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KEY ADVANCES
PRACTICE ADVANCE

Point-of-Care Ultrasound (POCUS)

New August 2025

Why is this topic important?
Point-of-care ultrasound (POCUS) is an essential tool in emergency medicine, providing rapid bedside diagnostic capabilities that enhance patient care. It enables immediate assessment and management of critical conditions, improves diagnostic accuracy, reduces procedural complications, and can be lifesaving in emergent situations. The application of POCUS in clinical practice continues to evolve and newer literature provides guidance on how it can be incorporated in novel ways that impact the care of patients in emergency settings.

How will this change my clinical practice?
Recent literature challenges common approaches to diagnostic imaging in some of the common clinical presentations, such as suspected nephrolithiasis, visual concerns, soft tissue infection, and trauma. Newer literature has reinforced the diagnostic utility of POCUS in these conditions, while adding evidence demonstrating improvement in important clinical outcomes.

Synopsis Focus Points:

1. **Renal ultrasound should be considered for the initial diagnostic imaging in younger patients with suspected "first-time" stone and pregnant patients with suspected nephrolithiasis.**
2. **A POCUS-first approach to patients with suspected nephrolithiasis can lower preventable radiation exposure, decrease costs, and shorten length of stay.**
3. **Gallbladder ultrasound for suspected acute cholecystitis improves diagnostic efficiency, expedites surgical consultation, and reduces reliance on additional imaging, while maintaining high sensitivity and specificity for gallbladder pathology.**
4. **Ocular ultrasound is a valuable alternative for evaluating posterior chamber ocular structures, with high accuracy in diagnosing conditions such as retinal detachment and vitreous hemorrhage.**
5. **Despite the effectiveness of ocular POCUS, its reliability varies with different ocular pathology, and a negative study does not rule out pathology, necessitating further evaluation by ophthalmology for patients with persistent visual concerns.**
6. **Soft tissue ultrasound significantly improves the management of cellulitis, leading to reduced diagnostic testing, shorter emergency department stays, and lower failure rates for patients who have incision and drainage (I&D).**

7. **The extended focused assessment with sonography in trauma (eFAST) examination is a highly specific tool for identifying intra-abdominal free fluid, pericardial effusion, and pneumothorax, leading to improved outcomes and more efficient resource utilization in trauma care.**

Renal Ultrasound:
Patients with suspected nephrolithiasis frequently undergo diagnostic imaging. Over the past 20 years, computed tomography (CT) of kidneys, ureters, and bladder has predominated, but more recently POCUS has emerged as an alternative diagnostic study. In a trial of patients with suspected nephrolithiasis who were randomized to CT or POCUS, the initial ultrasonography arm was associated with lower cumulative radiation exposure and there were no significant differences between the groups in high-risk diagnoses with complication, serious adverse events, pain scores, return emergency department visits, or hospitalizations.(1) This has led to a POCUS-first approach in certain patients and situations, including younger patients with suspected first-time stone, patients with a history of kidney stones and low-risk presentations, and pregnant patients.(2) Recent research has shown that this approach significantly affects outcomes, including lowered cost, shorter length of stay, and preventable radiation compared with a CT imaging approach.(3,4) Another approach to improving diagnostic accuracy in patients with a suspected kidney stone and normal renal function is to calculate a STONE score, which predicts the likelihood of a kidney stone being the etiology of a patient's symptoms.(5) It has been shown to have a higher specificity than physician gestalt. The STONE score should not be used in patients with a fever or suspected infection or who have had recent trauma or urologic surgery.

Gallbladder Ultrasound:
Gallbladder pathology, particularly acute cholecystitis, is a common emergency department presentation where timely diagnosis can impact patient management. Historically, the diagnostic approach has relied on radiology-performed ultrasound or CT imaging. Recent evidence suggests that POCUS has significant utility as the first-line imaging modality. A meta-analysis (6) found that POCUS has excellent sensitivity and specificity for gallbladder disease, supporting its use as a reliable bedside diagnostic tool. Additionally, another recent study (7) found that when POCUS findings are suggestive of acute cholecystitis, further radiology imaging adds unnecessary time without significantly altering the diagnosis or management. The current literature suggests that a POCUS-first approach to gallbladder ultrasound improves efficiency, expedites surgical consultation, and reduces reliance on additional imaging. As is the case with all POCUS applications, operator experience and clinical correlation is essential for gallbladder ultrasound, and equivocal findings may still necessitate further imaging or surgical consultation.

Ocular Ultrasound:
Traditionally, ocular concerns requiring detailed imaging were referred to ophthalmology or necessitated the use of advanced imaging like CT or magnetic resonance imaging. Ocular ultrasound is an alternative that facilitates evaluation of posterior chamber ocular structures that can be difficult to assess, such as the lens, vitreous body, and retina. Both traumatic and nontraumatic etiologies of visual changes can be evaluated, and pathology that includes lens dislocation, vitreous hemorrhage, intraocular foreign body, and retinal detachment can be readily identified. Recent literature characterizes the test characteristics of ocular POCUS compared to ophthalmology evaluation.(8) It is highly accurate for diagnosing retinal detachment (sensitivity and specificity of 94%). Other conditions, such as vitreous hemorrhage (sensitivity 90%, specificity 92%) are associated with slightly less overall accuracy or have not been studied as extensively (lens dislocation, intraocular foreign body). POCUS for the diagnosis of vitreous detachment is much less reliable than other posterior chamber pathologies. As with many POCUS applications, a "negative" study does not fully eliminate potential pathology. **Therefore, patients with visual concerns and a negative ocular POCUS examination should be referred to ophthalmology for further evaluation.**

Soft Tissue Ultrasound:
The diagnostic approach to skin and soft tissue infections can be a challenge, as the clinical examination often fails to differentiate between the conditions. The role of soft tissue ultrasound is to differentiate between simple cellulitis and abscess, which provides diagnostic clarity on the need for an I&D versus treatment with antibiotics alone. Early research demonstrated that the use of soft tissue ultrasound in the emergency department significantly improved the management of cellulitis by reducing the need for further diagnostic testing and altering clinical management in nearly one-half of the cases.(9)

Recent studies have continued to demonstrate significant utility of soft tissue ultrasound in differentiating cellulitis versus abscess, although the diagnostic performance is slightly less in pediatric patients.(10) Additional value has been shown in improved outcomes, such as reduced length of stay (11) and lower failure rates of patients undergoing I&D (12) when soft tissue ultrasound is included in the diagnostic approach.

eFAST:
The eFAST examination is often considered to be synonymous with POCUS and has been used by emergency physicians for over 30 years. Initial literature demonstrated improved outcomes, decreased utilization of resources, shorter length of stay, fewer complications, and lower hospital charges when a FAST examination was incorporated into patient management.(13) The “e” in eFAST incorporates bilateral lung views to assess for the presence or absence of lung sliding, the latter being highly suggestive of pneumothorax. There are several variables that affect the accuracy of an eFAST examination, such as operator experience, patient’s body habitus, mechanism of injury, and time since injury, but for most pathologies, it is extremely specific. It can be relied on to rule in pathology, such as intra-abdominal free fluid, pericardial effusion, or pneumothorax.(14) Additionally, it has been shown to be superior to a supine CXR for the diagnosis of pneumothorax.(15) However, there are limitations in using the eFAST examination to rule out pathology. For example, it cannot exclude injury to solid organs or bowel, and it is less reliable in situations with small amounts of hemoperitoneum.

Suspected Kidney Stone Algorithm

Suspected Kidney Stone

Common symptoms of Kidney Stone:

- Flank or pelvic pain
- Nausea/Vomiting
- Hematuria

Medications: Ondansetron IV x 1 / ketorolac / 1 L NS Bolus
Labs: Urinalysis w/ culture reflex / CBC / BMP

- Pregnancy test for female age <55y
- Do not provide ketorolac for pregnant patients
- Lipase / LFTs if potential alternative diagnoses suspected
- Consider IV lidocaine for pain

Concern for infection?

YES

Presence of Signs / Symptoms of Infection

- Fever > 100.4 °F or < 95 °F
- Sepsis physiology
- UA with WBCs > 30/HPF **AND**
- Moderate bacteriuria **AND**
- Few to no epithelial cells

Hemodynamically stable?

YES

Order Imaging and Antibiotics

- CT A/P with IV contrast - Flank pain protocol
- Sepsis order panel - Fever > 100.4 °F AND concern for infection

NO

Treat for Sepsis, Continue Evaluation, and Admit

- Consult Urology
- Sepsis order panel/ Type and screen
- CT A/P with IV contrast

NO

Calculate STONE Score

- **Use** in patients with suspected kidney stones and normal renal function
- **Do not use** in patients with fever or other signs of infection, recent trauma or urologic surgery, or active malignancy

Low (0-5 points)
Consider alternative diagnosis

Moderate or High (6-13 points)
Order imaging based on patient factors

Order Imaging Based on Patient Factors

PMHx Stone	Imaging Orders
No PMHx Stone	Low-dose CT A/P OR POCUS ED US in high STONE score
Recurrent Stone	POCUS ED US evaluation OR US Retroperitoneal
Pregnant	US Retroperitoneal
Significant comorbidity	CT A/P Flank pain protocol
High suspicion for stone not seen on POCUS	Low-dose CT A/P

Workup suggests nephrolithiasis?

NO

Consider Alternative Differential Diagnosis

YES

Urology not Routinely Needed for:

- Small stones (<5mm)
- Well-controlled symptoms
- Unlikely to need intervention

Notify Urology for:

- Medium (>5mm) to large stones
  - Well-controlled symptoms
  - May require intervention to pass
  - No concerning other PMHx or features

Consult Urology for:

- Fever
- AKI
- Intractable pain or symptoms
- Stone > 10mm on imaging

IR or Urologic Intervention Indicated?

Based on Urology recommendation

Order Labs: Type and screen / PT/PTT/INR / ECG

URGENT or EMERGENT procedure indications:

- Infection / sepsis
- Rapidly worsening renal function
- Hemodynamic instability

Non-Urgent procedure indications:

- Uncontrolled pain

Decision to admit?

NO

Nephrolithiasis symptoms controlled with oral medications?

YES

Admit Patient

Additional pain medications if needed:

- Ketorolac - if normal renal function
- Opiates Oral / IV - if ketorolac contraindicated
- Consider IV lidocaine

Decision to admit

NO

Order Additional Pain Medication

- **Order**: Ketorolac - if normal renal function
- **Order:** Opiates Oral / IV - if ketorolac contraindicated
- Consider IV lidocaine

Discharge and Outpatient Follow-Up

- Provide strainer on discharge
- **Order:** Tamsulosin x 28 days preferred to promote stone passage, decrease need for intervention
- Patient education - focus on prevention
- PCP follow-up
- Urology follow up (if established)
  - **Order:** Urology referral order (if not established)
  - if no imaging was obtained (or only POCUS), please alert urologist in referral order or in communication

Return Criteria:

- Fever, N/V, intractable pain

Lokeshwar SD, Choksi AU, Smani S, et al. A Novel Electronic Health Record-Integrated Clinical Pathway for Nephrolithiasis: Development and Management Outcomes. Urol Pract. 2025;12(5):603-612. doi:10.1097/UPJ.0000000000000847
Adapted in collaboration with Christopher Moore, M.D.

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Notes: Practice Advance synopses should be built from a strong body of evidence, that likely includes a systematic review. The synopsis will include a recommendation that should be similar in wording to how GRADE (Grading of Recommendations Assessment, Development and Evaluation) recommendations are given. These should not be controversial recommendations and essentially all emergency physicians should adopt. The impact or “effect size” should be substantial and no significant harm should be associated with this gain.

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