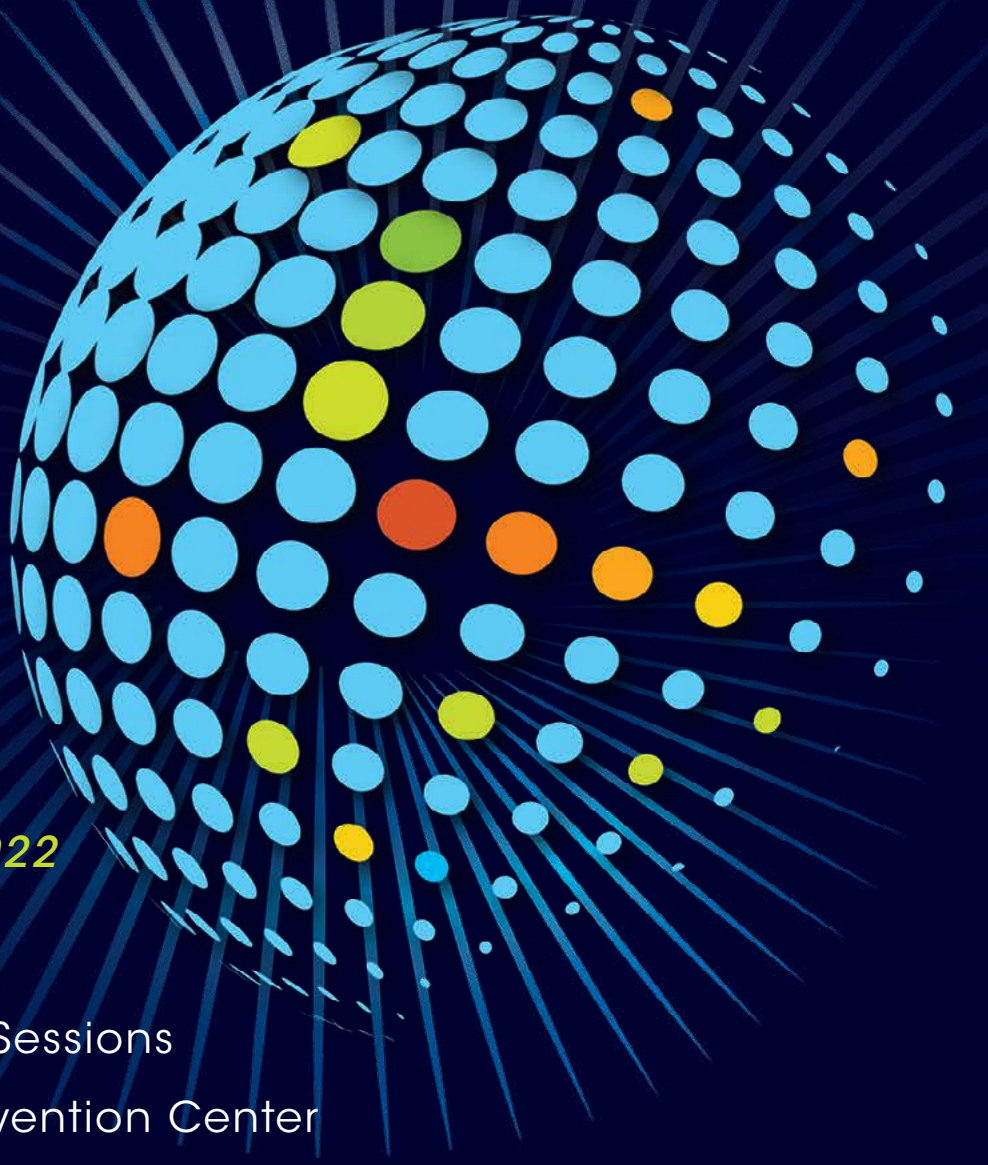
ECHO

VOLUME 10 ISSUE 1 **NOVEMBER 2021**

American Society of Echocardiography

ASE2022 HYBRID

SOUND WAVES IN SEATTLE: CONNECTING THE WORLD



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ABOUT ASE
The American Society of Echocardiography (ASE) is the Society for Cardiovascular Ultrasound Professionals™. Founded in 1975, ASE is the largest global organization representing cardiovascular ultrasound imaging. ASE is the leader and advocate for physicians, sonographers, scientists, veterinarians, students, and all those with an interest in echocardiography, setting practice standards and guidelines for the field. The Society is committed to advancing cardiovascular ultrasound to improve lives. For more information about ASE, visit: ASEcho.org and follow us @ASE360.

ASE'S MISSION
To advance cardiovascular ultrasound and improve lives through excellence in education, research, innovation, advocacy, and service to the profession and the public.

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ASE MEMBERS:

Since our first Echo Magazine issue in September 2012, we have strived to provide in-depth stories, spotlight advances in cardiovascular ultrasound, and offer reflections from our leaders to our members and the world at large. This issue is no exception, containing insights into the Twitter Journal club, viewpoints from our executive committee members, a focus article on pediatric echo, and more. We also have exciting news about the future of this magazine. Starting in January 2022, this magazine will become a monthly publication! Our new Co-Editors, Drs. Meryl Cohen and Benjamin Eidem, will shepherd this iteration, helping to review article submissions and encourage authors to submit interesting stories. Outstanding images with captions not accompanied by an article will also be considered for publication. Our Councils and Specialty Interest Groups (SIGs) will routinely provide articles, featuring pediatric, perioperative, sonographer, and vascular articles, and areas of interest including critical care, neonatal hemodynamics, cardio-oncology, and interventional echo. Members are also encouraged to submit! If you have an idea for an article, please send it to Echo@ASEcho.org. The new author guidelines can be found on ASE's website ASEcho.org/EchoMagazine.

I look forward to this new chapter in our publication offerings and thank our leadership for their investment in enhancing the Society's communications.

We are very grateful for your continued support!

Robin Wiegerink, CEO

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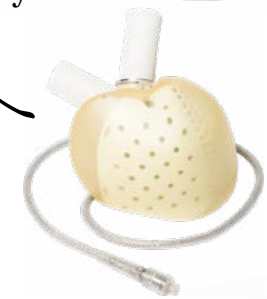

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American Society of Echocardiography

Cover art: CARMAT total artificial heart. See The Role of Echocardiography in the New CARMAT Total Artificial Heart article on page 12.

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.

Focus on LEADERSHIP

Of the many medical subspecialties available, please share how you became

enamored of echocardiography

In 1988, when I was a first-year internal medicine resident (intern) at Vanderbilt, cardiovascular ultrasound was not at all as ubiquitous as it is today. Ultrasound learning was not formally a part of medical school or even residency training. My first echo encounter happened ad hoc during a post-call morning. After 36 hours of rounding and taking admissions as the on-call intern, my exuberant, rested, and demanding (soon-to-be cardiology fellow) chief resident called a bleary me to his office for a teaching opportunity. He wanted to review the mitral valve echo Doppler information on one of my patients. I felt grateful for the attention, and I had not really known we had an echo lab. I felt impressed by his enthusiasm and happy for him.

RAYMOND F. STAINBACK, MD, FACC, FASE

PRESIDENT, ASE

TEXAS HEART INSTITUTE

Afterwards, I had no idea what he had been talking about. This Doppler stuff was abstract and not as real as starting central lines and running codes, which I quite liked. He seemed deflated by my blank reaction. However, at least I then knew that echos were a thing and probably something I should come to understand. One year later, while on the cardiology consult service, my attending took us to the echo lab following rounds. Dr. Ben Byrd was happy to pull out the videotape exams on our patients for review. I clearly remember his explanation of color Doppler (new technology). Echo was less abstract and an amazing sight!

When I became a cardiology fellow there at Vanderbilt, I spent my first fellowship month in the echo lab (1990). The lab's lead sonographers, Pat Tallent and Tandie Moore, RDCS, taught me to scan and perform portable surface echo exams within a couple of weeks, and this was one of the most empowering and impactful skills that I learned as a physician. This was a starting point towards my eventually choosing echocardiography. I last visited with Pat and Tandie in 2011, and the memory of their superb skills and supreme patient care still inspire me.

Stephen H. Little, MD, FACC, FASE

President-Elect, ASE

Houston Methodist DeBakey Heart & Vascular Center

Flashback to 1994: As a medical student I was fascinated by the cardiovascular physical exam. Truly amazed that with some training, you could feel and hear an organ working inside the body. After one of my first clinical mentors showed me the echocardiogram of a patient with aortic stenosis—I was hooked. With an echo you could hear the organ at work; see the organ thrive or struggle; and apply astronomical Doppler principles to measure blood speed—and calculate pressure and flow. Surely, I thought, this little hand-held gadget must be one of the most powerful tools in medicine.

Although I did briefly consider a career path in an interventional or surgical specialty, I always came back to how much I enjoyed the applied physiology that echocardiography reveals. In the years that followed, incredible educators (both sonographers and physicians) and grateful patients continued to confirm the power of the echocardiogram. Additionally, the wonderfully collaborative culture of the echo lab, and many friendships within the American Society of Echocardiography have created an enduring environment of terrific professional satisfaction. As we continue to incorporate new technologies and applications (including strain, 3D imaging, interventional guidance, POCUS and AI), echocardiography is just as exciting today.

My road to medicine began early in life at five years of age, when I decided that I wanted to be a doctor. I do not remember the "ah-ha" moment when I made that decision, but I do remember being the ambitious (and sometimes geeky) kid in elementary school with a career in medicine fully in my sights. It wasn't until I completed my college years that I decided cardiology would be my lifelong ambition, but I waffled between a career in cardiovascular surgery and adult cardiology. Finally, in my fourth year of medical school during a clinical rotation in Pediatric Cardiology, the complexities of congenital heart disease literally stole my heart and my career plan was final. During my pediatric residency, I was introduced to echocardiography which became my lifelong passion. The anatomic and hemodynamic abnormalities of congenital heart disease were a perfect fit for a career in echocardiography. Since that time, I have been blessed to train with and later work side by side with colleagues that are giants in our field. These colleagues, and my 25 years of involvement with ASE, have made my journey in echocardiography an unbelievable ride.

Benjamin W. Eidem, MD, FASE

Vice President, ASE

Mayo Clinic

Cynthia Taub, MD, MBA, FACC, FASE

Treasurer, ASE

Dartmouth Hitchcock Medical Center

It is often not the *what* rather the *who* that will determine one's path. I first met Dr. Linda Gillam, Past President of ASE, as a second-year medical resident looking for a fellowship training program in an academic medical center. Linda was one of the interviewers at Hartford Hospital, University of Connecticut, and the first female cardiologist I met in the U.S. In the late 1990s, only 5% of the practicing cardiologists were women. I realized that I could be what I saw.

As a woman in cardiology and echocardiography, when they numbered few many years ago, Linda's impact was quite significant. She inspired me to discover the beauty and power of echocardiography. Every echocardiogram carries a life and its story, from a repaired congenital heart abnormality to an infected heart valve to a heart that endured chemotherapy.

As a child, I fantasized about being Sherlock Holmes solving mysteries. Holmes' everyday carry was a magnifying glass at crime scenes, which Watson called "his pocket lens." The lens of ultrasound offers perspectives that are more than intuitive and intrigue curious minds. I drew parallels between a methodical, observant detective and an analytical, insightful echocardiographer. The more I learn about the intricacy of echocardiography, the more I understand my own ignorance. The unknowns in echocardiography and the process of exploring them continue to enamor me.

I became interested in echocardiography early on in my healthcare career. I was in the U.S. Air Force stationed in Columbus, Mississippi, as a Radiologic technologist. Although this career was rewarding, I felt there was something missing and took notice to this field called echocardiography. I didn't have a great understanding of it at that time, but started observing a few studies and found it to be amazingly interesting. So, as my service commitment was nearing completion, I applied to the Echocardiography program at Mayo Clinic. The timing was not ideal as I had to declare to separate from service prior to knowing if I was accepted, but I knew that this was the field for me. I got accepted into the program and moved my young family to Rochester, Minnesota, and have never regretted a day of it since. I find it so rewarding to be in a profession where my skills at work can really assist in the care of patients.

Matt Umland, ACS, RDCS, FASE

Secretary, ASE

Aurora Health Care

Meryl S. Cohen, MD, MSEd, FASE, FACC, FAHA

Council Representative, ASE

Children's Hospital of Philadelphia

I became interested in echocardiography after starting my pediatric cardiology fellowship at The Children's Hospital of Philadelphia. I noticed that echocardiography was the first line of imaging and that most congenital and acquired heart disease could be evaluated solely with echocardiography to achieve an accurate diagnosis. Being an echocardiographer means that you work with all the other disciplines in our field, interventional cath, CT surgery, heart failure, electrophysiology. It is the single most important imaging modality we use in cardiology because it is mobile, instantaneous, accurate, and comprehensive.

The reason I became enamored with echocardiography is that it has become the primary physiological tool for assessing cardiac hemodynamics by which I mean cardiac pump and valve function. Echocardiography has essentially replaced the cardiac catheterization lab in the assessment of valve disease and cardiac function. The applications for echo are increasing from diagnosis to guidance of therapy to actual ultrasound targeted therapy. There is so much that can be done!

Judy W. Hung, MD, FACC, FASE

Immediate Past President, ASE

Massachusetts General Hospital

Doing Pediatric Echo is a Blast and Full of the Unexpected

Contributed by: Jeff Jewell, BS, RDCS, FASE, Lead Pediatric Cardiac Sonographer, WakeMed, Raleigh, NC

There are not a lot of jobs in this world where you get to watch and talk about cartoons or the Marvel universe, where we are intimately aware of all the characters of Paw Patrol, and where we can be caught randomly humming the Baby Shark song. Now that song is in your head. We get to play with babies and laugh with teenagers and get to know a lot of loving parents. Most of us in pediatric echocardiography also get to do fetal echocardiography, and get to witness the joy of moms and dads seeing their baby and hearing the heartbeat. We get to know these children and their parents because we see them every few months or every year and watch these children grow into adults. Indeed, there are not a lot of jobs where you get to do all of these things and make a difference in children's lives. You can almost feel the 'but,' can't you? Couldn't resist a 'Finding Nemo' reference, which is why I love pediatric cardiology so much!

But, not every baby wants to be bothered, and not every teenager is in a laughing mood. Not every parent is friendly, and some are just plain rude. The worst part is that not every child is healthy. We work in a field where congenital heart disease is a very real finding, and while exciting to learn about and exciting to view on the screen, we have to realize that some parents' lives are about to be turned upside down. Many times throughout my career I have had to stop in the middle of an exam to let the cardiologist know that there is a complex congenital defect, or a fetal demise, or severely depressed left ventricular function in a child that has had a heart transplant. Then I have to go back in the room and put on my poker face, and in some cases bite my cheek to keep a tear away, because

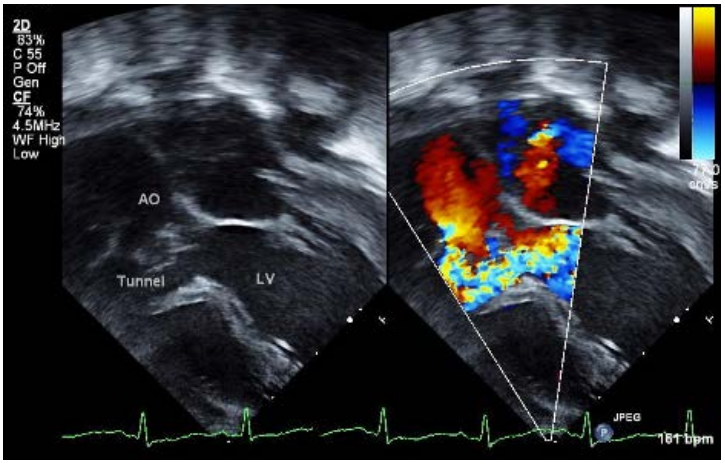

Figure 1: Apical image of an aorta to left ventricular tunnel

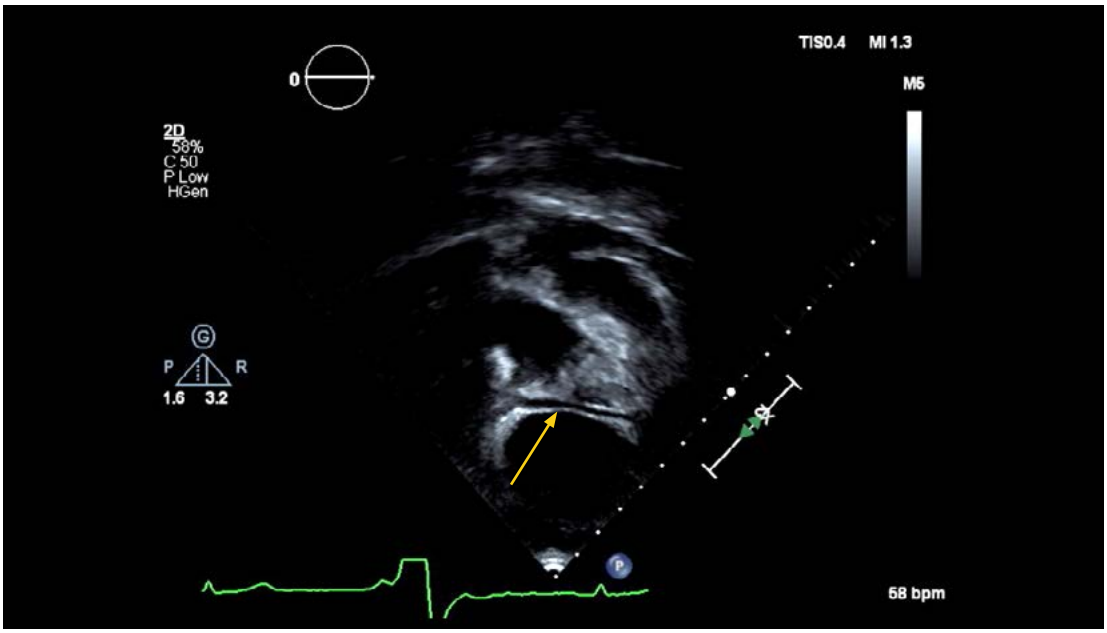

FIGURE 2: APICAL IMAGE SHOWING LEFT ANTERIOR DESCENDING CORONARY ARTERY ARISING FROM RIGHT CORONARY ARTERY

I know how devastated the parents will be and I also feel terrible for the cardiologist who must deliver this news. It's a reality, and it's a harsh reality. Annnddd here it comes, another 'but.'

But the reality is that we are living in a wonderful age. We forget that just 76 years ago the first successful Blalock-Taussig shunt was placed in Eileen Saxon. Sixty-seven years ago the first ventricular septal defect closure was performed by Dr. C. Walton Lillehei. Since then, we have rapidly progressed to Norwood, Glenn, and Fontan for single ventricle and gone from atrial switch for Dextro-Transposition of the Great Arteries to arterial switch as the standard. The point of all of this is that this rich surgical history is what makes pediatric echo so rewarding. The tetralogy of Fallot child born in 1986 had the option of growing up to be a three-time Olympic gold medalist in snowboarding. Doing a fetal echo on a patient, or their spouse, for their first child, and finding these congenital heart defects allows us to get to see these children grow from an 18-week-old fetus into adulthood. It is exhilarating to think that we, as sonographers, get the opportunity to share in every aspect of this child's life. From the parents learning what our 'poker face' looks like and already shedding a tear or bracing themselves that some bad news is coming their way to not needing a poker face and knowing that this child, and this family, are going to go about their day with a sigh of relief that all is well. I have sat with parents, laughed and cried with parents, gotten many big hugs from children, eaten many imaginary crackers, talked on many toy telephones, and made many silly faces, and as the clinic nurse reminded me; have played hide and seek on many occasions. I have had parents that chose to keep coming to see me and 'their' cardiologist, even after they had moved out of state. So, the 'but' stops here.

It is exhilarating to think that we, as sonographers, get the opportunity to share in every aspect of this child's life.

To me, pediatric cardiology doesn't have a typical day, which I love. We get to see the unexpected on a daily basis. A healthy six-year-old comes in for a murmur, and we find that he has a partial atrioventricular septal defect. The fussy four-week-old has a dilated cardiomyopathy secondary to an anomalous left coronary artery arising from the pulmonary artery. The list could go on and on. Sometimes it's easy to become complacent that all syncope patients or all murmurs are going to be normal. They usually are, but, as I always tell the students or new hires who come through, always go into this with a mindset that

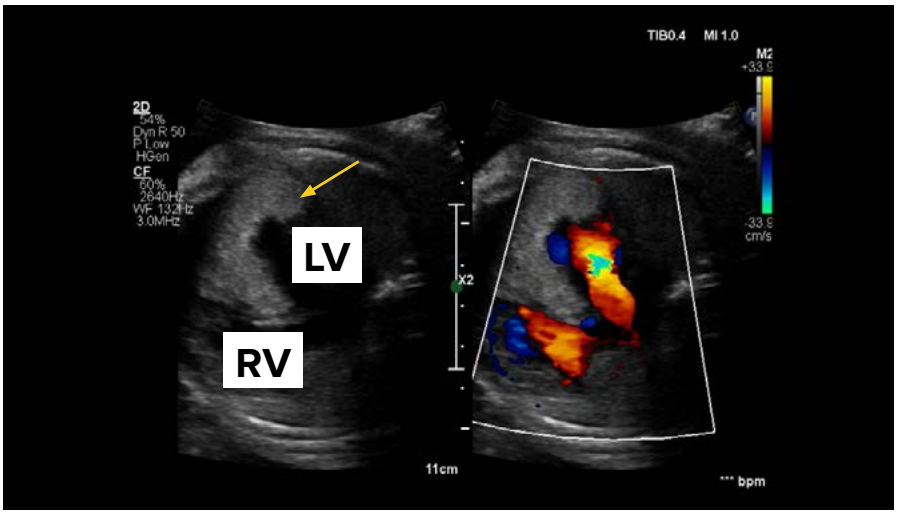

FIGURE 3: LARGE RHABDOMYOMA NOTED IN FETAL HEART

the echo will be something unusual. Always think about the protocol and what you should be examining in every view even when the baby is crying, even when the teenager is huffing that they can't take pictures for 'Insta.' I mean, sheesh, what's the problem bruh?

To wrap up, I am so happy that I discovered this field. Initially, I wanted to go into engineering, like my father. I still love doing math, much to the dismay of the students who come to our lab. Working with children has helped me realize I can be silly and fun even while working. Really, in the end, a typical day in pediatric cardiology is mostly fun, with a little work thrown in so I can pay my bills and buy another guitar. My wife is already shaking her head at that statement.

FIGURE 4: NEW THROMBUS NOTED IN A HYPOPLASTIC LEFT HEART SYNDROME

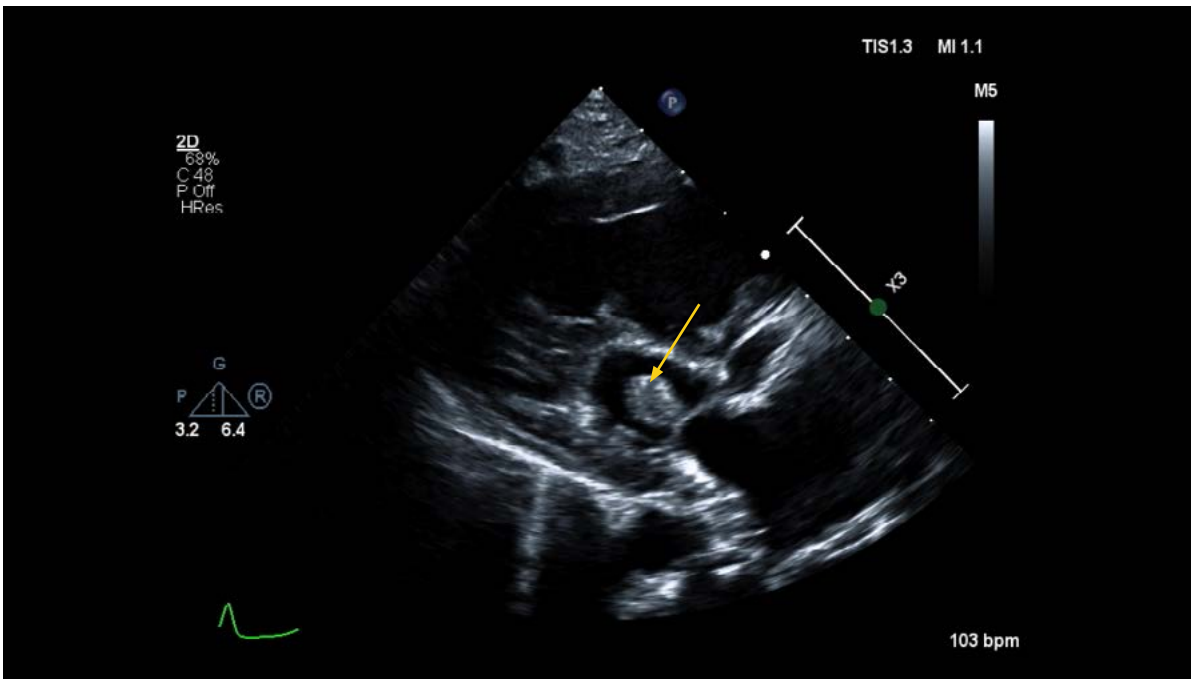

FIGURE 1: CARMAT TOTAL ARTIFICIAL HEART.

The Role of Echocardiography in the New CARMAT Total Artificial Heart

Contributed by: Sharon L. McCartney, MD, FASE, Assistant Professor of Anesthesiology, Duke University, Durham, NC and Dana M. Settles, MD, Assistant Professor of Anesthesiology, University of Louisville Health, Jewish Hospital, Louisville, KY

Innovation has been booming in the past decade for patients with heart failure. From newer, smaller, durable Left Ventricular Assist Devices (LVAD) that have less thrombotic complications, to less-invasive percutaneous LVADs that can support more circulation, to expanding the heart donor pool with ex-vivo organ perfusion or donation after circulatory death, there has been great progress towards alleviating the severe disease of end-stage heart failure. One of such innovations is the CARMAT (Aeson®) Total Artificial Heart (Figure 1). The device is currently undergoing clinical investigation (NCT04117295) as a bridge to heart transplant for patients with end-stage biventricular failure. The device includes two novel ventricles that simulate the right and left ventricles, four bioprosthetic valves (tricuspid, pulmonic, mitral, and aortic) and two Dacron grafts that attach to the native pulmonary artery and ascending aorta. Bovine pericardial membranes separate each ventricle into a blood compartment and silicon oil compartment, and the entire system is encased in a polyurethane sac with silicon oil. Two electro-hydraulic pumps move the bovine pericardial ventricular membranes within the silicon oil to simulate diastole and systole (Figure 2). The device also contains pressure sensors to detect preload and afterload, in addition to ultrasound sensors to measure membrane position and ensure complete ejection.

The device has some major benefits compared to other total artificial hearts. First, the device is hemocompatible. With four bioprosthetic valves and bovine pericardial membranes, the device has favorable surfaces for blood contact. Second, because of the "wave-like" motion in which the membranes are mobilized, there is less shear stress. Finally, the device has an autoregulation mode – so when the device senses a change in preload, it automatically changes the beat rate (analogous to heart rate) while the stroke volume is maximized to approximately 60 mL. This autoregulation allows for an increase in cardiac output during exercise and a decrease

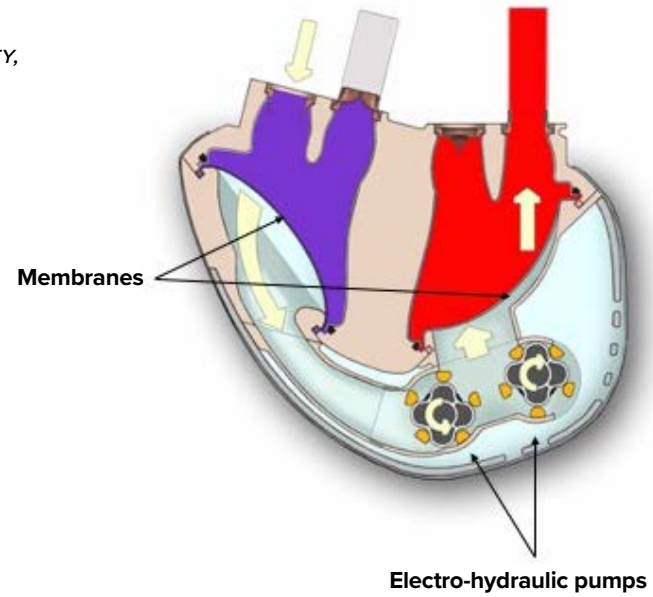

Figure 2: Schematic of the inside of the CARMAT total artificial heart. Bovine pericardial membranes separate each ventricle into a blood compartment and silicon oil compartment, and the entire system is encased in a polyurethane sac with silicon oil. Two electro-hydraulic pumps move the bovine pericardial ventricular membranes within the silicon oil to simulate diastole and systole.

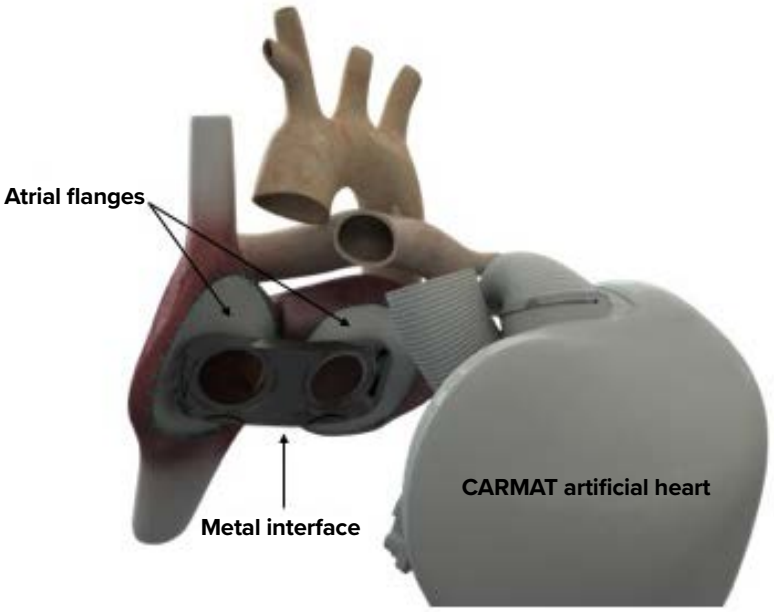

FIGURE 3: 3D RECONSTRUCTION IMAGE OF THE CARMAT TOTAL ARTIFICIAL HEART ATTACHMENT TO THE NATIVE ATRIA. DURING IMPLANTATION, BILATERAL VENTRICULECTOMIES ARE PERFORMED, WITH THE LEFT AND RIGHT ATRIA LEFT INTACT. THE ATRIA ARE CONNECTED TO A METAL INTERFACE PLATE, THAT ACTS AS THE MECHANICAL CONNECTION BETWEEN THE ATRIA AND THE CARMAT PROSTHESIS. THE NATIVE ASCENDING AORTA AND PULMONARY ARTERY ARE THEN ATTACHED TO DACRON GRAFTS THAT ORIGINATE JUST DISTAL TO THE CARMAT AORTIC AND PULMONIC VALVE, RESPECTIVELY.

in cardiac output at rest. The device is pulsatile, however, unlike the native heart, the left and right ventricles are in dyssynchrony. Each ventricle spends two-third of the cardiac cycle time in diastole and one-third of the cardiac cycle time in systole, but each ventricle is in diastole and systole at different times.

The surgical procedure consists of bilateral ventriculectomies with the left and right atria left intact. A flange is sutured to both the right and left atria, and these flanges then attach to a metal atrial interface plate (Figure 3). The atrial interface plate is the mechanical connection between the atria and the CARMAT prosthesis, which snaps into the metal plate. The native ascending aorta and pulmonary artery are then attached to Dacron grafts that originate just distal to the CARMAT aortic and pulmonic valve, respectively.

To date, 20 patients have been implanted with the CARMAT device in Europe, either as a bridge to transplant or destination therapy. One patient has had the CARMAT device for two years as destination therapy. On July 12, 2021, as part of an early feasibility trial in the United States that will use the CARMAT as a bridge to transplantation, Duke University implanted the first CARMAT device in the U.S. in a 39-year-old male with refractory ventricular tachycardia, and non-ischemic biventricular heart failure. Subsequently, the University of Louisville implanted the second CARMAT device in the U.S. on August 20, 2021 in a 58-year-old male, and then implanted the third CARMAT device in the U.S., however, the first to ever be used in a female, on September 14, 2021.

So, what is the role of echocardiography with this new device? While perioperative echocardiography has a pivotal role in some of the other surgeries for end-stage heart failure, such as biventricular assist devices (either two durable left ventricular devices used for biventricular support or temporary extracorporeal ventricular assist devices) and heart transplantation, the use of echocardiography in the CARMAT Total Artificial Heart has more challenges. We will discuss those challenges in detail here. Prior to implantation, a comprehensive transesophageal

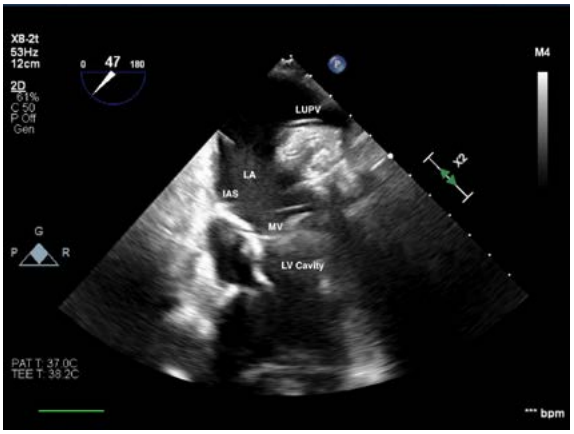

FIGURE 4A: MIDESOPHAGEAL FOUR-CHAMBER VIEW OF THE CARMAT PROSTHESIS IN LEFT VENTRICULAR SYSTOLE. NOTE THE LARGE AMOUNT OF ARTIFACT STARTING AT THE LEVEL OF THE MITRAL VALVE PROSTHESIS. ALSO NOTE THE ABSENCE OF EKG-SIGNAL, SINCE THE PATIENT'S NATIVE CONDUCTION SYSTEM HAS BEEN REMOVED WITH VENTRICULECTOMIES. (INTERATRIAL SEPTUM, IAS; LEFT ATRIUM, LA; LEFT UPPER PULMONARY VEIN, LUPV; LEFT VENTRICLE, LV; MITRAL VALVE, MV)

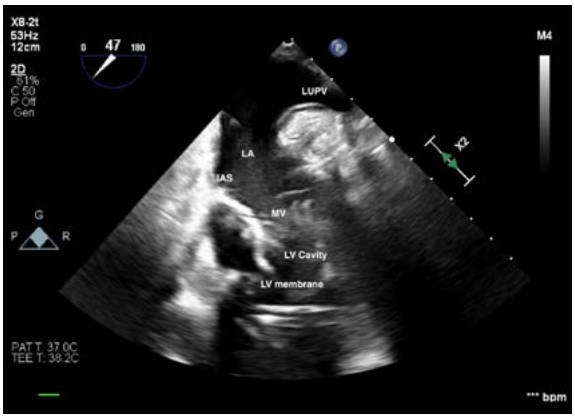

FIGURE 4B: MIDESOPHAGEAL FOUR-CHAMBER VIEW OF THE CARMAT PROSTHESIS IN LEFT VENTRICULAR DIASTOLE. OF NOTE, WHEN THE LV IS IN DIASTOLE, THE RIGHT VENTRICLE IS IN SYSTOLE. (INTERATRIAL SEPTUM, IAS; LEFT ATRIUM, LA; LEFT UPPER PULMONARY VEIN, LUPV; LEFT VENTRICLE, LV; MITRAL VALVE, MV)

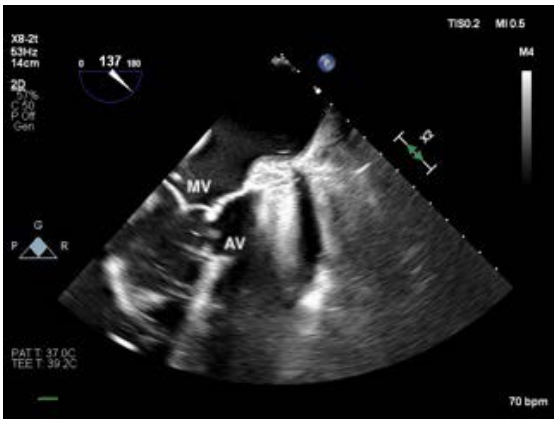

FIGURE 5A: MIDESOPHAGEAL LONG-AXIS VIEW OF THE CARMAT PROSTHESIS DEMONSTRATING THE DIFFICULTY IN VISUALIZING THE AORTIC VALVE BIOPROSTHETIC VALVE, DESPITE CLEAR VISUALIZATION OF THE MITRAL PROSTHESIS.

echocardiographic (TEE) assessment is performed. If there is a patent foramen ovale noted preoperatively, this will be closed during the implantation, to avoid right to left shunting after implantation. Additionally, anomalous pulmonary veins may alter filling of the device and should be assessed. Finally, to avoid thromboembolism, the atria and left atrial appendage should be assessed for thrombus that should be extracted during the procedure. During the implantation, TEE is used to de-air the device, while still on cardiopulmonary bypass. Using midesophageal views (Figure 4A and 4B), we evaluate for the presence of air in the left atrium and pulmonary veins. Some limited assessment of air in the left ventricular cavity and crossing the prosthetic aortic valve can also be performed, however, this area has a large amount of artifact and can be challenging to discern pockets of air, unless some are mobile. After de-airing the device, separation from cardiopulmonary bypass ensues. This is done in a step-by-step fashion of increasing stroke volume and beat rate of the device and decreasing cardiopulmonary bypass support, until adequate cardiac output is achieved by the CARMAT device. TEE can be useful here to show the relative size of the left and right atrium and ensure the device is being filled. Adequate filling of the left and right side can be assessed by evaluation of the interatrial septum, which should be midline or slightly shifted to the right with adequate filling. Additionally, obstruction to atrial filling can be assessed at the level of the pulmonary veins and the inferior vena cava. Gross abnormalities of the tricuspid, mitral, and aortic prosthetic valves can be assessed as well.

The aortic valve, tricuspid valve, and pulmonic valve can be difficult to image (Figure 5A). Use of color flow Doppler may help the echocardiographer localize the tricuspid and pulmonic valves and enable some limited evaluation (Figure 5B). The left ventricular cavity membrane can be visualized contracting, but the entirety of the left ventricular cavity is difficult to appreciate. While the right atrium can be easily seen, visualization of the tricuspid valve is difficult, and visualization of the right ventricular cavity is even more limited. Postoperatively, transthoracic echocardiography (TTE) may be more able to assess the right ventricle in the subcostal views.

Why is the assessment of the CARMAT by echocardiography so limited? First, as we know in patients who undergo multiple valve replacements, echocardiographic assessment, while vitally important to evaluate the protheses, can be fraught with a large amount of artifact and dropout from the prostheses themselves. The CARMAT is no exception to this. The CARMAT has four bioprosthetic valves, which, in itself can pose imaging challenges in a native heart. Second, the CARMAT device attaches onto a metal plate that is juxtaposed at the atrial interface. This means that just beneath the right and left atrium is a large metal plate. This metal plate creates a significant amount of attenuation of any structures beneath it, particularly with TEE. Finally, the CARMAT device has a plastic housing that also leads to difficulty in imaging using transgastric TEE views and parasternal and apical transthoracic views.

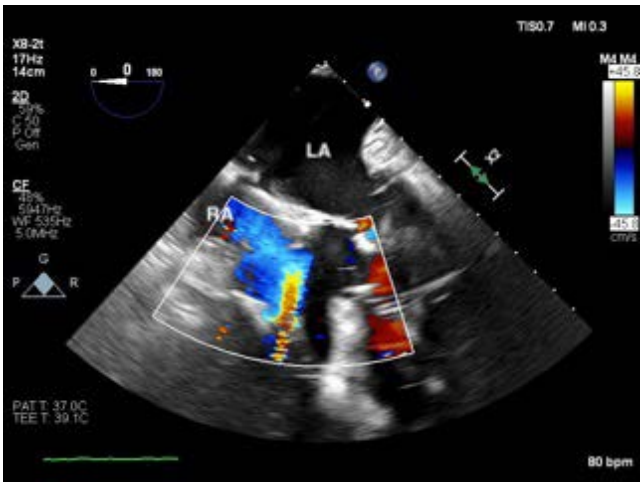

FIGURE 5B: MIDESOPHAGEAL 4-CHAMBER VIEW OF THE CARMAT PROSTHESIS. USE OF COLOR FLOW DOPPLER CAN BE HELPFUL IN IDENTIFYING FLOW THROUGH THE STRUCTURES THAT 2D IMAGING IS UNABLE TO DISCERN.

While echocardiographic evaluation is recommended and useful during the implantation, the imaging limitations have led to the use of other modalities for diagnosing postoperative complications. First, at the time of implantation, a percutaneous transseptal left atrial pressure line and a right atrial pressure line are placed through the internal jugular vein to monitor the pressure in the corresponding atria. These pressure monitors are left in place throughout the first week postoperatively, to ensure adequate filling of both sides of the device is achieved. Second, the device is adapted with pressure sensors within the device and will display left and right ventricular pressure monitoring during diastole and systole (Figure 6). These pressure waveforms are also very helpful in determining inadequate filling. As mentioned previously, the apparatus pumps within a bag of silicon oil. The pressure of this bag is also displayed on the external display. Typically, the bag pressure is negative. If the bag pressure increases and approaches or exceeds zero, this is typically indicative of accumulation of pericardial fluid and analogous to cardiac tamponade. While imaging with TTE or TEE is unable to be used to visualize these phenomena due to the amount of artifact, use of CT imaging can be helpful to visualize the pericardial fluid and estimate the amount present, if needed, prior to surgical exploration. Pericardiocentesis is strictly forbidden due to the compartment with silicon oil that the device is encased in. Rupture of this bag would render the device ineffective, and cardiopulmonary collapse would ensue.

This device is highly encouraging as an option for patients with end-stage biventricular failure. Use of echocardiography, though fraught with its limitations post-implantation, is important in the pre-procedure identification of shunts or anomalous pulmonary veins, and during de-airing and weaning from cardiopulmonary bypass. Evaluation of the device post-implantation is important, however, has significant limitations in visualization due to artifacts from the prosthetic valves, the metal interface plate, and the plastic housing in which the device lives. While TTE can be helpful to estimate filling pressure (Figure 7), monitoring becomes vitally important in the post-procedure monitoring of the patient. The pressure monitoring allows the clinician to have a peek of what is happening within the device, similar to the role that echocardiography usually serves to us. Perhaps further iterations of the device will have more echocardiographic-friendly materials, and the echocardiographic limitations that we have with the current device will be addressed, or perhaps as these devices become more widespread, we will learn new tricks to image them.

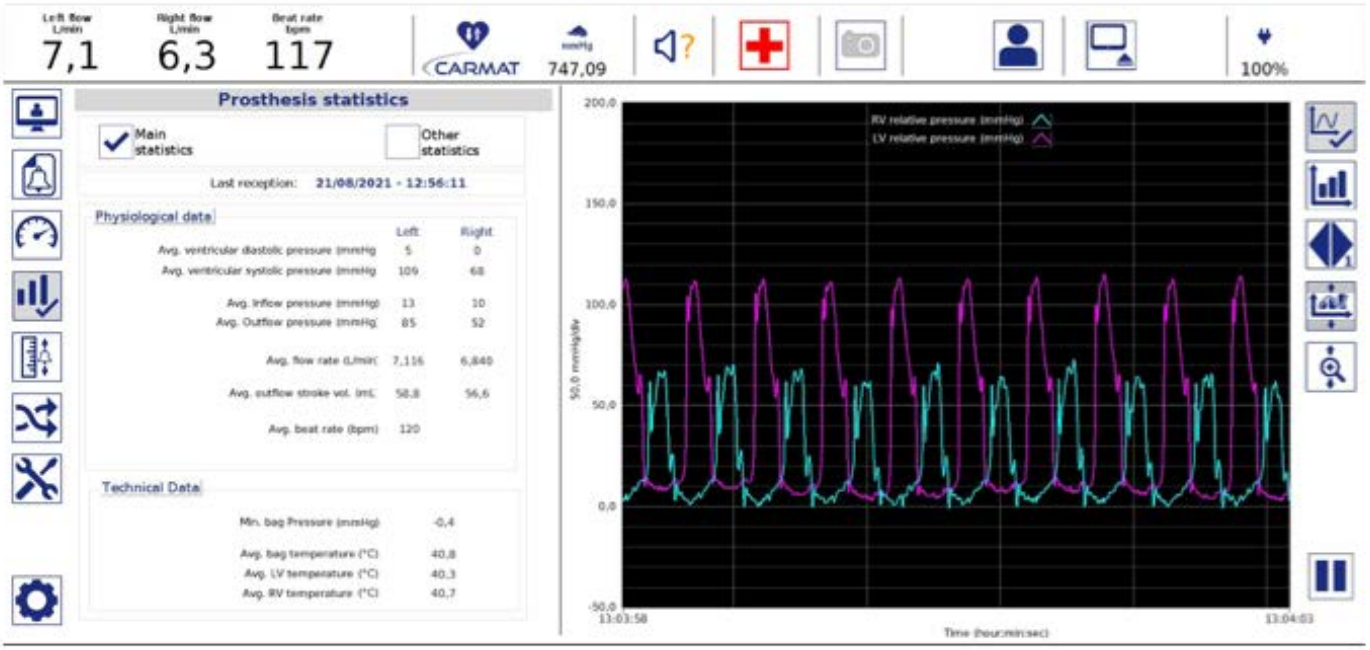

FIGURE 6: CARMAT CONSOLE DISPLAY WITH AVERAGES OF FLOW AND PRESSURE (LEFT PANEL) AND REAL-TIME LEFT VENTRICULAR (PURPLE) AND RIGHT VENTRICULAR (TURQUOISE) PRESSURE CURVES (RIGHT PANEL)

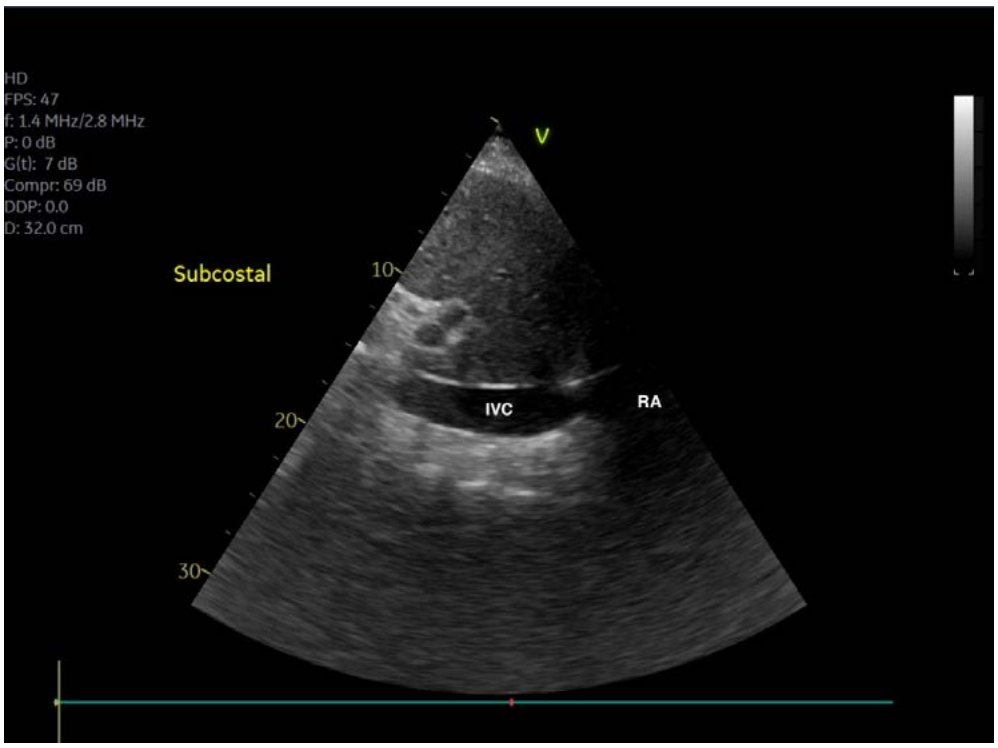

FIGURE 7: TRANSTHORACIC SUBCOSTAL INFERIOR VENA CAVA LONG-AXIS VIEW. SUBCOSTAL VIEWS CAN ALLOW FOR VISUALIZATION OF THE INFERIOR VENA CAVA, PORTAL VEIN, AND HEPATIC VEINS, TO ESTIMATE VOLUME STATUS AND FILLING OF THE CARMAT DEVICE.

WASE COVID UPDATE:

INITIAL ANALYSIS, CLINICAL FOLLOW-UP, AND NOVEL USES OF ARTIFICIAL INTELLIGENCE IN PREDICTION OF DEATH

CONTRIBUTED BY: ILYA KARAGODIN, MD, CARDIOLOGIST, NORTHSHORE UNIVERSITY HEALTHSYSTEM, EVANSTON, IL; ROBERTO M. LANG, MD, FACC, FASE, A. J. CARLSON PROFESSOR OF MEDICINE AND DIRECTOR, CARDIAC NONINVASIVE IMAGING LABORATORIES, UNIVERSITY OF CHICAGO, CHICAGO, IL; AND FEDERICO M. ASCH, MD, FACC, FASE, DIRECTOR OF THE ECHOCARDIOGRAPHY CORE LAB, MEDSTAR HEALTH RESEARCH INSTITUTE AND PROFESSOR OF MEDICINE (CARDIOLOGY), GEORGETOWN UNIVERSITY, WASHINGTON, DC

Over the past 18 months, as the COVID-19 pandemic has continued to ravage the globe, the World Alliance Societies of Echocardiography (WASE) COVID-19 investigators have continued their important work to identify both short- and long-term echocardiographic manifestations of the disease, as well as to determine which clinical and echocardiographic markers are most predictive of all-cause mortality.

To answer these questions, principal investigators Drs. Federico M. Asch and Roberto M. Lang, leaned on American Society of Echocardiography (ASE) International Alliance Partners and friends, including study centers from the United States, Mexico, Brazil, China, Philippines, Iran, Italy, France, and the United Kingdom, many of which also participated in the original WASE Normal Values study.

The results of the original WASE COVID-19 investigation were published in the *Journal of the American Society of Echocardiography* (JASE) in August 2021 in an article titled "Echocardiographic Correlates of In-Hospital Death in Patients with Acute COVID-19 Infection: The World Alliance Societies of Echocardiography (WASE-COVID) Study."[1]

This initial study included patients admitted with acute COVID-19 infection who underwent echocardiograms during their initial hospitalization between March and September 2020. WASE investigators found that significant regional differences existed in terms of echocardiographic parameters, with the best left ventricular and right ventricular functional parameters observed in Asia, followed in worsening order by Europe, Latin America, and the United States. Overall, in-hospital mortality was 22%, with age, previous lung disease, lactic dehydrogenase, left ventricular longitudinal strain (LVLS), and right ventricular free wall strain (RVFWS) found to be independently associated with mortality.

All of the echocardiograms in the WASE COVID-19 study were analyzed both manually by expert echocardiographers as well as using a novel, machine-learning based algorithm (EchoGoCore, Ultromics, United Kingdom) in order to quantify left and right ventricular size, function, and longitudinal strain. By analyzing each echo in multiple occasions, the AI-based method proved to have significantly better reproducibility than the traditional manual measurements. Interestingly, as a result of the improved reproducibility, left ventricular ejection fraction (LVEF) and LVLS were found to be independently predictive of all-cause mortality when measured by AI, but not when measured by manual methods. This was the topic of a late-breaking clinical trial presented by Dr. Asch at the American College of Cardiology 70th Annual Scientific Session in May 2021. These novel findings have been submitted for publication and are currently under review.

Following the initial report in JASE, WASE COVID-19 investigators have continued to follow their original patient cohort with follow-up echocardiograms over a nine-month period to determine whether cardiac structural and functional changes occur over time. The WASE COVID-19 follow-up study has now been completed and the results of this investigation have been accepted for publication in JASE.

The WASE COVID-19 project is being funded by the ASE Foundation and supported by industry partners Ultromics, a United Kingdom-based data analytics company, and TOMTEC Imaging systems. What makes this ASE-supported study unique is the power of collaboration of multiple stake-holders in our ultrasound community (professional societies, scientists, industry, and engineers) to answer relevant clinical questions at a time of unprecedented urgency in the midst of an ongoing global pandemic.

Throughout 2020-2021, ASE has made it a priority to focus on the health and safety of our patients, sonographers, and practices worldwide. Now, more than a year and a half into the pandemic, we have seen the emergence of novel viral variants in the face of a massive global vaccination effort. As the needs of the global ultrasound community continue to evolve, ASE, the WASE investigators, and other leading members of the international ultrasound community will continue to work together in order to answer the most pressing clinical questions relevant to patients and ultrasound professionals worldwide.

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1. Karagodin I, Singulane CC, Woodward GM, Xie M, Tucay E, Rodrigues A, et al. Echocardiographic Correlates of In-Hospital Death in Patients with Acute COVID-19 Infection: The World Alliance Societies of Echocardiography (WASE-COVID) Study. *J Am Soc Echocardiogr 2021* ; 34:819-30.

Becoming A Fellow of ASE

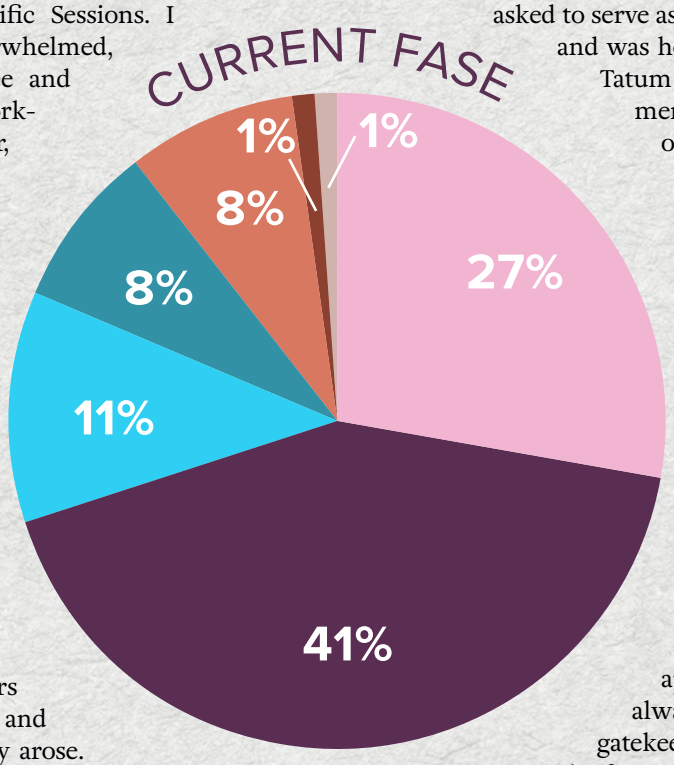
You Can Do It Too!

FASE Fellow of American Society of Echocardiography

Contributed by: Jennifer A. Warmsbecker, RDCS, BS, FASE, Clinical Sonographer, Assistant Supervisor of the Echo Core Lab, Cardiovascular Ultrasound Imaging and Hemodynamic Laboratory, Mayo Clinic, Rochester, MN

When I started my first job as a sonographer, I could only imagine and hope that I would have a long and rewarding career. Fast forward 20 years, and I can honestly say one of the highlights of my career thus far was being asked to be the first sonographer Chair of the FASE Training and Certification Advisory Committee. I feel honored and humbled to be in this position. So how did I get here? ASE has become an important and rewarding part of my career. My first conference was the 2004 ASE Scientific Sessions. I was amazed and a bit overwhelmed, there was so much to see and learn. One of my co-workers was a speaker that year, and I noticed she had the FASE designation on her name badge. I asked her what that meant. She explained that the FASE designation, which is an acronym for Fellow of the American Society of Echocardiography, recognizes dedicated ASE members who have an extraordinary commitment to the field of cardiovascular ultrasound. I wanted to mentor other sonographers and participate in research and volunteer if the opportunity arose. I also wanted to speak at conferences and meet other sonographers and physicians from around the country and world, so I decided working towards gaining my FASE designation would help me achieve those goals. It took a few years to complete the criteria for FASE, and I was very excited when I received my designation.

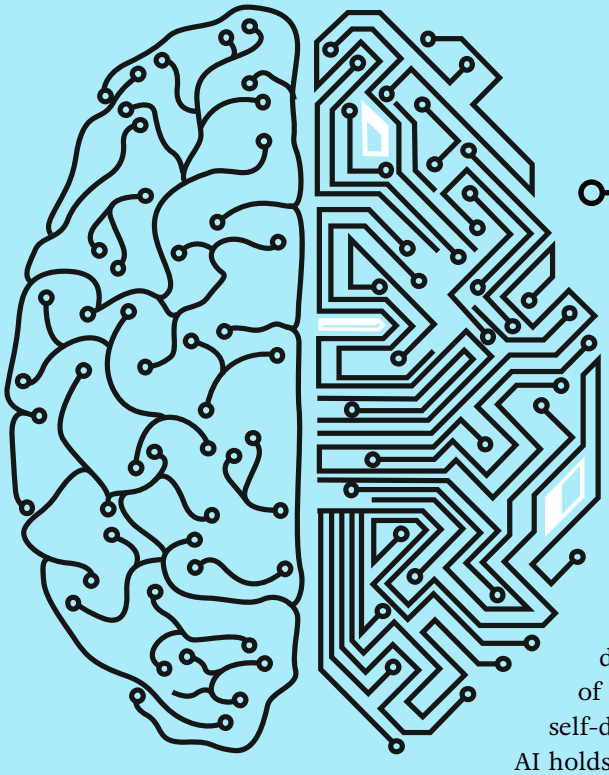
I have enjoyed ASE immensely, and the designation of FASE has greatly enhanced my experience within the organization. While it is not a requirement to have your FASE designation, ASE committees look at FASE status when selecting committee members. I first served on the Education Committee for two years before moving to the FASE Training and Certification Advisory Committee. I have had the amazing opportunity to speak at ASE Scientific Sessions. Another highlight of the Scientific Sessions is the opportunity to network with others during "Face to FASE" meetings in the ASE exhibit booth during the breaks. This gives prospective FASE applicants an opportunity to ask questions regarding the FASE criteria or process. I was later asked to serve as Co-Chair of the FASE committee and was honored to serve with Dr. Gregory Tatum as Chair. He was a wonderful mentor, and I am grateful for the opportunity I have had to serve with him. During this time, we hosted a webinar on "How to Become FASE," which is also available now on the ASE YouTube channel (YouTube.com/ASE360).



The motto for FASE is "Your Performance Stands Out and So Should You." Approximately 27% of FASE members are U.S. sonographers. If you want to stand out, and have not applied for your FASE credential, I hope you will consider applying now. Dr. Jamil Tajik always said "Sonographers are the gatekeepers of quality" (CASE Editor-in-Chief, Vincent Sorrell, MD, FASE, also noted this in his article in this magazine on page 27), and your commitment, compassion, and drive to always put the needs of the patient first deserves recognition.

Learn more about becoming a FASE at: ASEcho.org/FASE

BUILDING INTELLIGENT ECHOCARDIOGRAPHY WITH ARTIFICIAL INTELLIGENCE



Contributed by: Geoffrey H. Tison, MD, MPH, Cardiologist and Assistant Professor of Medicine, University of California, San Francisco, San Francisco, CA and Theodore P. Abraham, MD, FACC, FASE, Director, UCSF Adult Cardiac Echocardiography Lab, Co-Director UCSF's Hypertrophic Cardiomyopathy Program, and Professor of Medicine, University of California, San Francisco, San Francisco, CA

Recent advances in computing power and algorithmic development have renewed excitement in the field of Artificial Intelligence or "AI." While AI is an often loosely-used term, it generally refers to algorithms that identify patterns and learn from the data they are given. These algorithms have had a disproportionate, if often behind the scenes, impact in many aspects of our current daily lives, from internet search to voice commands to self-driving functionality. In medicine, and specifically in echocardiography, AI holds substantial potential given the richness of information contained in echocardiography and the image-based nature of echo data.

ASE, as well as various researchers around the world, has recognized this potential, which has driven a recent flurry of productivity at the intersection of echo and AI research. The field as a whole stands to benefit from collaborative cross-institutional efforts to combine data and expertise to bring added value to echocardiographic acquisition and interpretation.

The combination of AI and echo holds particular promise since many of the most substantial recent advances in AI derive from a sub-field of AI called "computer vision," which describes building algorithms that can interpret images and videos. Raw echocardiographic information is primarily contained in its series of complementary images and videos. Thus, echo is well positioned to benefit from many of these existing advances in AI/computer vision. The AI advances that have enabled classifying a photo as being either of a dog or cat can be altered and applied to interpret raw echo images or videos to make diagnoses, similar to how echocardiographers would interpret an echo video for a diagnosis. Since echo information is so highly enriched, containing information from anatomic structure to cardiac motion to hemodynamics, AI is better suited than any prior algorithmic approach to integrate conclusions across these various interrelated diagnostic domains. Even the unique challenges posed by echo, such as the high degree of skill required to obtain a diagnostic-quality transthoracic study, offers opportunities for AI-driven improvements to increase efficiency and streamline workflows. For example, AI may assist by guiding less experienced sonographers to obtain optimal images or by prioritizing (or deprioritizing) additional subsequent views based on automated analysis of views already acquired.

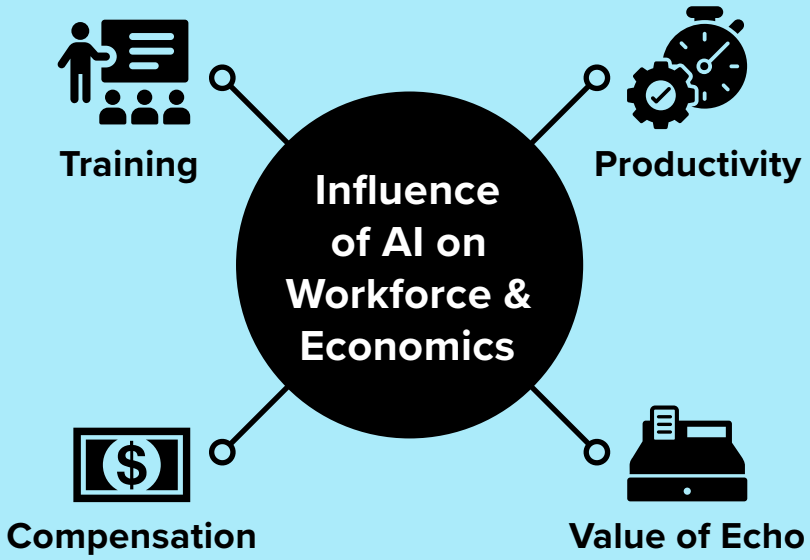


Figure 1: Sample topic being examined by the ASE – AI Task Force

Beyond just a theoretical benefit, exciting recent progress has been made in specific aspects of the echo workflow using AI, though much work remains to be done *(See block on page 22 for more information)*. Earlier progress tackled some of the problems which are critical to developing a computer algorithm that can analyze real-world (i.e., not hand-picked) raw echo data, such as identifying what echo view is being visualized or measuring chamber sizes from certain views (PMID 30354459, 30828647). AI has been applied to identify certain diseases from raw echos such as hypertrophic cardiomyopathy or cardiac amyloid (PMID 30354459, 33976142). More recently, investigators have taken advantage of the full echo video, rather than selected frames from one cardiac cycle, to more accurately calculate measurements such as ejection fraction that occur repeatedly over the duration of a video (PMID 32269341). AI has also been applied successfully to assist the acquisition of echos by less experienced operators (PMID 32269341). While exciting, these recent advances truly represent just the tip of the iceberg for the potential of AI and echo, establishing an important foundation for some of the most clinically relevant work that is yet to come. Such future work must build upon this proof-of-concept foundation to systematically tackle the many critical clinical functions echo serves while integrating into existing workflows. And because of the close interplay between the manufacturers of echo hardware and clinical care, such AI-solutions must be integrated with existing and future echo hardware in order to have clinical impact.

Understanding the critical importance of this topic, ASE Past President Judy Hung, MD, FASE, constituted an ASE Task Force to better understand the scope and implication of AI in echocardiography. This group includes the two authors of this article and industry partners (Ultromics, Caption Health, GE Healthcare, TOMTEC/Philips Healthcare and EchoNous), and is coordinated by Sarah Beth Bdoyan, MSPH, from the ASE staff. This AI Task Force has been meeting regularly for a year and seeks to understand and recommend possible directions for ASE to consider with regards to AI in echocardiography. After the initial meetings of this group, the following key objectives have emerged:

1. **How can ASE help its community understand AI and its implications for echocardiography?**
2. **How can ASE provide scientific and professional leadership with regards to the incorporation of AI into echocardiography?**

With these objectives in mind the group has come up with the following immediate proposals:

1. **Develop a "position document" that enumerates and describes the topics of interest within the context of AI in echocardiography.**
2. **Develop an AI-centric image database that will enable scientific and technological progress in the use of AI in echocardiography.**

For the position document, the topics this group plans to cover include:

- What are the clinical pitfalls in echocardiography that are ripe for AI intervention?
- What are the basic concepts and important AI methodologies that will be used to solve problems in echocardiography?
- What is the value proposition for the use of AI in echocardiography; will AI attempt to improve workflow, automatic measurements, diagnostic efficacy and provide prognostic information?
- What system enhancements do we need to enable the full use of AI and echocardiography – for example, image labeling, hardware and software, systems and methodologies for transfer and data storage?
- What about facile de-identification engines that will enable AI-based research?
- Where is AI being used currently in echocardiography? For instance, image classification, automatic measurements, enabling advanced methodology such as 3-D/4D, strain, and other parametric imaging?
- What are some of the barriers to leveraging AI to its fullest advantage in echocardiography?
- How can AI be used to improve all aspects of echocardiography being performed by the non-sonographer/non-cardiologist including but not limited to acquisition and diagnostics?
- How can we best leverage AI to drive the next generation of echocardiography research?
- How do we envision the practice of echocardiography in an AI-enabled environment?
- Lastly, what are the implications of AI in workforce development and the future economics of echocardiography practice; specifically, how does AI impact sonographer and physician training in echocardiography, will AI use in echocardiography impact productivity benchmarks, will there be an impact on sonographer and physician compensation, and furthermore, will it impact the value of echocardiography?

Another significant portion of our discussion is being dedicated to the planning and implementation of an AI-friendly database that will include raw images, both retrospective and prospective.

The goal of this group is to continue discussions over the next six to nine months, to present and receive feedback on these ideas from the ASE community and our industry partners at regular intervals, and hopefully publish our position statement within the next nine to twelve months.

We look forward to engaging with you all as we continue to tackle this exciting endeavor on a topic that we strongly believe will influence the future practice of echocardiography.

AI Forum: Echo Lab Workflow of the Future

MARCH 25, 2022
NEW YORK, NEW YORK

Chair: Theodore Abraham, MD, FASE

Bringing the field together to discuss the future of AI in the Echo Lab

For more information, contact MMorovati@ASEcho.org

New Developments for Quality Improvement in Cardiovascular Imaging

Contributed by: Sarah Beth Bdoyan, MSPH, CPHQ, ASE's Director of Research and Quality

ASE is proud to share that its innovative clinical data registry, ImageGuideEcho™, has recently achieved several noteworthy milestones that directly impact physicians' ability to adhere to best care practices and standards within the field of echocardiography.

First, the Registry has grown exponentially, with several large echo labs in the process of transferring their data by the end of 2021. The rapid acceleration of the data contained within the Registry serves to provide the field with clinical insights into guideline adherence, to identify quality improvement needs, and to ultimately improve patient care outcomes. ASE looks forward to ongoing increases in both institutional enrollment and echo data contained in its Registry, quickly growing to be the largest repository of cardiovascular ultrasound data and images.

Secondly, ASE has continued to advance in its offerings to Pediatric Echocardiography through the creation of three additional registry modules focused on pediatrics: Normal Anatomy/ Cardio-Oncology, Tetralogy of Fallot, and Hypoplastic Left Heart Syndrome. With more disease states to follow, the Society looks forward to serving as a multi-institutional collaborative to positively impact pediatric patient care.

Finally, ASE has partnered with the Intersocietal Accreditation Commission (IAC), a CMS-approved accrediting body, to connect its Registry to echo lab accreditation. Facilities or physicians participating in ASE's ImageGuideEcho Registry are now able to view accreditation specific data within the Registry interface, reduce data entry redundancy, and streamline their regular accreditation application process by uploading the Registry's QI documentation to report completeness and timeliness. All metrics are calculated automatically from data seamlessly extracted from institutions, which has created a process with minimal impact on clinical workflow – a key component of the Registry's growth and ASE's successful partnership with IAC.

By leveraging these new developments for the benefit of the field of cardiology and the specialty of cardiovascular imaging, ASE looks forward to being at the forefront of patient care innovation and physician practice improvements.

Have questions about how your institution can participate in ImageGuideEcho?

The Premier Cardiovascular Ultrasound Imaging Registry

Email Info@ImageGuideEcho.org, and ASE staff will set up a call with you to share more.

ASE FOUNDATION AND THE INDIA COVID CRISIS:
MAKING A WORLD OF DIFFERENCE

Contributed by: Madhav Swaminathan, MD, MMCi, FASE, Vice Chair for Faculty Development, Duke Anesthesiology, Duke University Health System, and Professor of Anesthesiology, Duke University School of Medicine, Durham, NC

"FIVE IS TODAY'S NUMBER," he told me. "What's that?" I asked. "The number of people I personally know who died today." My childhood friend, who is a cardiologist in New Delhi, was dejected and depressed when I discussed the COVID crisis that was unfolding in India in April 2021. And his wasn't even the only story that carried the weight of helplessness. Information about the catastrophic impact of the 'third wave' of COVID-19 in India kept coming in its own waves over the news, social media, and group messaging apps. We shared the feeling of helplessness with other healthcare colleagues throughout the United States using the same information channels.

Hundreds of boxes of supplies were prepared at Duke for shipment to India.

I found out that we all felt the same because every day we received distressing information from India about someone close who was either ill, hospitalized, or had perished due to COVID.

With the help of a few physicians at Duke University, we began exploring options to help those on the ground in India. There were several options available. One way was to financially assist humanitarian relief agencies. Another was to send medical relief supplies to healthcare organizations in India. A potentially more impactful way was to advocate for COVID relief in India with local or national legislators to enable international aid. Each of these involved a different level of personal effort and corresponding impact.

Sending money is often the easiest way to help. The challenge is how to ensure your money gets to those for whom you intend it. Should you give to a local charity that operates in India? An Indian charity that accepts international donations? How do you determine authenticity? When I spoke with my colleagues and friends in New Delhi, it became clear that hospitals and charities alike were struggling under the crushing burden of the explosive COVID surge. Locally, a group of us felt that perhaps organizing medical supplies for hospitals and personal protective equipment (PPE) for charities was an effort that we could manage. After all, the doctors had access to unneeded medical surplus, and PPE was freely and abundantly available in local stores. Little did we know what would follow...

Supplies being delivered in India.

I sent an email to my department members and friends in the local community informing them about the terrible surge in India, the need for help, and the effort that we were organizing. I also let them know how they could help – with donations of money towards shipping expenses, PPE supplies, and direct donations to certified charities in the U.S. with relief operations in India. There was an overwhelming response in each of these categories. However, there were still some issues to consider – who would we send the donations to, and how would they be using them? Through local contacts in India, we identified two local hospitals and one charity that were organizing care for the community.

News quickly reached Duke leadership who offered all the help we needed with surplus equipment that was earmarked for disposal (since supply was way above anticipated need). Volunteers were mobilized to assist with packaging and shipping. Some kept an inventory while others assisted with ensuring that all local, state, and federal guidelines were followed in sending medical supplies to India. Help also came from a familiar source – the ASE Foundation (ASEF).

Early on in this effort, I contacted the then ASE president, Dr. Judy Hung, ASE's CEO, Robin Wiegerink, and ASEF Chair, Dr. Vera Rigolin, for their thoughts on how ASE could lend a helping hand. ASEF immediately pledged a contribution and sent a call for donations to ASE membership for the India COVID relief effort. There was a heartwarming response from generous ASE members who collectively donated over $15,000 towards this relief effort. However, there was still the issue of shipping logistics.

I had never sent a shipment of aid anywhere, but people helped with contacting leaders in FedEx, who patiently walked me through how to organize a "commercial" shipment. We all spent innumerable hours navigating the complex world of international shipping and customs and excise rules in both countries. People also came forward with help in India once local beneficiaries of the aid were notified.

With the help of all our generous donors and volunteers, the first shipment left the U.S. on May 4, 2021. Three pallets containing more than 12,000 pieces of PPE and medical grade disposables arrived in New Delhi three days later. Oxygen masks, tubing, intubation equipment, stethoscopes, CPAP and BiPAP masks, isolation gowns, hoods, facemasks, and disposable gloves were distributed to healthcare and community workers soon thereafter. News of this effort spread quickly across the ASE and local communities. Offers of more support poured in, and we decided to organize a second shipment.

We identified two more local hospitals in New Delhi and an additional charity doing work in disadvantaged communities. Armed with "inside" knowledge of the process from the first shipment, the second promised to be a smoother experience, and it was. This time I was convinced that if we started down the path of help, partners would naturally emerge to fortify the effort. There was even more help from

institutional and community leaders, and of course, ASEF volunteers, and approximately two weeks later, we organized a second shipment of four pallets of even more equipment, including portable ventilators, resuscitation equipment, oxygen delivery supplies, and additional PPE. Soon thereafter, we received word of the supplies being used for the people they were intended for in the local hospitals.

A few valuable lessons emerged from this experience. (1) "Initiative is doing the right thing without being told."[1] Once we started down the path of organizing help, we realized that there were so many people willing to help, but were waiting to be shown a legitimate path they could walk on. (2) "Even a journey of a thousand miles begins with a single step."[2] Many donors felt that their donations were too small to make a difference. I spent considerable time explaining that whether it was time, money, or supplies, even a small amount made a big difference. Finally, (3) "The best way to get something done is to simply begin."[3] The task seemed daunting in the beginning, and life may have been easier without this project, but perhaps less fulfilling. The end result, however, of being part of ASEF and a caring global community made the effort worthwhile.

While our effort may have just been one step in a much longer journey, it was an important one. My cardiologist friend never repeated a number again in our conversations, and I hope that our effort contributed in some way to a positive outcome in a global effort to combat a pandemic. I think with ASEF, we made a world of a difference.

Supplies stacked up to be distributed in India.

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1. *Elbert Hubbard's Book of Initiative*, The Alongquin Publishing Co., 1936
2. Chinese proverb
3. Unknown attribution

Each box included a sheet noting the contents for easy distribution.

Beauty is in the Eye of the Pro(be)holder

Contributed by: Vincent L. Sorrell, MD, FACP (honorary), FACC, FASE, FSCCT, FSMCR, Anthony N. DeMaria Professor of Medicine, Acting Chief, Division of Cardiovascular Medicine, Chair, Cardiovascular Imaging for the Cardiovascular Service Line, Program Director, Adult Cardiovascular Fellowship Program at the University of Kentucky, Gill Heart & Vascular Institute, Lexington, KY and CASE Editor-in-Chief @VLSorrellImages

n. Probe holder = sonographer; responsible for creating the beauty of echocardiography

adj. Pro beholder = professional member of the echo lab; knows quality when they see it

Acquiring / interpreting a *quality echocardiogram* and writing / reading a *well-written CASE report* have many similarities.

First, the study indication (or CASE title) is critically important and provides the initial thought-gathering necessary to focus your attention moving forward. A study ordered for aortic stenosis warrants a critical focus on acquiring the maximal LV to AO pressure gradients, and this should include a non-imaging PEDOF probe acquisition rarely necessary for other pathologies. The reader will undoubtedly spend extra time confirming the leaflet morphology and calculation of the confounding variables (e.g., reduced LV stroke volumes contributing to reduced gradients). Similarly, a clever title will alert the reader to the subsequent reading experience (e.g., What the EF is Going on Here?)

> **"sonographers understand the critical importance of structured imaging acquisition.**

Second, who can acquire a quality echocardiogram? Who can write a quality CASE report? I hope you are not surprised when I say that, in my opinion, anyone can. As demonstrated by the growing body of literature of quality echo reports from non-cardiovascular specialists, you do not need to be an expert Probe-holder. But if you are, then you are expertly positioned to find and submit an educational pearl to CASE.

Why is it that sonographers are so well-suited to create quality case reports? Because sonographers understand the critical importance of structured imaging acquisition. When it is structured, the interpreting physician is able to read the parasternal long-axis while anticipating the findings on the soon-to-follow short-axis; as you read the apical findings, you mentally store the data already obtained while preparing your mind for the subsequent subcostal and suprasternal images. As an echo reader, you immediately feel the negative impact of a non-structured study. It forces you to adjust how you read; how you interpret the *company it keeps*. Give an echo reader a change in the order of image acquisition, and you actually impact the quality of the final interpretation. This is very similar to the uncomfortable feeling achieved when reading a CASE report that is non-structured. As both an echo reader and a journal editor, I am fortunate that there is a *standard echo acquisition* just as there is a *standard CASE report profile*.

Third, sonographers are gifted at *image optimization and artifact reduction*. Early in your Probe-holder careers, frustration must certainly arise with acquiring these often-subtle image manipulations. With experience, apical artifacts that mimic thrombi and side-lobe artifacts eerily similar to aortic dissection flaps are resolved prior to storing and displaying the final study. The echo reader may be entirely unaware of the efforts you took to keep them from misinterpretation and potentially, reporting incorrect conclusions. Once again, direct comparisons to writing case reports can be made. The figures included in your CASE report require careful consideration before selection. It is only with experience, where practice counts, that the finally selected figures will tell the whole story without misleading the reader down an incorrect path toward a *misguided conclusion*. So, who better to find these high quality, excellent images that do not mislead than the Probe-holding sonographer? I don't believe anyone is.

[Shhhh... exciting developments are coming your way! You asked... and we listened. Be sure to check out the CASE Homepage frequently to be the first to learn about opportunities to contribute educational tidbits from your vast experiences. Keep a running collection of '*things you've learned*' that have made you a better sonographer and then submit to the *Sonographer Sound-Off*; or create a question and answer for the *What is this Image Quiz*; watch for other chances to send in your answers to questions with a chance to win ASE bling. I'm fairly certain you will learn something every time you *click the link above*. Spread the word – but only to those you care about.]

In the end, all echo studies require a summary that includes what you have found and combines that with your knowledge base to provide clinical meaning. In other words, you don't simply reiterate what the body of the report states (e.g., calcified aortic valve with mean gradient 25mmHg), but instead you provide your *overall summary* combining all of the data (e.g., low flow, low gradient, hemodynamically significant severe AS). As a CASE report reader (or writer), you also need to combine the bits of information provided to you with a *summary conclusion* that takes each of these bits into consideration to form meaning and without leaping to unfounded conclusions. As an Editor or a Peer-Reviewer, this is one of the most important tasks assigned to you – make certain the conclusions are justified and supported by the body of the report.

HERE'S MY FAMILY - APPROPRIATE GIVEN THE TITLE! (... AND YES, THE MUSTACHE IS REAL).

So why compare echo acquiring / echo reading to CASE report writing / CASE report reading? Because this is something we should all be able to do. We have been practicing for this for years and have the educational material right in front of us each day. At CASE, the Editorial team and I are here to assist you if this is your first attempt at writing. We have an outline to guide you and will provide feedback to assist you along this process. Reach out to your reader of the day when you find something unexpected. If you are fortunate to work with trainees or students, conspire to have them join you in this adventure. I have little doubt that you will be able to contribute to the global field of echocardiographic literature and will take pride in seeing your name alongside other members of your team... forever!

Remember, every echo you see today has a teaching point, and every teaching point may be the next CASE report.

JOIN ASE'S WOMEN IN ECHO GROUP

Contributed by: Ritu Thamman, MD, FASE, Assistant Clinical Professor of Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA

In early 2021, ASE created a Women in Echo community. If you are a woman physician, veterinarian, sonographer, fellow-in-training, nurse, rising star, student, practicing in the field of cardiovascular ultrasound, the Women in Echo community is for you. Men are also welcome to join to be allies and support their female colleagues.

Since 1975, ASE has had six female presidents. In addition to the ASE Presidency, women have served on the ASE Executive committee since 1991, when Oi Ling Kwan, BS, RDCS, FASE, served as the first female Secretary; she was also the first sonographer on the committee. In 2019, Dr. Carol Mitchell became the first sonographer to serve as Treasurer of ASE. Five women (soon to be six!) have served as ASE Scientific Sessions chairs: Drs. Pam Douglas, Linda Gillam, Vera Rigolin, Judy Hung, and Marielle Scherrer-Crosbie. Dr. Sharon Mulvagh will serve as the 2022 Scientific Sessions Chair. Women also play a significant part of the four ASE Council Steering Committees and Specialty Interest Groups.

The community on Connect@ASE provides you with a forum to collaborate with women of all specialty areas and backgrounds to address the issues that are most important to you. Network, share your ideas, find a mentor, develop your leadership skills, advance your career, and much more. The Women in Echo community will also be a place where we can advocate for the interests of female ASE members and encourage young women to pursue careers in cardiovascular ultrasound. To join the community on Connect@ASE, go to your ASE Member Portal and select Women in Echo in the Communities section of your profile.

In March of 2021, ASE held a webinar in honor of National Women's History Month. I led a conversation with Drs. Pamela Douglas (ASE's first female President), Judy Hung (ASE Immediate Past President), Madhav Swaminathan (ASE Past President), and Carol Mitchell (past ASE and ASEF Treasurer). The discussion celebrated echo's female leaders and how these innovative women have not only been instrumental in shaping the field of cardiovascular ultrasound, but also ASE and the ASE Foundation. Attendees garnered insights on career pathways and how your contributions can make a difference in the future too. If you missed this webinar, you can view it on ASE's YouTube channel at YouTube.com/ASE360. Be on the lookout for upcoming webinars for this community on money and career this fall.

Women in Echo Workgroup

- Ritu Thamman, MD, FASE - Chair
- Judy Hung, MD, FASE
- Julia Grapsa, PhD, FASE
- Abimbola Faloye, MD, FASE, FASA
- Denisa Muraru, MD, PhD, FESC, FACC, FASE
- Erin Michos, MD, MHS, FASE
- Colleen Harrington, MD, FASE
- Malissa Wood, MD, FASE
- Sheela Pai Cole, MD, FASE
- Nishath Quader, MD, FASE
- Karen Zimmerman, BS, ACS, RDCS (AE, PE), RVT, FASE
- Melissa Wasserman, RDCS, RCCS, FASE
- Purvi Parwani, MD
- Sharon McCartney, MD, FASE
- Renee Bullock-Palmer, MD, FASE
- Nadeen Faza, MD, FASE
- Natalya Read – Staff Liaison

Taking Steps Toward Leadership – You Have the Legs to Do It!

Contributed by: Ashlee Davis, BSMI, ACS, RDCS, FASE, Chief Technologist, Cardiac Diagnostic Unit, Duke University Hospital, Durham, NC, and Madhav Swaminathan, MD, FAHA, MMCi, FASE, Vice Chair for Faculty Development, Duke Anesthesiology, Duke University Health System, and Professor of Anesthesiology, Duke University School of Medicine, Durham, NC

"Great leaders don't set out to be a leader. They set out to make a difference. It's never about the role – it's about the goal." – Lisa Haisha

Leadership, whether it is in your own institution or the American Society of Echocardiography (ASE), can seem intimidating at first. Many people ask "Why me?" We would encourage those of you interested in pursuing leadership opportunities to flip that question. Instead of "Why me?" ask "Why NOT me?" Though our leadership experiences may be different, ranging from committees, writing groups, task forces, outreach events, all the way to ASE President, there is one commonality amongst those in leadership positions – their passion for echocardiography and ASE. If you have a passion for quality echocardiography, doing the best you can in your field of expertise, and encouraging others to do the same, you are already a leader. Let's make it official.

There are many ways to volunteer your time through ASE: committees, task forces, global outreach, writing groups, as well as serving on the Board of Directors and Council Steering Committees. If you are interested in growing your career and have the capacity to volunteer your time, we would encourage you to consider an ASE leadership position. The Call for Nominations is open every year from October 1 through November 30.

> ***"In the almost 20 years I have spent as an ASE member, I have come to realize the value of service to a professional community. While it may not have been clear at first, it certainly became obvious as I worked on many ASE committees, councils, and task forces over time."***
>
> ***– Madhav Swaminathan, MD, FAHA, MMCi, FASE***
> ***ASE Past President and Nominations Committee Chair***

Open positions change every year, but positions open for 2022-2023 term include:

ASE EXECUTIVE OFFICERS

- **VICE PRESIDENT:** One-year term with a ladder to the presidency. Nominations are open for all active members. Must be a role model for the quality, initiatives, and mission of ASE.
- **SECRETARY:** Position held for Sonographer members only. Must have FASE, has served/currently serving as Chair or Co-Chair of an ASE Committee or Council.
- **COUNCIL REPRESENTATIVE:** Nominations are open for all active members that have served on a Council Steering Committee.

ASE BOARD OF DIRECTORS

- **MEMBER AT LARGE:** Nominations are open for all active members who meet Board Criteria. Three positions available.
- **LEADERSHIP ACADEMY GRADUATE:** One-year term. Must be a graduate of ASE's Leadership Academy.
- **ASE COUNCIL STEERING COMMITTEE CHAIR:** Openings for Chair of the Council on Circulation and Vascular Ultrasound and Chair of the Council on Cardiovascular Sonography. (See below for Council Steering Committee positions.)

ASE FOUNDATION BOARD OF DIRECTORS

- **CHAIR OF THE ASE FOUNDATION:** Nominations are open for all active members.
- **GLOBAL REPRESENTATIVE:** Must be a member of ASE's International Alliance Program, preferably with ASE Foundation outreach experience.
- **MEMBER AT LARGE:** Must be actively involved with ASE by serving on committee/council/task force, etc.
- **PROFESSIONAL FUNDRAISER:** Must have employment experience with fundraising outside of ASE.

ASE COUNCIL STEERING COMMITTEES

Council on Cardiovascular Sonography

- **CHAIR-ELECT** Ladder position to Chair.
- **MEMBER AT LARGE** Three positions available.

Council on Perioperative Echocardiography

- **EDUCATION COMMITTEE REPRESENTATIVE**
- **GUIDELINE AND STANDARDS COMMITTEE REPRESENTATIVE**
- **MEMBER AT LARGE** Three positions available.

Council on Circulation and Vascular Ultrasound Steering Committee

- **CHAIR-ELECT** Ladder position to Chair.
- **EDUCATION COMMITTEE REPRESENTATIVE**
- **GUIDELINE AND STANDARDS COMMITTEE REPRESENTATIVE**
- **MEMBER AT LARGE** Two positions available.

Council on Pediatric and Congenital Heart Disease Steering Committee

- **MEMBER AT LARGE** Three positions available.

> ***"I have gained knowledge, skills, and most importantly relationships, that I would not otherwise have had the privilege of experiencing without my time volunteering in ASE."***
>
> *- Ashlee Davis, BSMI, ACS, RDCS, FASE*
> *ASE Nominations Committee Co-Chair*

Instructions for nominations can be found at ASEcho.org/Nomination-Instructions.

If these leadership opportunities sound exciting to you, but you have not yet had the opportunity to volunteer with ASE, committee participation is a great place to start! The call for Committee Volunteers opens in November with applications due early January every year. Committee participation is a simple, yet rewarding way to get more involved in the important work being done by our organization. Committees are responsible for advocacy, guideline writing, creating educational content, awards and recognition, and much, much more. To find out more information about ASE Committees, please visit ASEcho.org/Committees.

As Chair and Co-Chair of the Nominations Committee, we hope that you will sincerely consider volunteering your time and expertise in a leadership capacity with the ASE. It is our personal experience that each time we volunteer, we receive way more than we give.

Cheers to leading the future of ASE together!

To learn more about Dr. Swaminathan's experiences volunteering with ASE, please visit the President's blog September 2019 at ASEcho.org/Presidents-Blog/#september

Engage with ASE's Twitter Journal Club

An Exciting & Fun Way to Learn

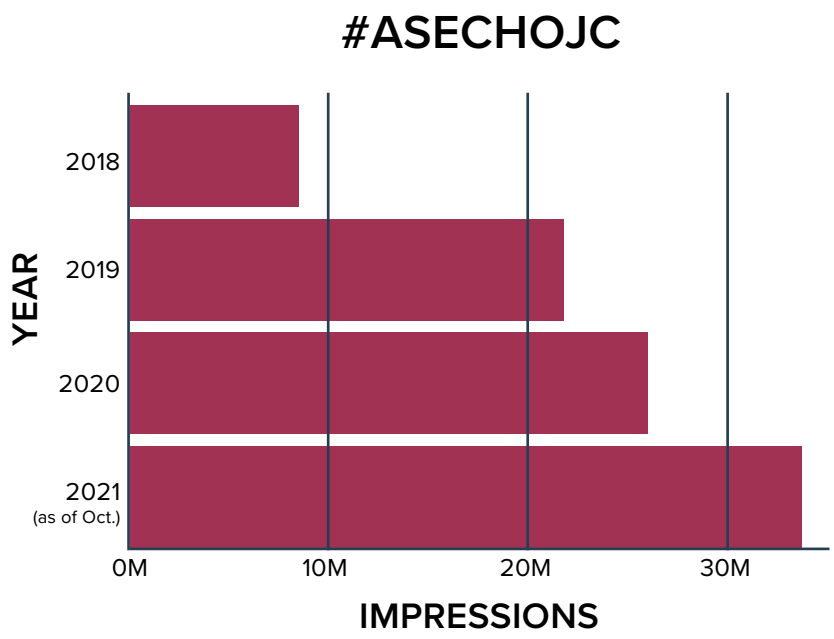
Contributed by: Ritu Thamman, MD, FACC, FASE, Assistant Clinical Professor of Medicine at the University of Pittsburgh School of Medicine, Pittsburgh, PA

Past President Madhav Swaminathan started the first #echofirst ASE Twitter Journal Club (TJC) in 2017, presented live to the ASE Board of Directors on November 17, 2017. The next year the TJC created its own hashtag ASEchoJC, and it started to gain traction. While not the first journal club on Twitter, #ASEchoJC was the first in cardiology.

The hashtag #ASEchoJC allows participants to read everyone else's comments on the discussion, regardless of whether one followed that individual on Twitter. This is the more modern version of the typical face-to-face journal club.

ASE first created a task force that was charged with developing a durable structure for the TJC. The task force chose the article to be discussed (usually from the *Journal of American Society of Echocardiography* and CASE, ASE's case reports journal), contacted the article authors, selected a moderator, and effectively scheduled and publicized the TJC. The task force also created a schedule of future TJCs and tracked engagement with the #EchoFirst community.

At the start of the live #ASEchoJC, the moderator introduces the article and the guest moderator, usually an author of the selected article. The moderator also reminds participants to use the #ASEchoJC in all tweets. Using the dedicated hashtag allows for identification of moderators' comments during and after the chat and contributes



to post-Twitter chat metrics. The moderator ensures a timely start and end of the Twitter chat, encourages participation by posing questions relating to the methodology or imaging, expands on replies from moderators to enhance the discussion, and invites comments from the authors who may provide further insight. The use of creative images and videos is key to enhance understanding and are often embedded in the tweet. Many tweets include the moderator offering a clarification of a participant's assertion and requesting references to back them up in the responses.

An author is usually on hand bringing their deep familiarity with the area being reviewed. This allows more nuanced observations and greater insights into the mechanisms and pathophysiology and stimulates a higher level of discussion. Prior to the start of the TJC, the moderator posts a summary of the article to be discussed with a series of linked tweets, also known as a "tweetorial." These tweets are enhanced with citations, videos, and images to create enthusiasm during the discussion hour. The tweetorial explains the chosen article(s) in-depth, highlighting several aspects that will be discussed further during the TJC to reinforce learning. In addition, this creates a resource that can be accessed before and after the TJC. These transcripts are available online at: ASEcho.org/TwitterJournalClub

In September 2019, a significant change was made when ASE introduced continuing medical education (CME) credit for the TJC. ASE is an ACCME accredited CME provider and the #ASEchoJC met their content specific requirements for live activities. The task of developing CME objectives and questions was assigned to the members of the task force. Participants are able to register in advance of the TJC and answer questions after the discussion to obtain CME credit. The ASE TJC is the first cardiology TJC to offer CME.

Over the past three years, ASE's TJC has continued to grow with both participants and impressions. In 2018, #ASEchoJC had 8.4 M impressions, and as of October 2021, #ASEchoJC now has 33.5 M impressions so far this year. One more TJC is scheduled for 2021 so be sure to join us on December 14 at 8:00 PM ET.

How does the Twitter Journal Club work?

Online Twitter Journal Clubs are a recent and popular innovation to highlight important articles or clinical dilemmas in echocardiography. Have your questions answered and share your knowledge by joining the discussion on Twitter. Download the Twitter app to your phone or computer. Create an account with Twitter by creating your own handle (@XXX) and follow @ASE360 and search for the Journal Club's hashtag, #ASEchoJC. We invite everyone to engage in the online forum. Please use the hashtag #ASEchoJC on your tweets to get recognized and join the discussion. If you are not able to attend in real time and have questions, please send them prior to the Journal Club and make sure you tag @ASE360 and use hashtag #ASEchoJC. Our goal is to get to all the questions during the TJC.

Follow @ASE360 and join us on Tuesday evenings at 8:00 PM ET for upcoming ASE Twitter Journal Clubs on December 14, 2021; February 1, 2022; March 29, 2022; and May 24, 2022.

ADVANCED CARDIOVASCULAR SONOGRAPHY

A REVIEW OF THE DEVELOPMENT OF THE PROFESSION

Contributed by: Michelle Bierig, PhD, ACS, RCS, RDCS, FASE, CoA-ACS Past Chair, Tulsa, OK; Joy Guthrie, PhD, ACS, RDMS, RDCS, RVT, FASE, CoA-ACS Chair, Community Regional Medical Center, Fresno, CA; Carol Mitchell, PhD, RDMS, RDCS, RVT, RT(R), ACS, FASE, Lead Author, "Advanced Cardiovascular Sonographer: A Proposal of the American Society of Echocardiography Advanced Practice Sonographer Task Force," ASE and CoA-ACS Past Treasurer, University of Wisconsin Hospital, Madison, WI; Matt Umland, ACS, RDCS, FASE, CoA-ACS Past Chair; ASE Executive Secretary, Aurora Health, Milwaukee, WI

ASE RESPONDS TO NEED FOR CAREER LADDER FOR CARDIOVASCULAR SONOGRAPHERS BY SPONSORING PROGRAMMATIC CURRICULUM ACCREDITATION

Data collected by the American Society of Echocardiography (ASE) Advanced Sonography Taskforce in the early 2000's, demonstrated a need for an educational pathway to recognize an advanced cardiovascular sonographer (ACS).

2007 NEEDS SURVEY

657 RESPONDENTS

94% indicated interest in acquiring information about an ACS Program

86% indicated interest in going back to school to become an ACS

At that time, many institutions recognized sonographers as entry level or senior sonographers. Promotion from entry level to senior sonographer was largely granted based on years of experience, maintaining active credentials, and completing required continuing medical education. Surveys demonstrated that many sonographers (approximately 20%) would leave the field if a career ladder was not implemented or opportunities to gain advanced skills for the profession were not developed.[1] In December 2009, a proposal for the ACS was published.[2] The proposal included a description of the advanced cardiovascular sonographer role, a professional educational pathway (to include required clinical experience and didactic knowledge with a suggested curriculum), and provided a mechanism for recognizing sonographers practicing with advanced clinical skills and knowledge.[2]

After the publication of the article, the next step was to go to the Commission on Accreditation for Allied Health Education Programs (CAAHEP) and request recognition of the ACS as a profession. ASE supported the proposal by financially sponsoring the creation of the Committee on Accreditation for Advanced Cardiovascular Sonography (CoA-ACS). The CoA-ACS was tasked with writing the educational standards and guidelines for the new profession. In 2012, CAAHEP endorsed the *Standards and Guidelines* allowing eligible programs to be recognized as accredited ACS programs by CAAHEP.

ASE became the initial organizational sponsor for CoA-ACS and has continually supported the ACS role and continuing education for sonographers.

CoA-ACS ROLE

The CoA-ACS Board of Directors is comprised of physicians, sonographers, and other stakeholders of the cardiovascular sonography community with varied backgrounds appointed by the sponsoring organizations. The CoA-ACS board performs the day-to-day work of reviewing program self-studies, and coordinates and participates in site visits. Based on information provided in the self-study and the site visit, CoA-ACS makes program accreditation recommendations to the CAAHEP Board of Directors. CAAHEP will then determine the accreditation action and is the accreditor of all CAAHEP-accredited ACS educational programs.

The ACS professional provides a unique and essential service beyond technical performance as they practice at a higher level in the echocardiography laboratory. The ACS integrates knowledge of clinical practice roles with education, research methodology, management, leadership, and consultation. Accredited ACS programs are graduating sonographers who possess advanced knowledge and skills. This is further validated by taking a board examination and earning the Advanced Cardiac Sonographer (ACS) credential. At this time, the registry examination for the ACS is offered by Cardiovascular Credentialing International (CCI).[3]

> ***"The rigorous ACS program has tremendously impacted my life personally and professionally. First and foremost, the program has improved my critical thinking skills and given me the knowledge to be a better sonographer for my patients. The program has also opened doors for my career that were not possible before; such as becoming the lead of an accredited cardiac lab, mentoring young sonographers, or potentially moving into a managerial role. Finally, along with opening career doors, the program has given me the ability to better provide for my family. My decision to go through the ACS program is one of the best I have made for my career, and something I would recommend to any sonographer looking for advancement in the field."***
>
> **Sarah L. Griffith, BS, RDCS(AE, PE), ACS, CRMC Graduate**

Some ACS programs are designed for students to continue working while enrolled in the ACS program. Currently there are two CAAHEP-accredited ACS programs.[4] ACS programs require didactic course work and completion of clinical education rotations/internships. Both accredited ACS programs have reached, or will reach, the five-year mark for continuing accreditation in 2021 and 2022.

Currently, the educational pathway and credential is limited to echocardiography. The CoA-ACS Board invites all ultrasound specialties to partner with the CoA-ACS to explore additional educational pathways in advanced sonography in other learning concentrations. SDMS currently partners with ASE on the COA-ACS organization, and we invite others to join us.

WHY ASE SUPPORTS ACS EDUCATION AND CREDENTIAL

Prior to development of the ACS, sonographers had limited opportunities for career advancement. Cardiac sonographers with advanced knowledge and skills were longing for an opportunity to function in a different role from that of the new graduate or senior sonographer. ASE listened to the needs of its members and supported the ACS role and an educational pathway to achieve their earned recognition.

ASE's mission is "To advance cardiovascular ultrasound and improve lives through excellence in education, research, innovation, advocacy, and service to the profession and the public." Supporting continuing education and the ACS professional pathway and credential is important in achieving this mission.

Patients will be better served by echocardiography labs using services of the ACS who has the education, training, and experience to review echocardiographic examinations and provide the most accurate cardiac diagnostic information for physicians to treat patients. Clinical practice will be enhanced by improvements to the quality of the examinations and by the availability of professionals who can assist with the teaching and incorporation of advancements in the field into daily practice.

Echocardiography is a team profession requiring collaboration between the sonographer and physician. An ACS facilitates this collaboration by being able to assist sonographers with tailoring the exam to answer the clinical question and reviewing image quality prior to release of the patient. A sonographer with the ACS credential can also acquire additional images or teach sonographers how to use advanced technology to ensure clinical questions are answered. ASE supports the ACS role because of its contribution to improved patient care and exam quality, and because it can also serve as a means for sonographer advancement thereby helping to retain key employees.

For more information about CoA-ASC, please contact COAACS@gmail.com.

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In Memoriam

"It is not length of life,
but depth of life."

Ralph Waldo Emerson

We will remember and miss these ASE members who passed away in the last year.

Marvin Berger, MD

David Hull

Itzhak Kronzon, MD, FASE - *The Passing of a Giant*

Martha Lange, RDCS

Jaclyn Polette

Nathaniel Reichek, MD

Roberto Ruiz, MD

ECHO

ASE'S MISSION

To advance cardiovascular ultrasound and improve lives through excellence in education, research, innovation, advocacy, and service to the profession and the public.

Renew for 2022 today

at ASEcho.org/Renew

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