

Rural Healthcare *Quality* Network  
*Hospital Peer Review*

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*Hospital Peer Review is a monthly newsletter sponsored by the Rural Healthcare Quality Network to alert Critical Access Hospitals regarding findings from the Peer Review Program. Summarized are a few of the key findings and best practices that would be helpful for other critical access hospitals to be knowledgeable about. This newsletter is edited by Myron Bloom, Medical Director and he can be reached at [drmbloom@msn.com](mailto:drmbloom@msn.com).*

## **A Rant on unchaining the US machine,**

### **Part two: Making the Diagnosis**

Clinical diagnoses are formulated by an analysis of the impressions made by performing a history and physical examination facilitated by use of instruments. The adoption of ED US use has been inhibited by the cost and complexity of the devices and the process for determination of competency and granting credentials to perform ultrasound examinations. However, as stated by Stein and Nobay, "It is important to understand that emergency physicians do not perform comprehensive ultrasound examinations such as those conducted by radiologists and outlined in the American College of Radiology or American Institute for Ultrasound in Medicine guidelines... Instead, the intent and design of ED ultrasound is to provide an examination that quickly answers a direct, focused, and predetermined question at the bedside. The study is conducted by a clinician who has examined the patient, is familiar with the details of their presentation, medical history, and other diagnostic tests, and who is responsible for subsequent patient management. ... These examinations are one piece of information used by the clinician to focus a diagnostic workup and make decisions about initial treatment. As such, they are no different than the interpretation of a chest radiograph, a laboratory test, or an electrocardiogram." [EMERGENCY DEPARTMENT ULTRASOUND CREDENTIALING: A SAMPLE POLICY AND PROCEDURE The Journal of Emergency Medicine, Vol. 37, No. 2, pp. 153–159, 2009]

*ED US quickly predicts:*

- *Is there a pericardial effusion?*
- *Is there inadequate circulating volume?*
- *Is there blood in the abdomen?*
- *Is there an abdominal aortic aneurysm?*
- *Is there evidence of an Intrauterine Pregnancy?*
- *Is there EMD/PEA?*

- *Is there evidence of Cholecystitis?*
- *Is there evidence of obstructive uropathy?*

Bedside US is particularly useful in hypotension, to evaluate intravascular volume status and predict whether fluid loading would be resuscitative while avoiding the time, instrumentation and risk of placing a central line. If the IVC collapses more than 50% with an inspiration, the patient will likely be responsive to fluid. To see an US assessment of volume status and predict responsiveness to volume supplementation, please watch the following YouTube clip: <http://www.youtube.com/watch?v=ndcJ4DjmWVY>

PEA and near-PEA states are sometimes due to potentially reversible causes that may be detected by emergency echocardiography and amenable to appropriate therapy. Indications for emergency echocardiography include suspicion of pericardial effusion or the detection of cardiac activity, usually in the hemodynamically unstable or symptomatic patient. There is no alternative test to emergency echocardiography for either cardiac mechanical activity or pericardial effusion.

[http://www.youtube.com/watch?v=VF\\_OGTSdSlo&feature=related](http://www.youtube.com/watch?v=VF_OGTSdSlo&feature=related)  
<http://www.youtube.com/watch?v=77wPDDT4Jw4&feature=related>  
<http://www.youtube.com/watch?v=usZJsJly51A&feature=related>

In a prospective study from Carolinas Medical Center in Charlotte, NC, 184 adult ED patients presenting with symptomatic non-traumatic hypotension were randomized to undergo immediate or 15-minute delayed goal-directed ultrasonography (US), performed by their emergency physicians. Their managing physicians were requested to list potential diagnoses, in the order of likelihood, at 15 and 30 minutes. The US focused on the presence of intraperitoneal fluid, left ventricular function, right ventricular size, and the presence of pericardial effusion, abdominal aortic aneurysm and inferior vena cava collapse. At 15 minutes, the median number of potential diagnoses was four in the immediate US group vs. nine in the delayed US group ( $p < 0.0001$ ). The most likely diagnosis cited at the 15-minute evaluation matched the final diagnosis in 80% of the patients undergoing immediate US but in only 50% of those undergoing delayed US. The conclusion was that in adults presenting to the ED with nontraumatic undifferentiated hypotension, early diagnostic accuracy was improved by immediate goal-directed US performed by EPs. [Jones, A.E., et al, RANDOMIZED, CONTROLLED TRIAL OF IMMEDIATE VERSUS DELAYED GOAL-DIRECTED ULTRASOUND TO IDENTIFY THE CAUSE OF NONTRAUMATIC HYPOTENSION IN EMERGENCY DEPARTMENT PATIENTS, Crit Care Med 32(8):1703, August 2004]

An earlier observational study at Carolinas Medical Center evaluated the contribution of bedside echocardiography performed by emergency physicians in the management of 20 adults with non-traumatic PEA or near-PEA and possible pericardial effusion. Near-PEA was defined as a systolic blood pressure (BP) below 90mm Hg or an unobtainable BP in the setting of a palpable pulse. Participating EPs received instruction in basic echocardiography and pericardial effusion states at a 20-hour emergency US course. Cardiac motion was observed in twelve of the 20 patients (60%), eight of whom demonstrated pericardial effusions. Three of the eight patients with effusions underwent

interventions for tamponade. Survival to hospital discharge was documented for seven of the eight patients with pericardial effusions. In two additional patients with cardiac activity and no pericardial effusion, bedside echocardiography was considered helpful in the resuscitation process by showing transcutaneous pacer capture in one patient and early return of spontaneous circulation in the other. In this small study, bedside echocardiography by emergency physicians facilitated identification of pericardial effusions with correctable causes from true PEA. [Tayal, V.S., et al, EMERGENCY ECHOCARDIOGRAPHY TO DETECT PERICARDIAL EFFUSION IN PATIENTS IN PEA AND NEAR-PEA STATES, Resuscitation 59:315, December 2003]

The indications for trauma ultrasound include blunt or penetrating trauma to the torso where there is suspicion of intraperitoneal hemorrhage, pericardial tamponade, or hemo/pneumo-thorax. The minimum 4-view trauma abdominal ultrasound should include the right flank to visualize the hepatorenal space, left flank to include the perisplenic anatomy, subcostal to visualize the pericardium, and pelvis to visualize retrovesical or retrouterine fluid views. Furthermore US is more sensitive for pneumothorax than radiologic imaging. The flank views also visualize the spaces above and below the diaphragm. Indications for ultrasound of the abdominal aorta to detect AAA included the presence of syncope, shock, hypotension, abdominal pain, abdominal mass, flank pain, or back pain especially in the older population.

[http://www.youtube.com/watch?v=XpN1R7A0r\\_0&feature=related](http://www.youtube.com/watch?v=XpN1R7A0r_0&feature=related) or  
<http://www.hqmeded.com/node/16>

Given that less than half of Abdominal aortic aneurism patients present with the "classic" history of a tender pulsatile mass and hypotension, a high index of suspicion must be maintained, especially in older patients for whom renal colic, mechanical back pain and diverticulitis are the most common misdiagnoses in patients with AAA. A positive FAST exam makes a diagnosis quickly rather than waiting for a trip to the CT machine and wait for a radiologist's report prolonging decision making and definitive care.

The Swedish Council on Health Technology Assessment (a national governmental agency that assesses healthcare technologies) concluded that the accuracy of ED US FAST Exam in detecting free abdominal blood is good with between 69% and 100% of hemorrhages detected (depending on the practitioner's skill, education and training) and specificity consistently high – between 96% and 100%. [SBU Alert Report # 2010-03, 2010-06-16]

But an US FAST exam is only a diagnostic test and may need to be repeated. Norwegian authors evaluated the use of FAST exams as part of the primary survey in 104 trauma patients aged seven and older with hemodynamic instability on presentation, defined as hypotension, tachycardia or acidosis. Blunt trauma accounted for 89% of the cases. The sensitivity and specificity of the initial FAST exam (generally performed within 5-10 minutes of patient presentation) were 62% and 96%, respectively. Positive and negative predictive values were 84% and 88%, respectively, and overall diagnostic accuracy was 88%. There were 75 true-negative FAST exams and 16 true-positives. But there were ten

false-negative FAST exams and three false-positives. These findings suggest that an initially negative FAST exam in hemodynamically unstable trauma patients does not reliably exclude intraabdominal bleeding. [Gaarder, C., et al, ULTRASOUND PERFORMED BY RADIOLOGISTS: CONFIRMING THE TRUTH ABOUT FAST IN TRAUMA, J Trauma 67(2):323, August 2009]

In a prospective, observational pilot study, researchers assessed whether specially trained paramedics could accurately perform Focused Assessment with Sonography for Trauma (FAST) and abdominal aorta (AA) ultrasound examinations on patients in the field. Twenty-five paramedics from two emergency medical services systems in Minnesota participated in a 6-hour didactic and practical training program and two 1-hour refresher courses during the 1-year study. FAST exams were performed in patients who experienced significant trauma, and AA ultrasound exams were performed in patients with abdominal pain. Ultrasound exams included at least 6 seconds of video clips of each view and were performed in the ambulance, either en route or at the scene if it did not cause delay. All studies were reviewed by a single physician overreader who was trained in ultrasound. Overall, 84 FAST exams and 20 AA exams were performed with inadequate views and video clips, in 8 of the 104 (7.7%) FAST exams. For adequate exams, agreement between interpretations by the physician overreader and paramedics was 100%. [Heegaard W et al. PREHOSPITAL ULTRASOUND BY PARAMEDICS: RESULTS OF FIELD TRIAL. Acad Emerg Med 2010 Jun; 17:624.]

**There are a number of conditions that demand immediate diagnosis that US can quickly detect such as:**

**Pneumothorax or Main Stem intubation (easily missed on chest x-ray)**

<http://www.youtube.com/watch?v=fntJ7GLjCSU&NR=1&feature=fvwp>

**Pleural effusion**

<http://www.youtube.com/watch?v=X1E7OgOLzw0>

**AAA**

<http://www.hqmeded.com/node/18>

**Pulmonary Embolism**

<http://www.youtube.com/watch?v=Tklaxe-kPrk&feature=related>

**Pericardial Effusion** see fast exam above

**DVT**

<http://www.youtube.com/watch?v=gcDucUGMMqo&feature=related>

<http://www.youtube.com/watch?v=hQCGE06g6kk&feature=related>

## **and to differentiate a Baker's cyst**

<http://www.youtube.com/watch?v=9fbKwuxb9Sw&feature=related>

## **Rib fracture**

<http://www.hqmeded.com/node/21>

## **Retinal detachment**

[http://www.youtube.com/watch?v=1Y9a\\_PHghzg](http://www.youtube.com/watch?v=1Y9a_PHghzg)

## **Problem Pregnancy**

<http://www.youtube.com/watch?v=iui0HF95XAw&feature=related>

<http://www.youtube.com/watch?v=ANhOwzbKe6Y&feature=related>

<http://www.youtube.com/watch?v=vIMDehOVnLI&feature=related>

Indications for first-trimester pelvic ultrasounds include establishment of the location of the pregnancy and identification of a yolk sac or fetal pole and/or heart beat in the symptomatic first-trimester pregnant patient with pain, bleeding, near syncope, or shock or the asymptomatic pregnant patient with risk factors for ectopic pregnancy. It is safer to perform a bimanual exam after a pelvic examination by transabdominal ultrasound or endovaginal ultrasound when an ectopic is in serious consideration. A recent study (Seymour, A., et al, Am J Emerg Med 28(2):213, February 2010) questioned the need except STD studies of a pelvic and bimanual examination after finding a viable (fetal heart beat) first or early second trimester pregnancy.

## **RUQ / Gall Bladder**

<http://www.youtube.com/watch?v=FY3dBuQV03w&feature=related>

Cholecystitis and cholelithiasis, common differential diagnoses for pain in the epigastrium, are best imaged with ultrasound. Indications for biliary ultrasound include the suspicion of a biliary etiology for epigastric, abdominal, flank, or right shoulder pain. The gallbladder is visualized to detect echogenic material that may produce shadowing, gallbladder wall diameter, and presence of fluid around the gallbladder. The abnormal size of the common bile duct and the presence of a sonographic Murphy's sign should also be noted.

## **Kidney Stones**

<http://www.youtube.com/watch?v=N750NAEmEso>

Indications for the ultrasound of the renal tract include the detection of hydronephrosis manifested by costovertebral pain, flank pain, or abdominal pain with vomiting. Both kidneys should be visualized from upper to lower pole in coronal/long and transverse planes for detection of hydronephrosis and echogenicity suggestive of stones with or without shadowing.

And to address the question of how difficult is acquiring the knowledge and skill to do bedside echocardiography to identify significant cardiac disease to augment your physical diagnosis I found this interesting study:

Authors from Cedars-Sinai Medical Center and UCLA compared the diagnostic accuracy of physical examination performed by one of five board-certified cardiologists, and use of a hand-carried ultrasound (device (OptiGo, Philips) by one of two first-year medical students in 61 patients with clinically significant cardiac disease. The students received 18 hours of training in use of the US device, which provides two-dimensional and conventional color- flow Doppler imaging, including four hours of lectures and 14 hours of practical experience. The students recognized 75% of the standard echocardiography identified 239 abnormalities in these patients (average, 3.9 per patient) compared with only 49% identified by the cardiologists by physical examination ( $p < 0.001$ ). The students were significantly more accurate than the cardiologists in the recognition of the most severe cases of left ventricular dysfunction and severe valvular disease (96% vs. 68%,  $p < 0.001$ ), and the US exams by the students were also more accurate than physical exams by the cardiologists in the recognition of lesions that cause systolic or diastolic murmurs. [Kobal, S.L., et al, COMPARISON OF EFFECTIVENESS OF HAND-CARRIED ULTRASOUND TO BEDSIDE CARDIOVASCULAR PHYSICAL EXAMINATION, Am J Card 96(7):1002, October 1, 2005]

A model credentialing policy proposed for UC San Francisco required a 90% or greater concurrence rate of the clinical interpretations with the radiologist on 25 or more ultrasound examinations before granting initial privileges for each of six separate diagnostic categories (Trauma, Pregnancy, Cardiac, RU Quadrant, Renal, and Aorta) as well as 25 tests per year in aggregate to maintain the privilege. For privileges in the 7<sup>th</sup> procedural category, 5 of each subcategory (Internal jugular, External jugular, Common femoral vein, Subcutaneous abscess or foreign body, and Thoracentesis or Paracentesis) were required to ask for credentials. That minimum number would seem to be required to reliably accurately independently exclude pathology (i.e. rule out without further testing) or to act as a consultant by doing a test and offering an opinion to another physician, but perhaps not for the bedside physician needing to diagnose and treat the patient. Their credentials policy said:

Physicians will be trained and credentialed separately for each of the following seven categories:

1) Trauma – The trauma ultrasound is performed according to standard guidelines for Focused Abdominal Sonography in Trauma (FAST). Presence or absence of free fluid in four fields will be assessed. Twenty-five credentialing ultrasounds are required in this area.

2) Identification of pregnancy – The pelvic ultrasound in early pregnancy is performed to identify the presence or absence of intrauterine pregnancy (IUP). A pregnancy is defined as an intrauterine gestational sac that contains a yolk sac or fetal pole. Both transabdominal and transvaginal approaches may be used.

Twenty-five credentialing ultrasounds are required in each area (transabdominal

and transvaginal – however, in many cases, these will be performed on the same patient).

3) Cardiac – the cardiac ultrasound is used to identify the presence or absence of cardiac activity in a code situation, or to identify the presence or absence of a pericardial effusion. Twenty-five credentialing ultrasounds are required in this area.

4) Right upper quadrant abdomen – the right upper quadrant or biliary examination is used to identify the presence or absence of gallstones, gallbladder wall thickening, pericholecystic fluid, sonographic Murphy’s sign, and dilatation of the common bile duct. Twenty-five credentialing ultrasounds are required in this area.

5) Renal – the renal examination is used to identify the presence or absence of hydronephrosis and to identify the presence or absence of renal calculi. Twenty-five credentialing ultrasounds are required in this area.

6) Aorta – the aortic examination is used to identify the presence or absence of increased aortic width consistent with abdominal aortic aneurysm ( $\geq 3$  cm considered abnormal). Twenty-five credentialing ultrasounds are required in this area.

7) Procedural – procedural ultrasound is used to identify anatomy critical to the successful completion of a procedure. The physician will use ultrasound to identify the relevant structure and location, and record an image and interpretation. The procedure will be performed in the usual fashion.

- a) Central venous line placements – 5 credentialing ultrasounds are required for each of the following regions: i) Internal jugular ii) External jugular iii) Common femoral vein
- b) Subcutaneous foreign body detection and abscess drainage – 5 credentialing ultrasounds required in this area.
- c) Thoracentesis and paracentesis – 5 credentialing ultrasounds required in this area.