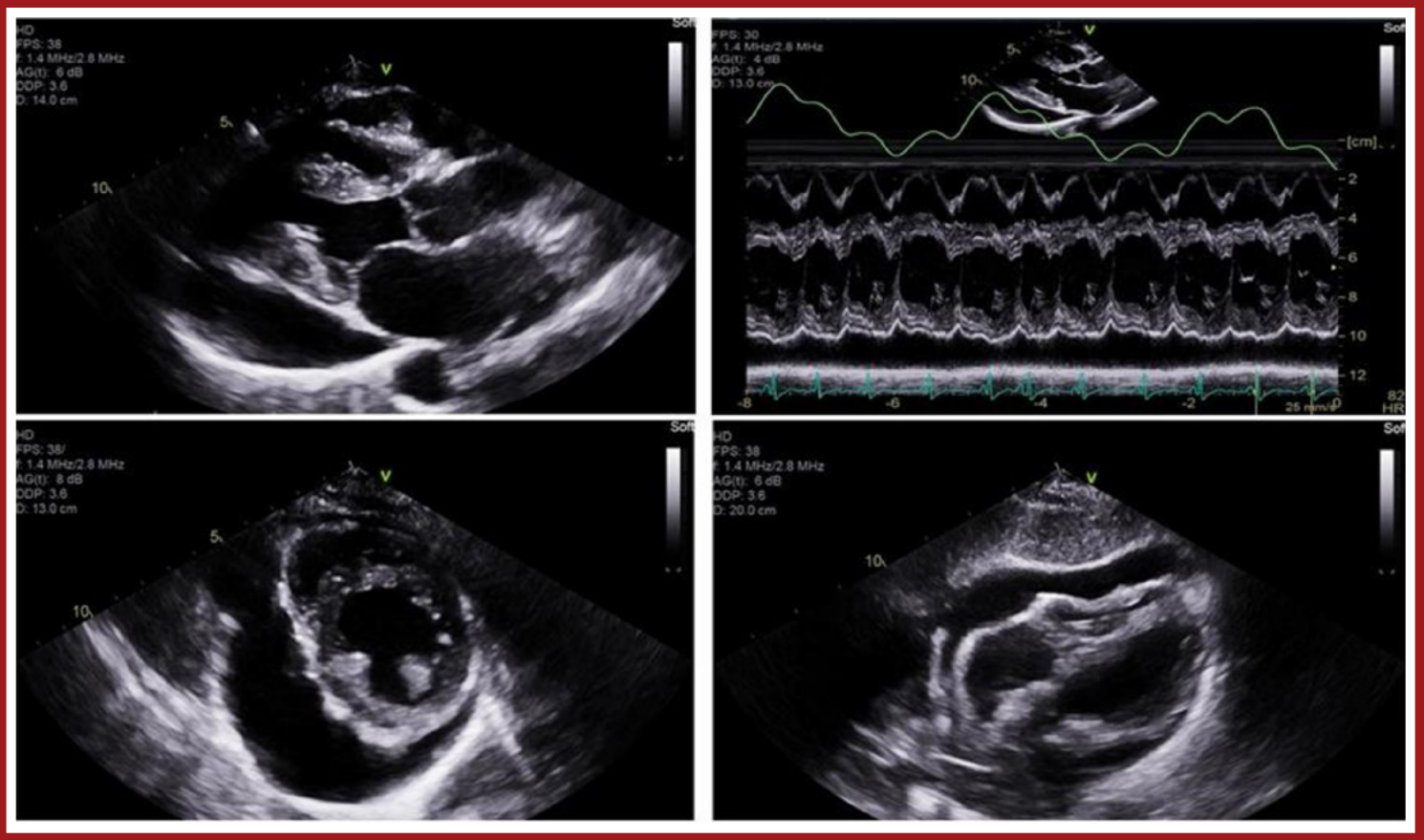
ECHO



VOLUME 11 ISSUE 12 **DECEMBER 2022**

2023 EDUCATION CALENDAR

JANUARY

32nd Annual Echo Hawaii

January 16-20, 2023
Westin Hapuna Beach Resort
Kohala Coast, Big Island, HI

Jointly provided by ASE and the ASE Foundation

FEBRUARY

35th Annual State-of-the-Art Echocardiography

February 17-20, 2023
Westin Kierland Resort & Spa
Scottsdale, AZ

Jointly provided by ASE and the ASE Foundation

MAY

24th Annual ASCeXAM/ReASCE Review Course | VIRTUAL

Content Available May 2023

Jointly provided by ASE and the ASE Foundation

JUNE

34th Annual Scientific Sessions

June 23-26, 2023
Gaylord National Resort & Convention Center
National Harbor, MD

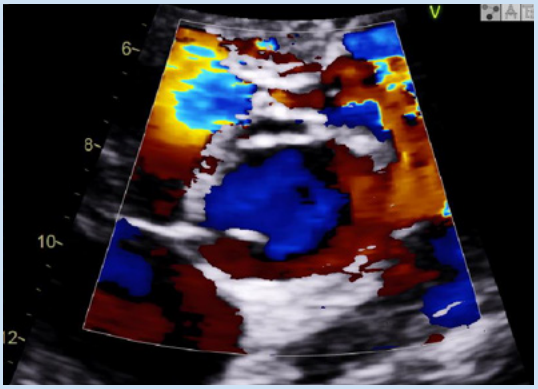
Jointly provided by ASE and the ASE Foundation

OCTOBER

11th Annual Echo Florida

October 7-9, 2023
Disney's Yacht & Beach Club Resort
Orlando, FL

Jointly provided by ASE and the ASE Foundation



Discounted rates for ASE members. *To learn more and register, visit us at* ***ASEcho.org/Education****.*

This text also appears in the December JASE. ***OnlineJASE.com***

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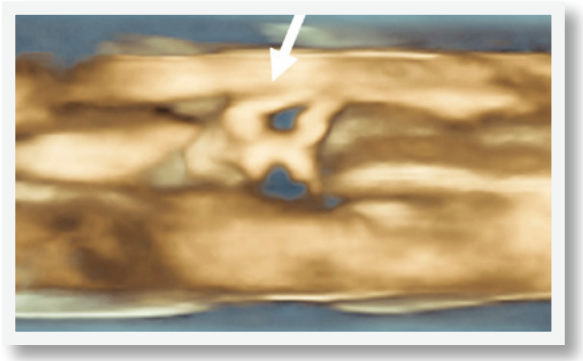

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American Society of Echocardiography

Cover art: "Scheduling the Pericardiocentesis" Madeline Schiminger, BS, RDCS (AE, PE), FASE, The Johns Hopkins Hospital Echocardiography Lab, Baltimore, Maryland

EDITORS' NOTE

ASE is very grateful to our members who contribute to *Echo* magazine and values their willingness to share personal insights and experiences with the ASE community, even if they may not be in total alignment with ASE's viewpoint.

THE ABCS OF CME

*Contributed by **Stephen H. Little, MD, FASE**, is the Cardiology Fellowship Program Director at Houston Methodist Hospital, System Director for Structural Heart, and Professor of Medicine, Weill Cornell Medical College, Cornell University*

It seems that every year our collective delivery of cardiovascular care gets just a little more difficult. Expanded patient complexity combined with pressure to be ever more efficient can mean that the crucial practice of ongoing professional education may get downgraded in priority. Thankfully, a core mission of ASE is to provide continuing medical education (CME) to our members that is readily accessible, up-to-date, comprehensive, and often social and fun.

Since its inception, ASE has strived to be the educational leader in cardiovascular ultrasound education, and over time the range of our offerings and the included specialty areas has grown immensely. In 2021, ASE delivered 82,390 CME hours, trained over 4,400 individuals who participated in face-to-face and virtual educational events, and reached over 44,000 users in ASE's online Learning Hub. In 2022, ASE expanded its educational team and with the partnership of expert volunteers working from the newly formed Critical Care Council, Women in Echo Forum, and Echo Lab and Technical Director Forums, and growing Specialty Interest Groups, have bolstered our educational offerings in new areas.

> Since its inception, ASE has strived to be the educational leader in cardiovascular ultrasound education

The ASE Learning Hub houses the largest collection of cardiovascular ultrasound specific educational resources for online learning as well as associated physical products for lab use. In fact, ASE membership guarantees access to at least 30 **free** CME hours per year, specific to cardiac care and relevant for IAC echo accreditation.

ASE is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing education for physicians. In addition to offering CME credits, all activities have been developed and registered with ACCME to provide Maintenance of Certification

(MOC) and MOCA 2.0 points in alignment with *AMA PRA Category 1 Credit*™. ASE CME activities offer MOC points for the American Board of Anesthesiology's (ABA) MOC in Anesthesiology Program® or MOCA 2.0®, the American Board of Internal Medicine (ABIM) MOC program, and the American Board ofPediatrics (ABP) MOC program.

For sonographers, ARDMS, CCI, and Sonography Canada recognize ASE's certificates and have agreed to honor the CME credit hours toward their registry requirements for sonographers. ASE transfers allCME credits and MOC points earned for ASE activities to the respective boards for both our physicians and sonographers.

Recently, in alignment with ASE's strategic goals, ASE began to expand its course offerings to meet the educational needs of the growing CVUS community. In 2022,we began to provide support to other allied health practitioners and now our live courses are compliant with American Academy of Physician Associates CME Criteria. In addition, we are working on providing credit for live courses for veterinarians too. We have a track of education for veterinarians at our annual meeting and a vet specificeducational focus in CASE now. ASE offers a regularly scheduled and long-standing list of in-person courses each year in a variety of locations to allow expert faculty to provide instruction in attractive destinations – in 2023 we will hold the 32nd Annual Echo Hawaii in January, the 33rd Annual State of the Art in Arizona in February, the 34th Annual Scientific Sessions in National Harbor in June, and the 11th Annual Echo Florida in Orlando in October. Besides in-person programs, ASE also provides online education through live webinars (more than 12 a year) and live virtual courses (ASCeXAM/ReASCE Review Course, Echo in PCHD, and Advanced Imaging Techniques). ASE's educational opportunities are enhanced by ASE's Twitter Journal Club, *Journal of the American Society of Echocardiography* (JASE) podcasts, CASE quizzes, monthly JASE CME articles, CASE e-Cases, and resource pages on cardiac amyloidosis and ultrasound enhancing agents (UEA, contrast) and microlessons on Hypertrophic Cardiomyopathy.

ASE's leadership understands that this is a dynamic field and that the needs of our members are constantly evolving. In 2023 we will undertake strategic planning activities focused on optimally evolvingthe future of our educational offering. In addition, we welcome members to engage with us to help plan our future education focuses or events and submit recommendations via our website. As we navigatethe ever-changing cardiovascular landscape we know that the ASE will remain focused all facets of our ongoing education.

Stephen H. Little, MD, FASE
ASE President

This text also appears in the December JASE. OnlineJASE.com

Sonographer VOLUNTEER OF THE MONTH

Congratulations

Rita France, RDCS, RDMS, RT (R), FASE

Technical Director, Echocardiography, Children's Mercy Hospital, Kansas City, MO

Q A

When and how did you get involved with cardiovascular ultrasound?

I graduated from college with a degree in Allied Health Sciences with an emphasis in Radiology. My first job was working in Radiation Therapy treating patients with both the Linear Accelerator and Cobalt treatment sources. While working with those patients was very rewarding, I missed the challenge of imaging, and it was about that time that the large adult tertiary hospital I worked for opened their Diagnostic Ultrasound Department as part of the Radiology division. I transferred to that department at the first opening, became registered in Abdomen and OB/GYN ultrasound, and was named supervisor of that department shortly after. While in that role, the only echocardiographer in the Cardiology department moved out of the area, and I was asked to step in and split my time between Radiology and Cardiology. Although the machine they had at that time made imaging cardiac structures extremely challenging, I grew up and worked in the state that Harvey Feigenbaum calls home, and it was exciting to perform the imaging I had been learning about through his texts and local seminars.

> "In my early days in echocardiography, I relied on ASE meetings and other learning opportunities to increase my knowledge and skill."

I began freelancing for a large Cardiology practice to steepen my learning curve and became registered in adult echo. I was hired full time by that practice and started to work with the first pediatric cardiologist in that area and finally discovered my true passion - pediatric and fetal echocardiography. I became registered in pediatric echo and was privileged to be one of the 100 technologists who sat for the very first ARDMS fetal boards and one of the fortunate few to pass. The Cardiology practice was purchased by another large adult tertiary center but, anxious to be employed at an academic pediatric facility, I began traveling. I accepted contracts at large and small pediatric centers across the country until I found the place I now call home, Kansas City.

What is the name and type of facility/institution at which you work, and what is your current position?

I am Technical Director at Children's Mercy Hospital in Kansas City Missouri. It is a large academic pediatric tertiary center celebrating its 125th year of service, and is ranked as one of the nation's top pediatric facilities by US News and World Report. I have the opportunity to work with an amazing group of professionals every day at every level of this organization but especially my staff whose skill, experience, and teamwork provide value-based care for every patient.

When and how did you get involved with the ASE?

I have been a member of ASE since my very early days

of ultrasound and echo and am a proud member of the 25- year+ club. However, it was not until I had the support from my first Medical Director at Children's Mercy, Dr. Anitha Parthiban, that I was able to become FASE and begin volunteering for positions with ASE committees.

Why do you volunteer for ASE?

Primarily to give back for all the learning and opportunities I have benefited from as an ASE member. In my early days in echocardiography, I relied on ASE meetings and other learning opportunities to increase my knowledge and skill. Networking with others in the community allowed for information sharing that was vital when I ran my first echo department and was responsible for the training of staff from a variety of backgrounds. The ASE CME program was how I provided education and CME credit for my staff at every organization I have held a supervisory role.

What is your current role within ASE? In the past, on what other committees, councils, or task forces have you served, and what have you done with the local echo society?

I am currently an At Large member of the Pediatric and Congenital Heart Disease Steering Committee that is chaired by Dr. Carrie Altman. My first committee membership was with Ethics and Bylaws, and this was followed by a term on the CME Committee. I was also a contributor in the writing group for the "Recommendations for the Adult Cardiac Sonographer Performing Echocardiography to Screen for Critical Congenital Heart Disease in the Newborn: From the American Society of Echocardiography" published in JASE last year.

As to local society involvement, I have been on the Planning Committee for the annual Greater Kansas City Echo Society since 2015 and served as the President the past two years, As President, I chaired a very successful first virtual meeting for the GKCES this past spring after COVID once again derailed the planned in-person offering.

Also, with the support of the Children's Mercy Heart Center, I have organized and lectured at pediatric and fetal symposiums in Kansas City and Joplin MO and Wichita, KS in an effort to improve the prenatal and postnatal detection of critical congenital heart disease in the region we serve through the education and support of front-line imagers.

Although some fear AI may replace the individual, I believe it will allow every sonographer to do better work, see more patients, and suffer less ergonomically than in the past while providing value-based care.

What is your advice for members who want to become more involved in their profession or with the ASE?

If you are passionate about your role in the field of cardiovascular ultrasound and are not an ASE member- JOIN! There are so many benefits to membership that it is worth visiting the web page to fully realize what membership offers. While taking advantage of the many learning opportunities and the amazing networking at these events, start planning on how to become FASE to become recognized for your passion, proficiency, and dedication to your work. Although FASE is not required for volunteering for many committees, it will open up new networks for learning and sharing as well as make you stand out when you do decide to volunteer. But with or without FASE, volunteer. It is very rewarding to be an active contributor to the success of the organization that supports the success of our field in service, in academia, and on the Congressional floor.

What is your vision for the future of cardiovascular sonography?

I used to tell my children that one day we would be using holograms in our field just like Spock. With the lectures on Artificial Intelligence (AI) I have heard at many ASE offerings and from message shared by the keynote speaker at the GKCES meeting, Dr. Partho Sengupta, we may not be far off. The on-cart 3D images on an OLED screen can seem surreal given that first echo machine I worked with in my career. Although some fear AI may replace the individual, I believe it will allow every sonographer to do better work, see more patients, and suffer less ergonomically than in the past while providing value-based care. I think where we are heading is where we have always wanted to go.

3D Vascular Carotid Imaging

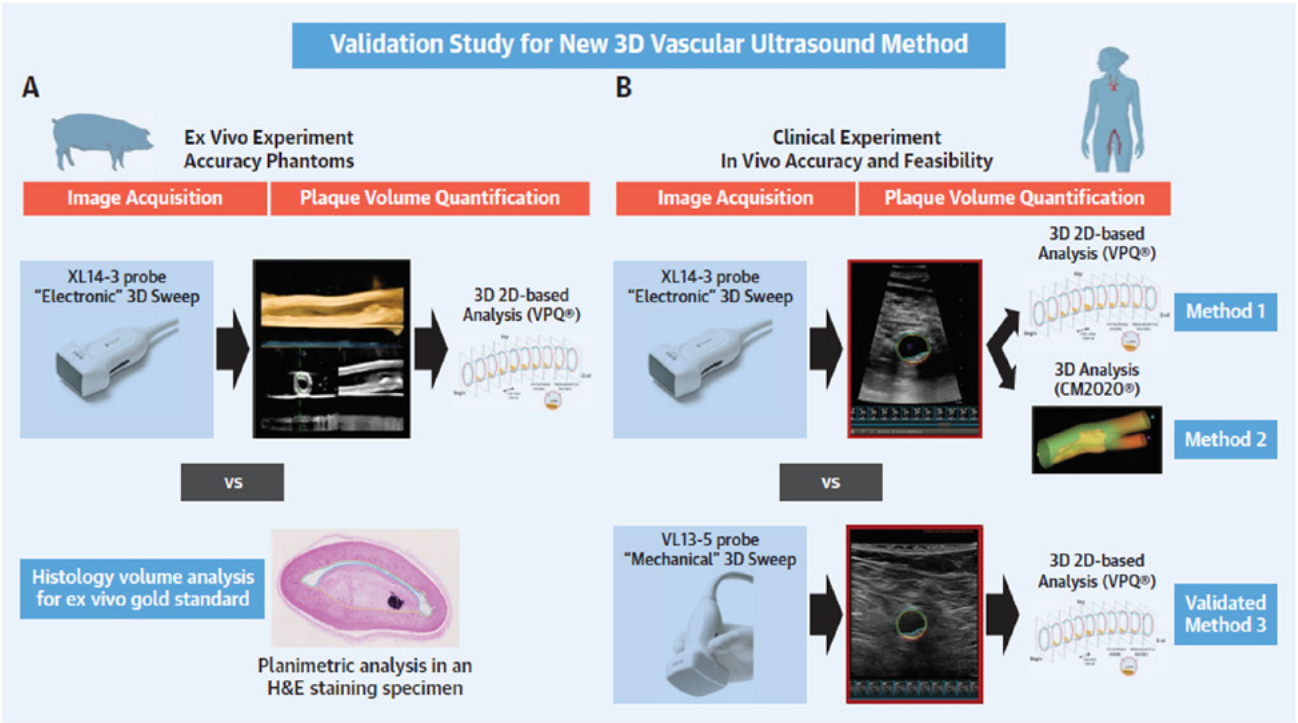
Contributed by: ***Edward Gill, MD, FASE****, University of Colorado Denver School of Medicine*

The most powerful, and by far the most studied imaging biomarker, is the CAC score derived from computed tomography.

HISTORICALLY BLOOD-DERIVED biomarkers, initially the classic being cholesterol, then LDL cholesterol and now the more favored Apo B, have been the cornerstone of estimating atherosclerotic risk. Biomarkers to measure the degree of inflammation such as CRP have further enhanced risk analysis, although not greatly so. However, imaging-based biomarkers of subclinical atherosclerosis improve cardiovascular risk compared to these conventional clinic risk scores. The most powerful, and by far the most studied imaging biomarker, is the CAC score derived from computed tomography. In the landmark MESA study, CAC scoring outperformed carotid intima-media thickness (IMT) scoring for predicting coronary events. Of course, this seems straightforward given that CAC is measuring anatomic features of the coronary arteries, whereas carotid IMT is measuring atherosclerosis in the carotid. A common-sense corollary is that carotid IMT is superior to CAC for predicting stroke. However, the presence of carotid plaque does correlate powerfully with coronary events since atherosclerosis there correlates highly and is often predictive of atherosclerosis throughout the body's arterial vascular system. The advantage of ultrasound is that it is radiation free and it can detect plaques in larger

FIGURE 1

CENTRAL ILLUSTRATION Study Design



López-Melgar B, et al. J Am Coll Cardiol Img. 2022;15(6):1124-1135.

peripheral arteries in the early stages before calcification. That is why the European Society of Cardiology guidelines now recommend ultrasound assessment of the carotid and/or femoral arteries for evaluation of cardiovascular risk.

There is now data utilizing carotid and femoral artery atherosclerosis screening by ultrasound to identify low risk patients and predict cardiovascular outcomes. This data comes from the CAFES-CAVE (Carotid and Femoral Ultrasound Morphology Screening and Cardiovascular Events in Low-risk Subjects). This study showed that identification of plaque within the femoral artery correlated higher with coronary events than did IMT. It also found that femoral plaques had an even stronger association with prevalent coronary events than CACS and carotid plaques did.[1, 2]

Hence, this leads to even further enhancement of the evaluation of carotid and femoral artery plaques using 3D ultrasound technology. Lopez-Melgar et al. used an automated 3D degree mechanical sweep transducer and compared it to an electronic sweep 3D transducer. Both transducers were capable of producing 3D images. The electronic sweep transducer has the advantage of smaller footprint and of course, the electronic sweep, theoretically producing superior images on both fronts. The authors used these two technologies to scan both ex-vivo pig femoral and carotid arteries, and also the same arteries in humans with risk for atherosclerosis. The pig artery scans were compared to histologic evaluation of the vessel wall. The results of their study are shown in the central illustration.[3] *(Figure 1)*

Traditional 2D methods of quantification of plaque have measure IMT as well as number of plaques. The reason that 3D methods could be preferred is 1) improved quantification of plaque using 3D volume and 2) potential detection of minor, smaller plaque with additional quantification of such small plaque.

FIGURE 2

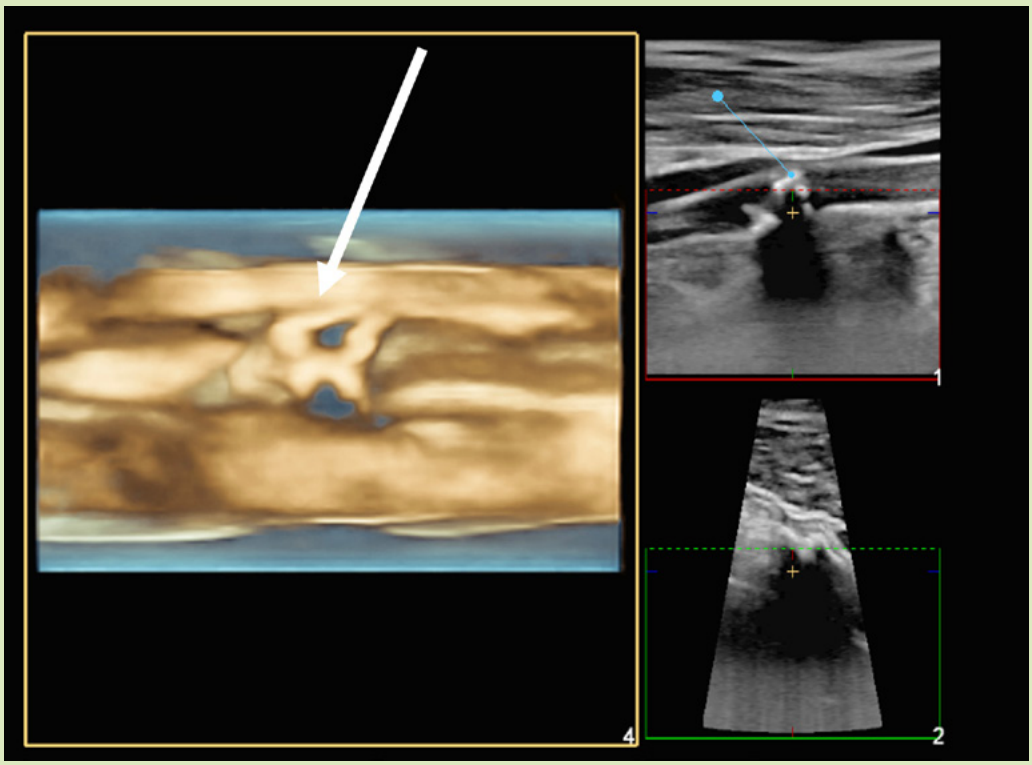


Figure 2 shows some examples of pathologic atherosclerotic plaque in the carotid artery obtained from our echocardiography lab at the University of Colorado. What can be appreciated is the entire depth and total volume of the plaque. Quantification of vessel wall volume and vessel plaque volume is accomplished using Q lab software. As shown, the vessel wall volume coupled with carotid plaque volume is a much more quantitative way of summarizing the degree of atherosclerosis, compared with carotid IMT alone. It would be expected that volumetric assessment would be superior to a 2D only evaluation.

The next step is of course proof that 3D volumetric assessment of plaque can predict cardiovascular events in a more accurate fashion than IMT or 2D plaque quantification. This will be tested in upcoming trials. Such trials will require a large N in order to show a difference and so of course will have to be multi-center trials. We look forward to such trials and anticipate their outcomes.

The next step is of course proof that 3D volumetric assessment of plaque can predict cardiovascular events in a more accurate fashion than IMT or 2D plaque quantification.

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Greg Tatum: A Life Well Lived

*Contributed by **Jimmy Lu, MD, FASE**; **Rita France, RDCS, RDMS, RT, FASE**, Children's Mercy Hospital, Kansas City, MO; **Jennifer Hake, RDCS (PE/AE), RDMS (FE), FASE**, Seattle Children's Hospital, Seattle, WA; **Seda Tierney, MD, FASE**, Stanford University Medical Center, Stanford, CA; **Shiraz Maskatia, MD, FASE**, Stanford University Medical Center, Stanford, CA*




For those of us who had the privilege of knowing Greg Tatum, we can see and feel his impact reverberating through our lives.

HOW CAN WE MEASURE measure the impact of one's life? What ripples and waves might one life make, in a sea of humanity? For those of us who had the privilege of knowing Greg Tatum, we can see and feel his impact reverberating through our lives. For many, it might be in the ways he impacted ASE, such as his legacy with each pediatric webinar. For those who worked or trained with him, it might be in the way they perform an echo or think through congenital heart disease, remembering pearls shared along the way. For many others, it will be an act of kindness, a reminder of our own humanity and of how we can touch others as well. For many underserved patients around the world, it was the kind man with special skills helping a child with rheumatic or congenital heart disease. We lost Greg Tatum to metastatic colon cancer, but the impressions he left on our lives, our community, and our society will not soon be forgotten.

Greg Tatum was a Professor of Pediatrics at Duke University. He graduated from Mayo Medical School in 1999, completed his pediatric residency at University of North Carolina in 2002 with an additional pediatric cardiology training/research fellowship in neonatal-perinatal medicine, and his pediatric cardiology fellowship at Children's Hospital of Pittsburgh in 2006. He was on faculty at UNC and Pittsburgh before joining Duke in 2012, where he served as the Quality Assurance Director for Pediatric Echocardiography, Medical Director of the Greensboro outreach

From left to right: Meryl Cohen, Greg Tatum, Greg Ensing, Melissa Wasserman, at the ASE Gala 2022.

Pediatric representatives of the first two Leadership Academy cohorts: Pei-Ni Jone, Dan Forsha, Sujatha Buddhe, Jimmy Lu, Melissa Wasserman, and Greg Tatum.

site, and Education Director for Pediatric Echocardiography. He was active in ASE throughout his career, having served on the Council on Pediatric and Congenital Heart Disease Steering Committee, as well as the pediatric representative to the FASE Advisory Committee and the Education Committee. He developed and organized the ASE pediatric webinar program. He served as the Chair of the FASE, Training & Certification Advisory Committee. He was a member of the inaugural Leadership Academy cohort. As Melissa Wasserman, RDCS, RCCS, FASE, shared "He taught me how to better contribute to our field, the pediatric cardiology imaging community we both love so dearly."

However, Greg's impact went far beyond his involvement in committees – it was in the way he saw and cared for people. As Dan Forsha, MD, MCS, FASE, a former trainee, states "His impact on the ASE community, as evidenced by the outpouring of love and support, runs deep and speaks volumes about the type of person and doctor that he was." What is it that made his impact so special? Sharon McCartney, MD, FASE, an anesthesiologist and fellow member of the inaugural ASE Leadership Academy cohort, had not previously met Greg despite also practicing at Duke. They bonded through the Academy, but even more afterwards. Dr. McCartney shared "In 2020, I found myself in the NICU with my newborn son, with Greg echoing the baby next to mine. When he saw me, he immediately came to me, asking if things were ok, offering help, alternatives for the differential when the treatment wasn't initially going as expected, and of course, offering congenital heart defects on that differential. He spoke to the NICU team for me and became my, and my newborn's, advocate, in a time where I felt completely alone."

This is who Greg is – not someone who chased his own career or advancement, but someone who always saw and cared for the people around him. According to Melanie Simms, RDCS, a pediatric sonographer at Duke, "The most lasting impression is kindness – he was a very kind and caring person." He served ASE faithfully because service is just the essence of who he is. Dr. Forsha describes, "He struck that fine balance of [being a] caring and impactful physician while also devoting himself to family and friends." As Dr. McCartney said, "Greg... loved pediatric cardiology, echocardiography, and was able to show these passions through mentorship and leadership in ASE. He was deeply loved by all who got the chance to know him."

Greg was completely devoted to his echo lab. Erica Snook, RDCS, a pediatric sonographer previously at Duke, credits Greg as the reason she got involved in sonographer education. If times of challenge bring out our true character, Greg shined even more brightly after his diagnosis. When the lab asked what they could do for him and his family, he simply asked them to "continue to strive for excellence." Erica relates, "All he wanted was for us to continue to do our best and raise each other up to the best of our abilities and continue to provide the best care for our little heart warriors." He even still visited the lab during his chemotherapy treatments, often continuing to work on those days. Long after his diagnosis, he continued to show remarkable strength and determination, continuing to serve in ASE and other roles. Melissa Wasserman shared, "I asked him to be the cardiologist editor for the first edition Congenital Echocardiographer's Pocket Reference and he did it. He did it in May and June while undergoing chemo and losing his hair and trying to figure out how to continue clinical work as his health rapidly declined."

Greg's heart could not be contained by borders, and he was committed to efforts with the ASE Foundation, Gift of Life, and other organizations. He did visiting professorships or spoke at conferences in the Philippines, El Salvador, Vietnam, Colombia, and Kenya. He was active in the ASE Foundation, having served as team leader for two global outreach trips to Kenya, and joined the ASEF Board of Directors in 2020. More important than the number of trips, though, was the depth of relationship and investment. James Kirkpatrick, MD, FASE, the chair of the ASE Foundation Board of Directors, recalled an outreach trip with Dr. Tatum in Vietnam. "On the fly, he was able to come up with multiple lectures to give to pediatric cardiologists, keeping them spellbound as he delivered a one-man symposium." When Hoai Nguyen, the echo director at Bach Mai Hospital in Hanoi, heard about Greg's condition, she said, "Dr. Tatum is always in our heart," remembering "his smile, his love for Vietnamese pediatric patients, [and] his wonderful lectures for Vietnamese colleagues."

> *His impact on the ASE community, as evidenced by the outpouring of love and support, runs deep and speaks volumes about the type of person and doctor that he was.*
>
> *–Dan Forsha, MD, MCS, FASE*

Greg's impact could not be better summed up than in the words of his beloved wife Jenn in a recent Facebook post: "Today Dr. Tatum signed off...

Carson McCartney, Sharon's son, during his hospitalization.

Sharon and Nick McCartney, with newborn Carson McCartney

He LOVED what he did and worked hard at it over a 20-year career at Children's Hospital of Pittsburgh, UNC, and Duke... Being a doctor was not just a job to him, it was part of his identity and his passion. I cannot begin to imagine the number of little lives he touched over his career. He gave it his all and finished well. Tomorrow he will begin hospice care and spend the rest of his time doing his favorite job – being dad to Jack & Sam."

Greg passed away on November 14, 2022. We were lucky to have had Greg Tatum as a colleague, as a friend, and as a dear member of our community. Love your people, serve those in need, and teach like there's no tomorrow – and Dr. Tatum's legacy and impact will continue to be with us.

Because of Dr. Tatum's own wonderful experiences and seeing first-hand the difference the ASE Foundation Global Outreach Events made in the care of those less fortunate, he wished for others to have the opportunity to serve as well. We are pleased to announce that we have reached the goal of raising $35,000 to create the Gregory Tatum Global Outreach Travel Grant Endowment. You may **contribute** to the endowment through December 31, 2022, by making a donation to the ASE Foundation in Dr. Tatum's memory. All funds raised will support global outreach travel grants in Dr. Tatum's name, over multiple years.

Dr. Tatum on a mission trip in Haiti

Dr. Tatum teaching as he echoes during a Gift of Life International trip to the Philippines

The Duke pediatric echo lab

Top 10 Questions for a

Structural Imaging Mentor and a Mentee

*Interview conducted by **Michael Mack, MD**, Medical Director of Cardiothoracic Surgery Baylor Scott & White and Chairman, Baylor Scott & White The Heart Hospital – Plano Research Center, Plano, TX with contributions from **Zuyue Wang, MD, FASE**, Regional Medical Director of Non-Invasive Cardiology, Advanced Imaging Fellowship Director at Baylor Scott & White The Heart Hospital, Plano, Texas and **Alice Soohyun Chang, MD**, former Advanced Imaging Fellow at Baylor Scott & White The Heart Hospital, Plano, current Advanced Echocardiographer and General Cardiologist at Trillium Health Partners, Mississauga, Ontario*



Q: Dr. Mack: Can you explain specifically what is Structural Heart Disease Imaging and how does it differ from Advanced Cardiac Imaging fellowship?

The key difference of structural imaging fellowship vs. advanced imaging fellowship is that the focus is on the interventional aspects

–Zuyue Wang, MD, FASE

A: **Dr. Wang:** structural (or interventional) imaging is a subspecialty of cardiology which involves using multi-modality cardiac imaging techniques for pre-procedural planning and intra-procedural guidance of transcatheter interventions.

The key difference of structural imaging fellowship vs. advanced imaging fellowship is that the focus is on the interventional aspects – procedural steps, wires, guides, devices – which goes beyond imaging acquisition and interpretation. Additional learning objectives include learning how to communicate with surgeons and interventionalists and to be able to speak the same language. This means that a structural imaging fellow is not only in the echo lab, but also in the operating room and the cath lab to become familiarized with the procedural steps and the devices used.

Q: Dr. Mack: What is the minimum number of structural procedures that a center must perform to allow a trainee sufficient procedural exposure?

A: Dr. Wang: do not think that attaining a certain number should be the main goal. From my perspective, it's not only volume, but also the amount of "hands-on time" as a trainee.

At the center level, there should be a well functioning and collaborative heart team which is inclusive of the imagers, and there should be a good variety of devices and procedures performed. Having a robust research program and trials on site would be important as well.

Q: Dr. Mack: What was your primary vision when you started the structural imaging fellowship? Any advice for the mentors in the field?

A: Dr. Wang: My primary vision has been to design a dedicated fellowship program to train a structural imager who can be a leader. Anyone can be taught to be good technicians. However, a good structural imager should be proactive, at times very directive, and take ownership during pre-procedural planning stages and during the procedure itself. As the imaging expert, you should not only present nice images, but also imaging-based guidance and recommendations.

To be a mentor in this field, one should have a comfort level to allow the learners to be on the probe during procedures. I generally aim to have the fellow to be the primary operator at least 90% of the procedure, from beginning to an end. This way, the learner can develop a comfort level as the primary operator and learn how to directly communicate with the team.

In addition, I wanted to ensure that the structural imaging fellow gains exposure to the whole spectrum of the structural space – research, education, presenting at major conferences.

To be a mentor in this field, one should have a comfort level to allow the learners to be on the probe during procedures.

–Zuyue Wang, MD, FASE

Q: Dr. Mack: Why did you decide to pursue structural imaging?

A: Dr. Chang: I developed interest in valvular heart disease and imaging early on during my general cardiology. Structural Imaging seemed like the perfect marriage of these two passions. It is also very cerebral subspecialty in my opinion – you need to understand the disease process, hemodynamics, and the cardiac anatomy in the 3D space. I am a hands-on person, so I liked the idea of being part of procedures and applying imaging to clinical use in real-time.

Q: Dr. Mack: Can you describe for us your typical weekly schedule during fellowship.

A: Dr. Chang: My week was generally divided into dedicated diagnostic TEE days, procedural days in the cath lab, and valve clinics. I attended weekly research rounds and high-risk rounds. For the weekly echo rounds, I would often be the facilitator or the presenter. There were also days set aside for research/core lab, and another day for cardiac CT. Aside from these activities, I

provided teaching for general cardiology fellows, and was on call to go to the operating room to assist with intraop TEEs.

Q. Dr. Mack: What kind of training or pre-requisite do you recommend prior to the fellowship?

A. Dr. Chang: Completion of a general cardiology residency, level II competency in echo, and at least 50 TEEs (preferably > 100) would be the minimal requirement. Level II CT would be helpful as well. Aside from these pre-requisites, one should have passion for imaging and be able to work well in a team setting.

Q. Dr. Mack: Tell us the highlights of your training experience?

A. Dr. Chang: The whole year was a blast. Attending major conferences to meet world experts in the field, being part of live cases as the primary operator on the TEE probe were some of the key memorable experiences. Coming from Vancouver, Canada, I learned a lot about Texas, cowboys, and Tex-Mex foods.

Q. Dr. Mack: What are some challenges have you come across as a mentor in this field? What are some challenges you encountered as a trainee?

A. Dr. Wang: In the early stages of the fellowship, one needs to understand that having the trainee could mean longer procedural times. This could be challenging when there are up to nine complex TEEs in a day. This no longer becomes an issue as the trainee develops more efficiency and skills.

A. Dr. Chang: Time management can be challenging, as there are many different aspects to the structural imaging training, and your day can be divided into multiple ways. It will be helpful to outline and prioritize what you want to get most out of the fellowship – for me, it was a focus on TEE and research.

Time management can be challenging, as there are many different aspects to the structural imaging training,

–Alice Soohyun Chang, MD

Q. Dr. Mack: What are the potential career opportunities after completing a Structural Heart Disease fellowship?

A. Dr. Wang: There is an increasing need for a structural imager, who has had dedicated training in the field, as more transcatheter therapies become more commercially used. I have no doubt that there will be ample opportunities for those with this skill set.

A. Dr. Chang: Having had this training gave me a special edge when applying for my job. Even if structural imaging may not be the primary focus of your job, it will provide you with in-depth understanding of valvular heart disease, and ultimately, make you a much better clinician cardiologist.

Q. Dr. Mack: What words of advice do you have for a future Structural Imaging mentor / fellow?

A. Dr. Wang & Dr. Chang: Keep you motivation, passion, and curiosity, and most importantly, have fun!

CARDIAC SONOGRAPHY:
Challenges Going Forward

Recent articles in *Echo* magazine have discussed how the profession of cardiac sonography got started in the 1960's,[1] how cardiac sonographers became cardiac sonographers in the 1970's,[2] and how training programs and professional opportunities have evolved.[3] To use a culinary analogy, my goal in writing these short articles was not to prepare a multi-course feast complete with wine parings and a dessert trolley, but rather to provide an amuse bouche intended to enhance interest in the history of (cardiac) sonography for those who are thinking about becoming cardiac sonographers, those who now work as cardiac sonographers, and those who depend upon the skills of cardiac sonographers to take optimal care of their patients. Lengthier and more authoritative sources[4] will be of interest. Since those currently working in the field will be familiar with more recent developments, in this final essay on the topic of cardiac sonography, I'd like to focus on what I see, going forward, as several challenges.

Contributed by **Alan S. Pearlman, MD, FASE**, ASE Past President, and Editor-in-Chief, Emeritus, *Journal of the American Society of Echocardiography* (JASE)

In the early days, the value of echocardiography was established in a relatively limited number of disorders. In the 1970s and early 1980s, I remember reviewing the studies "du jour" with the sonographers and a few cardiology fellows late in the afternoon. The number of studies was small, and requesting physicians were not eager to know the results because they were not convinced of

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the clinical value of echo findings. Sonographers were expected to complete a few studies each day, and we reviewed and discussed each of these as a group. The demands on laboratory personnel were not excessive, but the educational opportunity was considerable. Fast forward to the current era, where sonographers often have a "quota" of studies to complete each day, and where the goal is to load the digital files onto the laboratory's picture archiving and communications system (PACS) in time to make the afternoon bus. Now, reviewing studies as a group is difficult at best, and it seems to me that the importance of "volume" has taken precedence over learning. I'm not referring to ventricular or atrial volume, but instead to the number of studies performed, and the volume of relative value units billed – all without incurring any "overtime" charges! Keeping up with new technologies and new clinical applications is challenging, but it's also what makes the field so rewarding to practitioners and – most importantly – valuable to patients.

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Some might view the demand for echo exams as "job security," but there are downsides. A very important downside – one that may not have gotten enough attention – is the prevalence of work-related musculoskeletal disorders (WRMSDs). As the demand for echo studies has grown, and the settings in which exams are performed have expanded, cardiac sonographers are expected to do more studies, sometimes in challenging work environments. According to the Society of Diagnostic Medical Sonography (SDMS), WRMSDs (also termed "musculoskeletal strain injuries" or "cumulative trauma disorders") are caused or worsened by workplace activities. They are painful and involve the muscles, ligaments, tendons, and nerves. WRMSDs are not unique to cardiac sonography (or other sonography specialties), but – because they usually develop gradually – they can be overlooked.

A nice review of WRMSDs was published in 2017.[5] WRMSDS result from repeated exposure to physical risk factors, which are generally related to scanning techniques. If considered on a case-by-case basis, scanning techniques are not harmful per se. But when done repeatedly or for long periods of time, coupled with insufficient time for recovery, performing echo examinations can confer several physical risks, including:

A. *Force:* the physical effort needed to perform a given task. Pushing, pulling, pinching, gripping, and lifting are examples of activities that require force.

B. *Repetition:* performing the same or similar tasks over an extended period, without adequate time for recovery. The risk of WRMSDs increases when repetitive motions are needed, especially when combined with increased force and awkward posture.

C. *Awkward Postures:* these happen when the sonographer scans while their body parts are positioned away from the "neutral" position. Examples might include flexion or extension of the wrist, forward flexion of the shoulders needed to reach, and bending or rotating the neck. Such postures put stress on the sonographers' joints and associated muscles. The farther from neutral and the longer the awkward posture is maintained, the greater the stress.

D. *Contact Pressure:* sustained contact between the sonographer's body part and an external object, such as resting the hip or forearm against the exam table.

When these loads are repeated, the body is not able to recover and trauma to the sonographer's muscles and tendons can result. Symptoms of discomfort and risk of injury can result from awkward postures of

the arms, trunk, and neck, coupled with excessive downward force applied to the transducer. Frequent abduction of the sonographer's scanning arm, coupled with static loading of the muscles caused by pressure applied with the transducer, may result in shoulder injury – presumably caused by compression of parts of the sonographer's rotator cuff against their bony shoulder girdle, hypoperfusion of the muscles and tendons, and micro-trauma to the muscle fibers. Repeated twisting of the neck and trunk may result in back and neck pain, especially when combined with arm abduction. Sustained or forceful gripping, awkward postures, and repetition may lead to discomfort involving the hand, wrist, and elbow.

WRMSDs are common. The symptom reported most often is pain, which may be accompanied by joint stiffness, swelling, or muscle tightness, sometimes associated with numbness and tingling. A 2009 survey[6] indicated that 90% of sonographers reported shoulder pain, while 69% reported low back pain, and 54% reported work related symptoms involving their hand or wrist. WRMSDs affect other caregivers; surgeons, interventionalists, and physical therapists often note pain involving the neck, shoulders, back, and arms.

I found the educational materials available on the website of Sound Ergonomics (a company located in the Seattle area) to be helpful. In performing echo studies, sonographers can lessen the likelihood of WRMSDs by moving the patient closer, positioning control panels so they are nearby, and repositioning the patient when needed (to avoid reaching). Helpful adjustments include positioning the monitor directly in front of the sonographer and at a proper height (to avoid neck flexion, extension, or twisting), scanning with a neutral wrist position (to avoid excessive wrist flexion or extension), keeping their arms close to the body (to avoid arm abduction), and choosing a comfortable chair that provides support for the shoulders, trunk, lumbar spine, and feet. WRMSDs appear less likely when sonographers are attentive to their own health (doing stretching and strengthening exercises, eating wisely, and so forth). When feasible, changing posture is also helpful. Two recent articles in Echo magazine from the Cardiovascular Sonography Council[7] and the Pediatric and Congenital Heart Disease Council[8] discussed the topic of WRMSDs and suggested some helpful approaches to prevention. When I began work on the current article, these articles had not been published, but they are quite relevant, and I encourage readers to review them.

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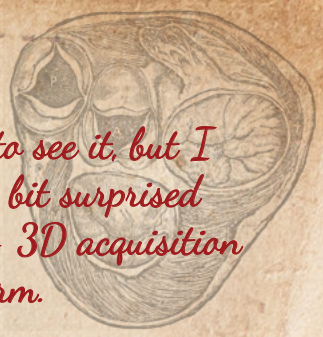
A 2000 report[9] from the Department of Labor's Occupational Safety and Health Administration (OSHA) noted that nearly two million workers in the United States suffer from WRMSDs annually, with lost time from work in about 600,000 cases. OSHA estimated that direct costs attributable to WRMSDs are $15-20 billion, while total annual costs reach about $50 billion annually. While these figures do not represent the cost of WRMSDs in cardiac sonographers per se, given the likelihood of continued growth in echo services, and the high prevalence of scanning in pain, the "cost" of WRMSDs deserves the attention of sonographers, laboratory directors, and administrators.

I'm fond of the quote "It's tough to make predictions, especially about the future," which has been attributed to baseball player Yogi Berra, but also (with minor modifications) to Niels Bohr, Samuel Goldwyn, Mark Twain, and the 16th century French astrologer Nostradamus, among others. Hence, I'm reluctant to make predictions about developments

that might influence the burden of WRMSDs. Obvious choices would include a lighter caseload, more time between cases, more flexible equipment with extra monitors, and control panels that can be positioned where convenient for the sonographer. There may be some fiscal downsides to these approaches.

An intriguing development is the growing availability and power of volumetric acquisition. A recent article from Dr. Roberto Lang's forward-thinking group at the University of Chicago piqued my interest. His team has documented and extolled the value of 3D echocardiography for a variety of applications, such as the accurate measurement of left ventricular and left atrial volumes, and the nuanced analysis of mitral valve morphology and function. Lang's group recently reported[10] that, starting with a volumetric dataset, one can extract multiple tomographic views in order to acquire the standard images now used for 2D echo analysis. They term this process "3D echo deconstruction," and it is possible that this approach could ***replace*** (rather than ***augment***) the conventional 2D echo study. From the perspective of WRMSDs, this approach could be a game-changer. Image acquisition would be much quicker and would not involve protracted efforts to optimize and acquire a large series of tomographic views, which ought to reduce the stresses that currently lead to scanning in pain. If this approach were implemented, I would anticipate that while the ***role*** of the sonographer would remain the same (to acquire optimal images needed to address the clinical concerns in each patient), their ***activities*** would change considerably. Instead of struggling to acquire a large series of images, which can take considerable time and may require stretching and reaching and twisting, the sonographer would need to identify those echo windows that provide optimal visualization of the heart, acquire the volumetric datasets, and then spend most of their time extracting needed views from the original dataset. This would mean spending less time scanning and more time examining the dataset. It would seem likely that this evolution of duties could markedly reduce the factors that appear to result in WRMSDs.

This may seem a "stretch" (pardon the pun) to those readers who view 3D echo as an advanced technique used in a few labs for research, but not a mainstream technique. I would simply observe that back in the late 1970s, when 2D echo was a novel technique, many practitioners claimed that "Surely there would be no need to perform 2D echo in every patient! This might be useful in some patients with coronary disease and asymmetric ventricular performance, or in some children with complex congenital heart disease, or in mitral stenosis when imaging the orifice area was needed. But certainly not in everyone!" I may not be around to see it, but I would not be the least bit surprised if – down the road – 3D acquisition were to become the norm. And this might be a game changer from the perspective of WRMSDs (and in many other ways). Time will tell.



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