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Ultrasound: Medical Efficiency for the 21st Century

### WORKFLOW EFFICIENCIES IN ULTRASOUND

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. This edition of advances in medical imaging is sponsored by Siemens Ultrasound, the only provider of knowledge-based workflow applications that improve efficiencies and generate consistent results. Siemens, answers for life.

Intelligent uses of artificial intelligence to improve diagnostic imaging services. With me today is Dr. Raley Lazebnik. Dr. Lazebnik is a radiologist with a PhD in biomedical engineering. He is the global radiology segment manager for the Siemens Healthcare Ultrasound Business Unit. Today we are discussing workflow efficiencies in ultrasound.

**DR. JASON BIRNHOLZ:**

Hello, Raley, thank you for joining us.

**DR. ROEE LAZEBNIK:**

It's my pleasure to be here, Jason. Thank you.

**DR. JASON BIRNHOLZ:**

Well, I wonder if we should think of you as a 21st century medical efficiency expert.

**DR. ROEE LAZEBNIK:**

That would be nice, yes.

**DR. JASON BIRNHOLZ:**

Why, you have a lot of tools at your disposal to do it in a way that business people were not able to do it nearly 50 years ago.

**DR. ROEE LAZEBNIK:**

I certainly think so. I think one of the benefits from medical imaging today not only stems from the actual imaging hardware, but also from the manipulation of the clinical data along the way. We see many of the efficiencies coming from our ability to now extract much more clinical information from the same exam.

**DR. JASON BIRNHOLZ:**

Well, we are into the information age, aren't we?

**DR. ROEE LAZEBNIK:**

We certainly are.

**DR. JASON BIRNHOLZ:**

Well, lets get down to some clinical discussions. There are a lot of similarities between the patient visiting his/her primary physician's care office or going to an imaging facility for a diagnostic procedure like ultrasound, there is some fundamentals and analyzing workflow that you consider before you even begin to look into ways to stiff things up?

**DR. ROEE LAZEBNIK:**

Absolutely. We think about maximizing workflow in terms of increasing the amount of information density obtained from a clinical study, that is not just the number of images, but the actual clinical information derived from those images. At the same time, we would like to lower the total exam time, that is the time required for acquisition, analysis of the data, as well as the annotation and reporting associated with it. So when we design new technologies to maximize information density, we are very cognizant of the need to minimize acquisition time, decrease analysis time, and at the same time make the reporting much easier.

**DR. JASON BIRNHOLZ:**

Ok, well, lets take a hypothetical patient and since there are probably more obstetrical ultrasounds done than any other kind of ultrasound worldwide daily basis, lets make this hypothetical person pregnant, a woman who is, lets say, in the second trimester of pregnancy and she is referred by a physician to an ultrasound facility with your latest and best workflow improvements, your best scanning equipment. Can you walk the patient through her side of the visit?

**DR. ROEE LAZEBNIK:**

Absolutely. I think these days the woman would enter the ultrasound suite just as she has in the past, but once situated the sonographer

or the sonologist – indicates that the scanning physician, would perform the exam using a volume transducer, that is rather than trying to obtain independent 2-dimensional views from various directions, the woman is going to experience a much shorter exam because now the transducer placed on her is able to acquire an entire volume; for instance, of the fetus almost instantaneously rather than the physician having to manipulate her, position her, and sweep the transducer manually across her. I think that that's a much more convenient experience for the patient in this case.

**DR. JASON BIRNHOLZ:**

Well, when that's done, can the patient be let go or should she stay until more is done?

**DR. ROEE LAZEBNIK:**

I think that's an excellent point. In fact the patient in many cases can be let go at that point particularly for non-emergency related cases that is for standard biometric measurements as well as for well visits that simply document the growth of the fetus and so forth. Certainly the patient can leave at this point because a comprehensive volume of data has already been acquired and any view can be retrospectively extracted from that patient, either on the ultrasound system itself by the sonographer for instance or even hours later at an off-line workstation.

**DR. JASON BIRNHOLZ:**

Okay, so on a conventional exam, patient comes in and whoever the operator is, is perhaps spending 30 or 40 minutes thereabout acquiring lots of particular images or according to some protocol may be saving video clips, etc. If you change things to volume acquisition, what's the change in time?

**DR. ROEE LAZEBNIK:**

You know, that certainly depends on the specifics of the exam, but I think in terms of time savings, results are fairly dramatic. In some cases, you might be looking at even an order of magnitude decrease particularly for patients where it would have been difficult to obtain some views due to fetal posturing for instance that is the specific orientation of the fetus is no longer an issue if we are able to retrospectively extract a view we didn't acquire directly.

**DR. JASON BIRNHOLZ:**

Okay, and actually I have heard from some of my colleagues that you know times go down to may be 4 or 5 minutes for exam.

**DR. ROEE LAZEBNIK:**

I think that would be reasonable in some cases absolutely.

**DR. JASON BIRNHOLZ:**

Well, I mean, there are a lot of advantages to that on the patient's side that you have minimal waiting time and you can probably get to something close like on-demand scheduling because on the facility side, we are able to do many more patients per day with the same equipment and the same personnel.

**DR. ROEE LAZEBNIK:**

Absolutely, and I think that the other aspect of this is that the exams can be much more standard across different users. So in the past there has been significantly more skill required to obtain a specific view. Today, the skill is more in the manipulation of the volume rather than in its acquisition, which can be standardized across the users much more effectively.

**DR. JASON BIRNHOLZ:**

Now, that's a really important point because one of the things that is always distinguished ultrasound is the requirements on the knowledge and experience of the operator whoever that may be, a technologist or a physician in that rest of the radiology, you can perform the imaging functions without having to interpret or understand the images particularly well. You just need to be able to decide if the image is satisfactory or not and so that's a very very big difference to decrease the requirement for a great deal of skill in acquiring the images.

**DR. ROEE LAZEBNIK:**

Absolutely. I also think that this allows the clinician to spend more time with the patient as opposed to with the imaging hardware that is when the burden is taken off the physician to obtain certain views for documentation purposes. Once the scan is initiated, I think the encounter can be much more personal for the patient. The physician is much more free to talk with the patient and answer questions during the exam and so forth.

**DR. JASON BIRNHOLZ:**

And acquire more history that helps the diagnosis as well.

**DR. ROEE LAZEBNIK:**

Absolutely. I think overall we are able through this to increase the density of clinical information. The clinician is able to extract from the same encounter both by interacting with the patient more effectively and at the same time getting the diagnostic views quicker and more efficiently.

**DR. JASON BIRNHOLZ:**

If you are just joining us, you are listening to advances in medical imaging on ReachMD, The Channel for Medical Professionals. I am Dr. Jason Birnholz and I am speaking with Dr. Roee Lazebnik. We are discussing workflow efficiencies in ultrasound.

Well, Roee, lets get to what is the sort of under the hood of all this, tell us what happens on the radiology side after a block of data is

acquired?

**DR. ROEE LAZEBNIK:**

It's quite interesting. In the past, once data was acquired, most of the analysis of that imaged data was manual observation of the image and may be some manually placed annotations on the image. These days we are able to automate a great deal of measurements using artificial intelligence technology, for instance, in the case of fetal biometrics, if a particular image demonstrates a fetal femur, the ultrasound machine can now automatically identify that it is looking at a femur and measure that femur automatically, transfer that measurement into the report, and in conjunction with other biometric measurements perform different obstetrical calculations again with minimal user intervention.

**DR. JASON BIRNHOLZ:**

But your artificial intelligence research has really gone far beyond that, hasn't it, actually recognizing patterns identifying organs or may be even pathology?

**DR. ROEE LAZEBNIK:**

Well, I think, we are not quite <\_\_\_\_> in terms of automatically recognizing pathology, although I think that's certainly down the line. I think at this point in time we have made great advances in terms of automating some of the more routine aspects of ultrasound. The way we have been able to do that is by transitioning our image analyzing strategies from thinking like a computer to thinking like a radiologist or an obstetrician in this case. We found that humans tend to look at things in a very probability based way that is when they look at an image, they are able to determine, which part of an image corresponds to the anatomy that they are looking for and which parts of the image are clearly not relevant diagnostically. We are able to essentially train the imaging software to perform that same type of analysis by feeding it a very large database of human analyzed cases that is we have developed machine learning algorithms that are able to analyze human behavior in terms of analyzing medical images and then simulate that behavior in response to new images that the algorithm has not seen before.

**DR. JASON BIRNHOLZ:**

My thanks to Dr. Roe Lazebnik, who has been our guest. We have been discussing workflow efficiencies and ultrasound. Roe, thank you very much for sharing your work and workflow concepts with us.

**DR. ROEE LAZEBNIK:**

It was my pleasure too.

**DR. JASON BIRNHOLZ:**

I am Dr. Jason Birnholz. Please visit our website at [www.reachmd.com](http://www.reachmd.com), which features our entire library through on-demand podcasts.

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