Community Ultrasound Toolkit

Created by the American College of Emergency Physicians
Emergency Ultrasound Section
Community Ultrasound Subcommittee

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Introduction
About the Toolkit

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The Community Ultrasound Toolkit

1. The goal of this toolkit is to provide a quick reference guide to establish Emergency Ultrasound (EUS) in the Emergency Department (ED) regardless of one's prior EUS training.

2. This toolkit is designed as a broad overview for establishing EUS. It is not meant to be exhaustive or comprehensive.

3. Emergency Ultrasound encompasses all ultrasounds performed in the ED by an Emergency Physician (EP). EUS ranges from diagnostics (eg, ocular US, EFAST exams) to procedural ultrasounds (eg, ultrasound guided peripheral IVs, ultrasound guided regional anesthesia).

4. Point-of-Care Ultrasound (POCUS) is an umbrella term for all ultrasound performed at the beside. It is sometimes referred to as "bedside ultrasound" or "clinician performed ultrasonography." Emergency Ultrasound is unique in the realm of POCUS in that it provides systematic way to evaluation the emergency department patient based on clinical question.

    a. EUS should be thought of as its own approach to evaluating and managing a patient and not just "a beside ultrasound."

    b. EUS requires clinician to ask a clinical question prior to performing the exam that provides a branch point for changing clinical management. For example, a FAST exam would be performed to answer the question "does the hypotensive unstable trauma patient have massive intraperitoneal hemorrhage?" Or a repeat Cardiac and Lung US performed to evaluate for volume response in the septic shock patient with history of CHF and ESRD.

    c. EUS is unique in POCUS in the versatility of the exams. EUS literally covers from head to toe. An Emergency Physician might rule out retinal detachment with an ocular ultrasound, place an ultrasound guided peripheral IV for the next patient, and then evaluate for Achille's tendon rupture on a third.

d. The fluidity of changing from exams quickly on a single patient is a cornerstone of EUS. For example, the RUSH Exam (Rapid Ultrasound in Shock and Hypotension) requires the EP to quickly jump from different "exams" (cardiac, lung, abdominal, and aorta) to determine the cause of a patient's hypotension and shock.

5. There is an abundance of EUS education available through ACEP and other free sources. This toolkit is not designed to teach EUS itself, but rather to provider resources to help anyone establish EUS in their department.

6. We've organized this toolkit to be a step-by-step process from purchasing your first ultrasound machine to becoming a EUS director in your department to CUAP accreditation.

Chapter 1
Equipment and Disinfection

Christopher Kumetz, MD

STEPS to help you purchase an ultrasound machine and to begin the process to maintain, clean, and disinfect that equipment:

1. **Purchase an Ultrasound Machine** – there are numerous manufacturers and machines to choose from for EUS. GE, SonoSite, Mindray, Samsung, and Philips are just some of the large manufacturers for ultrasounds, not including the new trend towards portable ultrasound with Butterfly and Clarius. The following will help you decided which ultrasound is right for you:

    a. **Ask** - When deciding what equipment to choose, you have to begin with the **needs of your department**. Do you want every provider to have their own portable ultrasound? **Are you looking for only a device to aid in procedures**? Do you want a well-rounded machine that can provide most, but not all, EUS modalities? Or **do you want a machine that can do everything,** including intracavitary exams and transesophageal studies, but might be overwhelming to beginners?

    b. **Consider** the following when purchasing a machine:
        i. **Size of the machine** – It must fit into the patient's room.
        ii. **Mobility of the machine** – Make sure you can easily move the ultrasound throughout the department without cords and wires catching on other equipment.
        iii. **Imagine quality** – The machine needs to provide images that are high quality and reliable for interpretation. The ultrasound machine you purchase should have versatility for quickly changing settings to maximize image quality depending on patient anatomy, and to be able to quickly change based on the type of exam needed.
        iv. **Probes** – The type, number, and footprint of the probes will need to be considered when purchasing a machine. These are the basic probes essential for practicing EUS in the ED
            1. Phased array with tissue harmonic imaging (for cardiac)
            2. Linear probe for soft tissue and ultrasound guided procedures
            3. Curvilinear for low frequency, large footprint for abdominal imaging
            4. Consider Intracavitary probes for transvaginal and intraoral studies (eg, peritonsillar abscess)
        v. **Interface** – Consider the interface of the machine. Do you want buttons verses a touchscreen? How durable is the machine? Will it hold up to the chaos of the emergency department? How easy is it to clean and disinfect?

vi. **Workflow** – Take your time exploring the knobology of different machines. Can you optimize your images quickly? How difficult is it to input patient information, save images/clips, and to label those images?
vii. **Image Storage** – Make sure your machine will have DICOM images that can be uploaded to a PACS system even if you will not have that capability for immediately at purchase.

c. Consider the **future of EUS in your department** – Do you want a machine that can adapt and change for new probes, studies, and evidence in the future? Do you want the ability to "turn-on" functions in the future?

d. **The cost** of purchasing a machine varies widely depending on degree of "bells and whistles." The Butterfly portable US may be $2000, while a SonoSite Xporte could be $50,000 with $10,000 per probe. Average range of a "Cart-Based" Ultrasound machine can vary from $30,000 to $80,000.

e. **Maintenance –** It is imperative you know who maintains the equipment if it breaks. We do not recommend that the physician or EUS director be responsible for replacing or fixing broken ultrasound machines or probes. Biomed, IT, Equipment personnel, and Nursing leadership should all be involved in this process. There should be a designated person who should be responsible when problems arise and is able to set in motion the repairs.

2. **Cleaning and Disinfection –** Cleaning and disinfection are an essential part of EUS. American College of Emergency Physicians (ACEP) has established guidelines for disinfection that can easily be adopted in your emergency department. The American Institute of Ultrasound in Medicine (AIUM) also has a disinfection policy that echoes ACEP's Recommendations.

a. The basics are as followed:
i. All ultrasound probes should be cleaned thoroughly with soap and water to remove any visible soil and then disinfected with low-level disinfection wipes or spray.
ii. Probes that are in contact to intact skin may use non-sterile gel. The probe should be disinfected with low level disinfection after the exam.
iii. Probes that are going to enter into a body cavity (transesophageal or transvaginal) must be disinfected with high-level disinfection to remove spores and viruses that low-level disinfection does not remove.
iv. All probes used for a percutaneous procedure must have a single use sterile cover and use single use sterile gel packets. The size and type of probe cover depends on the procedure.
1. A traditionally non-sterile procedure (eg, peripheral IV or nerve blocks) may use a short sheath or adhesive barrier with single use sterile gel.
2. Sterile procedures require full length sterile probe cover and sterile gel. (eg, central line, arterial line, paracentesis).

b. **Low level disinfection** kills most bacteria and viruses including MRSA and HIV. The skin still acts as a barrier preventing most transmission of infections. Intermediate disinfection also kills tuberculosis. **High level disinfection** requires the probe to be removed from the machine and undergo a chemical bath (usually peroxide based) that kills spores and HPV.
    i. All probes that have contact with mucus membranes require this high level of disinfection.
    ii. Percutaneous procedures are a unique case. Since the probe is never inserted into the patient and only used along the skin to guide the procedure, the risk of infectious transmission is low. However, to prevent even unlikely transmission from probe to patient (and patient to probe), a sterile barrier must be used. Sterile gel is required for any percutaneous procedure or intracavitary based ultrasound.

c. An easy way to remember is to consider what you would do (in a pre-COVID-19 age) when examining a patient. If you would consider not using gloves then the probe does not need a cover or sterile gel.
    i. If you would **use a regular glove,** then the probe needs a single use short sheath and single use sterile gel packet.
    ii. If you would **use a sterile glove,** then use a full sterile probe cover with the included sterile gel packet.
    iii. If the **probe is going inside the patient,** then a sterile probe cover and sterile gel is required, and the probe needs to undergo high level disinfection.

3. **Ultrasound Supplies –** Having supplies immediately available near the ultrasound machine can be extremely helpful. Trying to store all the extra equipment on the machine itself can be burdensome. A designated ultrasound cabinet, cart, or shelf is ideal. We recommend the following equipment to be immediately available for resupply:

    a. Ultrasound gel bottles, non-sterile
    b. Ultrasound wipes – low or intermediate level of disinfection
    c. Ultrasound probe covers, sterile
    d. Ultrasound probe covers for "non-sterile" procedures (eg, USGPIVs) such as adhesive coverings or short probe sheathes
    e. Single use sterile gel packets (traditional rectal gel packets are sterile and can be used for USGPIVs and Ultrasound guided regional anesthesia (USGRA))
    f. Additional equipment used regularly, such as additional supplies for USGPIVs.
    g. Other supplies to consider having with your US machine include: a bar code scanner, printer / printer paper if you are not uploading to a PACS system, probe holders, cord locks (to keep the cord from being pulled off the machine), and gel warmer.

SOURCES & RESOURCES:

- ACEP Policy Statement: "Guideline for Ultrasound Transducer Cleaning and Disinfection." April 2021. https://www.acep.org/globalassets/new-pdfs/policy-statements/guideline-for-ultrasound-transducer-cleaning-and-disinfection.pdf

- ACEP Policy Statement: "Ultrasound Guidelines: Emergency, Point-of-care, and Clinical Ultrasound Guidelines in Medicine." June 2016. https://www.acep.org/globalassets/new-pdfs/policy-statements/ultrasound-guidelines---emergency-point-of-care-and-clinical-ultrasound-guidelines-in-medicine.pdf
- ACEP Policy Statement: "Disinfection of Ultrasound Transducers Used For Percutaneous Procedures." April 2021. https://www.acep.org/globalassets/new-pdfs/policy-statements/disinfection-of-ultrasound-transducers-used-for-percutaneous-procedures.pdf
    - A joint policy statement of the American College of Emergency Physicians, American Institute of Ultrasound in Medicine, Association for Professionals in Infection Control and Epidemiology, Association for Vascular Access, Society for Healthcare Epidemiology of America
- The American Institute of Ultrasound in Medicine (AIUM) Official Statement: "Guidelines for Cleaning and Preparing External- and Internal-Use Ultrasound Transducers Between Patients, Safe Handling, and Use of Ultrasound Coupling Gel." Revised November 3, 2018.
- Tayal, Vivek; Blaivas, Michael; Foster Troy R. "Ultrasound Program Management: A Comprehensive Guide for Administrating Point-of-Care, Emergency, and Clinical Ultrasound." Springer International Publishing. 2018.

Chapter 2
Image Acquisition and Storage

Brianne Steele, MD

Basics of Image Storage

There are multiple ways that images can be saved and stored: physically printed, saved to an external hard drive, uploaded to a server or image storage software, or uploaded to your local PACS system.

1. **The ideal scenario is wireless upload** to an image storage software in order to permanently store images, modify images as needed, and provide QA.
2. In order to **bill**, CMS requires that the images be saved and stored permanently in some form.
3. **All ultrasounds work by converting and saving the images obtained into a DICOM (Digital Imaging and Communications in Medicine) format**, which is the international standard for medical images. This allows multiple different ultrasound machines, software, and PACS systems to exchange and interpret these images.

   Definitions:
   DICOM: industry standard whose goal is to make for easy communication from multiple modalities from multiple manufacturers. DICOM compliant means the device can speak the common "language" allowing it to send information across the network.

   PACS – Picture Arching and Communication System: computer servers that receive information (patient info and images) for purpose of image storage. It also provides digital means of managing and retrieving, distributing, presenting medical images.

   VNA – Vendor Neutral Archive: Medical imaging technology storing images in a standardized format so it may interface and be accessed from multiple types of systems (ie, vendor neutral).

Workflow

1. Ultrasound workflow begins with inputting patient medical information into the machine. There are a few options for this step. **It can be achieved by manually inputting the patients name, MRN, or FIN number**. It can be achieved by ID Scanners that can be purchased and added to most ultrasound machines. Finally, **certain ultrasound machine software enables the use of patient worklists** (eg, modality worklist), which allows the sonographer to choose their patient from a pregenerated list. An order in the EMR may generate such a worklist on your ultrasound device.
2. Next would be **scanning the patient** and saving the appropriate information.
3. From there, stills and video clips are automatically converted into the DICOM format. These can then be printed for storage or transmitted wirelessly to a permanent storage destination.

The storage of ultrasound images is an important component for all ultrasound programs, and with numerous options it can be hard to decide what is the best fit for your group. The **following are options and scenarios:**

External Hard Drive

1. This process **physically requires a hard drive to be plugged into a USB port** and each image manually **download to the hard drive**
2. **The pros- cheap**, **easy, and immediately** available for all ultrasound groups. Most ultrasound devices have a process for downloading images to an external hard drive. This has **advantages over the Photo Thermal Printing** in that it preserves the original images and video clips, and providers a pathway for QA and consultations.
3. The cons- **it has to be manually performed, which takes significant time.** Who is in charge of downloading the images and placing them on the hard drive? It is easy if it is your own images or a few of your partners. It becomes overwhelming if you have a large group of 20 or more physicians relying on you to perform this task. **Security is also an issue**. Small flash drives are easy to transport, but also easy to lose. These are medical records and **all HIPAA requirements apply**.

Photo Thermal Printers Directly off Ultrasound Device

1. This method is inexpensive and relatively immediately available, with an additional IT component. If you wanted to start saving images for your group and start billing, you could implement this as first step.
2. There are downsides to this method – one consideration is that these prints will only "representative stills" of your actual ultrasound.
3. Difficult to QA/Share image
4. Once these images are printed, where are they kept? Who is responsible for them?

Image Destination of PACS or VNA

1. PACS (Picture Archiving and Communication Systems) – This typically refers to the Radiology based system for image presentation and storage.
2. The **advantage of using PACS** is that it **provides searchability and storage options.** Often more accessible by providers of other specialties.
3. Potential issues – This can make it **difficult to separate out "education or teaching studies",** performed by learners for acquisition/improvement of skills, rather than being used for direct patient care decision making.
4. **There are options for VNAs (Vendor Neutral Archives**) that allow you to **store your DICOM images onto a server**. These archives are **basically an external hard drive** attached to your hospital network. These are relatively **cheap**, but do **not** allow you the ability to **modify images**, may be temporary storage only, may make QA a more intricate process.

Third- Party EUS Workflow Software Solutions-

1. Examples include systems such as **Qpath, SonoSite's Synchronicity, or Butterfly Cloud Network.**

2. These third-party solutions can provide the ability to upload to a secure network or server, **easily search and modify your images**, and then provide a process to bill or push to a PACS system if required. They are often set up to be **amenable to QA, even track providers numbers**.
3. Disadvantages: **these systems can be much more expensive/**require integration project with your IT department.

We recommend involving the following groups to ensure purchase will fit your needs for image storage:

1. Biomed
2. IT

+/- 3. Radiology department

Generally, you will need the following device capabilities:

1. Wireless capable (may be able to purchase a wireless dongle/plug in for existing device)
2. DICOM ready
3. Consider ID band scanners *see below
4. Consider intermediary platform – Qpath, Butterfly as examples
5, May need VNA as pathway to PACS
6. Consider EMR role
    - creating order list
    - documentation
    - how does billing occur at end of patient encounter
    - interface with radiology orders (avoiding order confusion, double billing)

***ID badge scanners may be helpful**, if your group will use a wireless image storage pathway that involves patient demographic entry on device as first step. An ID badge scanner helps eliminate data entry error. You will need to find a scanner that can work with your type of ID bands, you can work with a device representative on this. By contrast, if planning to use a workflow that involves order entry from EMR → DICOM worklist, this should create data entry for demographic info automatically, obviating need for ID badge scanner.

EMR and Orders

The **final step includes integration into the EMR** (Electronic Medical Record).

1. This can be a difficult process depending on your EMR and your storage option your group decided on, but when developed effectively it can improve your workflow efficiency.
2. Your IT department may require an order in the computer in order for your images to be uploaded into a PACS or other storage system. You may also find your billing department prefers to use orders as way to generate appropriate CPT code for encounter.

Example IT Workflows

Order placed in (Cerner, EPIC) creates worklist addition on DICOM/wireless ready device → VNA → PACS

DICOM/wireless ready device → perform study with manually entered or scanned data inputted onto device → intermediary software – Can stop here, images live here OR → VNA → order placed in EMR queries device to acquire images, then VNA link in EMR.

Chapter 3
Documentation and Billing

Michael Euwema, MD, FACEP

Documentation Essentials:

All ultrasound studies performed for clinical purposes should be documented into the patients chart regardless if images are able to be saved. (Note that only saved images are able to be billed). **The following are the essential components** of the ultrasound procedure note to document appropriately a allow billing:

1. **Clinical Name of the Exam**
   a. This allows other clinicians, especially emergency physicians, to quickly understand what ultrasound exam you performed.
   b. Eg, eFAST (Extended – Focused Assessment in Sonography in Trauma)
   c. Other examples are "Soft Tissue US," "Triple Scan – Heart, Lung, IVC," or "RUSH Exam – Rapid Ultrasound In Shock and Hypotension."
2. **List the Limited Ultrasound Studies**
   a. All ultrasound studies are based off limited exams with associated CPT code.
   b. For example, an eFAST exam is actually a limited abdomen, limited cardiac, and limited lung ultrasound. Three different studies
   c. Another example is the RUSH exam. This is actually a limited abdomen, limited cardiac, limited lung, and limited aortic ultrasound.
   d. This is what will be used by your billers to know what work you performed.
3. **CPT Codes**
   a. All ultrasound studies have associated CPT Codes. Ideally your note would include the associated CPT code to remove any ambiguity for your scan.
   b. For example, eFAST would be Limited Abdomen (CPT 76705), Limited Cardiac (CPT 93308), and Limited Lung (76604)
4. **Indication**
   a. All studies require an indication, such as hypotension for RUSH exam or Trauma for eFAST.
   b. Ensure that it is documented that this is the indication for each and all of your limited studies.
5. **Views**
   a. List the views that you obtained
   b. For cardiac, for example, you might evaluate the peristernal long axis, peristernal short axis, apical-4-chamber, subxiphoid, and IVC.
6. **Findings**
   a. This is what you see NOT your interpretation
   b. Example for a patient SOB, evaluating the patient's heart and lungs, you might document a "reduced EF, no pericardial effusion, dilated IVC, and diffuse B-lines."
7. **Interpretation**

a. This is what you believe your findings represent
b. In the example above, you might document "acute decompensated heart failure with signs of pulmonary edema and volume overload."

8. **Image Storage**
   a. Always document how the images were stored – eg, uploaded to Qpath, downloaded to external hard drive, or printed.
9. **Who Performed the Study**
   a. Document who physically performed and interpreted the study
   b. Example – "The ultrasound study was performed and interpreted by myself, John Smith, MD"

**** See Addendum (Documenting your EUS scans)**

Chapter 4
Group Buy In

Chris Tom, MD

Group Buy In

Goal of this section is to provide for a standardized rationale for the adoption and utilization of emergency ultrasound in the community setting. This can serve as an additional tool for interested emergency physicians to utilize in order to gain physician group and hospital buy-in for the adoption or augmentation of emergency ultrasound programs

Financial Considerations

EUS represents an opportunity for additional revenue capture for both the physician group and the hospital. If the billing criteria for a EUS study is met, then Emergency Physicians should be permitted to submit billing claims for the ultrasound studies that they complete.

1. The *American College of Emergency Physicians* has an Emergency Ultrasound Coding Guide available (see below) that denotes the various ultrasound studies that are commonly performed in EUS to include their CPT code and associated wRVU value.
2. By performing EUS in the course of their clinical practice, emergency physicians are able to increase wRVU's and potentially improve their compensation.
3. If the hospital is also organized to bill the accompanying facility fee, then the hospital stands to capture additional revenue from ultrasound activity.

While detailed numbers on a return on investment (ROI) will ultimately be determined at a local level, **the 2020 Medical Physician Fee Schedule National Average**, as well as **the 2020 Hospital Outpatient Prospective Payment System**, provide a **guide for potential reimbursement potential** from EUS billing.

Two of the most commonly billed EUS CPT codes are 93308 and 77605.

1. The 93308 CPT code is utilized for a limited Echocardiography study and has an assigned wRVU of 0.53. Using the average 2020 Medicare Physician Fee Schedule, this will provide for $26.35 in professional fee reimbursement. The associated hospital outpatient payment for this (eg, facility fee) would be $232.31.
2. CPT code 77605 is a limited abdominal ultrasound such as the abdominal portion fo the FAST exam or a biliary study. This is assigned 0.59 wRVU, which equates to a $29.59 professional reimbursement and $112.08 facility fee reimbursement.
3. Additional values for commonly performed ED EUS studies can be found by visiting the SonoSite reimbursement guide. Other ultrasound manufacturers offer similar presentations. Dependent on the type and number of ultrasound studies being performed, a hospital and physician group can quickly recoup the cost of ultrasound hardware. Once one knows the estimated number of studies that will be performed in their ED, one can use the available data to put together an ROI for their institution.

4. Once obtaining billing and reimbursement, the ED physician and hospital has an added rationale to consider thorough adoption of EUS.

In addition to the above, it is important to recall that the complexity of ED charts generally will increase when imaging or laboratory tests are performed. In other words, the E+M level that the visit is billed for could increase.

Patient Satisfaction Data

Emergency ultrasound has the advantage of potentially improving the patient experience in the Emergency Department. It lends itself towards an improved patient care experience, as it affords the ability the physician-patient relationship to improve through the use of a direct discussion and display of imaging results and findings. Research evaluating the impact of emergency ultrasound in Emergency Department patient satisfaction has demonstrated that this can be augmented and improved through the utilization of emergency ultrasound and improve these metrics. (4,5,6). This carries increasing importance as individual ED's strive to find novel ways in which to improve the patient care experience. can indeed augment and improve

Emergency Department Length of Stay

An additional benefit of adopting emergency ultrasound in clinical practice is the potential for improvement in emergency department length of stay.

1. By completing a limited ultrasound **immediately at the patient's bedside**, one can **often reduce the amount of time** that the patient waits for that diagnostic test, as well as their **overall length of stay in the ED**. This results from the patient not having to undergo an extended process which involves leaving the department for an ultrasound that is obtained by a sonography technician and then must be sent to an imaging specialist for interpretation. Only after all of these steps is the result then sent to the ordering emergency physician (EP).
2. **By contrast, an emergency ultrasound is obtained immediately** at the bedside, **with the EP contemporaneously interpreting the study** while obtaining images. **This improvement in efficiency can relieve capacity constraints on a busy ED and has the ability to improve key metrics, to include patient length of stay and left without being seen rates**.
3. Prior research looking at pregnancy and soft tissue ultrasound has demonstrated **improved LOS amongst ED patients when emergency ultrasound is utilized** (7,8,9). Another study demonstrated more rapid disposition for ED patients undergoing ultrasound for deep vein thrombosis evaluation (10). A reduction of time to key results has also been shown in various different emergency ultrasound modalities, to include lung ultrasound and hip ultrasound (11,12).

Improvement in the ED patient outcomes

An improvement in the clinical care of emergency department patients is perhaps the most notable rationale for the adoption of emergency ultrasound in emergency medicine practice.

1. There is a robust and growing body of literature that demonstrates this improvement in patient care centered outcomes through the usage of emergency ultrasound. *The American College of Emergency Physicians* discusses relevant parts of this peer reviewed literature, subdivided by ultrasound modality, in their Ultrasound Guidelines Policy Statement. (13)
2. Notable literature that is discussed within this document includes a **retrospective study** on ED patients **with penetrating trauma** that demonstrated the **usage of emergency ultrasound led to a more rapid diagnosis and reduction in mortality** (14), a study demonstrating that the **incidence of discharged patients** returning with a **ruptured ectopic** pregnancy **was significantly reduced** when emergency ultrasound was incorporated in the evaluation of these patients (15), and several studies noting the **utility of emergency ultrasound** in the **hemodynamic assessment of critically ill patients.** (16,17,18)
3. Importantly, there is abundant and readily available evidence that the thoughtful application of **emergency ultrasound can and does improve patient outcomes.** This is perhaps **most important in the community ultrasound setting,** where consultative imaging and **ultrasound services are not always readily available.**

Physician Recruitment

Emergency ultrasound has become a core component of Emergency Medicine residency training and is one of the required ACGME milestones for residency education.

1. As of 2010, up to 79% of training programs had a structured emergency ultrasound education program (19), with this number likely being higher at this time. The result has been an increased practice utilization and expertise amongst newly graduated Emergency Medicine residents.
2. This can subsequently lead to increased interest amongst these residents in a community ED site with an **active and vibrant emergency ultrasound program**. Having such a program may position a **community ED site favorable with regards to resident recruitment efforts.**

References:

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Chapter 5
Teaching Ultrasound Education in Community Emergency

Maria O'Rourke, MD

Teaching Ultrasound Education in Community Emergency

Currently graduating EM graduates obtain ultrasound training, instruction, and education and come into their first job essentially "ultrasound credentialed ready." However, in many community hospitals we have another group of learners that lack the ultrasound skills that new graduating residents get exposed to over three years. These learners include all health-care professionals such as: Senior Physicians, Nurse Practitioners, Physician Assistants, ED Nurses. These health care providers also need to incorporate ultrasound into their daily practice.

1. Learning ultrasound requires the integration of multiple skill sets including identification of appropriate patients, image acquisition, image interpretation, and integration of findings into the clinical management of patients.
2. Some of these skills can be learned through lectures, web-based training, simulation, and non-traditional educational media (electronic books, podcasts).
3. **However, in the Community setting with these learners listed above, 'Hands-on' bedside ultrasound instruction is a unique component of ultrasound education that is best utilized.** It provides the opportunity for the learner to become facile with the ultrasound equipment, develop hand-eye coordination, gain exposure to different ultrasound exam core competencies, and practice obtaining the standard views with an instructor.

Perform a Needs assessment

Prior to training, it is important to perform a needs assessment of your learners' baseline knowledge and expectations. Most Senior attendings have a variety of experiences and needs.

1. One method that you can employ to determine the learner's ultrasound knowledge is to gather a needs assessment prior to the initial workshop. **Questions can target details regarding prior instruction** (eg, have you previously been taught the basics of ultrasound?), types of machines used (eg, which machine types are you most familiar with?), **understanding of the material you intend to teach** (eg, how comfortable are you with performing an Extended Focused Assessment with Sonography or Trauma [eFAST]?), and **their expectations of the workshop** (eg, what would you like to learn during this course?).
2. While a formal needs assessment or survey monkey can be used, one can informally assess your learners at the beginning of the small group course and ask the above question prior to starting.
3. This will allow you to identify your learners in beginner, intermediate or advanced groups.

Focus on Two or Three Scanning Exams

Start with the novice or beginner group.

1. A novice should become a master in identification, location, and documentation of relevant structures before advanced techniques are offered. You must decide how many short training sessions you must have with the novice learner. **However, the Senior attending may just require scanning with them on shift so he or she can incorporate this into their daily practice style.** As well, the senior learner would do well with case-based teaching and clinical correlation.
2. A common teaching opportunity is to have the **senior learner show up 30 minutes before his shifts and scan** as many "gallbladders" in the emergency departments. Do this before each of the clinical shifts so as not to have the senior learner feel like that have to dedicate a large part of their personal time.
3. Alternatively, one can have that **30-minute period be paid from the "clinical hours",** depending on how ultrasound fits into the group's political and financial goals. As with most skills, mastery of ultrasound is acquired over time with deliberate practice, and ultimately a wisely investment long term for the group.

Include Cased Based and Abnormal Image Findings

Along with 'hands-on' bedside ultrasound sessions, ultrasound models for workshops, this will only reinforce the normal anatomy since models are usually young healthy volunteers.

1. Alternatively, scanning real patients in the emergency department, especially if the patient already has a "formal" study" can be helpful when training a senior attending. Other opportunities to teach is to send all learners weekly abnormal short video clips or Image of the Day.

Scan Throughout your Institution and Collaborate with Other Departments

1. Collaborate with other disciplines, (ICU, CCU, General Medicine Floor) as a wide variety of medical specialties in the hospital can help create a future vertical ultrasound curriculum and hands- on practice sessions.
2. For example, one can scan patients in the ED, then follow those same admitted patients upstairs for follow-up scans.

At Home Didactic Material Review/ Online FOAM Education List

The Senior learner will benefit from reading and learning prior to showing up to the hands-on sessions- the senior learner to review at his own convenience.

FOAM- US Resources include:
https://spocus.org/resources-programs/foamed/

References

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3. Tayal V. ACEP News: ACEP; [Nov 2016]. 2009. ACEP updates emergency ultrasound guidelines.

4. Thomas PA, Kern DE, Hughes MT, et al. Baltimore, MD: JHU Press; 2015. Curriculum Development for Medical Education: A Six-Step Approach; p. 312.

5. Eppich WJ, Hunt EA, Duval-Arnould JM, et al. Structuring feedback and debriefing to achieve mastery learning goals. *Acad Med*. 2015;90:1501-8.

Category	Name	Website	More Info
Cleaning & Disinfection	ACEP Policy Statement: "Guideline for Ultrasound Transducer Cleaning and Disinfection." June 2018	https://www.acep.org/globalassets/new-pdfs/policy-statements/guideline-for-ultrasound-transducer-cleaning-and-disinfection.pdf	**ACEP**
Policy Statement	ACEP Policy Statement: "Ultrasound Guidelines: Emergency, Point-of-care, and Clinical Ultrasound Guidelines in Medicine." June 2016.	https://www.acep.org/globalassets/new-pdfs/policy-statements/ultrasound-guidelines---emergency-point-of-care-and-clinical-ultrasound-guidelines-in-medicine.pdf	**ACEP**
Cleaning	The American Institute of Ultrasound in Medicine (AIUM) Official Statement: "Guidelines for Cleaning and Preparing External- and Internal-Use Ultrasound Transducers Between Patients, Safe Handling, and Use of Ultrasound Coupling Ge." Revised November 3, 2018.	https://www.aium.org/officialStatements/57	**AIUM**
Educational	Tayal, Vivek; Blaivas, Michael; Foster Troy R. "Ultrasound Program Management: A Comprehensive Guide for Administrating Point-of-Care, Emergency, and Clinical Ultrasound." Springer International Publishing. 2018.	https://www.springer.com/gp/book/9783319631417	

Coding	ACEP Emergency Ultrasound Coding Guide - 2018	https://www.acep.org/how-we-serve/sections/emergency-ultrasound/subcommittees/reimbursement/	**ACEP**
Coding	ACEP Emergency Ultrasound Section - Ultrasound Coding and Reimbursement Document – 2009	https://www.acep.org/how-we-serve/sections/emergency-ultrasound/subcommittees/reimbursement/	**ACEP**
Coding	SonoSite Ultrasound Reimbursement information - January 2020	https://www.sonosite.com/sites/default/files/2020%20SonoSite%20-%20Emed%20Guide%20022020.pdf	**SonoSite**
Educational	FOAM- US Resources	https://spocus.org/resources-programs/foamed/	**FOAM**

Chapter 6
Community Ultrasound Directorship

Don Bennett, MD

The site ultrasound director has unique challenges not see in large academic institutions. Your site may include physicians trained in eras or programs where EUS was not a key element to the workflow. Asking experienced EM physicians to change years of deep-seated workflow habits is challenging and can be viewed as disruptive. As discussed above "Group Buy-In" will be essential to your success.

> *ACEP Policy Statement: The emergency ultrasound director or coordinator is a board-eligible or certified emergency physician who has been given administrative oversight of the emergency ultrasound program from the EM director or group. In addition to coordination of education, machine acquisition and maintenance, the US director is responsible for developing, monitoring, and revising the QA process.*[1]

The director's duties will include:

1. Determining the storage and archiving method and working with your IT department to accomplish this.
2. Confirm the providers on site have the needed credentials. Review the issued credentials and identify any providers needing additional training.[1]
3. Ensuring entry level competency with EUS. Many EM physicians who have entered community practice over the last two decades have found a lack of adequate EUS resources at their practice location. This can lead to skill degradation, lack of confidence, and valid concerns about adding this once familiar skill to current workflow in a busy ED. Those lacking credentials or those needing additional training for skill competency can be trained/re-trained. The director can determine this by using a multitude of methods including surveys, personal interviews and discussion with the medical director.[2]
4. Education & Documentation

    a. Regular and formal teaching is an important aspect for a successful community program. This should not rest solely on the director's shoulders but will rely on their leadership to ensure execution of meaning learning and growth.

    b. The director becomes the subject matter expert on documentation of the EUS exam. They will work closely with the coding team to adapt to changing requirements to ensure reimbursement. Developing templates and short cuts can help the local team to make EUS less disruptive to the workflow of the physicians.

5. Quality Assurance

a. Necessary for Program Safety.

   The community quality assurance program essential for a high performing EUS program. Quality assessment and improvement starts with education, evaluates performance through review, and leads to improvement by clear feedback. These steps increase competency and build a foundation for success.

b. How Much to Review?

   Community EM physicians are board certified experts. The review process should meet the guidelines[3] and can be adapted to each practice site. As an example, our site, reviews a goal of 10% of physicians scans, reviews all cases going for M&M or other quality review. With the unique challenges of EUS we have found real time feedback at the bedside to help with scanning technique, image acquisition, and documentation to be the most potent form of QA and education.

c. QA Responsibility

   This can be a team-based approach or rest solely on the US director. The responsibility is always held by the leader to ensure an adequate and timely process.

d. How is QA documented?

   This can be done by middleware or other processes. A log should be kept of the process.

6. Compensation

   Most US directors need to have some form of compensation. Successful models include a reimbursement for the time and effort spent to ensure a robust and successful program.

Being the director of a community EUS program is an invigorating and challenging experience. The leader of this program will help to change your practice, provide valuable education to the group, and coordinate the implementation of a new revenue source for the group and the hospital.

References

1. ACEP. Emergency Ultrasound Director, Sample Position Description. https://www.acep.org/globalassets/uploads/uploaded-files/acep/membership/sections-of-membership/ultra/ultrasound_director_position_description.doc

2. Credentialing and Privileging, page 11, ACEP Policy Statement, Ultrasound Guidelines: Emergency, Point-of-Care, and Clinical Ultrasound Guidelines in Medicine. https://www.acep.org/globalassets/sites/acep/media/ultrasound/pointofcareultrasound-guidelines.pdf

3. Practice Based Pathway, page 8, ACEP Policy Statement, Ultrasound Guidelines: Emergency, Point-of-Care, and Clinical Ultrasound Guidelines in Medicine. https://www.acep.org/globalassets/sites/acep/media/ultrasound/pointofcareultrasound-guidelines.pdf

4. Quality Improvement Process, page 14, ACEP Policy Statement, Ultrasound Guidelines: Emergency, Point-of-Care, and Clinical Ultrasound Guidelines in Medicine. https://www.acep.org/globalassets/sites/acep/media/ultrasound/pointofcareultrasound-guidelines.pdf

Chapter 7
Pediatric EUS

Lilly Bellman, MD

The **majority** of pediatric patients are seen in **general EDs** and not in specialized children's hospitals. As you want your shop to be ready to care for sick children, you can also offer them better care by using EUS.

Top reasons to not forget the pediatric patients in your EUS program

1. Avoiding radiation is a priority in care of children
2. Children tend to be easier to scan and get good images (they typically don't mind the scan, and some find it neat to see the pictures)
    a. Parents helpful to comfort and hold small children while you do your exam
3. Core studies have similar interpretation principles as in adults
4. You can really help expedite a child's care
    a. Can be crucial if you need to arrange transfer
5. May not have 24hr ultrasound tech access

Equipment considerations

The typical phased array, curvilinear, and linear transducers can all be used on pediatric patients for their usual indications. Especially in the smallest children, make sure to adjust depth accordingly! For infants and small children, the high frequency linear transducer can be used for some abdominal indications as well eg, appendix and pylorus.

Some thoughts on linear transducers when considering choosing one

- **Linear transducer** choices: dependent on indication
    - smaller footprint (ie, SonoSite L25x) better for vascular access
    - larger footprint (ie, SonoSite HFL38x or HFL50) better for lung (see more pleural line), soft tissue, and MSK

No **special transducers** are required for general pediatric EUS but there are some specific ones that can be useful if there is sufficient interest at an institution.

- **Small footprint phased array** (eg, SonoSite p10x) useful for cardiac exams on infants and small children with higher frequency
- **Microconvex** (eg, SonoSite c11x) is nice for lung giving a curved small footprint but is higher frequency than the abdominal and phased array probes

Which studies are important in pediatric patients?

Core studies are similar in pediatric patients and in adults.
The PEM EUS Network (P2Network) has identified the following to be the primary pediatric POCUS studies**.**

Core	Basic	Advanced
Diagnostic		
Bladder Cardiac e-FAST Soft tissue	Gallbladder Lung OB (TA) Renal IVC	Airway Pediatric abdomen Ocular OB (TV) MSK Pelvic gynecologic (TA, TV) Testicular
Procedural		
Vascular access	Abscess drainage Foreign body removal Lumbar puncture	Arthrocentesis Nerve blocks Pericardiocentesis Thoracentesis

Adapted from Abo, 2019. Suggested categories of pediatric EUS indications. The core category scans are thought to be the most essential and high yield. Abbreviations: e-FAST, extended focused assessment with sonography in trauma; OB, obstetric; TA, transabdominal; TV, transvaginal; Pediatric abdomen includes evaluation for appendicitis, pyloric stenosis, and intussusception.

Consider your center: pediatric volume, capabilities (inpatient services) and availability of radiology performed ultrasound to determine your department's priorities in pediatric scans.

Considerations for EDs far from nearest hospital with pediatric services

- Build skill in scans for situations where early diagnosis can help **expedite transfer** and definitive care
    - Cardiac (global function, can also note number of chambers, and large defects)
    - Advanced abdominal
        - Intussusception ("easiest" of the advanced abdominal)
        - Appendix
        - Pyloric stenosis
    - Testicular torsion (using color and power doppler)
    - MSK for hip effusion (limp evaluation for septic joint)
    - Pneumonia and complications
- US Guided Procedures
    - US guided vascular access can save a life!

- Nerve blocks helpful for procedures (ie, extremity lacerations) and for pain control.
    - Same anatomy and landmark but beware weight based local anesthetic maximums

How to gain these skills

- use FOAM resources to look through (many listed in the Abo, 2019 publication listed below)
- the Marin et al 2016 document listed below has detailed information summarizing how to perform scans, identify findings, document them, as well as summarize the evidence supporting their use
- attending a conference course in pediatric specific EUS techniques
- Practice practice practice

Credentialing

For credentialing purposes, many use the number of scans of a given indication as a marker of competence. Abo et al. (Abo, 2019) has a table of suggested minimum scan numbers for common pediatric EUS indications which range from logging 5-25 scans. There is significant argument and ongoing research regarding the best ways to validate competency for EUS (Kumar, 2019). Competency based individualized assessments such as OSCE or direct observation may offer some more value rather than raw numbers. Ongoing QA processes are also essential to ensuring ongoing competence. See further discussions in chapters 5 and 6 of this toolkit.

PEM EUS resources and further reading

P2Network https://p2network.com/

References

Abo AM, Alade KH, Rempell RG, Kessler D, Fischer JW, Lewiss RE, Raio CC, Marin JR. Credentialing Pediatric Emergency Medicine Faculty in Point-of-Care Ultrasound: Expert Guidelines. *Pediatr Emerg Care*. 2019 Jan 7.

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Chapter 8
CUAP

James Villareal, MD, FACEP

The Clinical Ultrasound Accreditation Program (CUAP) was originally conceived by leaders from ACEP's Ultrasound Section.

CUAP's purpose is to recognize EUS programs that demonstrate the ability to provide efficient, quality care to patients through the use of EUS by qualified clinicians, with a particular focus on education, quality assurance, and safety.

CUAP consists of a voluntary board of EUS leaders along with a group of expert reviewers.

Conceptually, ACEP ultrasound guidelines serve as a blueprint for an EUS program. CUAP serves as the entity to evaluate the foundation, flooring, walls and roof of a EUS program.

CUAP evaluates EUS programs for issues related to leadership, training, credentialing, education, quality assurance, and safety.

Through the use of a website portal, a EUS program may submit an application for accreditation. The website also provides sample documents which can serve as templates for a program's procedures and processes. The completed application is reviewed by 2 expert reviewers. The reviewers may communicate with the program leader in order to answer questions about the application or to offer recommendations to further strengthen the application. Finally, the application is approved by the CUAP Board of Directors. There is an application fee. Accreditation lasts for 3 years with a reduced fee for renewal.

CUAP has several benefits:

1) It serves as a way to attest that your program meets the highest standards established by our EM specialty. This may be particularly beneficial when addressing other entities, such as administration and departments outside of EM.
2) CUAP-accredited programs are recognized for their excellence within the EUS community.
3) Increasingly, EUS programs are being asked to meet standards that involve issues such as disinfection, credentialing and reimbursement. CUAP envisions a role of supporting accredited programs through its defined processes of peer-review and standardization.

The goal of CUAP accreditation requires a significant commitment on the part of a community EM group. But, it also serves the purpose of defining where a developing program might want to devote effort, time and resources with the ultimate goal of recognized excellence.

Questions regarding CUAP can be directed to ACEP's CUAP manager, Julie Rispoli.

Appendix 1: Chart Ultrasound Documentation

EFAST Exam - normal

Limited Diagnostic Exam: Limited Abdomen, Limited Chest, Limited Cardiac
CPT: 76705-26, 93308-26, 76604-26
Patient Identity confirmed: Yes
Indication for exam: Trauma

Views & Findings:
- Hepatorenal (RUQ): No Free Fluid Identified
- Right Pleural Space: No Free Fluid Identified
- Perisplenic (LUQ): No Free Fluid Identified
- Left Pleural Space: No Free Fluid Identified
- Suprapubic: No Free Fluid Identified
- Pericardium: No Pericardial Effusion Identified
- Right Anterior Chest Wall: Pleural Sliding Present
- Left Anterior Chest Wall: Pleural Sliding Present

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)
Interpretation of cardiac, chest, and abdomen limited / EFAST US: In this traumatic patient with good lung sliding there does not appear to be a pneumothorax; with no pericardial effusion there does not appear to be pericardial tamponade; and with no free fluid intra abdominally there does not appear to be intra-abdominal hemorrhage.

Performed by ***

FAST Exam - normal

Limited Diagnostic Exam: Limited Abdomen, Limited Cardiac
CPT: 76705-26, 93308-26
Patient Identity confirmed: Yes
Indication for exam: Trauma
Views & Findings:
- Hepatorenal (RUQ): No Free Fluid Identified
- Perisplenic (LUQ): No Free Fluid Identified
- Suprapubic: No Free Fluid Identified
- Pericardium: No Pericardial Effusion Identified

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)
Interpretation of cardiac and abdomen limited / FAST US: In this traumatic patient with no pericardial effusion there does not appear to be pericardial tamponade; and with no free fluid intra abdominally there does not appear to be intra-abdominal hemorrhage.

Performed by ***

Thorax Exam - normal

Limited Diagnostic Exam: Limited Chest/Thoracic/Lung, Limited Cardiac Ultrasound
CPT: 76604-26, 93308-26
Patient Identity confirmed: Yes
Indication for exam: Shortness of breath, chest pain
Views & Findings:

Cardiac: Parasternal Long, Parasternal Short, Apical 4 Chamber, Subxyphoid, IVC: Normal EF, No pericardial effusion, Normal IVC, No right heart strain
Thoracic: Right and Left Anterior Chest/Lung, Left and Right Lateral Chest/Lung, PLAPS: Normal A lines, No B-lines, No Pleural effusions, Normal lung slide

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of thoracic & cardiac limited Thorax US: CARDIAC - Normal Cardiac US. No signs of Cardiac Tamponade, No signs of Acute Decompensated Heart Failure, Normal Volume Status. THORACIC/LUNG - In this patient with shortness of breath but with good lung sliding , absent b-lines, and no effusions, there does not appear to be a pneumothorax, pulmonary edema, or pleural effusions.

Performed by ***

Limited Cardiac Exam (TTE) - normal

Limited Diagnostic Exam: Limited Cardiac Ultrasound
CPT: 93308-26
Patient Identity confirmed: Yes
Indication for exam: Shortness of breath, chest pain

Views & Findings:

(TTE) Parasternal Long, Parasternal Short, Apical 4 Chamber, Subxyphoid, IVC: Normal EF, No pericardial effusion, Normal IVC, No right heart strain, Grossly normal EF by global function estimation

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of cardiac limited US: Normal Cardiac US. No signs of Cardiac Tamponade, No signs of Acute Decompensated Heart Failure, Normal Volume Status.

Performed by ***

Limited Lung Exam - normal

Limited Diagnostic Exam: Limited Chest/Thoracic/Lung
CPT: 76604-26
Patient Identity confirmed: Yes
Indication for exam: Shortness of breath, chest pain
Views & Findings:

Thoracic: Right and Left Anterior Chest/Lung, Left and Right Lateral Chest/Lung, PLAPS: Normal A lines, No B-lines, No Pleural effusions, Normal lung slide, No pleural thickening, No consolidations

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of thoracic limited / lung US: In this patient with shortness of breath but with good lung sliding , absent b-lines, and no effusions, there does not appear to be a pneumothorax, pulmonary edema, or pleural effusions, or signs of pneumonia.

Performed by ***

RUSH Exam (Rapid Ultrasound In Shock and Hypotension - normal

Limited Diagnostic Exam: Limited Abdomen, Limited Cardiac, Limited Thoracic/Lung, Limited Aortic US
CPT: 76705-26, 93308-26, 76604-26, 76775-26
Patient Identity confirmed: Yes
Indication for exam: Undifferentiated Shock or Hypotension
Views & Findings:

Cardiac: Parasternal Long, Parasternal Short, Apical 4 Chamber, Subxyphoid, IVC: Normal EF, No pericardial effusion, Normal IVC, No right heart strain
Thoracic: Right and Left Anterior Chest/Lung, Left and Right Lateral Chest/Lung: Normal lung slide, no pleural effusion or hemothorax
Abdominal: RUQ, LUQ, Pelvic Short & Long Axis: No free fluid in any portion
Aorta: Proxiamal, Mid, Distal, Long Axis: Normal diameter, no aneurysmal dilations

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of abdomen, cardiac, thorcic/lung, aorta limited "RUSH" US: Negative RUSH exam. CARDIAC: No sign of cardiogenic shock or ADHF. No Cardiac Tamponade. No signs of hypovolemia. THORACIC/LUNG: No tension pneumothorax. No massive PE. ABDOMEN: No gross free fluid. AORTA: No AAA. OVERALL: UNDERLYING CAUSE OF SHOCK IS MOST LIKELY *** ((***Alternate Interpretation: Patient with hyperdynamic EF, collapsible IVC. No signs cardiogenic shock. No signs of massive PE, pneumothorax, or cardiac tamponade. No signs of ruptured AAA or intraabdominal free fluid. EUS is consistent with hypovolemic vs distributive (septic) shock.))

Performed by ***

Limited Abdominal Ultrasound - normal

Limited Diagnostic Exam: Limited Abdomen
CPT: 76705-26
Patient Identity confirmed: Yes
Indication for exam: Abdominal pain, Distension, cirrhosis, etc
Views & Findings:
    Hepatorenal (RUQ): No Free Fluid Identified
    Perisplenic (LUQ): No Free Fluid Identified
    Suprapubic: No Free Fluid Identified
Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of abdomen limited US: In this patient with no free fluid intra abdominally there does not appear to be intra-abdominal hemorrhage.
Performed by ***

Appendix Ultrasound - normal

Limited Diagnostic Exam: Limited Abdomen
CPT: 76705-26
Patient Identity confirmed: Yes
Indication for exam: RLQ Abdominal pain
Views & Findings:
    Abdominal (RLQ – Long & Short Axis):
        No thickened tubular structure, no free fluid, no lymphadenopathy
Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of limited abdomen / appendix US: In this patient the EUS shows no free fluid or signs of acute appendicitis
Performed by ***

Bowel Ultrasound - normal

Limited Diagnostic Exam: Limited Abdomen
CPT: 76705-26
Patient Identity confirmed: Yes
Indication for exam: Abdominal pain, Abd Distention
Views & Findings:
    Abdominal Long & Short Axis covering entire abdomen including: RUQ, RLQ, Epigastrium, Periumbilical, Suprapubic, LUQ, LLQ: No dilated loops of small bowel, no thickened small bowel wall, no free fluid, No tanga sign
Other Findings: None

Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of limited abdomen / bowel US: EUS shows no signs of small bowel obstruction. No free fluid.
Performed by ***

RUQ biliary limited US - normal

Limited Diagnostic Exam: Limited Abdomen
CPT: 76705-26
Patient Identity confirmed: Yes
Indication for exam: RUQ abdominal pain, hyperbilirubinemia, jaundice, pancreatitis, etc.

Views:

Gallbladder short and long axis: Normal GB, not distended, no stones or sludge, no free fluid, not thickened, no pain with compression (negative Murphy's sign)
Gallbladder wall measurement: Normal thickness - ***mm
Common bile duct S & L axis: Normal diameter - ***mm
RUQ view / Morisson's pouch: No free fluid

Other Findings: None

Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of limited abdomen / RUQ biliary limited US: Normal Biliary US. The absence of pericholecystic fluid, Murphy's sign or gallbladder wall thickening indicates no signs of acute cholecystitis. The absence of stones or CBD dilation indicate no biliary obstruction.

Performed by ***

Limited Diagnostic Exam: Renal & Bladder - normal

Limited Diagnostic Exam: Limited Abdomen
CPT: 76775-26
Patient Identity confirmed: Yes
Indication for exam: Flank and/or suprapubic pain

Views:

Kidneys - Right and Left Short and Long Axis: No hydronephrosis bilaterally
Bladder - Short and Long Axis: Normal size, not distended, volume measured at ***cc, bilateral ureteral jets present

Other Findings: None

Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of abdomen limited / Renal and Bladder US: In this patient with bladder retention feeling, the bladder volume found indicates *** retention. There is no hydronephrosis noted so do not believe there is an obstructive uropathy.

Performed by ***

Limited Pelvic Ultrasound, Obstetric – normal

Limited Diagnostic Exam: US Pregnant Uterus / Transabdominal
CPT: 76815-26
Patient Identity confirmed: Yes
Indication for exam: Suparpubic pain, pelvic pain, vaginal bleeding, pregnancy

Views & Findings:

Transabdominal pelvic short and long axis of the uterus: Intrauterine pregnancy seen with normal fetal movement & FHR***.
R. Adnexa: no obvious ectopic mass w/ heartbeat
L. Adnexa: no obvious ectopic mass w/ heartbeat
Recto-uterine pouch: No signs of free fluid

Other Findings: None

Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of pelvic limited / TA pregnant uterus US: Exam consistent with intrauterine pregnancy with normal fetal heart rate & normal fetal movement. No signs of pelvic free fluid.

Performed by ***

Limited Ocular Ultrasound - normal

Limited Diagnostic Exam: Limited Ocular
CPT: 76512-26
Patient Identity confirmed: Yes
Indication for exam: Blurry vision, headache, etc

Views & Findings:

Long and short axis of right and left eye with linear probe:

Right Eye: anatomy identified, no pathology noted
Right Retinal Contour: no abnormalities noted, normal contour
Right Lens: Lens in normal position
Right vitreous body: clear vitreous body, no abnormalities noted
Right optic nerve sheath diameter (mm): less than 5.5mm
Right Ocular Foreign Body: none noted
Left Eye: anatomy identified, no pathology noted
Left Retinal Contour: no abnormalities noted, normal contour
Left Lens: Lens in normal position
Left vitreous body: clear vitreous body, no abnormalities noted
Left optic nerve sheath diameter (mm): less than 5.5mm
Left Ocular Foreign Body: none noted

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of ocular limited US: In this patient with ***, there is no obvious retinal flap or intraocular material consistent with blood, do not believe the patient has a vitreous hemorrhage. Likewise there are no findings to suggest lens dislocation, foreign body, or papilledema / increased ICP

Performed by ***

Limited DVT Ultrasound - normal

Limited Diagnostic Exam: Limited Lower Extremity exam
CPT: 93971-26
Patient Identity confirmed: Yes
Indication for exam: Leg pain and swelling
Location: (left or right leg)
Views & Findings:
CFV, GSV, Superficial FV, Deep Femoral Vein, Popliteal Vein:
R/L Saphenofemoral junction: compressible / normal color flow
R/L Common Femoral Vein: compressible / normal color flow
R/L Femoral Vein: compressible / normal color flow
R/L Popliteal Vein: compressible / normal color flow
R/L Popliteal Trifurcation: compressible / normal color flow
Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of lower extremity limited US: In this patient with leg *** there is good compressibility noted so there is not believed to be a DVT.

Performed by ***

Peripheral Venous Access with Ultrasound Guidance

Limited Diagnostic Exam: Vascular Access
Patient Identity confirmed: Yes
Indication for exam: Venipuncture requiring physician skill with ultrasound guidance
CPT: 76937, 36000
Risks, benefits and alternatives were discussed
Consent given by: ***
Vein Location: ***
Procedure: Vein was identified on Emergency Ultrasound. Site was cleaned with ChloraPrep. Sterile Tegaderm covering was used and single use sterile gel packet. A *** gauge needle was placed using ultrasound guided needle technique into *** Vein. Blood return and IV flushed without difficulty.
Number of Attempts: ***
Successful Catheter Insertion: ***
Complications: ***

Views & Findings: *** Vein in short access, scanned distal to proximal - Normal Compressibility and Visualized Patency
Other Findings: None

Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of vascular access US: In this patient with a need for IV access, a vein with good compressability was identified, and then successfully cannulated for IV access.

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Limited Soft Tissue Ultrasound / Muskuloskeletal

Limited Diagnostic Exam: Limited Exam of specific anatomic structure
CPT: Depends on the Location

- Neck (76536)
- Extremities including Axilla (76882)
- Chest wall (76604)
- Abdominal wall and lower back (76705)
- Pelvic wall (76857)
- Infant hip, static (76886)

Patient Identity confirmed: Yes
Indication for exam: Mass, swelling
Views & Findings:

Long and short axis of soft tissue with linear probe: Normal underlying soft tissue –OR-- Complex fluid with well demarcated wall with surrounding cobblestoning. No flow with color Doppler

Other Findings: None
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of soft tissue/msk limited US: In this patient with *** and the findings appear (cobblestoning, hypoechoic fluid, other ***) would correlate to ***(infection, cellulitis, abscess, other***) –OR-- No signs of injury, effusion, or foreign body. –OR--

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Ultrasound Guided Fascia Iliaca Block

Limited Diagnostic Exam: Regional Anesthesia block – femoral nerve, lateral femoral cutaneous, and obturator nerves
CPT: 76942-26, 64447-26
Patient Identity confirmed: Yes
Indication for exam: Hip fracture and pain control
Location: ***
Procedure:

*** femoral nerve and fascia iliaca were identified via ultrasound. The location was sterilized in standard fashion. *** mg of Ropivacaine, *** mg of Lido with epi, and mixed with sterile saline for a total of *** mLs. Using sterile procedure, anesthetic was placed in the fascia iliaca plane and around the femoral nerve under direct ultrasound needle guidance. Good hydrodissection and in-plane

needle was seen the entire time. No blood returned with aspiration. All vessels were avoided. Patient was on the monitor the entire time with no arrhythmia. No signs of toxicity. Intralipid was available if required. Patient reports significant improvement of pain after the procedure.
Image Documentation: Images are saved in*** (Qpath, etc)

Interpretation of regional anesthesia limited US: Neurovascular bundle visualized, target nerve isolated with hydrodissection, pain control achieved as intended

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ADD THESE TO YOUR PROCEDURE NOTES IF ULTRASOUND GUIDANCE WAS USED

EUS IMAGES SAVED TO * ** (or not saved)
ULTRASOUND GUIDED ARTHROCENTESIS
Small Joint (20604)
Medium Joint (20606)
Large Joint (20611)

ULTRASOUND GUIDED PARACENTESIS (49083)
EUS IMAGES SAVED TO * ** (or not saved)

ULTRASOUND GUIDED CENTRAL LINE (+76937)
EUS IMAGES SAVED TO * ** (or not saved)

ULTASOUND GUIDED ARTERIAL LINE (+76937)
EUS IMAGES SAVED TO * ** (or not saved)