Ultrasound: Incorporate Into Your Critical Care Assessment

Announcer: Welcome to the Mayo Clinic cardiovascular continuing medical education podcast. Join us each week to discuss the most pressing topics in cardiology and gain valuable insights that can be directly applied to your practice.

Dr. Bell: Welcome everyone again to another in our series of Interview with the Experts. I'm very pleased to have with me today, Dr. Courtney Bennett, who's the Medical Director of our Cardiac Intensive Care Unit and a Consultant in the Division of Ischemic Heart Disease and CICU as well as the Division of Cardiovascular Ultrasound. I'm Malcolm Bell. I'm the Vice Chair of the Department of Cardiovascular Medicine here in Rochester, Minnesota. So welcome Dr. Bennett.

Dr. Bennett: Thank you. Thank you for having me.

Dr. Bell: Yeah. So we are here to talk about something that may sound as though it's new, but I don't think it really is. And, and that's POCUS, or a Point of Care Ultrasound. Maybe just start off with just telling us what exactly is POCUS and and what sort of organ systems are, are we talking about looking at with ultrasound, in this point of care?

Dr. Bennett: Yeah, that's a great place to start the way that we typically differentiate, you know, Echocardiography or ultrasound of other organ systems from Point of Care ultrasound is that POCUS, which we'll--I'll use for for short in Point of care Ultrasound is actually a goal directed exam. So when we're doing POCUS, we're actually trying to answer a specific clinical question at the bedside or in the emergency department, wherever the patient may be located in the-- even in the operating room to try and image multiple organ systems at the same time to put that together, to answer that single clinical question. And so that's typically how we would differentiate that from a comprehensive echocardiogram

Dr. Bell: Or even the ultrasound. I mean--we-- you talk about other systems, so looking at the abdomen so potentially talking about abdominal ultrasound or

Dr. Bennett: Right, right. Yes, exactly. So with point of care ultrasound we'll typically do any combination of cardiac, lung, abdomen, even vascular imaging. And for example, with echo cardiography in order to be considered a Comprehensive Echocardiography there are certain components needed in the majority of the studies to be considered a Comprehensive Echocardiography, Echocardiogram. But for POCUS, for example, if someone comes with shortness of breath, you may image the lungs for findings of fluid, look at the heart, maybe to look for cardiac function or even strain on the right heart, And maybe then add vascular imaging to see if there's any evidence of a DVT. Putting that all together, normal lung ultrasound with maybe reduced right heart function and finding of DVT, may lead you down the path to start Heparin and do imaging for--to confirm the diagnosis of PE. And that's just an example of how you can put it together.

Dr. Bell: So today I think you wanted to confine your your comments and, you know, opinions here with use of POCUS in the critical care environment.

Dr. Bennett: Correct.

Dr. Bell: But very often your patient gets into the, you know critical care or ICU or, you know, cardiac intensive care unit because of findings of ultrasound or, or focus. What are your thoughts here? Is the physical exam gonna be complimented by purpose? Or is it the other way around? Maybe just spell how you see this play in terms of you know, the, the physical exam and, and, and beyond

Dr. Bennett: Right. I think this is a, a great debate. You know, many traditional providers will like to argue that it all comes down to the exam. And then there's another group who rely heavily on the POCUS findings. I would say that really it's actually the POCUS that's complimenting the clinical assessment. So the clinical findings on your--even your history and exam are going to guide your POCUS imaging. I will say that there is strong evidence to support the--the fact that POCUS does significantly improve clinical exam. For example, there's a study demonstrating that medical students, plus POCUS actually out-performed cardiologists in identification of murmur. So the cardiologists were using traditional exam skills and the medical students were using exam skills plus POCUS and they were able to identify the murmurs significantly more accurately than the cardiologist without POCUS alone.

Dr. Bell: Tell us, when do you think you'd be using this in in a typical patient, that's going be admitted to the cardiac intensive care unit or is already in the ICU?

Dr. Bennett: Yeah, so we will use actually any new admission to the cardiac ICU. Part of our admission workup I'll say is to perform POCUS on all of our patients. And so, often patients presenting with Undifferentiated shock or shortness of breath will start by doing POCUS and then see which direction the findings will actually take us. The POCUS exam can actually decrease the number of diagnostic studies by about almost 20% in terms of helping narrow down that differential diagnosis. So when the patient is admitted to the ICU we'll perform our clinical assessment history physical exam, and then perform POCUS following that. Sometimes it may be simultaneous depending on how many team members we have present but that will always follow the--the physical exam. And I actually did a small feasibility study looking at when does it feel most convenient for clinicians to incorporate POCUS using a NASA--NASA TLX survey in terms of assessing workload. And I compared in a simulation setting whether providers should do their POCUS exam after each system. So for example, examine the lungs and then do POCUS of the lungs or do the whole clinical exam, and then perform the POCUS. And the providers felt strongly that the workload of performing it after the physical exam made more sense. They didn't feel that they were fumbling between exam and POCUS. And so that was a--as I said, small study but no one had ever looked at it before to see when it felt like it made the most sense in the exam.

Dr. Bell: So, so what are the most common things that you would be imaging? I mean, you just talked about the, the lung exam. Maybe you'll walk us through what you're looking for there but what, what else would you be looking for?

Dr. Bennett: Yeah. So on the lung exam we're looking for findings. Specifically, if we're looking for Pulmonary Edema, we're looking for B-lines which are these comment tail artifacts that greater than three or more in a in a imaging window would be consistent with abnormal aeration, at least in that segment. So you're looking for those B-line artifacts. You can actually see on lung exam finding consistent with consolidation of the lung which would suggest pneumonia as well as even looking for plural fluid. If you're looking at the abdomen, one of the reasons that we most often in the cardiac ICU you're gonna look at the abdomen is to look for free fluid that could be related to trauma. And you might ask, well why would a patient in the cardiac ICU have trauma? Well, actually CPR itself can cause trauma and patients can have bleeding into the abdomen. So we'll look for findings of free fluid in that same setting. If you're looking at the IVC and see the IVCs completely collapsed and you see free fluid in the abdomen, putting that together, we might say the patient has some type of laceration or injury. Also patients have procedures and sometimes even spontaneously bleeding. So those are some of the findings we would look at using abdominal ultrasound. And finally, even looking at vascular ultrasound we're trying to identify the veins, typically the femoral veins, even down into the more distal veins and look for the compressibility of the veins as a sign of potential DVT. So non-compressible would be consistent with DVT

Dr. Bell: Yeah. I mean, you know, trauma it's not something we, you know, often consider in the cardiac Intensive Care Unit, but I mean, I understand that your POCUS has been used on, you know, for for some time in the emergency department. It's, it's a very valuable tool there right. In, in trauma patients.

Dr. Bennett: And that's where it really was established that fast exam, which is the focused assessment using sonography and trauma.

Dr. Bell: Right. But even just, you know, assessing the IVC, I mean outsiders setting a trauma, I mean surely must give you an indication of what the volume status is of a patient particularly if they're in shock and or you're having your renal failure.

Dr. Bennett: Correct.

Dr. Bell: And then with, with the, the lung ultrasound, I mean we typically don't think about ultrasound being used, you know, in rated organs, but is this something that is equivalent to a chest x-ray is it better than the chest x-ray for let's say identifying a Pulmonary Edema?

Dr. Bennett: Yes. So specifically looking for Cardiac Pulmonary Edema the sensitivity and specificity of the lung ultrasound is very good, but above 90% for both or near, at least 90% for both, and actually in some settings has outperformed the chest x-ray in terms of the sensitivity and specificity.

Dr. Bell: That's very interesting. So who--who's actually doing the, these focus exams. And, and so you, you, you said that when a patient comes into your cardiac intensive care unit that this is really part of the admission process you know, complimenting the, the physical exam. I mean, these are trainees that are doing this the consultants and, and tell us about what sort of training and perhaps even credentialing people need, you know, to be able to do this.

Dr. Bennett: Yeah. And that's an ongoing topic of discussion even within our institution, as well as outside of that. So it depends on really who's present on the team with those skills, myself and some of my colleagues share both the echo--Echocardiographer role, as well as the Cardiac Intensive Care Unit provider role. And so that would include myself and a few other of our colleagues. Our fellows are also experienced in performing POCUS and there is a curriculum for them. And, and I'm sure you're aware that our institution has supported providing handheld devices for the fellows as part of their training. It's a little bit more straightforward for Cardiology Fellows in training because Ultrasound is incorporated into their curriculum fairly heavily. And our echo lab has begun performing Lung Ultrasound. So our fellows get experience with that as well. In terms of overall credentialing there-- the NBE has actually now a Critical Care Ultrasound exam that providers can sit for. That does require that the-- the non Cardiologists who are sitting for that exam have 150 studies that have been over-read by an experienced Echocardiographer before they're eligible to sit for the exam but there are some credentialing processes such as this present or available and this continues to be evolving.

Dr. Bell: So if, if you find, if we are using POCUS and, and there's a a cardiac exam, and its clearly an abnormality, you know whether it's, you know, kind of a fusion or, you know, some left ventricular dysfunction, is that gonna replace a formal Transthoracic Echocardiogram? And on the other hand, if the interpretation is that the cardiac function appears to be normal, again does that replace the need for a Transthoracic Echocardiogram?

Dr. Bennett: Yeah, so I actually think it won't replace the need. I think it will reduce the number of overall imaging studies required, but I don't think that it's going to replace the Echocardiogram itself completely, mainly because just assessing, for example, Tampa nod itself it can be difficult at the bedside and someone who's not as experienced as a Stenographer in terms of getting all those Doppler indices as well as the fact that many point of care or handheld ultrasounds don't have that Doppler capability. You know, if the patient is unstable and and any 2D imaging would be able to provide you with evidence of chamber collapse but if it's an early assessment of tampenon you really need that additional data. And that's why I think you'll still be-- you'll still be ordering the Comprehensive Echocardiogram but maybe not the Ultra-- or the CT Scan or the Doppler as well. Cuz you've narrowed it down. You've narrowed your differential diagnosis down and you can focus your imaging studies then.

Dr. Bell: And what about in--at sites that, you know don't have the resources that, you know' large hospitals or academic centers you have. And so I'm thinking about, you know a remote hospital in their Emergency Department or in their small Intensive Care surely this must provide an opportunity for real time, your review, and, and, and I know at least, you know, one or two of these devices, you know, are cloud based as well. And so what, what are the opportunities there for us to to help our colleagues who are in these smaller, acute care hospitals?

Dr. Bennett: Yeah. So I don't actually personally have experience with this, but I do know something very interesting. Our emergency--emergency department has the capability through tele-medicine to actually guide our referring health system sites in performing handheld ultrasound or POCUS while in real time, to help with imaging and then see on the monitor those images to help with decision-making. And so those capabilities do exist.

Dr. Bell: Okay. Well, I think we're-- that's running out of time here. Maybe the, the last question I'll ask you, Dr. Bennett is, do you see this as improving outcomes in, in patients? if we have any data to, to support that? And I'm talking specifically about the intensive care patients.

Dr. Bennett: Yes. So this is, this is one of my favorite, you know soap boxes to get on, because I think there's a lot of--there's argument about the fact that Point of Care Ultrasound itself probably does not improve outcomes. But my argument is that diagnostic studies themselves typically are not going to improve outcomes. It depends on what you do with the results of the diagnostic study. And so, I typically will go back to one very strong study that I like to cite by Dr. Kanji and it was done in the Emergency Department where they scanned patients doing-- actually Cardiac Ultrasound and then IVC, and based on the findings they actually had a, an intervention protocol. And so they were able to demonstrate actually less use of fluids in patients presenting with Undifferentiated shock, as well as decrease end organ damage as well--as well as and most the primary outcome was looking at mortality. So if, if you are able to incorporate some kind of intervention protocol with your diagnostic imaging then you're able to improve outcomes.

Dr. Bell: Yeah, I think it's always difficult isn't it to, to demonstrate you do improve outcomes but you know, at the very least, you know, making sure that those outcomes are not compromised, but whether you increase efficiency and maybe decrease you know, resource utilization and, and I think particularly maybe coming to a diagnosis, you know, sooner rather than later, and as I said, particularly, you know it's at smaller hospitals. So I, I think these are really helpful comments that that you you've made and guiding us into I think what we're gonna see in the next phase of working the, you know, the Cardiac Care Unit or the Cardiac Intensive Care Unit, you know, doing building on the experience from the ED of the many years. And, and so I think as we see, you know increased utilization of POCUS, I think that our viewers and listeners will find this very, very interesting but it's, I think it's gonna be important for people to understand you still need to be sort of well-trained in this and, and I look forward to hearing more about your efforts in, in that regard.

Dr. Bennett: Yes.

Dr. Bell: So thank you very much Dr. Bennett for your time.

Dr. Bennett: Thank you.

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