

New Perspectives in Imaging at Phoenix Children's 3D Innovation Lab



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Dianna Bardo, MD
Director of Body MR &
Co-Director, 3D Innovation
Laboratory, Phoenix
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Applied Radiology recently had the opportunity to speak with Dianna Bardo, MD, Director of Body MR and Co-Director, 3D Innovation Laboratory at Phoenix Children's Hospital in Phoenix, Arizona, about some of the game-changing work that's going on in their 3D Innovation lab.

AR: How is the 3D Innovation lab using advanced visualization to improve care at Phoenix Children's?

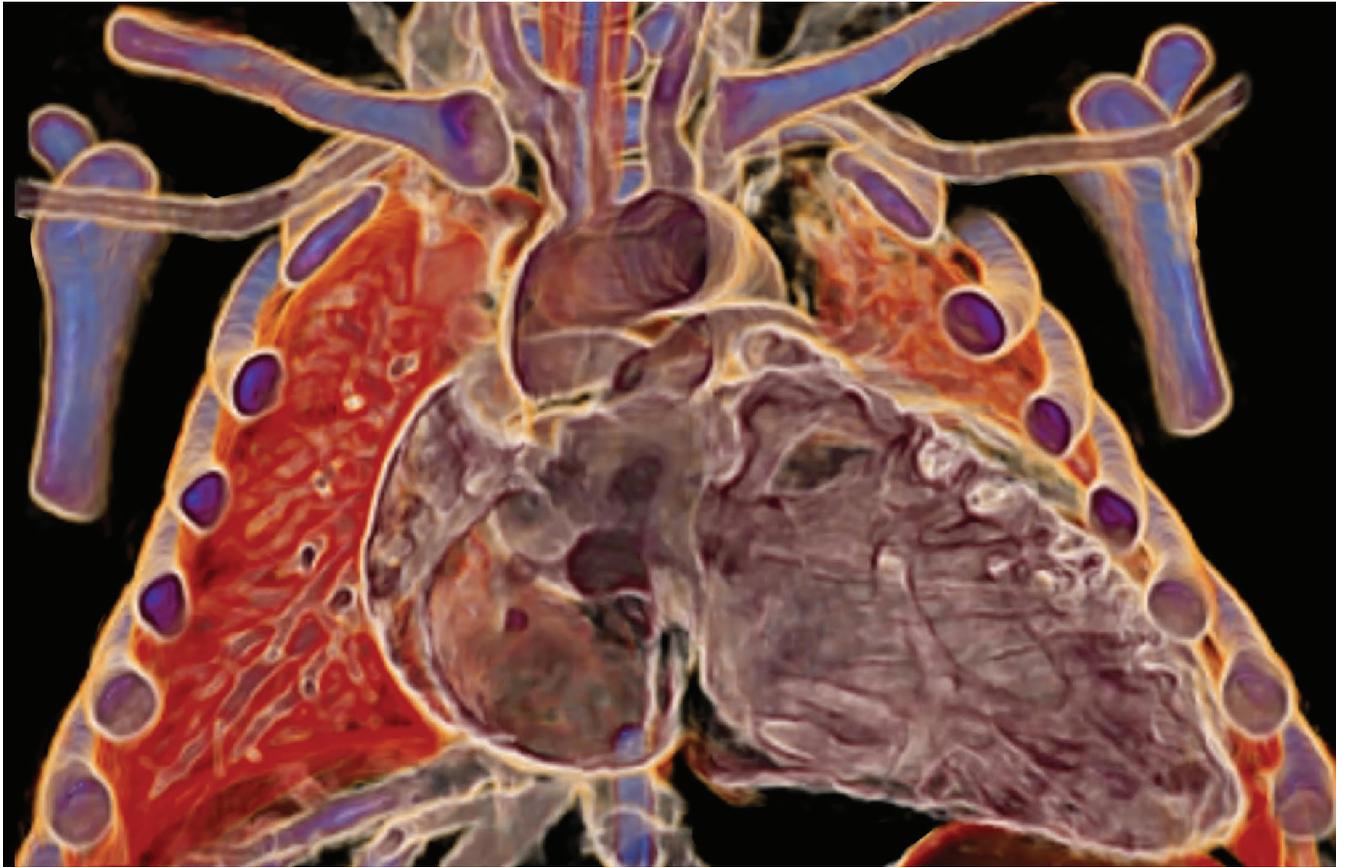
DB: Our 3D Innovation lab is really sort of a unique situation where we have some extremely talented technologists with unique knowledge of cross-sectional anatomy using Philips' IntelliSpace Portal, an advanced visualization platform that offers a single integrated solution to help clinicians work quickly with increased diagnostic confidence — especially for complex cases and follow-up, to process clinical images in multiple ways. With all that technical expertise and computing power our radiologists envision diagnoses more efficiently and enable our clinicians to utilize CT and MR images in a more intuitive manner.

We all believe that we can sort of make that 3D image in our minds just by viewing the 2D axial images, but as it turns out, we are not really very good at it. If we show the image in a virtual 3D environment — or sometimes using a

3D print — by virtue of seeing it that way, we are helping clinicians or surgeons to actually see *the images better* and understand the pathology, or even the normal anatomy, better than we ever imagined we could.

AR: What are some types of cases or particular types of images that you've worked on for clinicians?

DB: With post-processing techniques and advanced visualization, we can segment out a tumor, a vascular structure, or even the heart, and really have a much more thorough understanding of what that anatomy looks like. We often meet with a clinician in the lab or in the reading room, where we can manipulate the image even further to show them things they are specifically interested in seeing, answering detailed anatomic questions about their patient. Oftentimes, they have additional questions, or want to see structures from a different perspective that requires us to alter the image based on



A 3D view of the right atrium and ventricle is reconstructed from CT data using a transparent algorithm within Philips IntelliSpace Portal. Transparency enables optimal visualization of important details of cardiac structure.

information they need to prepare for a surgical procedure, for example.

AR: How has having the 3D Innovation lab changed the way you practice at Phoenix Children's?

DB: It's been really interesting to see the level of variability that exists between each reader, how we measure things, and how our visual perception plays into that. We did a study here where we asked eleven radiologists to look at and measure tumors, myself included. Next, we were asked, without using 3D, what shape do you think this tumor is? From the radiologist's measurements made on axial, sagittal,

and coronal 2D images we calculated a volume of the perceived tumor shape. Our calculated results were all over the board. Our 3D lab technicians used IntelliSpace Portal software to segment these same tumors and make direct volumetric measurements. Their results were very similar and more accurate than the radiologists' because they used the advanced visualization 3D software.

AR: A great exercise, but how does that translate into better outcomes for Phoenix Children's Hospital patients?

DB: In a tumor situation, if we're more accurate in how we're measuring it, then we know from

one time point to the next that the treatment might be working better — or if that treatment isn't working because the tumor is growing. In that case, the oncologist knows sooner to change a treatment method. If the patient is getting chemotherapy and the tumor is still growing — and we know that because we've been more accurate in calculating its volume or its size — then we know it's time to change that course of treatment. Maybe the patient needs to go back to the OR, or maybe they need a different type of chemotherapy. If the tumor is really shrinking, perhaps we can take a child off of chemotherapy sooner.

Because 3D visualization is more easily understood, everyone is drawn to utilizing it. It has resulted in a more complete and collaborative clinical approach for our patients. I was just in cardiology conference this morning, and brought up an active case to show an idealized image. Everything is in our IntelliSpace Portal, so even in a fast-paced surgical conference situation, I can manipulate the image on the spot, adding anatomy back or subtracting anatomy to show them a particular view in a live situation. It's a very powerful tool. The Portal has been loaded into all of the conference room computers, and it's a thin client so it can go anywhere.

AR: I've heard you have printed out special 3D models for some pediatric cancer patients. Can you tell me about those experiences?

DB: A 3D printed model is often made to supplement virtual 3D images; the printed model provides a tactile experience which helps our physicians and surgeons plan treatment for our patients. Holding that life-size model of a patient's heart allows the surgeon to rehearse a surgical approach or plan maneuvers before the patient is in the operating suite. Surgeons can dry fit a stent or implant and make certain that the surgical plan is optimized.

Virtual and 3D printed models are great educational tools for patients and families who often struggle to understand the diagnosis of a complex condition or anomaly. Models illustrate their child's anatomy and pathology and can ease the stress of comprehending surgical or treatment plans. This visual and touchable tool allows them to better understand some of the complex terms and concepts presented by their medical team which really helps drive the road to progress and recovery.