

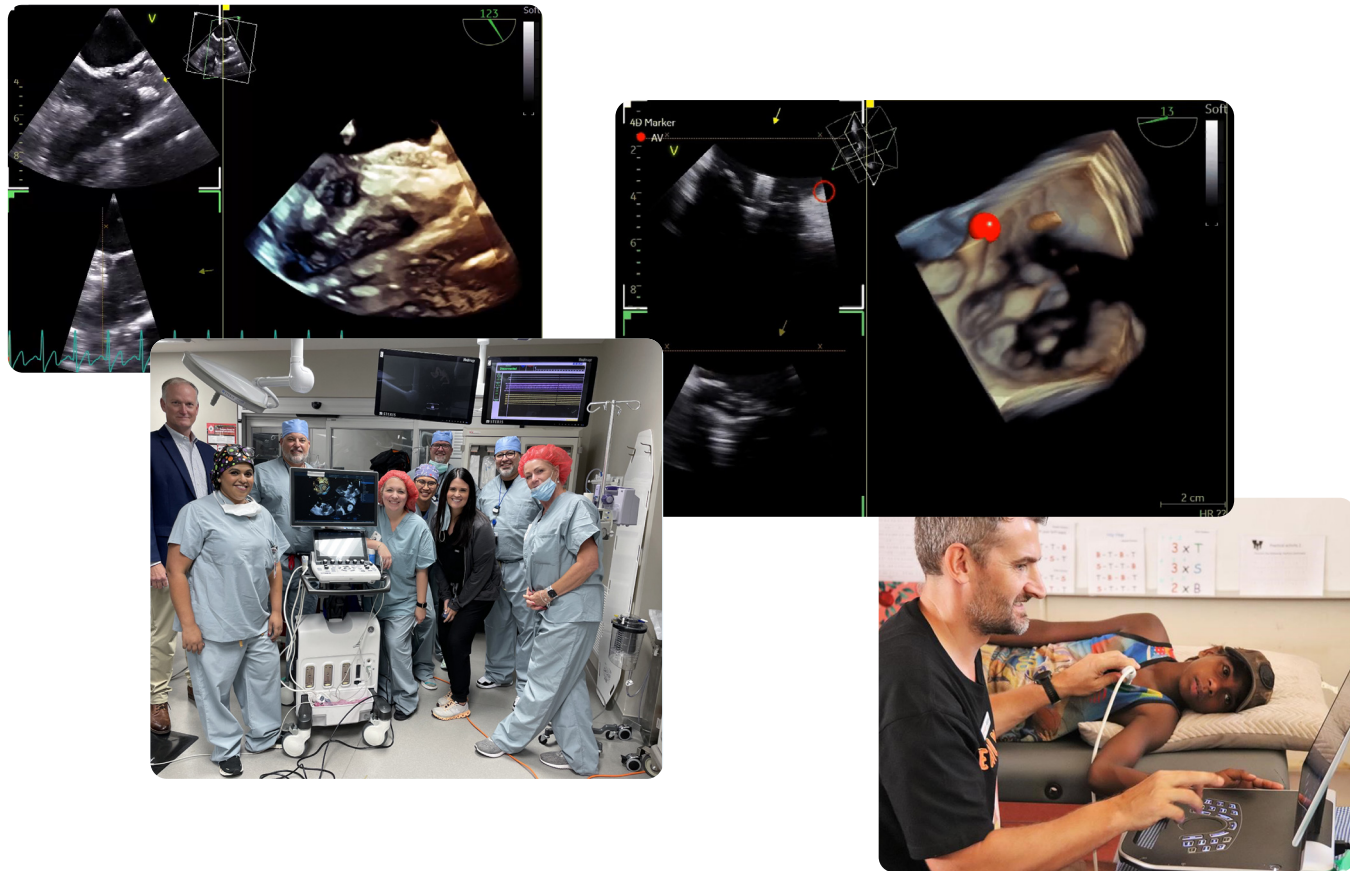


GE HealthCare

VividTM Magazine



EDITION 2



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Dagfinn Saetre,
General Manager
Cardiovascular Ultrasound

Dear Reader,

The field of cardiovascular ultrasound is continuously evolving, driven by constant innovation that pushes the boundaries of what is possible. In this edition of the Vivid Magazine, we take you on a journey to explore some of the latest innovations in our field, 4D ICE NUVISION catheter and mini 3D TEE, through the eyes of early adopters who have embraced this cutting-edge technology. They discuss the differences these innovations can make for minimal invasive cardiac procedures, for both adult and pediatric populations. Additionally, we feature an enlightening article that sheds light on the diagnosis of rheumatic heart disease in Australia and Gambia, underscoring the wide-ranging breadth and impact of cardiovascular ultrasound in our field.

Dr. Devi G. Nair of St. Bernard's Healthcare in Jonesboro is among the early adopters of the 4D ICE NUVISION catheter. She talks about how this new tool offsets the need for General Anesthesia for Structural Heart procedures, while also streamlining scheduling and organization. Additionally, we showcase a compelling case study on the Tricuspid clip, conducted by Dr. Nadira Hamid at Abbot Northwestern Hospital. Dr. Hamid concludes that the utilization of 4D ICE NUVISION catheter enhances procedure efficiency, as well as provide great help for certainty and precision.

Presenting the 9VT-D Mini 3D TEE probe a remarkable addition to the arsenal of tools for Structural Heart procedures that fulfills a longstanding request from the Pediatric Cardiovascular community. Dr. Pei-Ni Jone, of Lurie Children's Hospital, presents a case study where the 9VT-D Mini 4D TEE probe was used to guide a balloon valvuloplasty procedure on a 3 year old girl, concluding that the 3D provided improved imaging resulting in less radiation.

Furthermore, Dr. Srikanth Vallurupalli, a trailblazer at the University of Arkansas, shares his firsthand experience as one of the early adopters of this probe on adult patients. Dr. Vallurupalli confidently asserts that moving forward, he anticipates utilizing the probe for a significant portion of his LAAC (Left Atrial Appendage Closure) cases and valvular procedures, citing its exceptional imaging capabilities that enable procedures to be performed with only moderate sedation, prioritizing patient comfort.

As we celebrate the 25th anniversary of Vivid, I look back and feel so privileged to have led the development of one of the early Vivid products, the Vivid 7. Reflecting on the journey since then, it is amazing to see the level of innovation that has taken place in cardiovascular ultrasound, including some of the most recent ones with 4D ICE NUVISION catheter and mini 3D TEE. In this edition you'll have the opportunity to delve deeper into the thoughts and perspectives of key members of our Vivid team, as they share their insights on the latest advances in our field.

Structural Heart is truly a field of intense innovation, and ultrasound is needed for the diagnosis and treatment of all cardiac patients. This significance becomes evident in the last article of this magazine, where we are introduced to physicians who are actively enhancing cardiac services in remote regions of Australia and Gambia. Their dedication exemplifies how ultrasound plays a vital role in extending cardiac care to underserved communities worldwide.

I hope you enjoy the stories of this Vivid Magazine, a magazine from our GE HealthCare Vivid team dedicated to the entire cardiac ultrasound community.

Dagfinn Saetre

9VT-D probe is exclusively available for Vivid E95 and Vivid E90 systems. Vivid Ultra Edition is released as of 25th August 2022 Ultra Edition is not a product name, it refers to the 2022 release of the Vivid portfolio. 4D ICE NUVISION catheter is only available in the U.S.A. The combination of Vivid E95 with 4D ICE NUVISION is not CE-marked. 4D ICE NUVISION is distributed by Biosense Webster



The small solution that could make a big Impact

See new possibilities in structural heart interventions with the first mini 3D TEE probe¹

The University of Arkansas for Medical Sciences (UAMS) is a hub for high quality medical treatment, innovative research, and rigorous academics to train the next generation of clinicians. It also has a rich history of breaking new ground in cardiology. Now its physicians are among a small group of specialists to experience the world's first mini 3D TEE probe in guiding adult structural heart procedures. Dr. Srikanth Vallurupalli, MD, who is the Director of the Non-Invasive Testing Laboratory, recently shared his insights and big plans for the highly compact probe.

Dr. Vallurupalli's team performs TAVR, edge-to-edge repairs, Left Atrial Appendage closures occlusion and valve-in-valve procedures. He's part of the Division of Cardiovascular Medicine, that has a dedicated cardiac intensive care unit, cardiology step-down ward, cath lab, EP lab, and non-invasive testing laboratory on the Little Rock campus. At the VA, there are also state-of-the-art facilities, including a dedicated ICU, cardiology ward, two cath labs, an EP lab, and non-invasive testing laboratory.

Dr. Vallurupalli says he is drawn to new technologies that can provide wider access to minimally invasive therapies and still inspire diagnostic confidence. We asked him to share his initial experiences with the 9VT-D mini 3D TEE probe.

What are the main challenges you face during structural heart procedures? What steps have you taken to overcome these challenges?

Dr. Vallurupalli: From an echocardiography standpoint, the two major challenges are image quality and patient safety. Echocardiography is key to the success of all structural heart procedures. As we image patients who are older and with significant co-morbidities, imaging quality can be challenging. A state-of-the-art TEE probe (capable of 3D imaging) and echo system are key. At the same time, we perform structural TEE on patients with prior esophageal surgery, severe spine arthritis and end stage liver disease, so preventing esophageal injury and bleeding is

paramount for patient safety. We have used pediatric TEE probes in these situations in the past, but the lack of 3D imaging and poor image resolution have been issues.

You are among the first physicians to use the mini 3D TEE probe in your adult structural heart procedures. Can you describe your experience?

Dr. Vallurupalli: The mini 3D TEE probe perfectly addresses the dual concerns of better imaging, while enhancing patient safety. Probe insertion is simple and atraumatic, and the image quality, specifically 3D, is similar to the adult TEE probes.

“ I believe the miniaturized probe will enable performing most TEE guided structural procedures under moderate sedation. This will improve patient care, increase structural lab and hospital throughput, and reduce complications associated with mechanical ventilation.”

Dr. Vallurupalli

Are there any other current challenges that you believe you could overcome with such a miniaturized probe?

Dr. Vallurupalli: I have been an early believer in performing TEE guided structural procedures under moderate sedation. Adult probes are

uncomfortable and can cause partial airway obstruction due to their girth. I believe the miniaturized probe will enable performing most TEE guided structural procedures under moderate sedation. This will improve patient care, increase structural lab and hospital throughput, and reduce complications associated with mechanical ventilation.

Based on your preliminary experience, how could you utilize the mini 3D TEE probe in your lab in the future?

Dr. Vallurupalli: When purchased, I anticipate using the mini 3D TEE probe for 100% of the left atrial appendage occlusion cases since this is the highest risk population we image. For MitraClip and other valve-in-valve procedures (where familiarity is key), I anticipate 50% use in one year.

For echocardiologists, one common challenge is navigating the devices and communicating with the interventional cardiologist during the procedure. How do you address this challenge?

Dr. Vallurupalli: The key to successful communication in the structural lab is good communication outside the structural lab. Successful teams communicate often (and well) and cultivate mutual respect for each other's skills. I am fortunate to work with Dr. Gaurav Dhar MD, our structural interventionalist. We do structural clinic together where we see patients together, review imaging, and discuss potential challenges prior to a structural procedure. This ideal

scenario is hard to replicate in all practice settings, but it's something worth striving for.

Are there any other interesting features and applications that you would find useful in your structural heart procedures?

Dr. Vallurupalli: Continued miniaturization of TEE probes. At some point, they should be no wider than a nasogastric tube.

What impact do advancements in echo have in structural heart procedures and on overall patient care?

Dr. Vallurupalli: Echo is crucial in the care of patients with structural heart disease. Those who have been

performing structural procedures (specifically MitraClip) will attest to the fact that advances in imaging have made the procedure safer, quicker, and more deployable among operators of varying experience levels.

What challenges do you feel are still unmet and should be addressed in the future?

Dr. Vallurupalli: In my opinion, technology is progressing satisfactorily. Advances in image fusion both on the echo cart and the cath system will allow the imager and the operator to speak the same language. The major challenge to structural echocardiography is the reimbursement model. The structural imager is reimbursed about 1/5th of

the structural interventionalist, despite spending as much time in the structural lab. Similarly, TTE guided TAVR remains a loss leader with an echo system and a sonographer being tied up for 1-2 hours in the structural lab for no additional reimbursement. ■

“ When purchased, I anticipate using the mini 3D TEE probe for 100% of the left atrial appendage occlusion cases, since this is the highest risk population we image.”

Dr. Vallurupalli



Srikanth Vallurupalli MD Srikanth Vallurupalli MD is an Associate Professor of Medicine in the Division of Cardiology, College of Medicine at the University of Arkansas for Medical Sciences(UAMS) and a staff cardiologist at the Central Arkansas Veterans Health Care System(CAVHS). He serves as the medical director of the cardiac noninvasive lab at UAMS and the cardiology fellowship training. Dr. Vallurupalli attended medical school at the Jawaharlal Institute of Post Graduate Medical education and Research(JIPMER) in Pondicherry, India. He completed his internal medicine residency and served as a chief medical resident at the University of Illinois at Urbana Champaign. He then worked as an Assistant Professor of General Internal Medicine at the Southern Illinois University in Springfield, IL before moving to Little Rock to complete his cardiovascular diseases fellowship at UAMS. He is level 3 certified in adult echocardiography and specializes in the management of valvular heart disease and structural echocardiography.

¹ 9VT-D probe is exclusively available for Vivid E95 and Vivid E90 systems. Vivid Ultra Edition is released as of 25th August 2022. Ultra Edition is not a product name, it refers to the 2022 release of the Vivid portfolio.

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.

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Valvuloplasty in pediatric patient with 9VT-D, 3D TEE mini probe



Courtesy of Pei-Ni Jone, MD, Professor of Pediatrics, Pediatric Cardiology, Lurie Children's Hospital Northwestern University Feinberg School of Medicine, Chicago, U.S.A.

Patient History/ Pathology

3 year old with a bicuspid aortic valve and severe stenosis with peak gradient of 107mmHg and mean gradient of 58mmHg by echocardiogram by transthoracic echocardiogram. She presented to the cardiac catheterization for aortic balloon valvuloplasty.

Challenges

The procedure relies on fluoroscopy (radiation) to balloon the aortic valve. Visualization is difficult with 2D images.

System, probe & device used

Pediatric mini 9VT-D 3D TEE probe was used to help provide better visualization of the aortic valve, supporting reduced use of radiation.

Step-by-step procedure

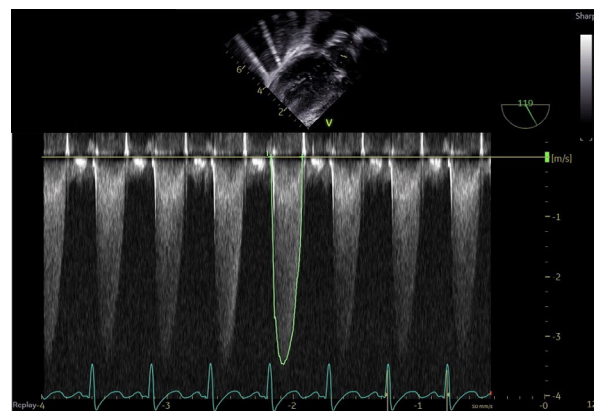
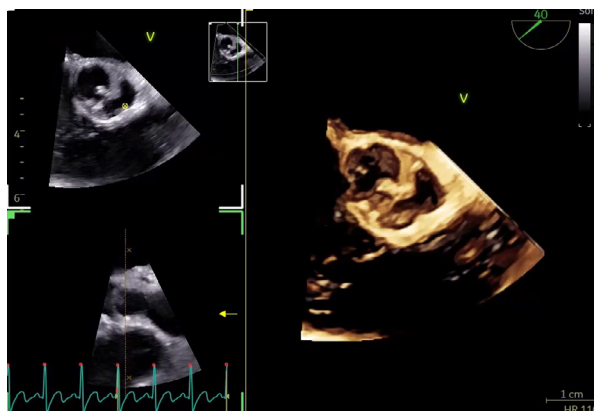
- Right heart guidance of catheter by using 3D TEE image views.
- Precise crossing of the aortic valve via 3D TEE en face views.
- Ballooning of the aortic valve supported by 3D TEE views to help enable reduced amount of radiation.

Conclusion

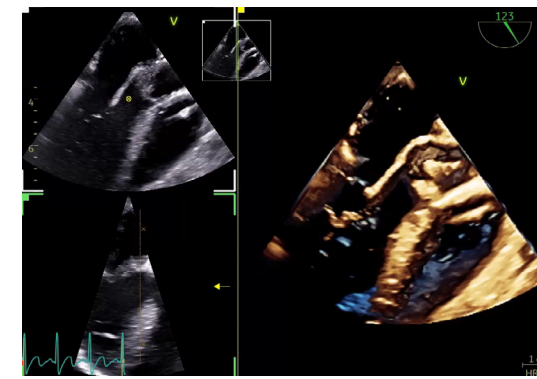
- Successful balloon valvuloplasty with less radiation used.
- Less radiation was made possible by using 3D TEE views to support the procedure.
- Severe aortic stenosis was decreased to moderate stenosis.

Echo lab follow-up

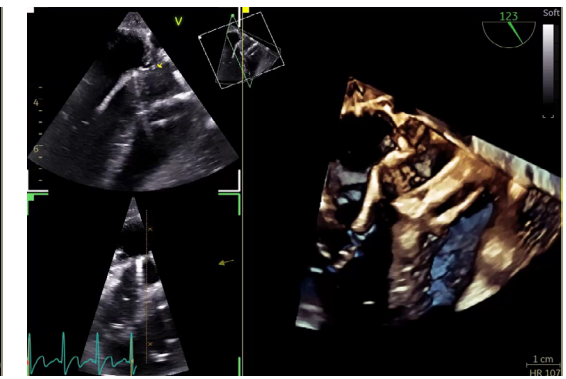
- Severe aortic stenosis was decreased to moderate stenosis (peak gradient of 52mmHg and mean gradient of 28mmHg).
- Mild aortic insufficiency.



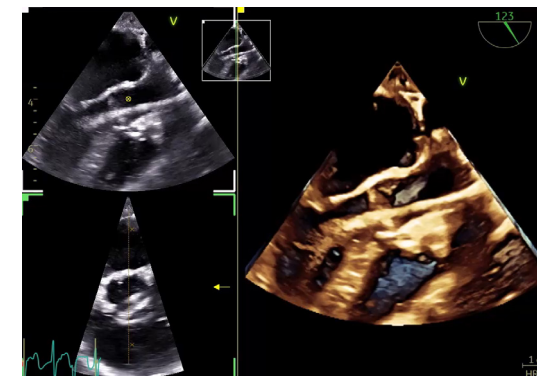
Preballoon (peak gradient of 48mmHg and mean of 30mmHg)



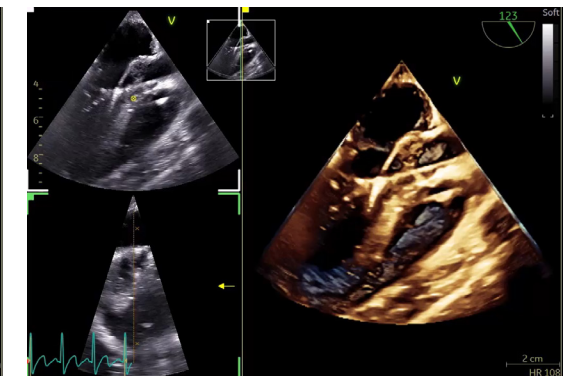
Crossing of the aortic valve



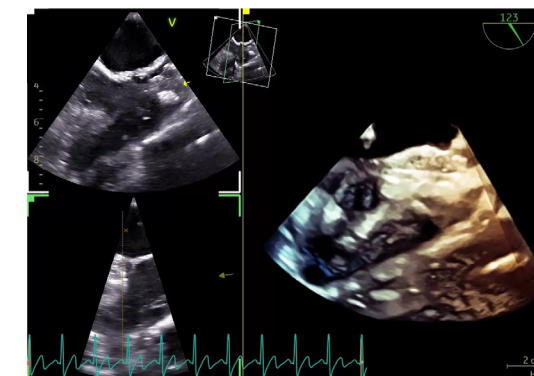
Crossing of the aortic valve



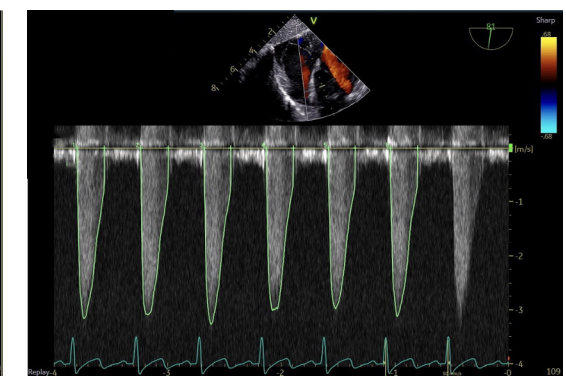
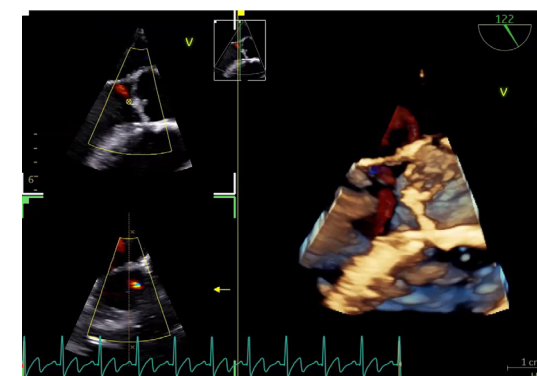
Catheter crossed into the left ventricle



Catheter at the mitral valve – need to move to prevent rupture of chords when balloon valvuloplasty is occurring



Balloon valvuloplasty – seen well on 3D and not 2D



Post balloon valvuloplasty (peak gradient 38mmHg, mean gradient 20mmHg), mild aortic insufficiency

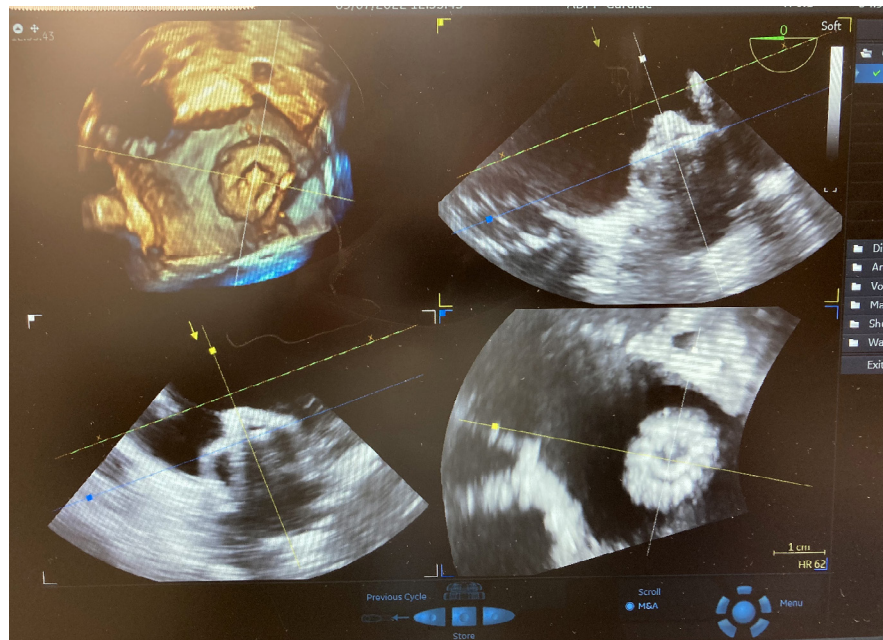
9VT-D probe is exclusively available for Vivid E95 and Vivid E90 systems.
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A New perspective in structural heart interventions

**4D ICE NUVISION catheter allows
for more ease and efficiencies at
St. Bernard's Healthcare**

Advanced technologies are making inroads in Arkansas that could shape the future of structural heart procedures. Focused on being a center of innovation, St. Bernard's Healthcare in Jonesboro participates in many clinical trials and administrators have made cutting-edge tools a priority for its EP program. Dr. Devi G. Nair, MD, FACC, FHRS, Director of Cardiac Electrophysiology, was an early adopter of the 4D ICE NUVISION™ catheter by Biosense Webster. She sees the imaging technology as an important step forward in performing left atrial appendage closure procedures.



The electrophysiology program at St. Bernard's Medical Center began in 2000 and it includes Three fully functional EP labs (includes one hybrid lab and one satellite EP lab). Along with LAAC implants, the team performs procedures for cardiac rhythm management, including implantation of pacemakers, defibrillators, and cardiac resynchronization devices. Other treatments include laser lead extractions, Impella implants, and ablations for SVT, atrial fibrillation and ventricular tachycardia.

During her past 12 years at St. Bernard's Healthcare, Dr. Nair has embraced emerging imaging technologies that enable minimally invasive structural heart procedures. She says her program is shifting away from TEE towards multiplanar catheters that can simplify procedures and avoid general anesthesia. The

move expands access to care for a growing population of patients with structural heart diseases and can improve hospital efficiencies.

Another Dimension

St. Bernard's Healthcare first adopted 2D ICE when it emerged as an alternative to TEE. A few years later in 2022, the team began using the 4D ICE NUVISION catheter with GE HealthCare's Vivid™ E95 ultrasound system. The advanced imaging modality combines 3D images with the fourth dimension of time for a more accurate picture of cardiac function. With an independent rotating tip and a 90x90° field of view, the catheter allows users to obtain crucial views of targeted anatomy to facilitate decision-making.^{1,2}

We recently asked Dr. Nair to share her thoughts on the 4D ICE NUVISION

catheter in LAAC procedures and her growing EP program.

What are the biggest challenges you face in performing LAAC procedures?

Dr. Nair: General anesthesia can be a challenge and, in addition to the multiple risks associated with TEE and general anesthesia. Usually, the patients referred for LAAC are elderly and frail and have significant concerns about going under anesthesia. With TEE, there are also challenges with case coordination between multiple providers. It can be difficult to bring all the players into one room, especially when you want to take care of large patient volume in an efficient manner without compromising efficacy and safety. With TEE, we are also tying up two or three TEE probes on one procedural day, which is challenging for the workflow of our imaging program.

How are you working to overcome some of these challenges?

Dr. Nair: We started thinking outside the box early on, and in 2018 began using 2D ICE technology to mitigate these challenges. The proof of using ICE is that you can potentially eliminate the need for TEE and the need for general anesthesia. As we started to implement 2D ICE, we also started to implement same day discharge. We then became an early adopter of the NUVISION 4D ICE catheter.

How would you compare the 4D ICE NUVISION catheter to 2D ICE?

Dr. Nair: Sizing with 2D alone is always a challenge because I never feel like I get the whole three-dimensional plane of the appendage for measurement. For that reason, I really only use 2D ICE in patients where I can get a CT and size their appendage ahead of time.

With the 4D ICE NUVISION catheter, you have less manipulation of the ICE catheter in the left atrium and I think that's the key to expanded adoption and quicker learning curves for physicians. There's less of a concern with the 4D ICE NUVISION catheter compared to 2D because you're not having to move the catheter around so much. A lot of it is done on the [Vivid] ultrasound machine. You can continue to go through detailed imaging intra and post procedure, but it's easier to acquire images because you're using electronic steering and three-dimensional assessment from the catheter.

Can you elaborate more on the ability to 'park' the 4D ICE NUVISION catheter to image the LAA and what are the benefits?

Dr. Nair: With the 4D ICE NUVISION catheter, you place the catheter in the left atrium. You find a good plane or stable plane for the catheter and then leave it there and electronically manipulate on the Vivid system to get your full imaging plane. So even though I'm a single operator it feels like there is a second operator that is maneuvering the ICE catheter remotely.

It makes the procedure easier and foolproof because you're not going to miss certain angles or miss certain lobes or miss any leaks. You get a really good understanding of the 3 dimensional anatomy of the heart—of the left atrium, of the left atrial appendage and its relationship to the septum and surrounding structures. It allows you to get a successful implant the first time and you also get very good measurements intraprocedurally, so you can size appropriately without a CT ahead of time.

Are there any specific features that make the 4D ICE NUVISION catheter stand out?

Dr. Nair: The 4D ICE NUVISION catheter has near field imaging and many more options on the catheter. What sets it apart is the rotational feature. I think it's the only catheter that gives that whole single plane and the full rotation as well.

How has utilizing the 4D ICE NUVISION catheter in LAAC impacted patient safety and outcomes?

Dr. Nair: We feel like we have been able to do these procedures very safely and very effectively with this catheter. Intraprocedural safety has been very good. We haven't seen any higher incidence of complications, effusions, and we haven't had any long-term issues with safety, such as leaks or inappropriate device positionings. We have seen really good closure results in patients as well.

How has the imaging modality affected your overall workflow?

Dr. Nair: We've found it's so much easier and efficient to have the 4D ICE NUVISION catheter in the room. With TEE, there's a lot of challenges we tend to forget, for example, cleaning time—especially when you are going back-to-back between two labs. With ICE, the set up is so easy. Our ICE machines are usually in the EP lab and are part of our usual workflow. We're not taking any imaging machines away from anyone. It's the same machine from vascular access at start to post implant assessment and completion of case, so it's almost a seamless procedure. I'm not standing around waiting for anyone else to come to the lab or start their part of the procedure.

“ It makes the procedure easier and foolproof because you're not going to miss certain angles or miss certain lobes or miss any leaks. You get a really good understanding of the four dimensions of the heart. It allows you to get a successful implant the first time.”

Dr. Nair

“With NUVISION 4D ICE, you have less manipulation, and I think that’s the key.”

Dr. Nair

How are these efficiencies making an impact at St. Bernard’s Healthcare?

Dr. Nair: Initially there was a concern that because it’s a new technology the procedure times were going to be longer, but that’s definitely not the case anymore. The procedure times are similar to TEE, but the room times are much, much shorter because you aren’t using general anesthesia.

We still have to sit down and do the analysis of what it means having the

4D ICE NUVISION catheter compared to bringing all the players [for TEE] together in the room. It just seems more reasonable financially for the team. We’re making the procedures efficient and financially feasible without compromising safety.

Based on your experience, how do you project using the 4D ICE NUVISION catheter in your lab moving forward?

Dr. Nair: Like anything we start, it’s usually a slow uptake. While the catheter is intuitive, there is also a learning curve understanding how to electronically steer and learning all the features on the console. But we have had great clinical support from the NUVISION and GE HealthCare team. I think we are at the point where we could start using it more consistently.

Around the U.S., I think we’re going to see a pretty steep growth in the use of 4D ICE. I definitely feel 4D ICE is going to replace 2D ICE because it’s more intuitive and because of ease of use in structural heart procedures.

The structural heart market is constantly evolving. What is it like to be at the center of so much innovation?

Dr. Nair: There have been a lot of changes in technology since I started the ablation program here at St. Bernard’s. Now I’m able to take care of more patients, in a much safer way, in earlier stages of the disease. And I’m able to give a more comprehensive care package. I think that’s big for us to be at the forefront of this field with all these technological partners. ■



Dr. Devi G. Nair, MD, FACC, FHRS is the Director of Cardiac Electrophysiology, Heart and Vascular Division at St. Bernard’s Medical Center in Jonesboro, Arkansas. Her clinical practice focuses on heart rhythm disorders and treating patients with cardiac ablation, pacemakers, defibrillators, cardiac resynchronization therapy devices, and left atrial appendage occlusion therapy. Dr. Nair’s research interests include the evaluation of fluoroscopy reduction techniques in cardiac electrophysiology and cardiac resynchronization therapy. She is also focused on quality of life and healthcare outcomes related to atrial fibrillation and sudden cardiac death. Dr. Nair is the principal investigator for the Arrhythmia Research Group and actively participates in multiple clinical trials.

¹ 4D ICE NUVISION catheter is only available in the U.S.A. The combination of Vivid E95 with 4D ICE NUVISION is not CE-marked. 4D ICE NUVISION is distributed by Biosense Webster

² Evaluating the role of transesophageal echocardiography (TEE) or intracardial echocardiography (ICE) in left atrial appendage occlusion: a meta-analysis – Akela et al. – 2020 – Journal of Interventional Cardiac Electrophysiology

Doctors are paid consultants for GEHC and were compensated for participation in this article. The statements described here are based on their own opinions and on results that were achieved in their unique setting. Since there is no “typical” hospital and many variables exist, i.e. hospital size, case mix, etc.. there can be no guarantee that other customers will achieve the same results.

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Discover the key to previously unreachable hearts

with a 3D TEE probe that has a 57% smaller tip volume¹

Vivid™ 9VT-D

Smaller probe. Better access.



¹ Volume of the TEE probe tip compare to standard adult probe 6VT-D Vivid probe. DOC2639172. 9VT-D probe is exclusively available for Vivid E95 and Vivid E90 systems.

Case study using 4D ICE NUVISION Ultrasound Catheter



Courtesy of Dr. Nadira Hamid MD, Minneapolis Heart Institute, Abbott Northwestern Hospital, U.S.A.

Patient History/ Pathology

This is a very pleasant 78 year old lady presented to clinic with increasing shortness of breath and right-sided heart failure symptoms. She has the following comorbidities: Previous Mitral valve repair with an annuloplasty ring, Non-ischemic dilated cardiomyopathy (now LVEF improved to 50%), previous transient ischemic attack (TIA), obstructive sleep apnea and persistent atrial fibrillation (on oral anticoagulation). Echocardiography (both TTE and TEE) demonstrated torrential atrial functional tricuspid regurgitation. She was discussed at our multi-disciplinary valve meeting and was deemed high surgical risk. Hence, she was considered for transcatheter tricuspid intervention i.e tricuspid edge to edge repair (TEER).

Challenges

Challenges include imaging difficulty in visualization of the tricuspid leaflets adequately for tricuspid valve intervention. This is due anatomical factors including shadowing of the

previous surgical mitral valve repair and orientation of her heart (horizontal).

System, probe & device used

System used is the VIVID E95 by GE Healthcare. The Probe used is the NUVISION 4D ICE Ultrasound Catheter.

Step-by-step procedure

The procedural steps include advancing the delivery system, orientation of the implant and confirming the trajectory of the delivery catheter. The NUVISION 4D ICE Ultrasound Catheter is used to better visualize the tricuspid leaflets and the grasp. After identifying the arms or the clip above the tricuspid valve (TV) and confirmation of the implant orientation (central antero-septal), the clip is advanced below the TV leaflets. Grasping of the leaflets is performed and this is confirmed by imaging with the 4D ICE NUVISION Ultrasound Catheter. Pre-release assessment was performed and once confirmed adequate leaflet grasp with appropriate reduction in TR, the clip was released. Decision was made to place

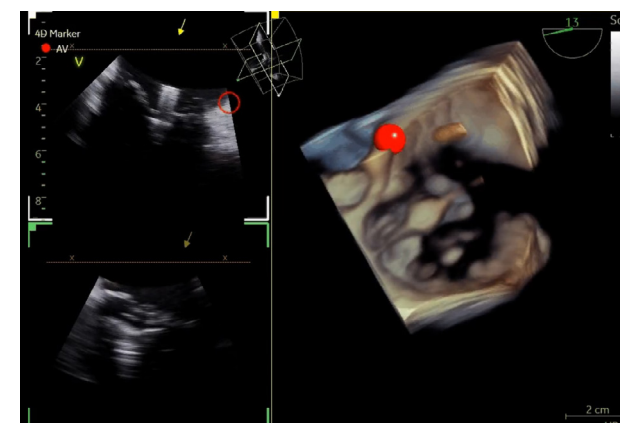
another clip in the central postero-septal region. The above steps were repeated and the second clip was placed successfully. There was residual mild tricuspid regurgitation at the end of the procedure with improved hemodynamic benefit (no reversal seen in the hepatic veins).

Conclusion

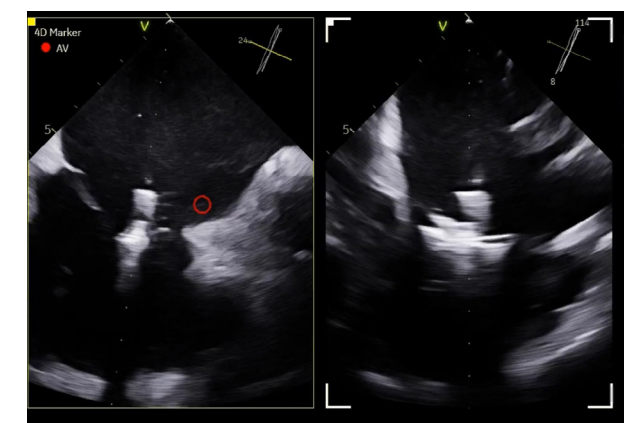
Overall, the 4D ICE NUVISION Ultrasound Catheter is a great adjunct and complement for transcatheter tricuspid valve intervention imaging. It helps improve the workflow for efficiency of the procedure and enhances the procedure with great certainty and precision.

Echo lab follow-up

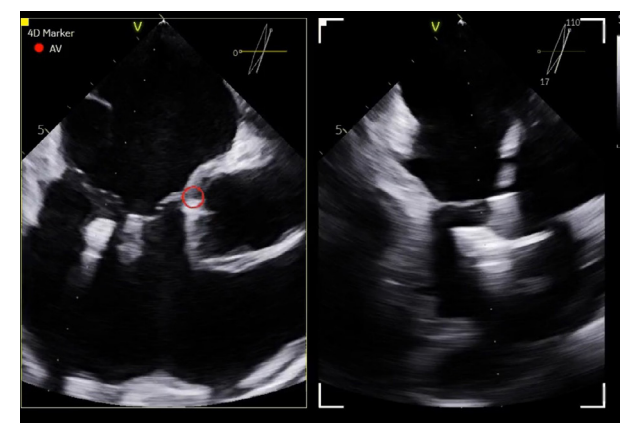
Follow up transthoracic echocardiogram (TTE) prior to discharge and one month after device implantation showed 2 well-seated tricuspid clip, which are stable and Color Doppler confirmed residual trace tricuspid regurgitation. There was also absence of flow reversal in the hepatic veins.



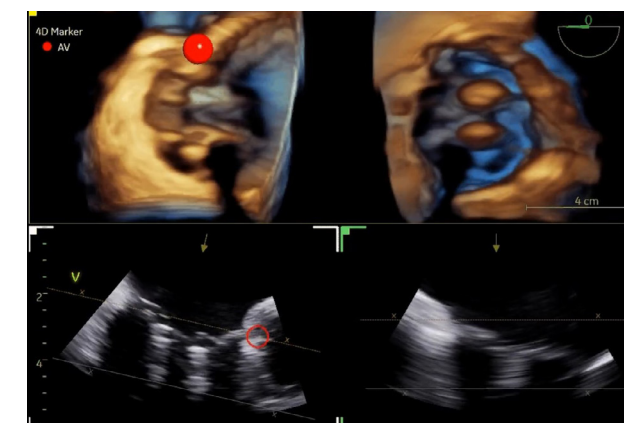
Live 4D image of Tricuspid Valve using the NUVISION 4D ICE Ultrasound Catheter aligning EER clip to the regurgitant orifice of the TV. 4D Marker is in area the AV to help identify and maintain orientation of the Tricuspid Valve leaflets.



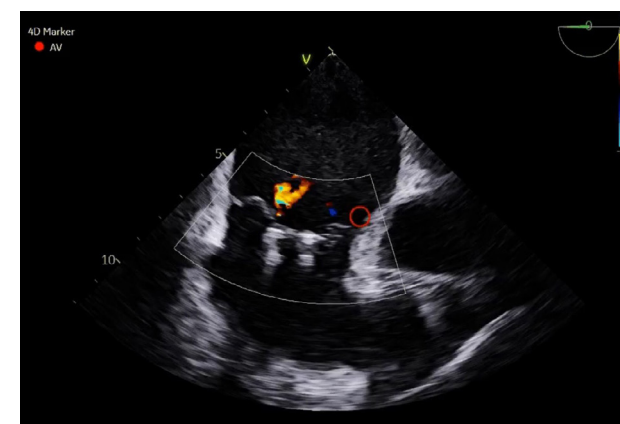
Biplane image showing 2 simultaneous images of the advancement of the open clip and grasping arms to get proper positioning and to ensure enough leaflet can be grasped by clip arms.



Biplane image of 2nd clip being deployed and positioned properly to help reduce Tricuspid Regurgitation further.



Live 4D image using Dual crop to visualize the 2 clips from both the right atrium and right ventricle simultaneously, while seeing the 2D reference planes.



Post assessment color flow showing reduction of Tricuspid Regurgitation to mild

1 4D ICE NUVISION catheter is only available in the U.S.A. The combination of Vivid E95 with 4D ICE NUVISION is not CE-marked. 4D ICE NUVISION is distributed by Biosense Webster

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The heart of progress and possibility

Vivid Celebrates 25th Anniversary

It's been a history of firsts for GE HealthCare's Cardiovascular Ultrasound and the groundbreaking Vivid™ brand. For a quarter century, its creative teams have turned big ideas into bold innovations and real healthcare solutions. The only thing more exciting than the pioneering past is GE HealthCare's promising future.

By plane, by train, by car. The head of GE HealthCare's Cardiovascular Ultrasound hits the road regularly, making stops in hospitals and clinics around the globe to visit customers.

"This time I'm in Missouri," says General Manager Dagfinn Saetre, before beginning a several hour road trip in the United States. Saetre embraces any travel that leads to new insights and better problem-solving.

"It's so important to get first-hand information from physicians. Not only get their words, but also see how they are using our equipment and understand what can be developed to provide even better service. They're really driving us forward."

Working alongside physicians and researchers has always been a hallmark of GE HealthCare's revolutionary Vivid brand, which is celebrating its 25th Anniversary. The business began in 1998 when GE Medical Systems acquired Dasonics Vingmed in Horten, Norway. Now after

Vivid™

25 Years

Inspired Innovations.
Infinite Possibilities.

a quarter century of medical milestones, GE HealthCare is considered a global leader in cardiovascular ultrasound. Saetre has had a front row seat for all of it.

The Early Days

Before finding its home at GE HealthCare, Dasonics Vingmed was revered for its groundbreaking Doppler devices and highly respected in the ultrasound space. Yet, insiders say Vingmed struggled with operations and distribution. Despite some initial growing pains, GE HealthCare is credited with vastly improving the quality of products by

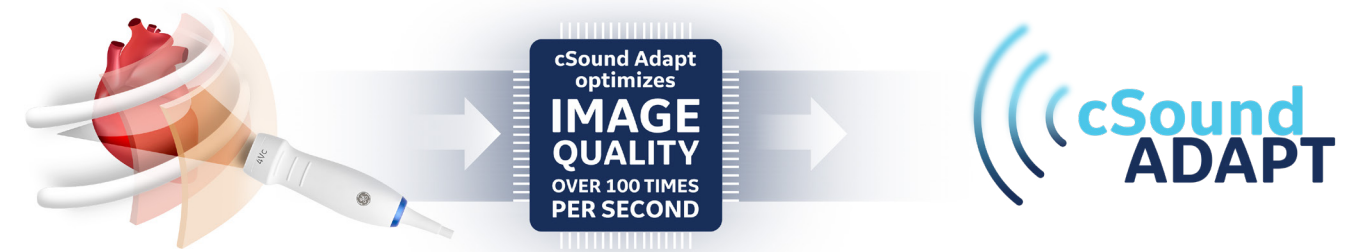
implementing new processes and procedures, resulting in a significant jump in U.S. market share.

Saetre, who was a young engineer at the time, led the development of one of the first products, the Vivid 7. "It turned out to be even bigger than we thought because we generated a new platform for almost everything ultrasound. In terms of ergonomics, the look, how you interacted with it, the software functionality, it was a big step forward and went beyond anything on the market," he recalls.

Soon after, engineers created miniaturized portable versions, the Vivid i and Vivid q, which was the first miniaturized cardiovascular ultrasound. These PC-based systems paved the way for further progress and led to more pioneering developments in image processing, beamforming, and image display.

The Power of cSound

In 2015, GE HealthCare made an unprecedented leap with the introduction of cSound and a new generation of scanners. The software-based beamformer platform enabled another level of versatility, flexibility,



and processing power in image acquisition, reconstruction, and visualization. The Vivid E95 Ultra Edition and Vivid S70N Ultra Edition¹ ultrasound systems were the first machines to be built around the revolutionary architecture. The latest version, cSound ADAPT², powers even more solutions today.

"This has given us a fantastic innovation platform for image quality. If you want to change algorithms, it's a matter of changing a piece of software instead of implementing a new electronic board. We keep coming up with new ways of processing the images, new ways of doing beamforming, and that gives us new possibilities," Saetre explains.

Accelerating Structural Heart Innovation

GE HealthCare has also been an important player in the rapidly evolving world of structural heart interventions. For the last decade, it's been expanding Vivid's cutting-edge tools to meet the growing demand for minimally invasive procedures.

"TAVR was the first and then came transesophageal imaging—with 4D

imaging increasing big time. Heart teams are relying on our equipment for superb visualization of anatomy and flow dynamics to confidently plan, guide, and assess complex procedures," Saetre says.

The ability to treat more patients, who aren't suited for general anesthesia is also a driver, along with uncovering new ways to boost productivity and reduce the overall cost of care.

The latest breakthrough is small in size but could make a big impact in patient care and daily efficiency. The Vivid brand recently launched the world's first mini 4D TEE probe (9VD-T)³, and it's already stirring a lot of interest in the field. The compact probe is suitable for a broad range of pediatric and interventional cardiology procedures, potentially eliminating the need for general anesthesia in adult patients.

An Intelligent Future

GE HealthCare's vision for the future also encompasses more advances in automation, artificial intelligence, and machine/deep learning. Under Saetre's leadership, creative engineers continue to add progressive tools that

not only enhance image quality, but also reduce tedious tasks and inter-operator variability. Areas of focus include intelligent image optimization and computer-assisted image acquisition, image interpretation and computer assisted diagnostic support, and measurement simplification.

As Vivid celebrates 25 years of inspired innovations and impact, Saetre has no intention of taking his foot off the gas. No matter where he travels—the direction is always forward. "Hospitals in every corner of the world have a Vivid. We've been part of a big change in enabling a better diagnosis and in recent years, help enabling new treatments for countless cardiac patients," Saetre reflects. "That's quite something, but there's so much more to come."

"We keep coming up with new ways of processing the images, new ways of doing beamforming, and that gives us new possibilities."

Dagfinn Saetre



Profiles of progress

The people and experiences that make Vivid™ shine

GE HealthCare is known for its revolutionary inventions in cardiovascular ultrasound, but it's really the people that make Vivid so vibrant. For the last 25 years, dreamers and doers have been putting in the work, day after day, to advance cardiac care. Here are some of their stories.



Eva Nilssen - R&D Program Manager

After 40 years in med tech, including 25 with GE Healthcare, Eva still marvels at the life-changing innovations that are dreamed up and developed in her small community off the southern coast of Norway. "Our headquarters is in Horten. You would think it would be a huge cosmopolitan center, but it's just a tiny town. It's incredible to think that all this technology comes out of here."

It's also become a melting pot of sorts. The R&D Program Manager says as the Vivid brand has evolved over the years, it's added some of the best and brightest minds from around the globe.

She also appreciates that the team is multigenerational and includes some of her

original Vingmed colleagues, which allows for different and dynamic perspectives.

Naturally curious, Eva says she thrives in a field that is based on problem solving. "Sometimes you will be working on something, and you can't get anywhere. Then you work with engineers and suddenly solve it, and that joy is really inspiring."

Eva also understands the power in every discovery and decades of progress. "We can do so much more, see so much more, and we can aid so much better care. Every improvement we make from the factory is making an impact. All that inspires me—the product, the people, and learning something new all the time."



Gunnar Hansen - Global Clinical Research Manager

"I have been working very closely with researchers for more than two decades, and during that time we have built an extensive research program, both technical and clinical. This has given us a unique opportunity to learn and prioritize the best utilization of our technology for the maximum clinical benefit," he says.

Gunnar believes those relationships have propelled GE Healthcare Cardiovascular Ultrasound from a highly technical driven team to a global leader in echocardiography. He points to a few of the pioneering

achievements that paved the way for major advances in cardiac care. "Some of the main BTs were a result of an intensive investment in miniaturization of hardware, which was the enabler for 3D imaging and 3D probes, and the later development of the Vscan hand-held scanner."

And the best part of his job? "Seeing your work used in the clinic," Gunnar says. "Knowing that more than 300,000 patients get their health checked or a procedure done with our equipment every day."



Claudia Lacerda - Global Clinical Leader

Claudia was never suited for a 9 to 5 desk job. It's just not her nature. "I've always needed to be at the heart of everything that's happening in the hospital and working with physicians."

As Global Clinical Leader, she's the link between customers and engineers—gathering valuable feedback from the field and providing extensive training. Claudia says she's always eager to get reactions to new features, but the comments she values most might surprise you. "I'm happy to hear what physicians like about our systems, but it's even better to learn what they don't like, so we can keep improving."

Claudia says today's technology needs to solve many challenges, including

unprecedented workloads, staffing shortages, and training limitations. "We are continuing to push the boundaries in image quality and are working on innovations to improve workflow, utilizing AI for automation and reproducibility in tasks." With a growing demand for minimally invasive procedures that don't require general anesthesia, Claudia is especially excited about GE Healthcare's latest advancements in structural heart. She sees great potential in the new mini 4D TEE probe and 4D ICE NUVISION™ Ultrasound catheter⁴. "What I like about my job is that I get the opportunity to be creative and think outside the box. We are constantly looking ahead to what's next and what would be the next Ultrasound revolution."

¹ Ultra Edition is not a product name, it refers to the 2022 release of the Vivid portfolio. All features or products may not be available in all markets, please contact your sales representative for more information.

² cSound ADAPT is exclusively available for Vivid E95 Ultra Edition and Vivid E90 Ultra Edition

³ The content herein refers to 2022 release of Vivid portfolio. 9VT-D probe is exclusively available for E95 and E90. Vivid. Ultra Edition is released as of 25th August 2022

⁴ 4D ICE NUVISION catheter is only available in the U.S.A. The combination of Vivid E95 with 4D ICE NUVISION is not CE-marked. 4D ICE NUVISION is distributed by Biosense Webster JB24398XX



Helping hearts

Working to create a world where healthcare has no limits

We live in world of health that makes rapid and remarkable progress yet still faces so many heartbreaking challenges. Access to healthcare is one of them. That's why GE HealthCare is continuously looking for ways to bring hope and healing to more people in more places. Some of the latest philanthropic efforts with Vivid technology lead to The Gambia and remote Australia, where preventable heart diseases and other cardiovascular conditions are having devastating effects.



mitral valve and when you detect rheumatic heart disease early, treatment with monthly penicillin injections is very successful in reversing it,” Dr. Bo Remenyi explains.

She has also been working with colleagues Alex Kaethner, chief cardiac physiologist (echocardiography) with NT Cardiac and Associate Professor Josh Francis at Menzies School of Health Research to expand the use of vital cardiac ultrasound in these communities through education and training. The experts developed a curriculum that teaches Indigenous healthcare workers, and local doctors and nurses how to perform simplified echocardiograms.

“The training will be done on handheld devices, such as the GE HealthCare Vscan Extend,” says Kaethner. “These devices are affordable, easy to use and perform echocardiograms with good 2D images and good color flow, which is what we need to pick up rheumatic heart disease. The advancement of the Vscan technology is going to help us get echocardiography into these communities, where it’s most needed.”

The first of many firsts

Rheumatic heart disease also thrives in the Gambia. That’s the home of Dr. Lamin .E.S. Jaiteh, who is the African nation’s first interventionalist cardiologist. He returned a few years after extensive training in Kenya, Egypt, and Germany, determined to bring modern cardiology to the Gambia.



Part of his efforts are focused on reducing the burden of RHD. Dr. Jaiteh says too often patients come to him after the disease has progressed and their heart valves are severely damaged. Sadly, many don’t recover because patients can’t raise enough money or receive the financial aid needed to travel abroad for surgery.

“I usually see patients with advanced symptoms because of lack of proper public health intervention,” says Dr. Jaiteh, pointing to high costs and long lines. “We have fewer hospitals than we need in this country.”

Dr. Jaiteh says he also treats patients with heart failure and other cardiac conditions that are often misdiagnosed by doctors who don’t have cardiology training. His services are in such high

demand that he sees 30 to 40 patients during each 10-hour shift at Edward Francis Small Teaching Hospital in Banjul.

The shortage of care goes beyond hospitals and medical staff. Dr. Jaiteh estimates the Gambia has less than 10 ultrasound machines. And the cost for an echo scan in a Gambian private hospital can run \$20 or more, which is not feasible for many patients.

Still, Dr. Jaiteh refuses to be pessimistic. Back in 2021, Dr. Jaiteh and his friend & mentor in cardiology, Dr. Einar Gude hatched the idea of creating the Gambia’s first cardiac unit. Dr. Gude took on the role of lead designer and developer and they appealed to the Norwegian charity, ScanAid to help with fundraising efforts. The multi-million-dalasi cardiology unit was inaugurated in February.

“Healthcare is so fundamental for all nations to prosper to grow—and is needed for development. With this clinic and with these possibilities, many Gambians now face safer diagnosis and treatment, and are in a good facility for care,” says Dr. Einar Gude.

GE HealthCare donated two echocardiography machines and one EchoPAC™ Software Only to ScanAid Charity for the cardiology unit. Once again, the compact and highly portable Vivid iq Ultra Edition

presented several advantages, including the power to deliver exceptional 2D and 4D imaging. Now Gambians are also being scanned with the Vivid T8 Ultra Edition system. Designed for the most demanding practices, the reliable ultrasound utilizes AI-based tools to help reduce user fatigue and improve workflow efficiency. Both systems compatible with EchoPAC that support the doctor from prior exam reviews all the way through post exam interpretation, reporting, and archiving.

In addition to treating patients, Dr. Jaiteh is teaching a future generation of Gambian cardiologists and cardiac nurses. “Having someone who comes from the same place as you, the same socioeconomic background and having seen him go through all this—he’s a light in the middle of the dark,” says Dr. Landing B.M. Jarju, one of four local physicians Dr. Jaiteh is training.

Dr. Jaiteh’s goal is to have a fully functional interventional cardiology practice in five years that will include advanced imaging, a catheter lab, stent implantation and the valve replacement and repair surgery that is still out of reach to so many Gambians.

“It is a battle that is really difficult to win but I am trying to do my best,” says Dr. Jaiteh. “Maybe I’m too ambitious but I have to keep fighting.” ■

Disease of the disadvantaged

Rheumatic heart disease (RHD) affects 40 million people around the world and was linked to more than 305,000 deaths in 2019¹. It is most common among children and young people living in low-income countries, where poverty is widespread and there is limited access to basic health services². RHD often begins as strep throat and untreated infections can lead to acute rheumatic fever, which can cause life-threatening heart valve damage. While RHD is a substantial global health problem, it’s both preventable and treatable with the right resources and care.

The journey to end RHD in Australia

Little by little. Trek after trek. Scan by scan. A group of volunteer pediatric cardiologists and other healthcare professionals is working to stop the

spread of RHD in remote Indigenous communities in Australia. Supported by portable GE HealthCare Vivid iq Ultra Edition ultrasound systems, they screened hundreds of children last summer as part of the Deadly Trek program.

“Rheumatic Heart Disease is solvable, but people put it into the too-hard basket. This is a disease we can definitely get rid of in my lifetime,” says Dr. Bo Remenyi, who practices at the Royal Darwin Hospital, NT Cardiac and works with the Menzies School of Health Research.

Ultrasound is a critical tool in driving progress, and the ultra-portable Vivid iq Ultra Edition was the perfect companion for the recent trek. Not only is the system compact and lightweight, but it also makes scanning straightforward, allowing for fast and confident diagnoses.

“Ultrasound scans of the heart only take two minutes—it’s an abbreviated scan of the aortic and

1 Roth GA, Mensah GA, Johnson CO, et al. Global Burden of cardiovascular diseases and risk factors, 1990–2019. *J Am Coll Cardiol* 2020;76:2982-3021.

2 Auala, T.; Zavale, B.G.; Mbakwem, A.C.; Mocumbi, A.O. Acute Rheumatic Fever and Rheumatic Heart Disease: Highlighting the Role of Group A Streptococcus in the Global Burden of Cardiovascular Disease. *Pathogens* 2022, 11, 496.

Ultra Edition is not a product name, it refers to the 2022 release of the Vivid portfolio. All features or products may not be available in all markets, please contact your sales representative for more information.

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GE HealthCare

About GE HealthCare

GE HealthCare is a leading global medical technology, pharmaceutical diagnostics, and digital solutions innovator, dedicated to providing integrated solutions, services, and data analytics to make hospitals more efficient, clinicians more effective, therapies more precise, and patients healthier and happier. Serving patients and providers for more than 100 years, GE HealthCare is advancing personalized, connected, and compassionate care, while simplifying the patient's journey across the care pathway. Together our Imaging, Ultrasound, Patient Care Solutions, and Pharmaceutical Diagnostics businesses help improve patient care from prevention and screening, to diagnosis, treatment, therapy, and monitoring. We are an \$18 billion business with 51,000 employees working to create a world where healthcare has no limits.

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