What is POCUS
Basic Settings/info
Practical applications
Optimization of image
Intro to AAA anatomy

AAA anatomy image optimization

DVT relative anatomy and image optimization

Bladder scan relative anatomy Image optimization

Scan
DVT

Unlocking the Potential: Point of Care Ultrasound

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Disclosures

- We have no financial disclosures or conflicts of interest to report in relation to this presentation. Our commitment is solely to provide information for the benefit of medical education and practice.

Objectives

- Explore the practical applications of Point of Care Ultrasound (POCUS)
- Understand the fundamental principles of ultrasound and how they apply to POCUS.
- Discover strategies and resources for gaining hands-on experience and proficiency with POCUS.
- Learn relative anatomy and begin some initial guided scans for common uses of POCUS

Overview of Point of Care Ultrasound

- What is POCUS?
    - The use of ultrasound technology at the bedside or point of care to perform real-time imaging and assist in clinical decision-making.
    - It is typically used to quickly assess and diagnose conditions in a variety of settings, including emergency, inpatient, and outpatient care.

Citation: Manning, J. (2022). *Point-of-Care Ultrasound in Primary Care: A Review*. Journal of Primary Care & Community Health, 13, 21501319221102672. doi:10.1177/21501319221102672.

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Overview of Point of Care Ultrasound

- What are benefits of using POCUS

  - Enhanced Diagnostic Accuracy
  - Improved Patient Management
  - Reduced Need for Referrals and Imaging
  - Streamlined Decision-Making
  - Enhanced Patient Safety

Citation: McGowan, J. (2021). *Benefits of Point-of-Care Ultrasound in Primary Care: A Systematic Review*. *Journal of Family Practice*, 70(1), 48-56. doi:10.12788/jfp.0428.

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Equipment and Setup

- POCUS Equipment
  - Types of ultrasound machines suitable for primary care
  - Probes and their uses (linear, curvilinear, phased array)
  - Portable vs. stationary systems
- Budget Considerations
  - Cost – effective options for startups
  - Leasing vs. purchasing equipment
- Additional supplies
  - Ultrasound gel
  - Cleaning supplies
  - Storage solutions

Citation: Shen-Wagner J, Deutchman M. Point-of-Care Ultrasound: A Practical Guide for Primary Care. Fam Pract Manag. 2020 Nov/Dec;27(6):33-40. PMID: 33169960.

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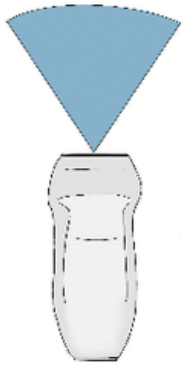
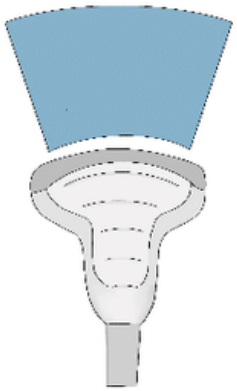
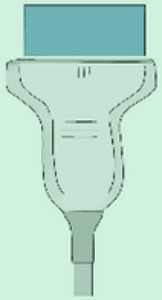
Types of Machines

Types of Machines

- Qualities of POCUS Device

    - Portable, Portable, Portable.
        - Likely will be deployed in different rooms
        - Usually unplanned scenarios
    - Compatible with other technology (your phone, EHR)
    - Adjustable with the skill level
    - Contains the probes that produce the best quality scan for your intended use

Types of Probes

Transducer Type	Phased array	Curvilinear	Linear
Frequency	1-5 MHz	2-5MHz	5-10Mhz
Debth	35cm	30cm	9cm
			Used for DVT diagnosis 
Applications	Heart,lungs, pleura, abdomen	Gallbladder, kidney, liver, bladder, uterus, ovaries, aorta	Arteries, veins, skin, muscoloskeletal, testicles, eyes, breast

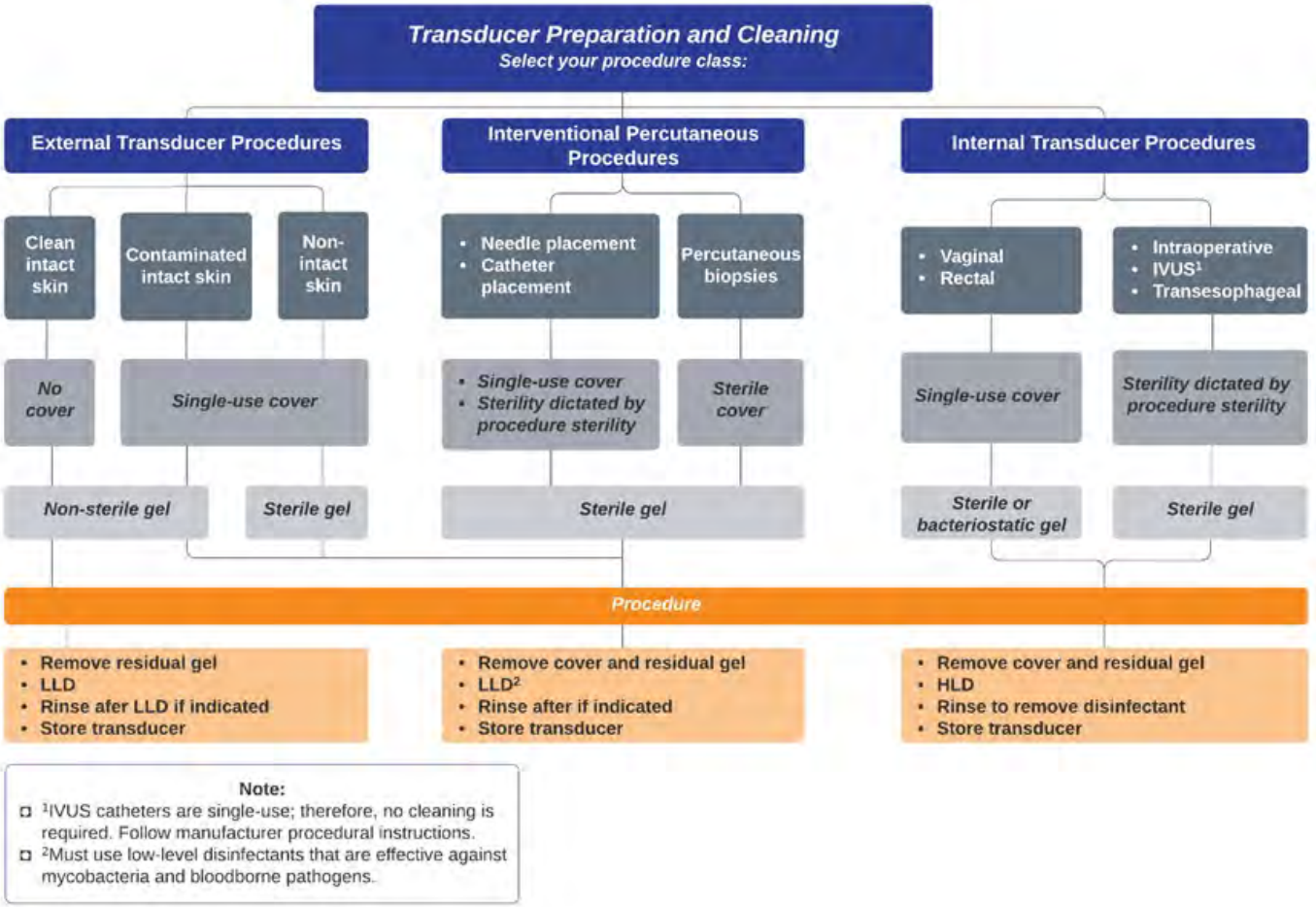
Typical Setups

Cleaning

- Ultrasounds = Critical items
    - Confer a high risk for infection if they are contaminated with any microorganism.
    - Manufacturers have guidelines and products for cleaning
    - Sterile and non-sterile single use gels and covers

Cleaning

Cleaning



Note:

- [1]IVUS catheters are single-use; therefore, no cleaning is required. Follow manufacturer procedural instructions.
- [2]Must use low-level disinfectants that are effective against mycobacteria and bloodborne pathogens.

Education and Training Resources

- Formal Training Programs
- Online Resources
- Textbooks and Literature
- Peer Learning and Mentorship

Education and Training Resources (?Free)

- Ultrasound at the University of South Carolina School of Medicine YouTube Channel. Review most ultrasound scan protocols in under 1 minute with the One Minute Ultrasound videos, also available as a free app for your smartphone.
- The full list of SUSME modules is a great resource as well.
- SonoWolrd has lots of great free online lectures, but you will need to create a free account to view them.
- The Ultrasound Podcast is entertaining and informative. From the same people that brought you the Ultrasound Leadership Academy.
- POCUS101 : free website with indepth breathdown of anatomy, technique, indicactions and differentials to consider
- Introduction to Bedside Ultrasound. A free E-Book for iBooks. From the creators of Ultrasound Podcast.
- The American Institute of Ultrasound in Medicine (AIUM) is the largest multi-disciplinary ultrasound professional organization. They have some good online videos in the member community sections, but you will have to join or create a fee guest account to access them.

Practical Applications

POCUS FOR BEGINNERS

The best procedures for point-of-care ultrasound (POCUS) beginners are impactful for the patient, easy to perform (require a small number of quickly obtained views), simple to interpret (limited diagnostic endpoints), and low liability for patient and physician.

Tissue/system	Learn this first	Then proceed to	Transducer type
Skin and soft tissue	Cellulitis vs. abscess	Lumps and bumps	High frequency
Musculoskeletal	Knee effusions	Needle guidance	High frequency
Pelvis and obstetrics	Bladder obstruction	Intrauterine pregnancy labor and delivery	Low frequency
Abdomen	Abdominal ascites	Hydronephrosis	Low frequency
Chest	Pleural effusion	Pulmonary edema	Low frequency

Citation: Shen-Wagner J, Deutchman M. Point-of-Care Ultrasound: A Practical Guide for Primary Care. Fam Pract Manag. 2020 Nov/Dec;27(6):33-40. PMID: 33169960.

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Abdominal Aortic Aneurysm

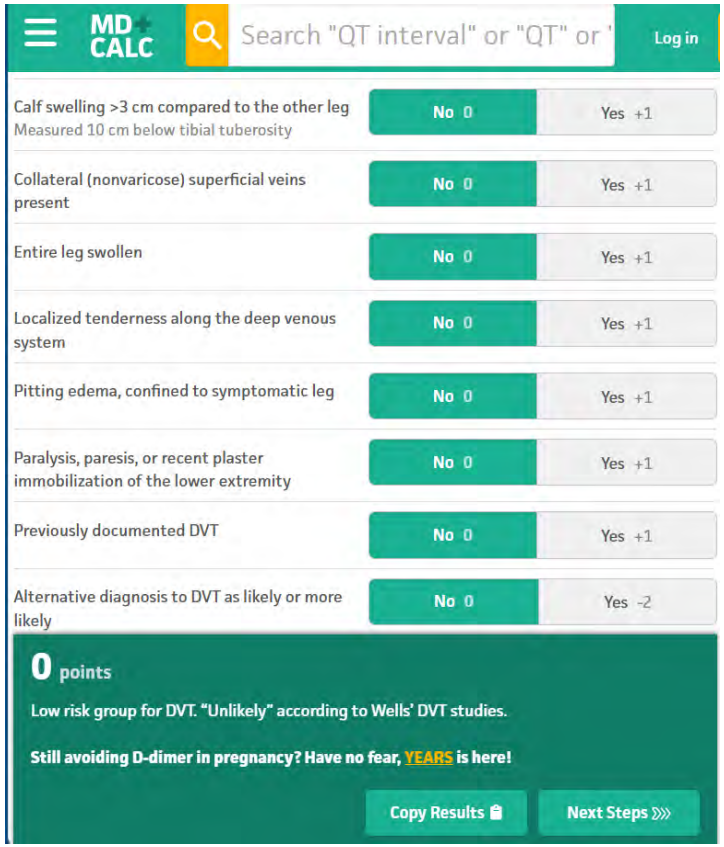
- POCUS – AAA
- Symptoms of concern

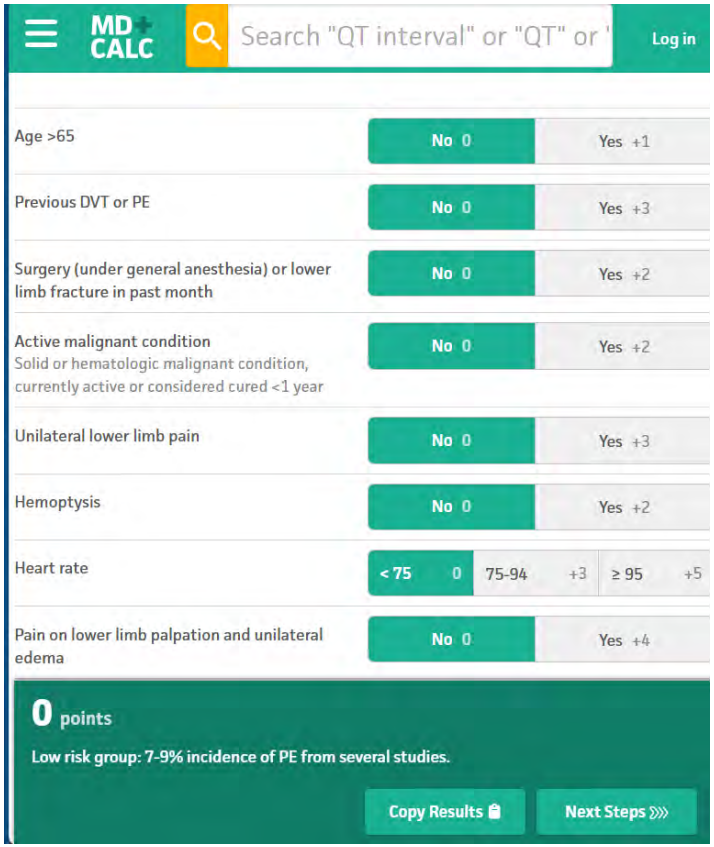
- Limitations

- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://edus.ucsf.edu/sites/edus.ucsf.edu/files/wysiwyg/UCSF%20ED%20US%20Protocol%20Abdominal%20Aorta_Final.pdf
- Reference images to use?

Deep Venous Thrombosis (DVT)

- POCUS – Deep Vein Thrombus
- Symptoms of concern
  - Lower extremity pain/ swelling concerning for venous thrombus embolus
  - Acute dyspnea on evaluation w/ concern for lower extremity DVT source for pulmonary embolism
  - Wells/Geneva score concerning for VTE prior to scanning
- Limitations
  - Body habitus
  - Limited ER of hip and/or limited F of knee
  - Operator
  - Patient history
  - Limited exam can miss isolated femoral vein DVTs


MD+ CALC
Search "QT interval" or "QT" or '
Log in
Calf swelling >3 cm compared to the other leg
Measured 10 cm below tibial tuberosity
No 0
Yes +1
Collateral (nonvaricose) superficial veins present
No 0
Yes +1
Entire leg swollen
No 0
Yes +1
Localized tenderness along the deep venous system
No 0
Yes +1
Pitting edema, confined to symptomatic leg
No 0
Yes +1
Paralysis, paresis, or recent plaster immobilization of the lower extremity
No 0
Yes +1
Previously documented DVT
No 0
Yes +1
Alternative diagnosis to DVT as likely or more likely
No 0
Yes -2
0 points
Low risk group for DVT. "Unlikely" according to Wells' DVT studies.
Still avoiding D-dimer in pregnancy? Have no fear, YEARS is here!
Copy Results
Next Steps


MD+ CALC
Search "QT interval" or "QT" or '
Log in
Age >65
No 0
Yes +1
Previous DVT or PE
No 0
Yes +3
Surgery (under general anesthesia) or lower limb fracture in past month
No 0
Yes +2
Active malignant condition
Solid or hematologic malignant condition, currently active or considered cured <1 year
No 0
Yes +2
Unilateral lower limb pain
No 0
Yes +3
Hemoptysis
No 0
Yes +2
Heart rate
< 75 0
75-94 +3
≥ 95 +5
Pain on lower limb palpation and unilateral edema
No 0
Yes +4
0 points
Low risk group: 7-9% incidence of PE from several studies.
Copy Results
Next Steps

- Probe selection
  - Linear probe: Higher resolution & Shallow imaging (typical go to)
  - Curvilinear Probe: Lower resolution & Deeper imaging
- Presets
  - MSK or Nerve or Venous
- Mode
  - Primarily B mode/ brightness mode & color doppler (good for A V distinction)
- Depth
  - Vessels in middle of screen

Positioning

- Hip: AbER
  - Use towels/ gowns/ chucks to cover the patient
- Knee: F
  - More so when looking in popliteal fossa

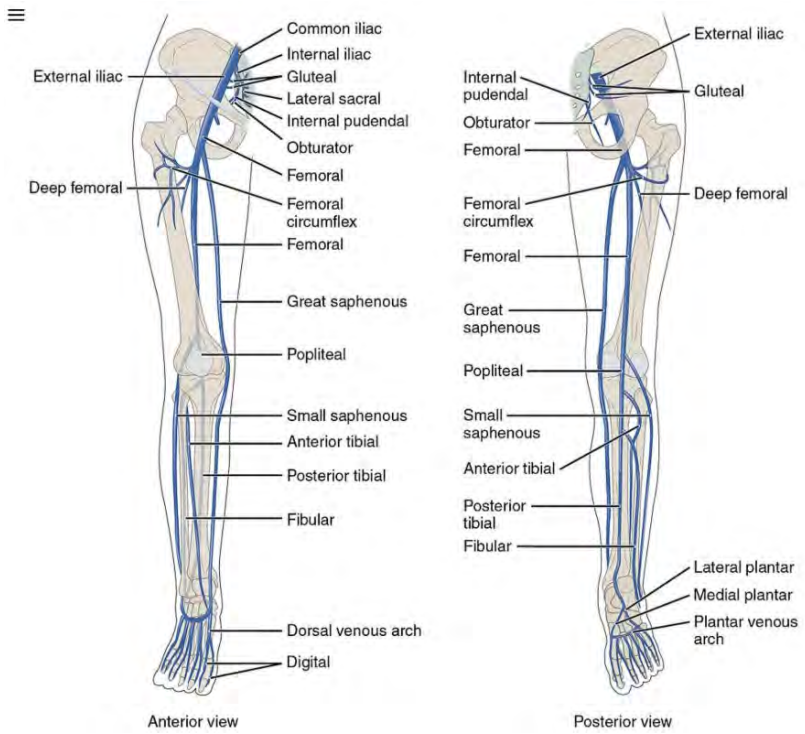
Protocol

- Great saphenous vein (GSV)
- Femoral vein (FV) / Deep femoral vein (DFV)
- Popliteal Vein Trifurcation (PVT)

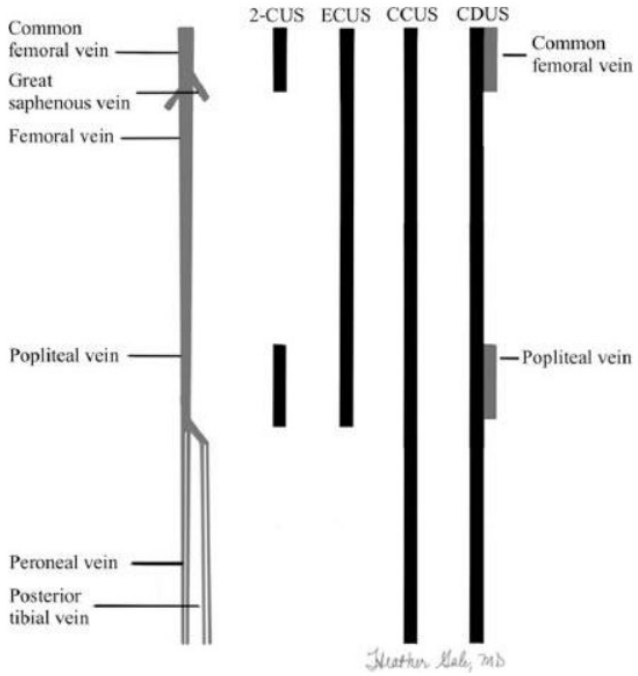
- Compression is needed

- 2-Point Compression = CFV/GSV + PV trifurcation
- 3-Point Compression = 2-point + FV/DFV junction

DVT anatomy


Common iliac
Internal iliac
External iliac
Gluteal
Lateral sacral
Internal pudendal
Obturator
Femoral
Deep femoral
Femoral circumflex
Femoral
Great saphenous
Popliteal
Small saphenous
Anterior tibial
Posterior tibial
Fibular
Dorsal venous arch
Digital
Anterior view
External iliac
Internal pudendal
Gluteal
Obturator
Femoral
Deep femoral
Femoral circumflex
Femoral
Great saphenous
Popliteal
Small saphenous
Anterior tibial
Posterior tibial
Fibular
Lateral plantar
Medial plantar
Plantar venous arch
Posterior view

Compression Area

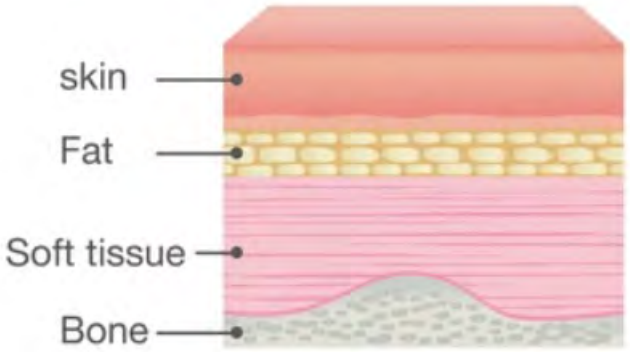


Soft tissue (cellulitis v abscess)

- POCUS – Soft Tissue
- Symptoms of concern: tenderness, erythema, fever, pain, co-morbidities

- Limitations: Operator recognition
- Probe selection: Linear probe
- Presets: Soft tissue / skin

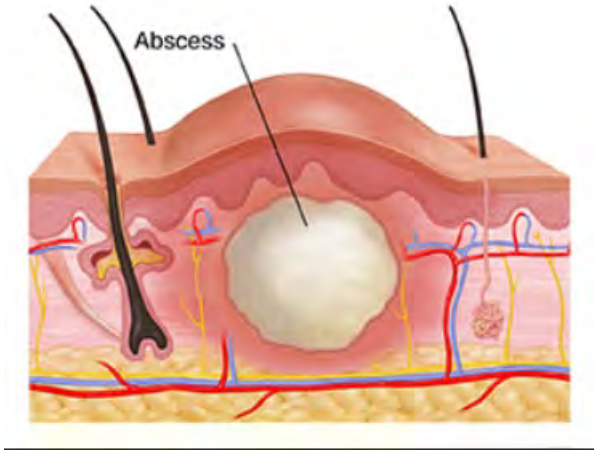
Normal

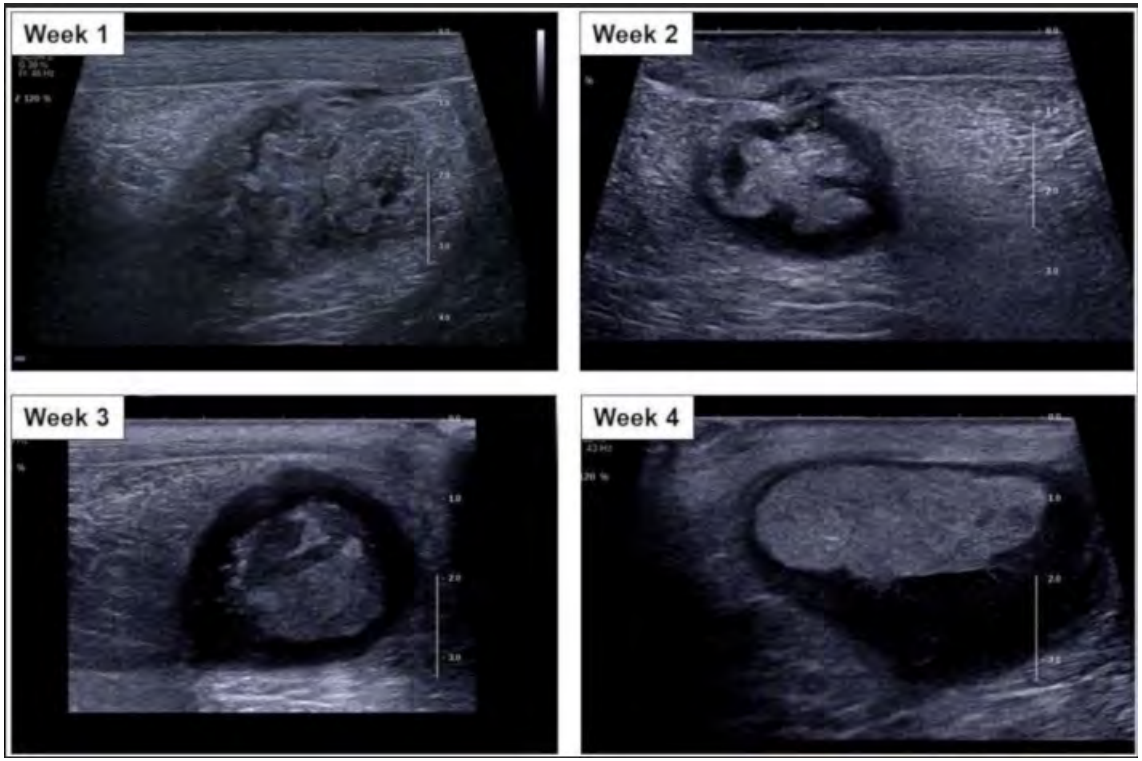

skin
Fat
Soft tissue
Bone


Epidermis
Dermis
Subcutaneous adipose tissue (fat)
Subcutaneous connective tissue
Bone
Muscle
Acoustic shadow

Cobblestoning

Abscess





Bladder

- POCUS – Bladder
- Symptoms of concern: dysuria, hematuria

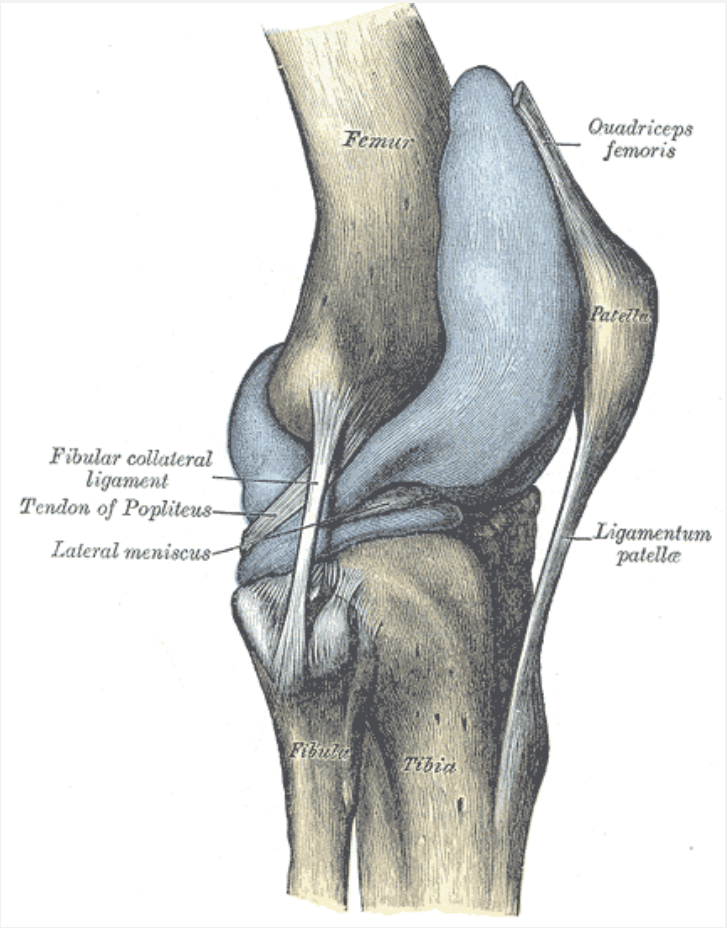
- Limitations
  - Body habitus
  - Limited ER of hip and/or limited F of knee
  - Operator
  - Patient history
  - Limited exam can miss isolated femoral vein DVTs

- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://edus.ucsf.edu/sites/edus.ucsf.edu/files/wysiwyg/UCSF%20ED%20US%20Protocol%20Renal_Final.pdf

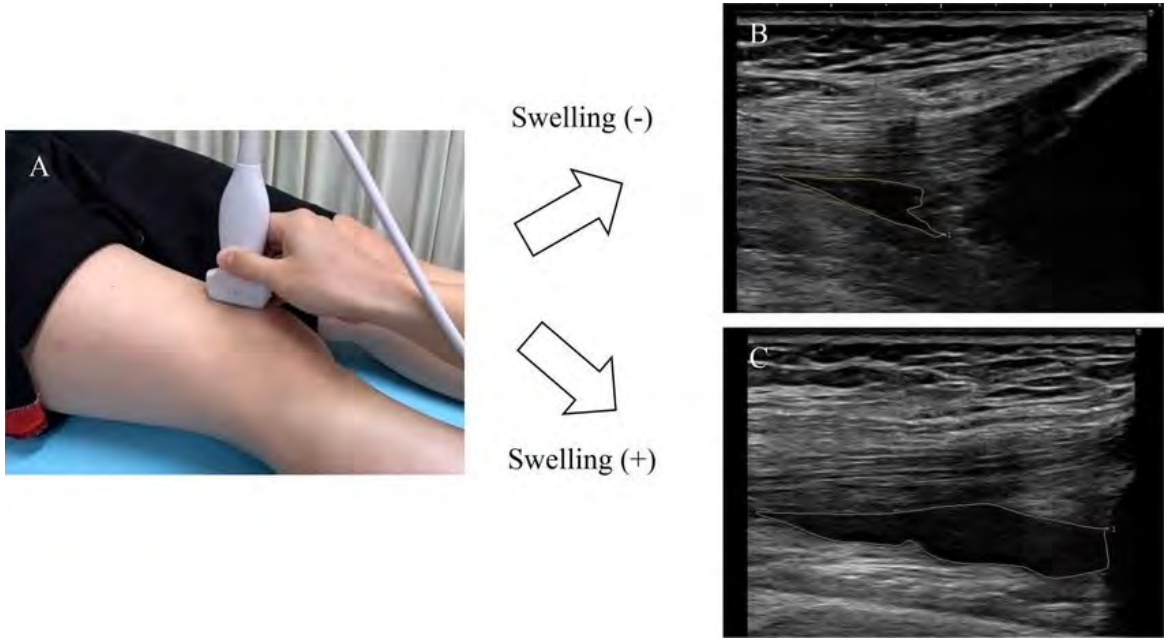
- Bladder images with annotation

Ultrasound Guided knee injection

- *Werner, Platzer (2004). Color Atlas of Human Anatomy, Vol. 1: Locomotor System (5th ed.). Thieme. ISBN 3-13-533305-1.*

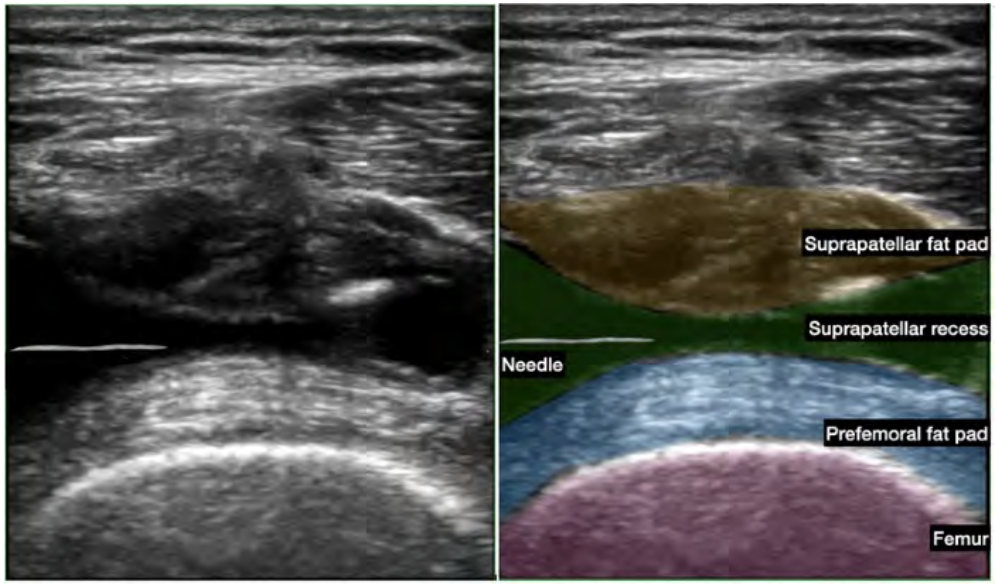


Ultrasound view: longitudinal



- https://www.researchgate.net/figure/Quantitative-evaluation-of-effusion-in-the-suprapatellar-bursa-objective-swelling-A_fig1_356015885

Ultrasound view: Transverse



- https://www.acep.org/emultrasound/newsroom/oct2024/ultrasound-guided-suprapatellar-recess-injection-for-knee-pain-in-the-emergency-department

Technical notes

Typically using linear probe

Want target halfway to 2/3 down the screen

Identify any potential obstacles to avoid (arteries, veins, tendons)

Don't rely solely on image, if it feels wrong, then think about what might be off

Practice, practice, practice- there are models now that can be used to practice on