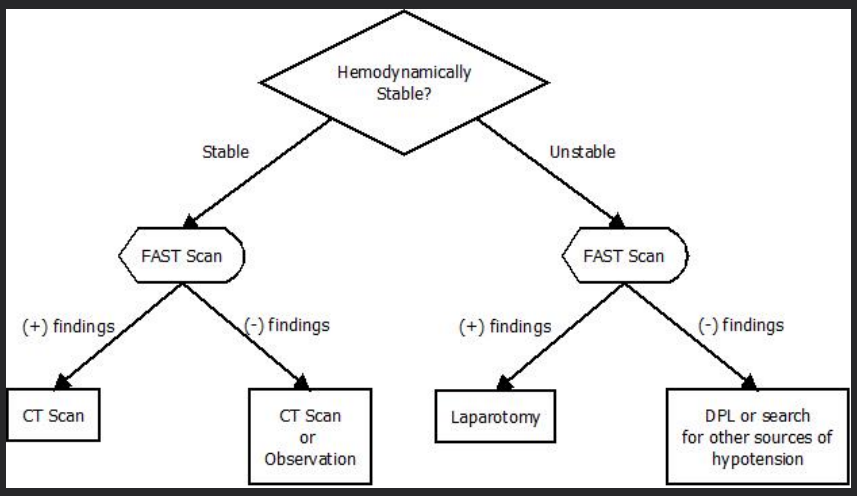
FAST Exam



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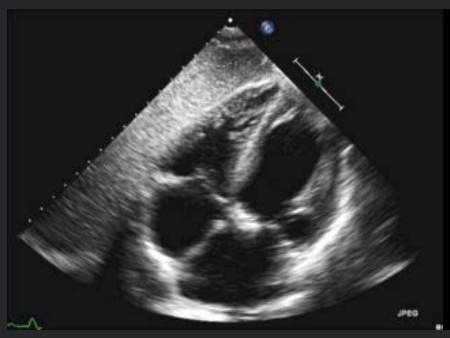
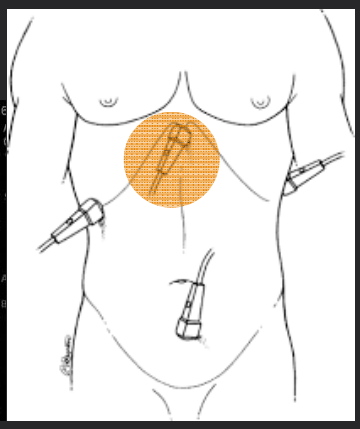
FAST Exam

Cardiac





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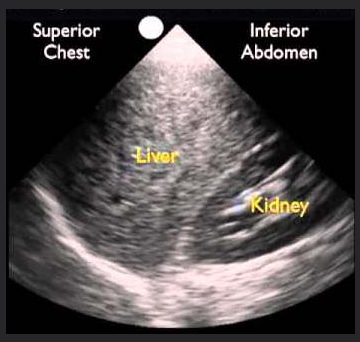
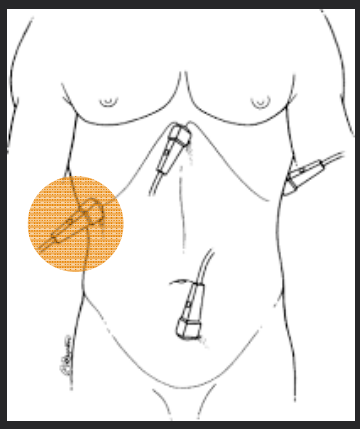
FAST Exam

Right Upper Quadrant





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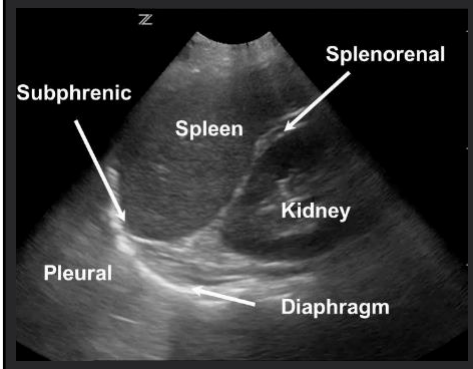
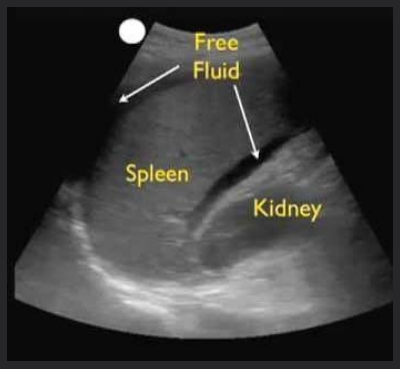
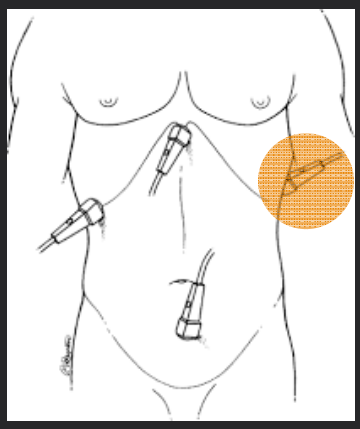
FAST Exam

Left Upper Quadrant







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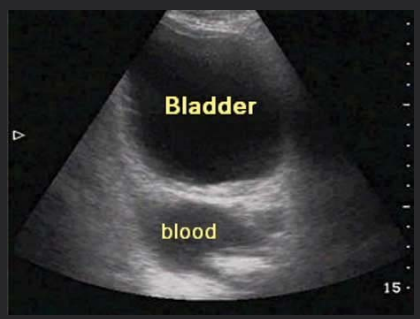
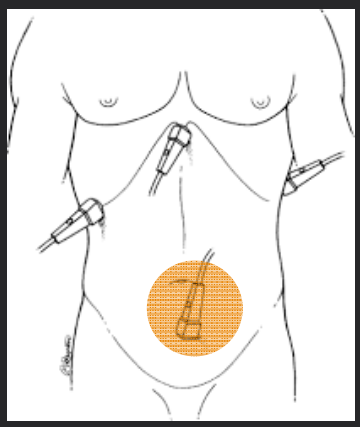
FAST Exam

Suprapubic





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FAST Exam

Sideline Uses

- **FAST is very SPECIFIC in trauma**
- **NOT sensitive: ie NOT used to RULE OUT INJURY**
- **Negative FAST in setting of very recent trauma is NOT diagnostic**
- **May require significant bleeding (up to 200cc or more) before blood can be visualized**

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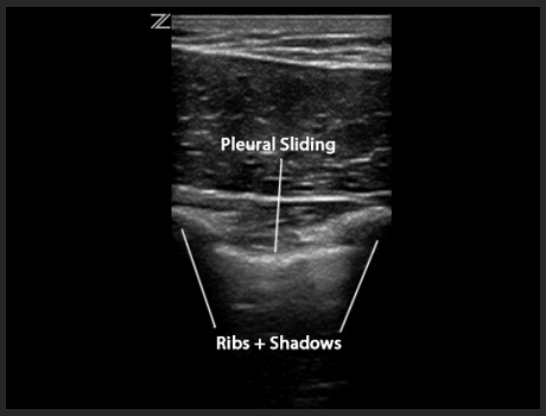
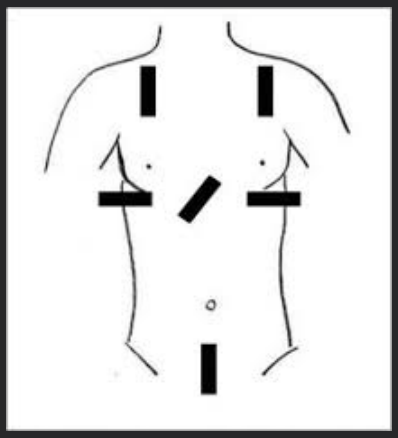
E-FAST

FAST exam can be expanded to E-FAST, including lungs





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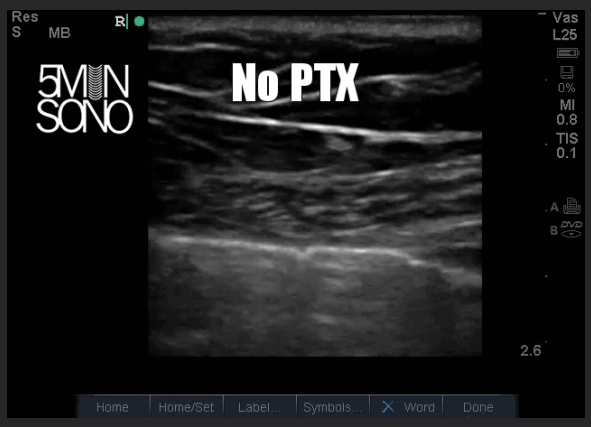
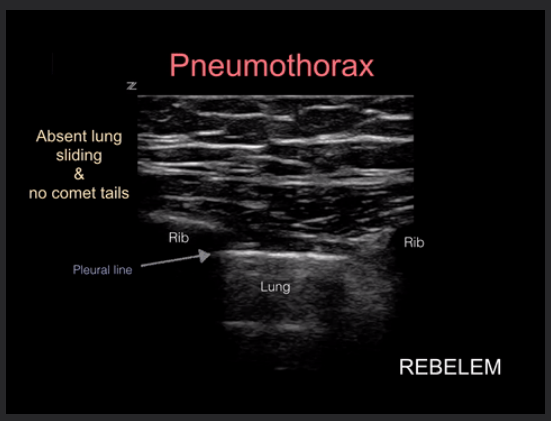
E-FAST

Lung sliding





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FAST Exam Pearls/Pitfalls

- Positive FAST indicates need for **EMERGENT** intervention
- Negative FAST does not rule out injury
  - FAST can be repeated, especially if high suspicion
- Important to visualize as much perihepatic and perisplenic area as possible
  - Multiple windows may be required to fully evaluate for free fluid
- Not all abdominal injuries produce free fluid
  - Bowel injury and solid organ injury without significant bleeding will not be detected by ultrasound
- Free fluid isn't always blood
- Clotted blood can generate various degrees of echogenicity
  - May be mistaken for normal surrounding soft tissue.
- Chest US can only detect a pneumothorax directly under the probe
  - Scan several sites on the anterior chest

https://www.acep.org/sonoguide/FAST.html

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Fracture Evaluation

- **Evaluation of long bones on ultrasound**
  - Sound waves don't penetrate through bone
  - Cortical disruptions often easily visualized
  - Also possible to visualize bone healing, callus formation, etc

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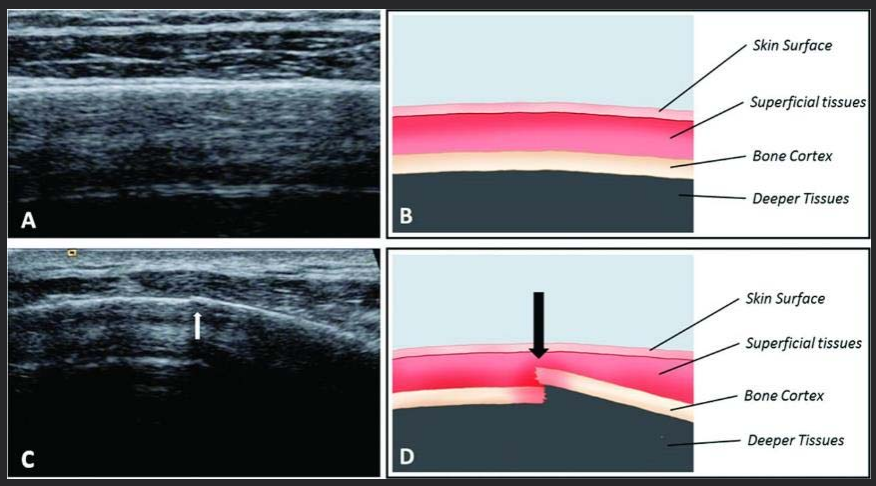
Fracture Evaluation



http://bjsm.bmj.com/content/51/14/1093

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Ligament/Tendon/Muscle Injuries

- Achilles
- Patella/Quad Tendon
- UCL (thumb)
- UCL (elbow)
- Hamstring
- Calf

- Dynamic evaluation!

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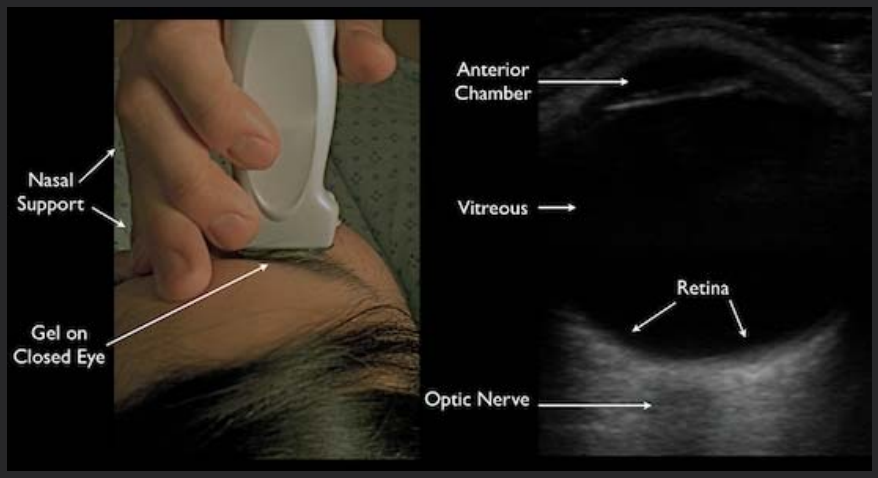
Ocular Ultrasound



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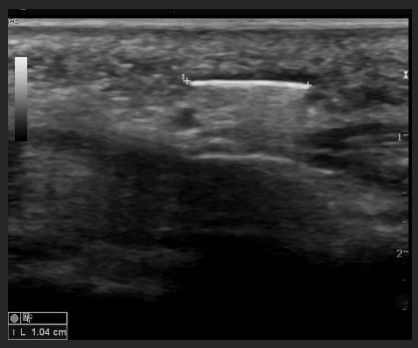
Foreign Body



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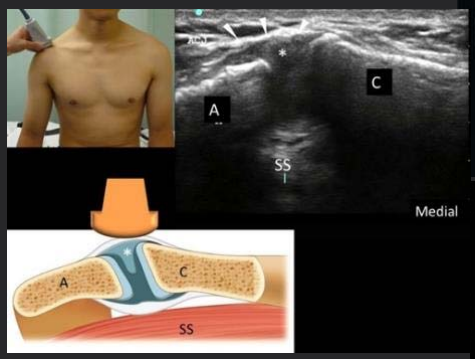
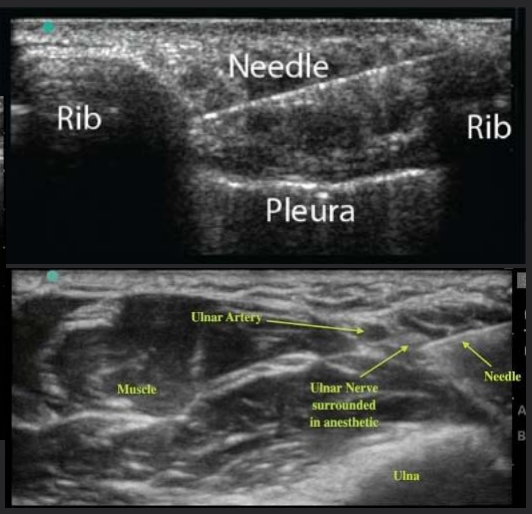
Guided Injections

- AC Joint
- Rib
- Finger
- Ankle
- Nerve block





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Ultrasound Guided IV Placement

Not all athletes have great veins!

- Dehydration
- Large athletes
- Need for rapid access

You can see a lot more with ultrasound than with the naked eye!

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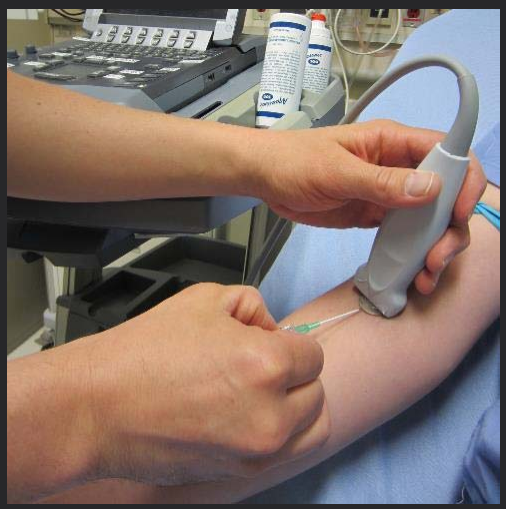
Ultrasound Guided IV Placement



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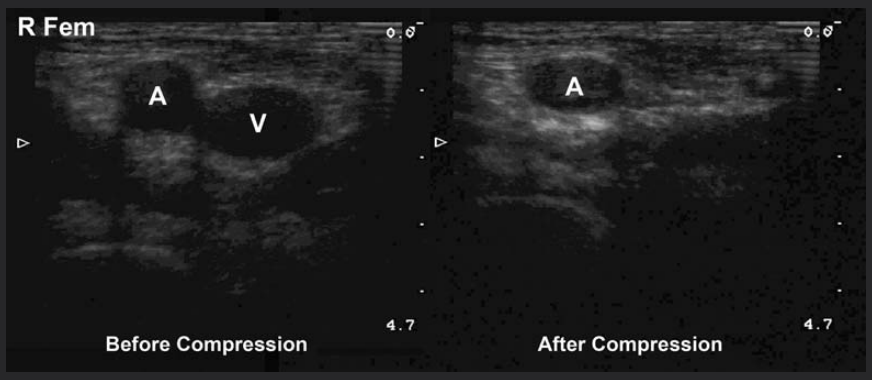
Ultrasound Guided IV Placement

Artery or Vein?



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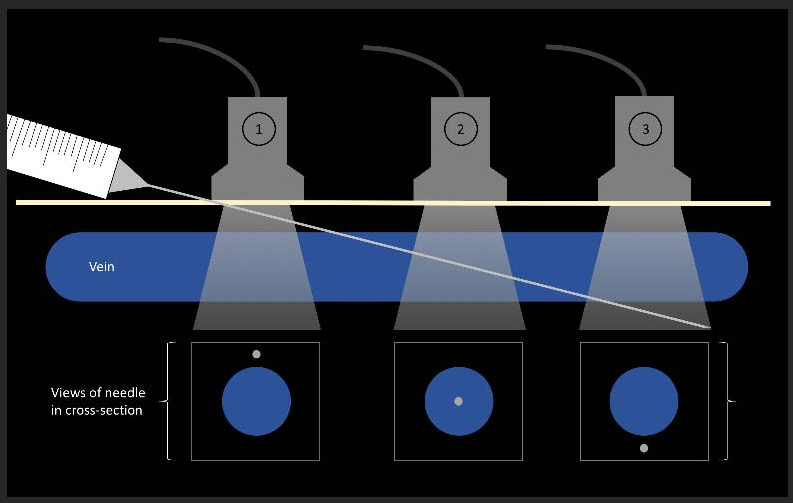
Ultrasound Guided IV Placement



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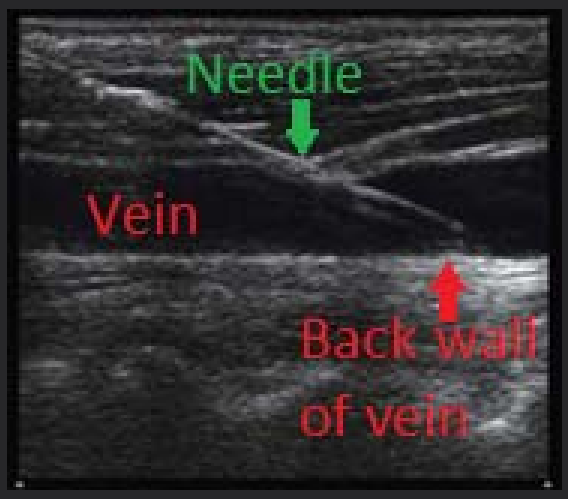
Ultrasound Guided IV Placement

Long axis approach



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Summary

- Many potential uses for ultrasound on the sidelines
  - (E)-FAST exam
  - Bone and soft tissue injury evaluation
  - US guided IV placement
- Additional uses limited only by willingness to try
  - PPE Cardiac Screening?
  - Splenic enlargement in mononucleosis and RTP?
  - Dehydration/volume status evaluation?
- The more you scan, the better you scan!

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Questions?

AMAZING THINGS ARE HAPPENING HERE

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