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Ultrasound in Emergency Medicine

ULTRASOUND IN AN EMERGENCY DEPARTMENT OR CRITICAL CARE UNIT

You are listening to ReachMD, The Channel for Medical Professionals. Welcome to advances in medical imaging, a program discussing the latest innovations in clinical radiology and imaging technologies. Your host is Dr. Beverly Hashimoto, Ultrasound Section Head of Virginia Mason Medical Center in Seattle, Washington.

Do you know the impact of emergency ultrasound in saving lives? A growing number of physicians and emergency rooms and critical care units have become dependent upon this modality to make critical life-saving decisions in a few minutes. With me today is Dr. Victoria Noble who is going to discuss the use of ultrasound in the emergent or critical care setting. Dr. Noble is the Director of Division of Emergency Ultrasound and is an Emergency Medicine physician at the Massachusetts General Hospital in Boston, Massachusetts.

DR. BEVERLY HASHIMOTO:

Thank you Dr. Noble for speaking with us today.

DR. VICTORIA NOBLE

Oh, it is my pleasure.

DR. BEVERLY HASHIMOTO:

Dr. Noble, the focussed assessment with sonography for trauma or FAST study was one of the first widely examined application of ER sonography. When do you do this study and what does this study consist of?

DR. VICTORIA NOBLE

So, the past exam has been used by emergency physician's and trauma surgeons for almost 20 years now and the study consists of looking at the abdominal cavity, so looking in few different views of the abdominal cavity looking for fluid, which in a trauma patient would be suggestive of hemorrhage, and in addition, we look at the heart and the cardiac view of the heart using ultrasound to see if there is any fluid around the heart again suggesting hemorrhage or blood, and the reason why we use ultrasound in this way is that

many times there is discussion in most trauma textbooks about the golden hour of trauma and what that means is that most physicians believe that if you get to a patient within 1 hour and begin the stabilization process, you greatly improve their chances not only of better outcomes and doing better during their hospitalization, and even of survival. For example, someone comes in to the hospital and has been in a car accident and they have a fracture of their sternum, which is the breast bone kind of right over the heart and that punctures one of the chambers of the heart, you don't have time if that patient even makes it to the emergency room. Once they get there, you have minutes to make that diagnosis before they are bleeding in that cavity around the heart causes them to be severely hypotensive and critically ill, and so the chance to make that diagnosis has been improved dramatically by the ability of physicians at the bedside whether they are emergency medicine physicians or surgeons to use the ultrasound and look for that fluid around the heart. There are few critical studies that were done in the late 80s or early 90s and one of them is by Dr. Plummer, who was a trauma team member at the University of Denver and what he showed was that patients if you did a bedside ultrasound looking for this bleeding around the heart, you could actually improve their mortality over the standard of care, and once that was published, it was pretty hard for people to go back to doing other ways of diagnosis when you could show that there was actual mortality benefit from using this simple stool.

DR. BEVERLY HASHIMOTO:

Well, how often do you have to use this FAST study? How often does that come up in your practice?

DR. VICTORIA NOBLE

Because the more you do it, the better you get. We actually do this on any patient who comes to the emergency room or the emergency department with trauma, and so we use this on people who come in just after minor accident to people who come in who has had a major mechanism or a major trauma, and so we do it probably I don't know 10 or 20 times a day, depends on the volume of trauma patients that people see in the emergency department, but it is something that is very common and performed daily in the emergency departments across the country.

DR. BEVERLY HASHIMOTO:

Now for certain circumstances, I am sure, you have seen patients in all different types of situations, for example, for pregnant women is there anything different that you do with this FAST study or do you look for other kinds of findings with ultrasound?

DR. VICTORIA NOBLE

That's a great question. With pregnant patients, you know most people know when they are pregnant and so they can tell you that many times if a trauma patient is unconscious or if the patient is very early in their pregnancy, they don't necessarily know or can't communicate that to the treating physicians, and so one of the great things about ultrasound is while you are doing this kind of quick assessment or quick screening test to look for hemorrhage, you are also looking in the pelvis, and so often times you know we have had numerous examples of patients who come in who are getting the FAST exam, and because they can't communicate with us or because they don't know, when we look at the uterus and we see a pregnancy, that drastically alters our thresholds for doing more definitive imaging, for example, a CT scan because if they are very early in their pregnancy, we reserve the CT scan for someone who really needs that imaging and we weigh that against the risks for the fetus. So, it can help a lot of times in sort of prioritizing what further studies people need or what the risk-benefit analysis is for those next studies, and if we can avoid it in all patients, certainly we would like to try and avoid radiation exposure and certainly in pregnant patients given the bigger concerns.

DR. BEVERLY HASHIMOTO:

Well, besides trauma, are there any situations in which you have found ultrasound in the emergency room very useful?

DR. VICTORIA NOBLE

There is a great document for those who are interested that is listed on the American College of Emergency Physician website, which is the ACEP, which is the organization that kind of speaks for Emergency Medicine practitioners and it lists 6 applications that have been well studied in a variety of emergency medical situations that are very common for using ultrasound. One of them of course is the FAST exam like we just spoke of, second kind of subgroup of that, is looking just at the heart for patients we suspect they have fluid around the heart. That can be true in trauma patients, but it can also be true in cancer patients, patients with autoimmune diseases, patients with renal failure, who come in with abnormal vital signs and need to have the diagnosis of pericardial fluid ruled out. We also use the ultrasound to screen for looking at the abdominal aorta and screening for abdominal aortic aneurysms. As you mentioned, we will use the ultrasound to look for intrauterine pregnancies so that we may alter some of our diagnostic workup for those patients. Some places use the ultrasound to look at the gallbladder to make the diagnosis of cholecystitis or biliary colic, and also we can use the ultrasound to look at the kidneys and the bladder. For example, if the patient comes to the emergency room with what's presumed to be renal colic where they have known kidney stones. Often times we have in the past gotten CT scan to evaluate whether that stone is obstructing the ureter and causing hydronephrosis, but as we become more sensitive to the amount of radiation the patients are exposed to over their lifetime, we have used ultrasound more and more to look for that hydronephrosis and reserve CT scans only for those patients, who have positive hydronephrosis on their ultrasound scans. So, that way we can limit their radiation exposure and also make the diagnosis of either a normal kidney or a kidney that we are worried about.

DR. BEVERLY HASHIMOTO:

For those just joining us, you are listening to advances in medical imaging on ReachMD, The Channel for Medical Professionals. I am Dr. Beverly Hashimoto and I am speaking with Dr. Victoria Noble, Director of Division of Emergency Ultrasound at Massachusetts General Hospital in Boston, Massachusetts. We are discussing the use of ultrasound in an emergency department or critical care unit.

Dr. Noble in looking at some of the applications that you have discussed, you state that after performing an ultrasound you are very careful about deciding whether they need more radiation or other tests. Are there certain types of findings in which you know you will be sending the patient for a CT or MRI or other examination.

DR. VICTORIA NOBLE

That's a great question because most of what we do in the emergency ultrasound is use the ultrasound as a screening test and so that's an important concept because that's different than what most other radiologists or imaging professionals do if they are diagnostic testing. Most people are using diagnostic testing to get as much information on any diagnosis that may be possible and they are using it as sort of overall diagnostic catch all. What we are doing in an emergency ultrasound is we are taking care of the patient who we are examining clinically and in whom we have suspicion of disease and we can use the ultrasound to either confirm or deny that suspicion, so most of our questions for ultrasound are yes/no questions and so the idea is the trauma patient have internal bleeding, yes/no; does this patient with abdominal pain have an aortic aneurysm, yes/no; is this young female patient pregnant, yes/no and the next step depends a little bit on either how critical the patient is or how important that diagnosis is or if there is more information we need about that diagnosis in order to treat the patient. So, for example, say a patient who is elderly comes to the emergency department and has abdominal pain and we are suspicious for the diagnosis of an abdominal aortic aneurysm. If that patient is hypotensive and has unstable vital signs and when we do the ultrasound we see some leaking blood or fluid around that aortic aneurysm, we will call our vascular surgeons and send them directly to the OR because we don't have time to do further testing. However, if that patient is stable or they have normal vital signs, absolutely those patients will get referred and the majority of those patients are in that category and they will

get referred for CT scans because the surgeons obviously appreciate the diagnostic information and anatomy that a CT scan can provide, which an ultrasound really just can't provide. So that's 1 example of how we use you know ultrasound in conjunction with all the other tests that are done by the normal kind of pathway from radiology. For example, we had the patient recently who came to the emergency department, who was a child-bearing age female who had unstable vital signs. She had not been in a car accident. She had no kind of other traumatic injuries and when we did the ultrasound we didn't see any blood in her abdomen and we did not see an intrauterine pregnancy despite the fact that she had a positive pregnancy test. Because her vital signs were stable, she absolutely went for formal testing with our radiology department to see if they could see anything more subtle that would suggest an ectopic pregnancy. So, you know, it's not that we replace anything that's done by the radiology department, we more supplement or a confirmatory screening test for the diagnosis that we have made clinically as we are seeing the patient.

DR. BEVERLY HASHIMOTO:

Well, thank you Dr. Noble. This has been a wonderful discussion. Thanks for sharing your expertise about the use of ultrasound in an emergency department and critical care unit.

I am Dr. Beverly Hashimoto. Please visit our website at reachmd.com, which features our entire library through on-demand podcasts. Thanks for listening.

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