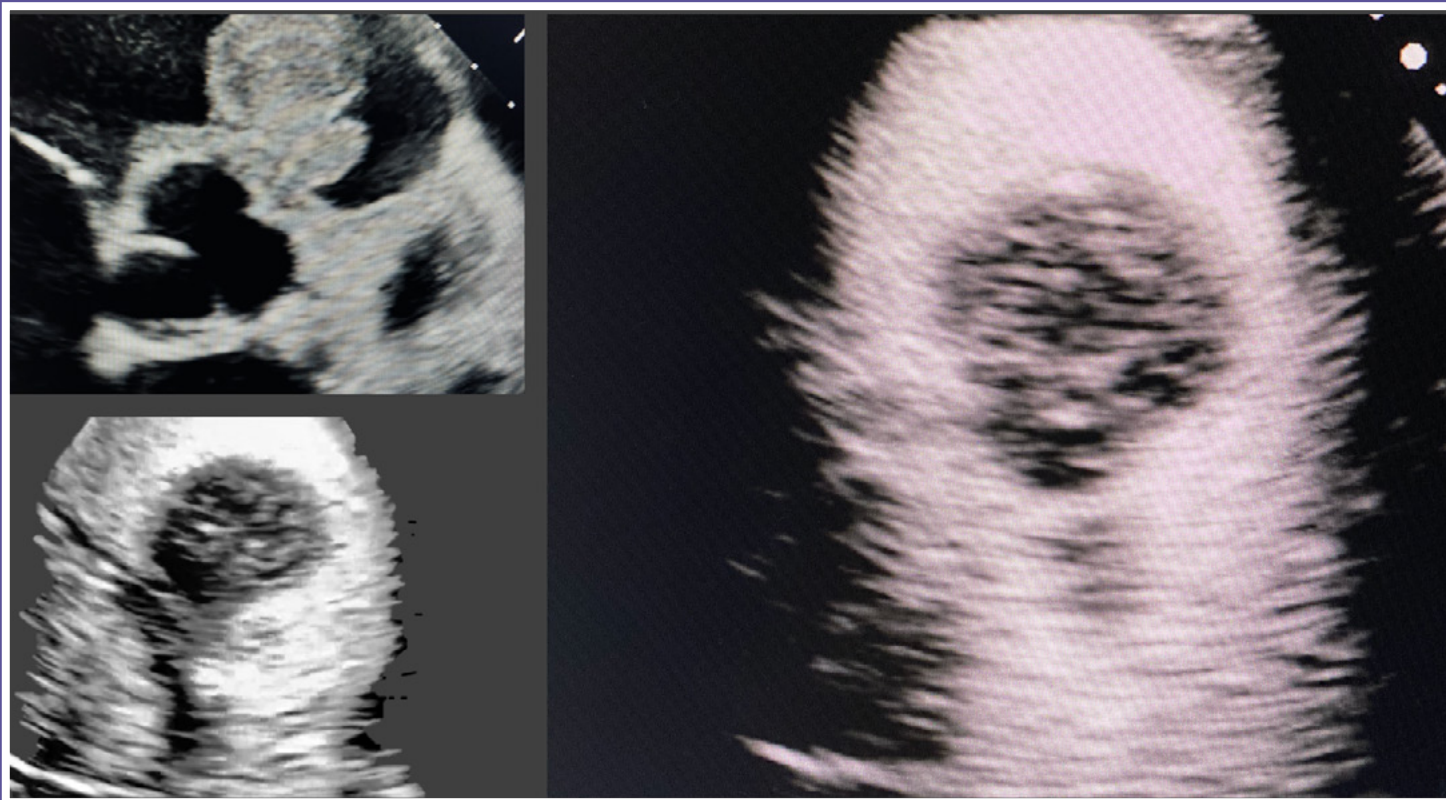


ECHO



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2023-2024 EDUCATION CALENDAR

CONTENT AVAILABLE NOW

[Advanced Echo: Echo Access Online Course](#)

Featuring the best content from Echo Hawaii and State-of-the-Art Echocardiography

Jointly provided by ASE and the ASE Foundation

[Registered Physician in Vascular Interpretation \(RPVI\) Online Review Course](#)

An overview of all vascular imaging modalities for board review, introductory learning, or as a review for experienced imaging readers

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

[Hoag 37th Advanced Echo Symposium](#)

October 20-21, 2023

Provided by Hoag Memorial Hospital Presbyterian
in cooperation with ASE

NOVEMBER

[Critical Care Echocardiography Review Course](#)

November 14-16, 2023

*OLC Education & Conference
Center, Rosemont, IL*

Held in Partnership with SCCM and ASE

JANUARY 2024

[33rd Annual Echo Hawaii](#)

January 15-19, 2024

*Fairmont Orchid, Kohala Coast
Big Island, HI.*

Jointly provided by ASE and the ASE Foundation

FEBRUARY 2024

[36th Annual State-of-the-Art Echocardiography](#)

February 16-19, 2024

*Westin Kierland Resort & Spa
Scottsdale, AZ.*

Jointly provided by ASE and the ASE Foundation

JUNE 2024

SAVE THE DATE:

[35th Annual Scientific Sessions](#)

June 14-16, 2024

*Oregon Convention Center
Portland, OR*

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 October JASE.
OnlineJASE.com*

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Clinicians Weigh in on New
Data, Trends, Challenges,
and Advancements in
HCM Management



AMERICAN SOCIETY OF ECHOCARDIOGRAPHY

Meridian Corporate Center
2530 Meridian Parkway, Suite 450
Durham, NC 27713

ASEcho.org | ASEFoundation.org

Phone: 919-861-5574

Email: ASE@ASEcho.org

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Cover art: "Alien Portal RVOT Mass" Clara
I. Angulo, ACS, MBA, FASE, and Melanie
Martinez, RDCS, Houston Methodist Hospital,
Houston, Texas

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.

ORGANIZATIONAL CORE VALUES: THE ASE CARES PERSPECTIVE

Contributed by **Benjamin W. Eidem, MD, FASE**, Director of Pediatric and Congenital Echocardiography, Mayo Clinic and Professor of Pediatrics and Medicine at Mayo Clinic College of Medicine, Departments of Pediatrics and Cardiology, Rochester, MN, and **Madhav Swaminathan, MD, MMCI, FASE**, ASE Past President, Cardiac Anesthesiologist and Intensivist, Duke Health and Professor and Vice Chair for Faculty Affairs in the Department of Anesthesiology, Duke University School of Medicine in Durham, North Carolina.

“

Caring is not just a personal virtue, but a powerful force that could shape an entire organization.

A

s I articulated in my previous JASE President's Message, our core values are the foundation of our Society. Last month, I highlighted diversity as one of ASE's important core values. This month, I would like to highlight another of our core values – ASE Cares. This core value was originally championed during the ASE presidency of Madhav Swaminathan, MD, MMCI, FASE, and I have asked him to give us an update of this core value in action.

“People do not care how much you know until they know how much you care.”

–Theodore Roosevelt

In early 2019, burnout among healthcare workers was attracting the attention of institutional leaders. Well-being and resilience were widely discussed, and many organizations were acknowledging burnout as an existential threat. Leaders struggled not only to understand its etiology, but also what actions we could take to address burnout. We approached this problem using the traditional model of diagnosing and treating the illness. It had been our mantra for centuries. But this time, it was different. We were the ones who were “ill.” Burnout is a personal experience, and well-being is strongly influenced by those around us. As a member-based organization, ASE recognized the need for a purposeful pivot. Could we see it differently? Could we tackle it differently?

ASE has consistently prioritized its mission to educate, inform, and advocate for our members. With burnout posing a threat to any progress we made as a Society, ASE quickly recognized that well-being was the glue for our culture that would keep us together and help us thrive in this challenging environment. Caring is not just a personal virtue, but a powerful force that could shape an entire organization. That became the foundation for the ASE Cares campaign in 2019.

We aimed to create a sense of belonging within ASE and brainstormed ways we could make our members feel more valued. Perhaps belonging can be best defined as being missed when you are absent. How could ASE be more inclusive and help all our members feel that they are cared for and like they belonged in the ASE family? Caring can be contagious. By fostering an environment where compassion and empathy would thrive, ASE sought to create a culture that would inspire its members to care deeply for each other and their patients. We began thinking about how we could make our Scientific Sessions and courses, guideline documents, advocacy, and member services more inclusive. In 2019, we introduced childcare on site at our Scientific Sessions in Portland to facilitate participation of parents of young children. We also introduced private pods for nursing mothers. At the 2023 Scientific Sessions, there were meditation rooms to allow for prayer or quiet reflection. A “bark park”



Madhav Swaminathan,
MD, MMCI, FASE

“
When ASE embraced caring as a core value and implemented the ASE Cares campaign, we realized that compassion and empathy can have a profound impact not only within a professional organization but beyond in healthcare.
”

was introduced in 2022 to allow attendees some ‘down time’ with puppies and enhance their sense of well-being.

At our leadership retreat in 2019, we developed our latest strategic plan, described our vision, and ensured that our core values were clearly defined. Once established, our core value of diversity and inclusion was embedded in all our actions. There would be more diverse panels at our meetings, a broader range of speakers from all spheres of ASE, a wide representation in the authorship of our guideline documents, and a volunteer workforce that represented every facet of our membership. The goal was to ensure that no one felt excluded, and everyone felt a sense of belonging. “Who are we missing?” was the essential question in every selection process.

We introduced the ASE GEM (Going the Extra Mile) award to honor members who went above and beyond, embodying ASE’s core values. Fellow members choose nominees who show caring and compassion. We also paid closer attention to our traditional awards to ensure our implicit biases did not influence decisions about awardees. To ensure fairness and inclusivity, we once again asked ourselves, “Who are we missing?” When ASE embraced caring as a core value and implemented the ASE Cares campaign, we realized that compassion and empathy can have a profound impact not only within a professional organization but beyond in healthcare. We recognized that caring can be a catalyst for personal and profes-

“
ASE Cares
serves as a
reminder that when
caring becomes the
heartbeat of
an organization,
remarkable
transformations
are possible.
”

sional growth. We also hoped that our efforts at ASE would inspire other organizations to prioritize caring as a core value and eventually foster a more compassionate society for all. When COVID-19 struck, ASE was well positioned to help our members navigate a crucial moment in history marked by unfamiliar and uncomfortable social isolation. Caring for each other was critical through much of 2020 and remains important now.

The ASE Cares campaign is part of ASE's fabric, and caring is firmly in our DNA, as we move forward with our mission and strategic goals. While the bricks of our organizational structure are clearly visible, it is the mortar of caring that binds us together and is fundamental to our mission. In the years to come, ASE Cares will evolve to include other aspects of our Society such as advocacy, healthy member initiatives, and well-being programs that focus on all our members, including those who are the future of our specialty. ASE Cares serves as a reminder that when caring becomes the heartbeat of an organization, remarkable transformations are possible.

*This text also appears in the October JASE.
[OnlineJASE.com](https://www.onlinejase.com)*

Benjamin W. Eidem,
MD, FASE
ASE President



Ultrasound Enhancing Agents in Pediatric Echocardiography: Discussing the Benefits and Areas for Advancement

Contributed by **Jennifer Acevedo, ACS, RDCS, FASE**, Ann & Robert H. Lurie Children's Hospital, Chicago, IL and **Jarrett Linder, MD, MS**, Northwestern University Department of Cardiology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL



UEAs have the potential to advance our field significantly through enhanced image quality and improved diagnostic accuracy

PEDIATRIC ECHOCARDIOGRAPHY PLAYS a crucial role in diagnosing and managing cardiovascular conditions in children. The use of ultrasound enhancing agents (UEAs) in pediatric echocardiography is relatively new and perhaps hasn't gained momentum because of the timing of FDA approval (on the cusp of the COVID-19 pandemic) and the general lack of awareness of availability. However, the future for UEA use in pediatric echocardiography is bright. UEAs have the potential to advance our field significantly through enhanced image quality and improved diagnostic accuracy. In addition to endocardial border definition, UEAs lend value through visualization of anatomic structures in congenital heart disease, as reported in the article, "[Novel Utilization of Ultrasound Enhancing Agents in Complex Congenital Heart Disease Following Superior Cavopulmonary Connection](#)," by Chaszczewski, et al.

Pediatric echocardiography is used to evaluate the anatomy, function, and physiology of the heart in children. When scanning children with technically challenging windows, a qualitative systolic function assessment has been widely accepted. In some cases, patients may be referred for a cardiac magnetic resonance (CMR) imaging study. However, CMR comes with its challenges, for example, patient-faced challenges, including the patient's inability to cooperate, potentially requiring anesthesia. CMR is also expensive, and there can be scheduling challenges. UEA use in pediatrics offers an opportunity for an alternative. The FDA approved

the first UEA for pediatric echocardiography in December 2019. UEAs have revolutionized adult echocardiography by improving image quality through improved endocardial border definition and enabling an accurate assessment of left ventricular function.

Could UEAs have the same impact on pediatric echocardiography?

UEAs improve the visualization of endocardial border definition in challenging pediatric populations, like children with muscular dystrophy. In some instances, patients with technically challenging windows, i.e., immediate postoperative period, body habitus, or requiring advanced cardiac therapies such as ventricular assist devices, could also benefit from using a UEA. Incorporating UEAs during the echocardiogram allows for a more precise assessment of systolic function. This improves the echocardiogram's diagnostic quality, potentially reducing the frequency of other testing such as CMR, CT, or angiography.

At Lurie Children's Hospital, we are pioneering innovative novel UEA uses in acquired and congenital heart disease in children to visualize hard-to-image structures like superior or total cavopulmonary connections, baffles in atrial switches, and coronary artery anatomy. With each use of UEAs in pediatrics, we can continue to learn more about image optimization and be enthusiastic about the possibilities of the future of UEAs in this field.

By improving diagnostic accuracy in branch pulmonary artery assessment following surgical repair, UEAs could reduce the need for testing that involves radiation from CT evaluation or angiography performed through invasive procedures such as cardiac catheterization. This would protect our most vulnerable patients to minimize their lifetime radiation exposure and the need for sedation or anesthesia.

Pediatric UEA use has several barriers different from our adult counterparts, including safety and access-related concerns with needle phobia. Historically, UEAs are relatively safe to use in adult echocardiography, with minimal risk of adverse events,

With each use of UEAs in pediatrics, we can continue to learn more about image optimization and be enthusiastic about the possibilities of the future of UEAs in this field.

and as a safe imaging alternative in patients with kidney or liver disease. Although UEAs are safe in adults, safety remains paramount in our pediatric patients. Echo laboratory preparedness is essential to ensure staff comfort while providing the highest quality patient care. Anaphylaxis is a reported adverse reaction in pediatric patients. Understanding the many ways anaphylaxis can present, especially in nonverbal patients and our youngest patients, is crucial. At our institution, we have placed EpiPens in our crash carts in outpatient areas designated for UEA echocardiograms to minimize time to treatment and simplify clinical management. Additionally, most pediatric patients fear needles, making IV placement for UEA administration problematic. We bundle the patient's routine laboratory draws with the insertion of the IV to avoid unnecessary needle sticks. Lastly, communication is essential. IV placement for an echocardiogram is a practice change. Thorough explanations with families and introductions to all additional team members are critical for success and a positive patient experience.

UEAs are well established for left ventricular and right ventricular opacification, biventricular functional assessment, evaluation of intracardiac mass including thrombus, and evaluation of regional wall motion abnormalities in adult echocardiography. We can learn from our adult counterparts from their vast experience while utilizing these indications in pediatrics and continue to expand UEA uses in pediatric echocardiography, especially in congenital heart disease. UEAs have shown tremendous promise in improving the diagnostic quality of pediatric

echocardiography. Pediatric UEA echo research is necessary, focusing on optimizing use in specific patient populations, including muscular dystrophy, preventative cardiology, anthracycline exposure and children with ventricular assist devices (VADs), refining pediatric dosing protocols and image optimization strategies with pediatric transducers, and exploring novel UEA indications in congenital heart disease. Additionally, the long-term safety of UEAs in pediatric echocardiography remains an important area of research and surveillance.

Using UEAs in pediatric echocardiography can revolutionize the field, providing enhanced image quality, improved diagnostic accuracy, and potentially reducing the need for other costly and invasive procedures while reducing radiation exposure for children. The FDA approval of the first UEA for pediatric echocardiography represents a significant advancement, opening doors for further innovation and exploration in this vital area of pediatric cardiology. Continued research efforts and collaboration between institutions will undoubtedly lead to even

more significant benefits and advancements in pediatric echocardiography, with an opportunity to change clinical practice in pediatric cardiac care.

Areas of Growth

Industry: Develop UEA settings for the higher frequency transducers commonly used in pediatric echocardiography. Currently, the presets only exist on the lower frequency (adult) transducers.

Clinicians (sonographers/nurses/physicians): Education on the administration of the product, subsets of patients that can benefit from the use, and ultrasound cart acquisition settings.

Patients & Families: Ensure product information is available for patients to review for a clear understanding before consent.

Research: Collaboration and multicenter knowledge sharing are needed to establish innovative uses in acquired and congenital heart disease.

Societies (ASE, ESC): Assign a task force to produce guidelines to help labs establish imaging protocols, implement best practices, and ensure patient safety.



The ASE/SCCM Critical Care Echocardiography

Board Examination Review Course

Contributed by **Vincent Sorrell, MD, FASE**, University of Kentucky Gill Heart & Vascular Institute, Lexington, KY



Now, with years of feedback-based modification and hindsight, the course has developed into a unique annual experience due to the mix of faculty perspectives with advanced ultrasound expertise.

AS AN INAUGURAL MEMBER of the ASE Critical Care Echocardiography (CCE) SIG, now the CCE Council Steering Committee, and as an inaugural member of the Organizing Committee for the CCE Exam review course, given annually since 2018, I am privileged to offer you my thoughts into why you should consider attending. Using the *Echo* magazine as a means of dedicated communication throughout our ultrasound community, including critical care providers, you have already heard from other CCE Council members on other relevant topics.

Critical care clinicians are increasingly using echocardiography to rapidly assist in the diagnosis and management decisions for hemodynamic instability and respiratory failure, to assist in the categorization of shock states and evaluate myocardial function, and to serially document the response to pharmacologic and procedural interventions. Recognizing this, the first Examination of Special Competence in Critical Care Echocardiography (CCE-EXAM) was offered by the National Board of Echocardiography in January 2019. The first CCE Exam Review Course, which is provided by the Society of Critical Care Medicine (SCCM) in partnership with ASE, was boldly offered to a group of highly motivated, and blindly faithful attendees, in 2018. At that time, we had been provided with a blueprint of the exam content material, just as any exam-taker would be given, but nothing more. From that exam outline, we created the content for the review course. Although we were pleased that the majority of the feedback we received was that we had ‘hit a bullseye’ on much of our efforts, it was clear that we had room for improvement and we definitely had a few ‘misses’ that needed adjustment.

Now, with years of feedback-based modification and hindsight, the course has developed into a unique annual experience due to the mix of faculty perspectives with advanced ultrasound expertise. Beyond simply preparing attendees for the CCEeXAM, this course now provides a comprehensive lecture series that covers a wonderful overview that is valuable for any critical care provider who is hoping to stay up-to-date or wishing to expand their ultrasound capabilities.

The SCCM and ASE faculty, with proven dedication and content expertise, deliver exceptional talks in a spectacular educationally robust environment where you can follow along with your own slides, making notes and openly engaging with the speakers. Question and answer sessions are held throughout the three-day program to maximize your intellectual curiosity and enhance your intuition. The panel of experts moderate and provide their insights as to why an option is incorrect or only partially correct. The subsequent debates are frequently enlightening for both the audience members and the faculty, providing a clear understanding of the value of ultrasound in this critically ill clinical population. I have learned much from my colleagues regarding the power of ultrasound to image the lungs and pleura as well as an improved understanding on how to assess fluid responsiveness.

The depth of the content evolves from basic physics, knobology, and a normal exam to the assessment of diastolic function and adults with congenital heart diseases. The breadth of the content includes global and regional ventricular function, ultrasound of the lung and pleura to the assessment of volume status, and fluid responsiveness. Significant attention is given to address the role of ultrasound in most clinical scenarios leading to ER and ICU management including trauma, pre- and post-operative care, medical and cardiovascular emergencies. With such a unique blending of specialties, in both faculty and attendees, the ensuing discussions are very relevant for both practice and board preparation. Most participants feel this has become an excellent environment to promote and advance our field.

Whether you are thinking of sitting for the CCEeXAM or purely interested in advancing your CCE knowledge, this course should be given consideration as a one-of-a-kind educational program that is aimed at critical care practitioners who are already familiar with ultrasound and echocardiography. There is not another course like this one. See you there!

This course should be given consideration as a one-of-a-kind educational program that is aimed at critical care practitioners who are already familiar with ultrasound and echocardiography.

Topics Covered During the Critical Care Echocardiography Review Course

- Fundamentals of Physics and Knobology
- Concepts of Imaging, Artifacts, and Knobology
- Normal Transthoracic Examination
- Transesophageal Echocardiography Views
- Left Ventricular Systolic Function
- Left Ventricular Diastolic Function
- Evaluation of Right Ventricle
- Hemodynamics (Static Evaluation of Intracardiac Pressures)
- Volume Status and Fluid Responsiveness (Dynamic Evaluation)/Heart-Lung Interactions
- Ultrasound of the Lung and Pleura
- Respiratory Failure
- Pericardial Disease Including Tamponade
- Echocardiography in Shock
- Cardiac Arrest
- Heart Failure and Cardiomyopathies
- Pulmonary Hypertension Syndromes Including Pulmonary Embolism
- The Aorta and Other Great Vessels
- Acute Respiratory Distress Syndrome
- Vascular Ultrasound
- Trauma Including Focused Assessment with Sonography Examination
- Abdominal Ultrasound
- Devices and Foreign Bodies
- Ischemic Heart Disease and Left Ventricular Regional Function
- Aortic Valve Disease
- Tricuspid and Pulmonic Valve
- Mitral Valve
- Intracardiac Masses Including Endocarditis
- Congenital Heart Disease in Adults

▶ **Click here to learn more.**

Answering the Call for ASE Committee Volunteers

Contributed by **Amy Dillenbeck, MS, ACS, RDCS, FASE**, Cleveland Clinic, Cleveland, OH



With over 40 different volunteer groups involving over 1,300 members, ASE relies on dedicated volunteers like you to achieve its mission and goals.

THE EMAIL IS COMING SOON... “Call for ASE Committee Volunteers: Apply Today!” But wait! Don’t hit that delete button just yet.

With over 40 different volunteer groups involving over 1,300 members, ASE relies on dedicated volunteers like you to achieve its mission and goals. Volunteering with ASE offers a wide range of opportunities, catering to various levels of commitment and interests. From short-term micro-volunteering and workgroup participation to one-year commitments on task forces, and limited-term positions on committees and boards, there is something suitable for every echo enthusiast. Being a Fellow of ASE (FASE) is preferred, but not required. If you would like to obtain your FASE designation, but you are unable to accumulate the points needed to be eligible, you can now volunteer to write an article for the Echo magazine, and if your article is published, that can count toward your FASE application volunteerism requirements. [Click here for more information](#) on how to submit your own Echo magazine article.

As someone who has experienced the transformative power of volunteering for ASE, I can personally attest to the profound impact it has had on my professional and personal development. Initially, I was unsure of what I could contribute, but over the years I have realized the immense value it brings. Volunteering has not only allowed me to enhance my technical knowledge and skills, but it has also provided a platform to collaborate with brilliant professionals who share the same passion for echocardiography.

By engaging with fellow experts, including physicians, researchers, sonographers, and educators, I have gained exposure

to diverse perspectives, experiences, and knowledge. This networking opportunity has led to invaluable mentorship, collaborations, and lasting friendships.

I have volunteered on multiple committees and councils in the past and each experience has been unique, meaningful, and fulfilling. Currently, I serve on the new Interventional Echocardiography Council Steering Committee. We are an active group; supporting interventional ultrasound by providing educational offerings like webinars, guidance to the ASE Board of Directors regarding interventional ultrasound, and a forum for members with similar interests to network.

If you are interested in applying for a committee position, here's what to expect:

- The deadline for submitting the Committee Interest Application is January 5, 2024.
- Applications will be reviewed in February, and the appointment process begins in March.
- Applicants will be notified in April regarding potential committee appointment(s).
- The new committee members will begin their work immediately following the Annual Scientific Sessions (terms start July 1).

In line with ASE's commitment to diversity and inclusion, we aim to have our volunteer groups reflect our membership. To help us better measure our Society's adherence to these principles, we request that you complete your entire membership profile before submitting your application. Log into your [ASE Member Portal](#), click "Change" and complete all available fields under **My Profile**, and **click Save**.

I genuinely hope you will consider volunteering your time and expertise to help ASE achieve its mission. Embrace this opportunity to make a difference, grow as a professional, and leave a lasting imprint on the advancement of echocardiography. Your unique strengths and contributions will undoubtedly make a meaningful impact. You won't regret it!

Embrace this opportunity to make a difference, grow as a professional, and leave a lasting imprint on the advancement of echocardiography.



Pediatric Cardiac Research Initiative in Imaging to Support Mentoring (PRIISM)

Contributed by **Shiraz Maskatia, MD, FASE**, Lucile Packard Children's Hospital Stanford, Palo Alto, CA; **Rita France, RDCS, RDMS, RT, FASE**, Children's Mercy Hospital, Kansas City, MO; **Jimmy Lu, MD, FASE**, University of Michigan Congenital Heart Center, Ann Arbor, MI; **Rebecca Klug, BA, ACS, RDCS, (AE, PE), RT(R), FASE**, Mayo Clinic, Rochester, MN; **Daniel Forsha, MD, MCS, FASE**, Children's Mercy Kansas City, Kansas City, MO



The overarching structural goal of PRIISM is to use the experience of the core advisory board to build a network of experienced research mentors (ERM) who will provide feedback on grant applications for junior faculty.

RATIONAL

THE CONCEPT OF PRIISM came about somewhat serendipitously during a reunion dinner in November 2021 between Drs. Kanwal Farooqi and Shabnam Peyvandi, who had attended medical school together. The conversation revolved around the challenges of applying for funding as a pediatric cardiovascular imager. Dr. Farooqi was in the process of reapplying for an NIH K23 grant and Dr. Peyvandi had just been awarded an R01. Although they had the privilege of working with numerous wonderful mentors, finding specific guidance regarding grant funding had been challenging. Inspired by additional academic opportunities, including the Winn Career Development Program, Dr. Farooqi considered the idea of assembling a core group of faculty as a resource for others. After further discussion with Dr. Peyvandi and brainstorming regarding successful mid-career researchers in the pediatric cardiovascular imaging community, a core advisory board was formed. These mid-career faculty were at a point in their careers at which they had experience with building a research track record, publishing in their area of interest, and had built a network of more senior faculty mentors. The advisory board is currently comprised of 11 faculty members with Dr. Farooqi serving as the Chair and Dr. Rebecca Beroukhim as the co-Chair.

STRUCTURE

The overarching structural goal of PRIISM is to use the experience of the core advisory board to build a network of experienced research mentors (ERM) who will provide feedback on grant applications for junior faculty. In contrast to other types of mentorship opportunities, our intent is to support junior faculty from an academic lens. The core advisory board includes mid-career faculty members in all areas of cardiovascular imaging including echocardiography, fetal echocardiography, cardiac MRI, cardiac CT, 3D printing, and virtual reality. The advisory board brings a robust source of knowledge regarding high quality, supportive mentors. After discussions amongst the members of the core advisory board, approximately 50 ERMs have now accepted invitations to participate in PRIISM. There are ERMs from a variety of specialties including cardiovascular imaging, cardiogenetics, heart failure, adult cardiology, electrophysiology, and biostatistics. One important aspect of PRIISM is our focus on providing avenues of academic mentorship without fears of unethical behavior on the part of the mentor or mentee. To that end, we are providing specific guidelines and documentation with regard to ethical academic behavior. We expect that the ERMs will review one to two applications per year in the programs' early stages. A [website](#) currently in production will allow junior faculty to submit applications and ERMs to submit reviews and feedback. The turnaround time for review is expected to be approximately four to six weeks from submission and adequate time is requested to

PRIISM also aims to promote underrepresented minority groups in cardiovascular imaging research and contribute to their academic success by facilitating networking and mentorship.

avoid proximity to the grant deadline. This website also has links which allow viewing of past webinars and talks.

GOALS AND PROGRESS

While the primary goal of PRIISM is to provide a structured program which can be utilized by junior faculty to obtain feedback on grant applications pertaining to pediatric and congenital cardiovascular imaging, there are a number of additional goals. PRIISM also aims to promote underrepresented minority groups in cardiovascular imaging research and contribute to their academic success by facilitating networking and mentorship. In addition to the structured grant advisory process, the PRIISM core advisory group aims to provide career advice and mentoring. They have participated in multiple educational activities through web-based and in-person scientific meetings. Providing guidance regarding



building an academic research career within or beyond pediatric cardiovascular imaging has quickly become a central goal of the group. The talks that have been given at different venues provide information that is easily generalizable to anyone looking to pursue an academic research career.

An initial kickoff webinar was held in the summer of 2022 with guest speakers Dr. Emile Bacha, Chief of the Division of Cardiac, Thoracic and Vascular Surgery at Columbia University Irving Medical Center, and Dr. Dipti Itchhaporia, Director of Disease Management for Hoag Heart and Vascular Institute. Drs. Bacha and Itchhaporia provided insight on challenges they faced during their early careers and how those challenges turned into opportunities. The perspective offered by these two phenomenal leaders and mentors, who are not cardiac imagers, allowed for appreciation of the commonality in career challenges across medical specialties. A moderated question and answer session at the end of the webinar provided an opportunity for attendees to ask questions to the speakers and core advisory board. PRIISM also held a half-day symposium at the Cardiology 2022 meeting, sponsored by Children's Hospital of Philadelphia and other cardiac centers. This symposium featured talks on a wide variety of topics, including balancing research and administrative responsibilities, conduction of multicenter research, and social determinants of health in fetal cardiology. A unique session included

representatives from ASE, the Society of Pediatric Echocardiography, the Fetal Heart Society, the Society of Cardiac Magnetic Resonance, and the Society of Cardiac Computed Tomography regarding available opportunities for junior faculty interested in research. At the annual Scientific Sessions for the Society of Cardiovascular Magnetic Resonance (SCMR) in February of 2023, PRIISM collaborated with the SCMR Early Career Subcommittee to hold a session focused on academic research career building. This well-attended session included talks by PRIISM core advisory group members, followed by a speed mentoring session, during which fellows and junior faculty were paired with mentors for five minutes at a time to ask questions regarding building a research career. Conversations are ongoing for PRIISM sessions at multiple national conferences in the coming year. Dr. Farooqi gave a talk at the 2023 ASE Scientific Sessions which included an update on PRIISM.

The core advisory group of PRIISM is excited to provide this resource to the pediatric cardiovascular imaging community. Long term goals of this initiative include providing seed grants for junior faculty, holding an annual PRIISM symposium, and tracking progress of junior faculty who utilize the PRIISM grant review process. Amplification through collaborations with different societies such as ASE will facilitate educational sessions and visibility of this valuable resource.



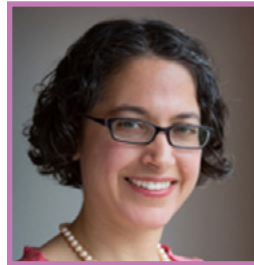
PRIISM advisory board members and featured speaker Dr. Meryl Cohen (second from the left) at the recent Cardiology 2022 meeting

PRIISM Core Advisory Board

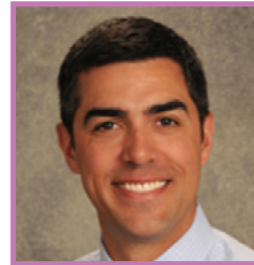
The PRIISM core advisory board is comprised of mid-career pediatric cardiologists from 10 different academic centers across North America.



Kanwal M. Farooqi, MD, Chair
Associate Professor of Pediatrics Division of Pediatric Cardiology
Director, Cardiac 3D Printing
Columbia University



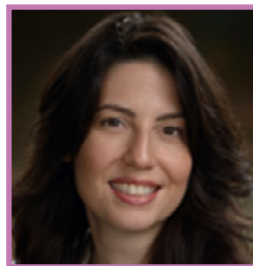
Rebecca Beroukhim, MD, Co-Chair
Assistant Professor, Harvard Medical School Co-Director, Cardiac Tumor Program
Boston Children's Hospital



Michael V. DiMaria, MD, FASE
Director, Echocardiography Lab
Director, Single Ventricle Program
Children's Hospital Colorado
Heart Institute
Associate Professor University of Colorado School of Medicine



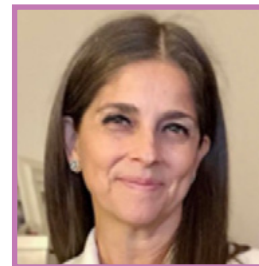
Daniel Forsha, MD, MHS
Assistant Professor of Pediatrics Director, Cardiovascular Imaging
Research Children's Mercy
Kansas City School of Medicine



Keila N. Lopez, MD, MPH
Associate Professor, Pediatrics Director, Transition Medicine Division of Pediatric Cardiology Texas Children's Hospital/ Baylor College of Medicine



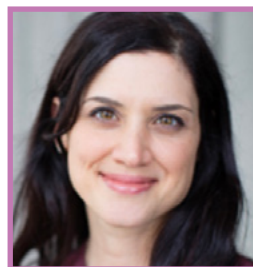
Shiraz Maskatia, MD
Associate Medical Director, Echocardiography
Clinical Associate Professor
Lucile Packard Children's Hospital Stanford University School of Medicine



Laura M. Mercer-Rosa, MD, MSCE
Associate Professor in Pediatrics, Perelman School of Medicine at the University of Pennsylvania
Director, Echolab Research Unit
Associate Program Director of Research, Cardiology Fellowship Program



Shaine A. Morris, MD, MPH
Associate Professor of Pediatrics Medical Director, Fetal Cardiology Medical Director, Cardiovascular Genetics
Texas Children's Hospital and Baylor College of Medicine



Shabnam Peyvandi, MD, MAS
Associate Professor of Pediatrics, University of California San Francisco
Co-Director, Healthy Hearts and Mind Program
Division of Cardiology, Benioff Children's Hospital



Nelangi Pinto, MD
Professor of Pediatrics
Division of Pediatric Cardiology University of Washington Seattle
Children's Hospital



Laura Olivieri, MD
Associate Professor of Pediatrics, University of Pittsburgh Director, Cardiac Imaging UPMC
Children's Hospital

TEE Masterclass

Contributed by **Burkhard Mackensen, MD, FASE**, University of Washington, Seattle, WA and **Charles Nyman, MBBCh**, Brigham and Women's Hospital, Boston, MA



We wanted to show in detail how experienced echocardiographers perform their examinations and measurements.

ASE PERIOPERATIVE Echocardiography Council (COPE) members Charles Nyman, MBBCh, and Burkhard Mackensen, MD, FASE, participated in the second TEE Masterclass in Leipzig Germany in June 2023. The hybrid meeting was organized and produced by ASE members Joerg Ender, MD, and Massimiliano Meineri, MD, FASE. It was unique in that it was a live real-time meeting demonstrating advanced TEE imaging in both operative and structural heart procedures. Below is an interview of Drs. Ender and Meineri to enquire more about this innovative approach to TEE education.

Q: What inspired you to start TEE masterclass?

A: **Dr. Ender:** The first idea came when I was invited to a cardiology meeting in Cologne 2017 where the faculty had to provide a lecture and then show a live TEE examination on a patient. At that congress, only echo images and the echocardiographer were shown. Another inspiration was the long experience of live transmissions of cardiac surgical and interventional cases at the Herzzentrum Leipzig. However, instead of focusing on the surgical or interventional techniques and having just a short presentation of the TEE findings we wanted to show in detail how experienced echocardiographers perform their examinations and measurements.

Q: How does TEE Masterclass differentiate itself from the from ASE, EACTAIC ECHO, and SCA Echo Week, was there a specific deficit you were looking to address?

A. Drs. Ender and Meineri: For all mentioned echo courses the program is mostly based on lectures displaying optimal video clips. During the Leipzig TEE Masterclass there are some lectures embedded in the program, but most of the time the live transmissions from surgical operating rooms and interventional suites show the echocardiographers at work. In high-definition quality the simultaneous visualization of echocardiographic images, the handling of the echo machine's knobs, and probe manipulation are displayed. The echocardiographers are connected via a headset and "guide" the audience (virtual and in-person) through the steps needed for 2D and 3D image acquisition, optimization, and manipulation while the moderators' panel could convey questions at any time allowing the maximum degree of interaction.

Q: What were some of the challenges you faced, and how did you overcome them?

A. Dr. Ender: The costs of the technical setup together with experienced and reliable technical support made the financial risk for such a new endeavor during and immediately after the pandemic extremely high. For this reason, several attempts to organize such an event within scientific societies failed. Finally, we decided to organize the Leipzig TEE Masterclass together with the Leipzig Heart Institute using departmental research funds with the support of the CEO from the Heartcenter Leipzig. The lack of sponsors, mandated by institutional policies, made the first edition of our event not financially successful but allowed us to test the feasibility of this new format. Thanks to the excellent feedback from the participants, we decided to organize a second edition for which industry support was finally allowed.

A. Dr. Meineri: Communication between the auditorium and the operating rooms constituted a big challenge that was overcome in the second edition by an independent "offline" communication channel between the main moderator and the echocardiographer in the room. Patients'



Dr. Massimiliano Meineri



Dr. Joerg Ender

Screen capture of broadcast to auditorium and livestream, top left panel shows a live view of Phillips epic platform for the purpose of demonstrating TEE knobology. Bottom right panel shows faculty, Drs. Forner and Nyman, communicating with the audience in Realtime via two-way headsets. Right panel broadcast of the TEE imaging for the percutaneous mitral valve replacement.



confidentiality was assured by anonymization of the TEE exam display and live broadcast only when the patient was fully draped, and the head covered.

Q: Can you discuss the target audience for TEE masterclass and how is the experience different for virtual and in person?

A: **Dr. Meineri:** The target audience includes anyone involved in perioperative echocardiographic imaging with varied levels of expertise. The program of this second edition of the Leipzig TEE Masterclass was designed to fulfill the needs of novices and experts and went from basic TEE examination and intraoperative hemodynamic monitoring to 3D imaging optimization and post-processing to procedural guidance for structural heart interventions. The aim was not just to reach the “Masters” but also to learn from “Masters” and thereby create new ones.

Q: What types of cases does TEE masterclass cover, and do you plan to change significantly from one year to another?

A: **Dr. Ender:** The live cases included coronary artery bypass grafts, conventional and minimally invasive single and multiple valve repairs and

replacements, mitral and tricuspid valve clips, transcatheter mitral valve implantations, surgery of the aorta, and left ventricular assist device implantation. The content was modified in our second edition to meet the needs of a broader audience and will be adapted to newer echocardiography, transcatheter and surgical techniques in the future.

Q: What technologies or tools do you utilize to facilitate the virtual experience. Technologically is there a difference between the virtual or in-person experience?

A: **Dr. Meineri:** The feeling of being able to be close to the echocardiographer and be guided through the practical steps of image acquisition and analysis while being able to ask questions makes this event a unique educational opportunity for the growing field of virtual events with very similar interaction opportunities for virtual and in-person audience. The in-person attendance of the course adds the possibility of personal interaction with the experts in the field as well as with other delegates.

Q: What are the opportunities for interactive or collaborative features of TEE masterclass that foster participant engagement and interaction?

A. Dr. Ender: The in-person delegates can ask questions at any time to the panel and to the echocardiographers by using multiple microphones in the audience. The virtual delegates have the same opportunity by using the virtual chat function.

Q: How do you address concerns about the lack of face-to-face interaction and personal connection in virtual learning?

Dr. Ender: One of the three moderators of each session is in charge of the virtual chat and forwards the raised questions to the echocardiographers and the panel. All participants and all recordings are available soon after the live broadcast and can be accessed and reviewed for one year.

Q: Can you share any success stories or testimonials from participants or instructors who have attended TEE masterclass?

A. Dr. Meineri: Here is what former participants found to be the best aspect of the event.

“To meet leading experts as they perform live TEE examinations. To discuss problems and to learn from each other.”

“Great ability to see knobology of TEE.”

“Detailed TEE Exams with demonstration of every single step including explanation and discussion.”

Q: What are your plans for the growth and expansion of TEE masterclass?

A. Dr. Ender: In the future edition of this event, we would like to maintain the same format but also offer the opportunity for on-site hands-on workshops for acquisition and manipulation of 2D and 3D datasets on several vendor platforms. There will also be workshops for image guided transcatheter valve procedures.

Q: How do you envision the future of virtual education, and how does TEE masterclass fit into that vision?

The Masterclass allows the virtual audience to be in the operating room and “look” over the shoulder of the echocardiographer.

A. Dr. Meineri: We believe that interacting during live transmission of real clinical scenarios constitutes the future of virtual education. The Masterclass allows the virtual audience to be in the operating room and “look” over the shoulder of the echocardiographer. Every delegate has access to all sessions on demand for a year after the event. One possible future development could be to create a directory from select previous broadcast cases with the relevant literature and questions as problem-based learning modules.

Q: Can you discuss any partnerships or collaborations you have established or would like to enhance TEE Masterclass?

A. Dr. Ender: In the past the Leipzig TEE Masterclass was endorsed by the DGAI (German Society of Anesthesiology and Intensive Care Medicine), the EACTAIC (European Association of CardioThoracic Anaesthesiology and Intensive Care), and IACTA (Indian Association of Cardiovascular Thoracic Anesthesiologists). We would be very honored to count on the official endorsement of scientific societies around the world and reach an even broader audience for the next TEE Masterclass on June 3-5, 2024.

In Memoriam:
Liv K. Hatle, MD, FASE

Transformative Pioneer of Doppler Echocardiography



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he global cardiology community lost its foremost, and widely respected pioneer in Doppler echocardiography, Dr. Liv Kristen Hatle, who passed June 22, 2023, at age 87 years at her beloved “sunny” home in Calonge, Spain.

Her contributions using non-invasive Doppler to diagnose a multitude of cardiac conditions,

and their hemodynamic consequences, forever transformed clinical cardiology by replacing the need for invasive hemodynamics; thus, making cardiac ultrasound (imaging and Doppler) our primary and most often definitive diagnostic tool in cardiology. Not a part of our current Doppler exam is untouched by her genius. Sharing this knowledge freely is her legacy, one that is celebrated worldwide on every echo-Doppler examination performed. Now that she is gone it is fitting to look back at the remarkable person Dr. Hatle was and celebrate her monumental contributions to the practice of cardiology.

Born in 1936, Liv was fiercely Norwegian and proud of her Viking heritage. Independent by nature, this trait was amplified by growing up above the Arctic circle in the small and isolated port city of Kirkenes. As a young child she witnessed the bombing and destruction of her hometown during World War II, its citizens surviving in caves eating potatoes. With no road links to the rest of Norway she was sent to schooling far away by boat, sleeping in transit on deck, returning home only twice a year for holiday.

She attended medical school in Oslo as one of only 10 women in a class of 100. Training in internal medicine and cardiology in Trondheim followed, after which she took a staff position at the University Hospital in Oslo for three years. With a solid cardiology, physiology, and hemodynamic background she moved to the University Hospital in Trondheim as a Consultant cardiologist in 1974 at the age of 38, buying her house with its beautiful view of the fjord and crosscountry ski trails she enjoyed minutes from her doorstep.

Liv’s genius as a cardiologist was present before her introduction to Doppler technique. She viewed each patient’s heart problem as having an effect on their entire heart, with heart rate, loading conditions, and blood pressure modifiable factors to optimize. She would initially adhere to standard conventional therapy, but was unafraid to try other approaches based on pathophysiology if she felt the patient might further benefit. Successfully treating some patients with obstructive Hypertrophic Cardiomyopathy (HCM) with >800 mg of verapamil is

Her contributions using non-invasive Doppler to diagnose a multitude of cardiac conditions, and their hemodynamic consequences, forever transformed clinical cardiology



Contributed by two fortunate and grateful pupils, and lifelong friends,
Christopher P. Appleton, MD, FASE, Mayo Clinic Arizona, Scottsdale, AZ, and **Jae K. Oh, MD, FASE**, Mayo Clinic, Rochester, MN

an example of the individualized medicine she practiced. "Calcium overload," she said, then remarking to our quizzical look "don't feel limited by what's written in textbooks." Her gold standard was always patient response and long-term outcome, whatever therapy given.

In 1976, engineer Bjørn Angelsen and others from the Norwegian Institute of Technology in Trondheim had a pulsed echo Doppler flowmeter (PEDOF) ready for clinical trials. Angelsen proposed the Bernoulli equation be used with cardiac flow velocities to estimate pressure gradients. If this non-invasive technique had clinical value, Liv believed she would need to prove it by Doppler – cardiac catheterization correlations. She learned normal and abnormal cardiac flow velocities without image guidance, always starting with tricuspid inflow, because it increased with inspiration. She used Doppler when seeing her patients; infants without a murmur and short right ventricular isovolumic relaxation time (RV IVRT) had normal pulmonary artery pressures and further study was unnecessary. In other patients with pathology, such as mitral stenosis (MS), pedals attached to a regular bicycle wheel mounted at the end of her exam table were used to see the effects of increasing heart rate and cardiac output. Within a year, Liv and research fellow, Alf Brubakk, had met with Daniel Kalmanson and other early clinical pioneers, and published how to diagnose valvular heart disease using Doppler ultrasound in 1977.

Between 1978 and 1983 were Liv's years of greatest individual academic discovery and writing. She initially focused on aortic stenosis (AS), MS, valvular regurgitation, and estimating pulmonary artery pressures, then expanded to hypertrophic obstructive cardiomyopathy (HOCM), and congenital heart disease. Cardiologists from around the world sensed the importance of the new Doppler technique and travelled to Trondheim to observe her application of it to patients. All were welcome, and ideas were

exchanged with other researchers at conferences. Knowing there would be skepticism about non-invasive Doppler replacing traditional invasive pressure measurements, (especially in the U.S. which rejected her initial work!), Liv authored these early seminal papers in her sparse and direct style, the data and figures speaking for the unembellished conclusions. Her 1983 textbook with Bjorn Angelsen, *Doppler Ultrasound in Cardiology: Physical Principles and Clinical Applications* sold more copies faster than any medical book in history and remains the classic cardiology textbook on Doppler technique.

The years 1984 through the early 1990s continued Liv's remarkable era of validating Doppler diagnostic hemodynamics in complex as well as simple cardiac diseases, including some that invasive hemodynamics had failed to provide definitive diagnoses. During a 1985 to 1987 sabbatical at Stanford and the Mayo Clinic, access to research fellows and resources made possible numerous studies of her previous observations in various heart pathologies including diastolic dysfunction, constrictive pericarditis, cardiac amyloidosis, and valvular heart disease. She taught the art of obtaining excellent Doppler recordings, made easier by new machines with both 2D and Doppler capabilities, along

with the still frame images needed for publication and teaching. Both labs embraced and incorporated her teachings into clinical practice and educational conferences. Continued travel, speaking, and published papers from other investigators worldwide accelerated the adoption of Doppler into clinical echocardiography.

Arriving in the U.S. in 1985, her knowledge about the diseases Doppler could be useful for, but not yet recognized, was stupefying – there was no recording that puzzled her. The first day in the Stanford lab no images could be obtained on a young Mexican woman referred for cirrhosis. Liv took the PEDOF probe, obtained pulsed superior vena cava flow and calmly stated the patient had constrictive pericardi-

She viewed each patient's heart problem as having an effect on their entire heart, with heart rate, loading conditions, and blood pressure modifiable factors to optimize.

tis, and she did, with a heavily calcified pericardium! The first month at Mayo Clinic, her pulsed wave Doppler interrogation of mitral inflow changed a previous diagnosis of HCM to cardiac amyloidosis, which was confirmed by subsequent evaluation!

Cardiology trainees and young staff like us were put to work on various patient groups to further explore her previous personal observations. To our amazement, Liv insisted that we, her students, be the first authors on these important Doppler papers which included the pathophysiology and magnitude of left ventricular (LV) outflow tract obstruction in HOCM; the diagnosis of restrictive filling by shortened mitral deceleration time; the diagnosis and severity of cardiac tamponade; the first description of flow convergence (PISA) by pulsed and color Doppler as a sign of hemodynamically significant MR (“flow acceleration” she called it); the three fundamental abnormal diastolic filling patterns and their underlying diastolic abnormalities; the importance of pulmonary venous flow velocity and its atrial flow reversal for diagnosing increased LV end-diastolic pressure; the changes in LV and left atrial filling patterns with progression of diastolic dysfunction; diagnostic mitral and hepatic vein Doppler in constrictive pericarditis, and how Doppler variables could follow disease progression and predict prognosis in numerous cardiac conditions such as cardiomyopathies, myocardial infarction and aortic regurgitation. Studies on valve stenosis were further bolstered, while regurgitation was purposely neglected because of a lack of a quantitative “gold” standard for comparison; but Liv was comfortable her published assessment worked well for clinical management of these patients, and it did. For many of us who worked with her, the focus of our subsequent academic research was on the same cardiac diseases that she had mentored, which expanded the application of non-invasive Doppler hemodynamics to many different cardiac disorders. Liv returned to Trondheim in 1988 but left in 1992 at age 58 when cardiac surgery was discontinued at the University hospital. She moved to the King Faisal Hospital in Riyadh as Chief of Cardiology and was fascinated by the cardiac pathology seen there, especially among the Bedouins whose interbreeding provided abundant and often rare examples of adult and congenital heart disease. Although she and her



**Cardiologists from
around the world
sensed the importance
of the new Doppler
technique and travelled
to Trondheim to
observe her application
of it to patients.**

staff were too busy to engage in formal research, Liv's unpublished data gathering, and unique observations continued as always. As true for her entire career she did this mostly at night after work, overlapping recordings from both sides of the heart (a technique she routinely and uniquely practiced) to see how abnormalities on one side affected the other. How excited she was to show us a case of acute severe aortic regurgitation, with reverse flow in diastole into the LV, then continuing backwards through the mitral valve, pulmonary veins, pulmonary capillary bed and ultimately augmenting pulmonary regurgitation and increasing RV diastolic pressure!

Periods in Linköping Sweden (1996-98) and then as a visiting professor in the University Hospital in Leuven in Belgium (1999-2001) followed. Collaborating with close friends George Sutherland, Bart Bijmens, and others she contributed to the integration of new insights from myocardial Doppler imaging into the assessment of regional and global ventricular strain and strain rate in cardiac diseases. Here, her ideas on the importance of assessing both longitudinal and transverse ventricular systolic function, which she did routinely by M-mode annular excursion since the mid-1990s were verified, predating TAPSE and 2D speckle tracking strain. After Leuven, she intermittently returned as a consultant cardiologist to Riyadh until 2012 retiring at age 76 years.

Liv was aware and proud of the adoption of Doppler methods into the mainstream of cardiology patient care. Her curiosity, background in clinical cardiology, learning a cardiac Doppler exam without an image, and constant studying of interesting recordings she saved gave her pathophysiologic insights that eluded contemporaries. She was more puzzled by this than dismissive, as most observations seemed obvious to her. Normal LV ejection fraction with reduced mitral annular longitudinal excursion or e' velocity "abnormal systolic function;" an LV isovolumic relaxation time of 0 ms – "not that

unusual in severe AS." She felt fortunate Doppler technology had "found" her but also insisted credit always be given to others who pioneered earlier work, especially if clinical; D. Kalmanson, H. Light, PNT Wells, P. Peronneau, D. Baker, and JG Stevenson were names we heard. She pointed out many times that it was Jarle Holen from Oslo in 1976 (using flow signals from a modified fetal monitor and the Gorlin formula) who was the first to show that MS pressure gradients could be accurately estimated non-invasively. And she admired and absorbed the findings of investigators who did well-performed research, such as Akira Kitabatake of Japan, the first author

to report in detail how ventricular inflow velocity patterns could give information about filling disorders. For the rest of career Liv remained keenly interested in cardiac diastolic function and assessing filling pressures using Doppler.

We never heard her voice personal regrets about her professional life. Patient care was serious business, and Doppler was her powerful clinical tool. She had no patience for poor recordings, muting the Doppler audio signal when the pitch leads to the highest velocities!, exam shortcuts, "sloppy research," or self promotion. She was meticulous in cropping and labeling of Doppler images to a perfect proportion. Important talks

should be given by the experts, and stress content rather than witty banter. She did believe that color Doppler, as useful as it is (and underappreciated color M-mode Doppler), came a few years too soon and its "visual" nature disrupted our generation, and its sonographers from becoming more proficient at obtaining high quality Doppler signals. She also believed attempts to simplify the interpretation of complicated physiology (like diastolic function and filling pressures) by ratios or simplified algorithms as is often the case in guidelines, rather than using primary Doppler variables and their response to altered loading conditions, were intellectually disappointing, misguided and unreliable for individual

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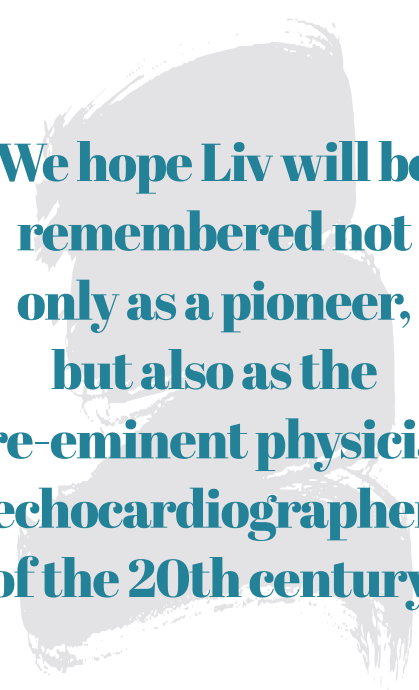
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patient care. Instead, she felt if every patient echo also included a mitral color M-mode with both CW and PW Doppler to check peak LV velocities and location, a pulmonary venous recording (a must!), an LV and RV IVRT, and LV and RV longitudinal and transverse function and cardiac output that adequate data would be available to define filling pressures and the main cardiac pathology present. The echocardiographic community would have benefited if she had explained her rationale for these views in writing, as well as other innumerable insights into Doppler interpretation, but Liv was not a prolific writer - and it was always more interesting to understand something new about a disease or the heart - and there was a trove of saved cases and data to examine from, which was more enjoyable than writing.

Of Liv's numerous prestigious scientific awards, she was especially proud of the ESC Gold Medal (2003), the Norwegian Heart Association Distinguished Researcher shared with Bjorn Angelson and presented by King Harald (2008), and the KU Leuven (Belgium) Honorary Doctorate for special achievements in the field of science (2020). In the US she received the ACC Presidential Citation (1998), an Honorary Membership to the ASE (2007), and a recognition as a Legacy Pioneer of Echocardiography along with Dr. Harvey Feigenbaum in 2022. Now at each ASE Foundation Research Awards Gala dinner there is a legacy table honoring her as one of five individuals (imaging and Doppler) most influential in advancing the modern practice of echocardiography.

In retirement Liv lived mostly in Spain with a view from her veranda of the Mediterranean over Palamos. She loved gardening and enjoyed her decades long project of building rock stairways and terrace walls to create a beautiful multilevel hillside landscape. She loved visitors and dinner on the veranda with fresh seafood, laughter, and red wine, followed by scotch or homemade limoncello over vanilla ice cream. Lifelong interests included cross country skiing, hiking, tennis, oriental carpets, and reading world history and mysteries. Each summer she returned to her home in Trondheim usually visiting her tundra and Arctic cabins. In the U.S., the Southwest was her favorite region, and she had Navajo rugs hanging next to her Anatolian gems in Spain, and a silver-turquoise inlay Zuni bracelet frequently on her wrist.



We hope Liv will be remembered not only as a pioneer, but also as the pre-eminent physician echocardiographer of the 20th century.

Although time tends to erase the names of all but a few of the people who contribute to the evolution of medical practice, we hope Liv will be remembered not only as a pioneer, but also as the pre-eminent physician echocardiographer of the 20th century. Her application of Doppler technique to cardiac diagnosis, function, prognosis, and patient management continues to be an essential part of today's cardiac ultrasound examination worldwide, which is performed in over 50 million individuals yearly. Arguably together with cardiac catheterization and angioplasty, the echo-Doppler examination was the most important heart procedure developed in the 20th century, and Liv was the genius who revealed its most important, and enduring components.

A memorial event to celebrate Liv will be arranged by her friends and colleagues in Europe this fall. The intellectual material for her long awaited second edition of her book was finished to her satisfaction shortly before her passing and when published in 2024 will serve as an epitaph of her genius. She is resting in peace in Trondheim next to her son Torkel, who predeceased her.



CLINICIANS WEIGH IN ON **NEW DATA, TRENDS, CHALLENGES, AND ADVANCEMENTS** IN HCM MANAGEMENT

Contributed by **Frieda Wiley**

ELVIS Presley, Corey Haim, and Harris Glenn “Divine” Milstead may appear to have nothing in common, but these celebrities share one major trait. All three notable figures may have died of hypertrophic cardiomyopathy (HCM), a genetic disease in which cardiac muscle thickens abnormally.

Thickening hinders proper cardiovascular function, potentially resulting in heart failure and abnormal heart rhythms. Once classified as a rare condition, the medical community now recognizes HCM as the most common heritable heart condition in the United States, occurring in one in every 500 persons.¹ Other studies suggest that the condition may be more common, with an occurrence of one in every 200 persons.² However, the true prevalence of the condition remains unknown, as a large percentage of people with the condition are undiagnosed. The overwhelming majority of patients diagnosed with HCM have obstructive HCM (two-thirds), while the remaining third have nonobstructive HCM.

During ASE’s 2023 Scientific Sessions, a group of industry thought leaders and pioneering clinicians comprised of cardiologists, sonographers, and nurse practitioners convened for ASE’s first HCM Forum to share their insights on the challenges, successes, and future of HCM management. ASE gathered stakeholders from numerous medical organizations such as the Heart Failure Society of America, the Hypertrophic Cardiomyopathy Medical Society, the American Association of Thoracic Surgery, and the Society of Cardiovascular Magnetic Resonance with the goal to lead inclusion and integration in HCM.

Disease Burden is Complicated by Variable Presentation, Asymptology, and Comorbidities

Over the past decade, a growing body of data on HCM, including patient-reported outcomes (PROs), has revealed a shift in disease burden that includes multigenerational familial impact. The latest evidence has revealed new information about the impact of specific symptoms, previously unrecognized or misunderstood, such as dizziness and fatigue.

“We now have better tools in the toolbox, but there’s an emotional aspect to this because we’re watching what our families went through,” said Lisa Salberg, founder of the New Jersey-based Hypertrophic Cardiomyopathy Association. “In terms of symptom burden, [patients are just] as frustrated with symptoms as the medical community trying to treat us.”

Diagnosed with obstructive HCM at age 12, Salberg later received a transplant that cured her condition. Now, she tirelessly advocates for HCM patients. Established in 1996, her organization has become the largest HCM support group and network.

The tireless advocate also shed some light on the psychological effects of HCM on patients and family members. Patients and their loved ones lack

Once classified as a rare condition, the medical community now recognizes HCM as the most common heritable heart condition in the United States

support in coping with the stressors of the disease, and the gap highlights the need to recruit mental health colleagues to help support patients and their loved ones in coping with the mental and emotional anguish of the disease.

“People have watched their family members struggle with arrhythmia, and the next generation is as well,” she said.

Another challenge the HCM community faces is the complex and highly variable presentation of the condition. For example, an asymptomatic patient may have worsening biomarkers. Meanwhile, other patients struggle with more easily discernible signs and symptoms or may experience arrhythmias, variable fatigue, and shortness of breath.

Some clinicians find biomarkers beneficial in managing HCM, especially for patients with other medical conditions. Such is the case for panel moderator Dr. Timothy Wong, assistant professor of medicine at the University of Pittsburgh School of Medicine, who regularly uses biomarkers in his practice. He finds them particularly helpful in tracking the condition in patients and in helping to differentiate their cardiac symptoms from their non-cardiac symptoms (e.g., breathlessness from COPD).

Furthermore, the diverse clinical presentation among the HCM population warrants clinicians to adjust their diagnostic practices to improve accuracy and fidelity. Modifying diagnostic protocols and strategies improves diagnostic accuracy in subpopulations including athletes and physically active patients who are not athletes.

“The reality with HCM is that athletes may feel much worse not necessarily related to BNP or stress,” said Dr. Dermot Phelan, Atrium Health-Sanger Heart & Vascular Insti-

tute in Charlotte. “[Their bothersome symptoms are] more related to FitBit, stress, sleep, nutrition, and activities.”

In non-athletes' cases, compromised cardiovascular function can make even simple tasks and activities such as standing or engaging in moderate exercise extremely difficult due to the dizziness patients with HCM often face. A symptomatology often resulting from arrhythmia, many patients refrain from sharing their dizzy spells with others for fear of what Salberg described as “freaking them out.”

Despite the challenges exercises present in non-athletes with HCM, Salberg expressed interest in seeing families impacted by HCM exercise safely together. In the case of pediatric patients, Salberg explained that, in addition to building healthy lifestyle habits, familial physical activity helps prevent friction caused when parents have conflicting views, or even fear around whether or not to exercise.

Spontaneous arrhythmias and its complications aside, many patients with HCM also wrestle with variable fatigue. According to Dr. Milind Desai, Haslam Family Endowed Chair in Cardiovascular Medicine and professor of medicine at the Cleveland Clinic Lerner College of Medicine, many clinicians fail to recognize the full impact of fatigue in the HCM population.

Chair of the first ASE HCM Forum, ASE's President Elect, Theodore Abraham, MD, FASE, (right) with Alicia Armour, MA, ACS, RDCS, FASE, American Society of Echocardiography, (left) and Andrew Wang, MD, Hypertrophic Cardiomyopathy Medical Society representative (center).



“If you can understand the variability of fatigue, you can help patients feel better,” he told the group.

Dr. Desai went on to express reservations about newer guidelines that decrease the use of beta-blockers, a reflection on how the negative inotropes can contribute to fatigue. He argued that de-escalating beta-blockers might lead to subtherapeutic dosing, resulting in suboptimal outcomes and increased symptomatology.

Improving Diagnostic Strategies Requires Training, Protocols, and High-Volume Centers of Excellence

Clinicians employ various tools and strategies to facilitate the diagnosis of HCM. Key diagnostic features include a septal wall thickness meeting or exceeding 15 mm threshold (or at least 13 mm in adults with a family history of HCM). Other important features include an asymmetrical pattern of hypertrophy and a systolic anterior motion of the mitral valve towards the septum. Some echocardiography laboratories have a standard HCM protocol for any patient presenting with increased myocardial thickness.

However, according to panelists, the most challenging technical consideration for the diagnosis of HCM is evaluating septal thickness. This issue further increases the importance of capturing high-quality images. Both the panelists and audience consider cardiac magnetic resonance imaging (CMR) a beneficial tool when evaluating patients for potential or diagnosed HCM. CMR assesses wall thickness more accurately than other methods—an important benefit in a disease state where over- and under-measurements of septal wall thickness abound. Pulsed-wave Doppler pinpoints the site and level of obstruction within the left ventricle.

Nevertheless, even such common practices cannot completely ameliorate the numerous complexities clinicians face when confirming HCM diagnosis and determining the most appropriate course of treatment. For example, ascertaining wall thickness often proves more challenging in the subset of patients with apical HCM, owing to the distal and variable focal location of myocardial thickening. In addition, when measuring extracellular volume and evaluating interstitial fibrosis, clinicians find CMR with T1-mapping a useful tool.

Panelists also agreed that echocardiograms play a critical role in both diagnosis and treatment.

“We now have better tools in the toolbox, but there’s an emotional aspect to this because we’re watching what our families went through”

– Lisa Salberg, founder of the New Jersey-based Hypertrophic Cardiomyopathy Association

Dr. Anna Woo, director of echocardiography at Toronto General Hospital at the University of Toronto, discussed various methods of assessing for the presence of provokable left ventricular outflow tract (LVOT) obstruction in patients with HCM.

The main techniques for eliciting a provokable LVOT gradient are the Valsalva maneuver and exercise testing (e.g., treadmill test). The Valsalva maneuver is less sensitive than exercise for detecting a provokable LVOT gradient. The magnitude of the LVOT gradient is generally lower than the LVOT gradient obtained following treadmill exercise. Echocardiography reports will include technical comments regarding the adequacy of the Valsalva maneuver performed during the echo examination.

In addition, Dr. Woo shared previous experience regarding the advantages and disadvantages in using the inhaled agent, amyl nitrite, during an echocardiographic examination to elicit a provokable LVOT gradient. She emphasized that Valsalva and exercise are mainstays of HCM therapy today, while amyl nitrite is very infrequently used.

An equally important element in diagnostics and treatment is providing medical students/trainees and professionals the proper training and exposure to patients with HCM. Recruiting patient volunteers can help improve practicing and aspiring clinicians’ learning.

To that end, experts agreed that hands-on training is an irreplaceable tool in HCM diagnosis and treatment. However, the smaller patient population in the HCM community sometimes limits real-world training. One strategy to counter the issue is for institutions with HCM practices to have patients volunteer as a model for a training session with sonographers.

Challenges in providing high-level training may compromise outcomes in the HCM patient population. There are a limited number of centers in North America that have sufficient volume and experi-

ence to offer invasive septal reduction therapies. For example, suboptimal open-heart surgery (surgical myectomy) performed at inexperienced centers can worsen outcomes (inadequate surgical relief of obstruction, residual valvular lesions) and ultimately lead to valve replacement and/or ongoing serious cardiac issues. Yet, receiving adequate training is only one part of the solution. Proper surgical techniques are very difficult to teach, resulting in both variable techniques and outcomes. Surgeons need training in myectomy procedures and other surgical techniques that are sometimes performed in patients with obstructive HCM.

However, ensuring clinicians receive proper training in myectomy is an arduous undertaking. Dr. Woo described myectomy as “...one of the toughest surgical procedures to teach.”

“It is not just technical surgical expertise—it is also understanding the clinical manifestations of the

disease and the experience in interpreting the echo images at multiple time points during treatment: pre-operative, intra-operative (intra-operative transesophageal echocardiography performed before and after cardiopulmonary bypass), and post-operative (in the ICU),” said Dr. Woo.

To improve training and interventional outcomes, centers of excellence (COEs) should treat patients with HCM. In an ideal situation, the high clinical proficiency required to produce optimal HCM outcomes only likely occurs at a true COE with a high-volume HCM patient population. However, the reality remains that most institutions that treat HCM do not see a high volume of HCM patients, and they are, therefore, by definition, not true COEs. HCM patient population aside, conference attendees discussed the potential need for a pyramid approach to COEs to help identify the best COE, and they discussed strategies to improve other centers.



Sherif Nagueh, MD, FASE, (second from the left), American Society of Echocardiography, shares his thoughts during the Burden of Disease and Risk Stratification discussion. He is joined by (left to right) **Lisa Salberg, CEO, Hypertrophic Cardiomyopathy Association;** **Andrew Wang, MD, Hypertrophic Cardiomyopathy Medical Society representative;** and **Dermot Phelan, MD, FASE, American Society of Echocardiography.**

ASE Past President Judy Hung, MD, FASE, (right) led the discussion on Diagnostic Strategies. She was joined by (left to right), **Madeline Jankowski, BS, ACS, RDCS, FASE,** American Society of Echocardiography; **Alicia Armour, MA, ACS, RDCS, FASE,** American Society of Echocardiography; **Anna Woo, MD, FASE,** American Society of Echocardiography; and **Christopher Kramer, MD, Society for Cardiovascular Magnetic Resonance.**



An equally important element in diagnostics and treatment is providing medical students/trainees and professionals the proper training and exposure to patients with HCM.

HCM Clinicians Optimistic About Strides in HCM Management

In efforts to continue driving innovation and to improve outcomes, panelists contemplated issues hindering effective data capture, citing issues such as logistics, patient access barriers, and variable circumstances.

When implemented properly, shared decision-making tools can enhance patient-clinician dialogue, improve compliance, and enhance data capture by ensuring no patient is lost to follow-up (or there is a failure to document). Ensuring all patient-generated paperwork is completed at the point of care offers a plausible strategy, as highly motivated patients who complete their paperwork following clinician contact is rare.

As conference participants shared further insights about patients' symptoms and clinical issues, patient advocate Salberg took the opportunity to advise clinicians to reframe how they describe patients' symptoms in their correspondence and electronic medical records. She suggested that physicians and providers replace the word "complains" with the word "reports." The word "complains" carries the stigma and negative connotation that the patient is whining and complaining.

Moreover, despite the uptick in patient-reported outcomes in recent years, clinicians stressed the need for more comprehensive patient-reported outcomes to better identify issues.

Aside from the countless hurdles precluding effective patient care, the panelists shared encouraging views about the future of treatment options in the HCM population—especially in patients with nonobstructive HCM, given some promising data

emerging from a Phase III trial on Mavacamten.³ A cardiac myosin inhibitor, Mavacamten is a first-in-class therapy for nonobstructive HCM.

Data showed the myosin inhibitor, Mavacamten, significantly decreases the composite endpoint of the patient eligibility for invasive septal reduction therapy at the 16th week in a recent Phase III trial (VALOR-HCM).

However, the potential benefits do not mean Mavacamten therapy comes risk-free. The major concern is the small risk of left ventricular systolic dysfunction in patients who are on Mavacamten.

Yet, increasing access to myosin inhibitors requires clinicians to carefully document key information associated with a diagnosis of obstructive HCM, especially when seeking coverage for the medication. Panelists expressed optimism about the potential to correct genetic deficiencies with targeted therapy and the durability of the infusions. One infusion may last for several years; some patients may not require a second infusion afterward.

One panelist pointed out that echocardiography reports lacking appropriate measurements get payer pushback for reimbursement for myosin inhibitors.

Whether obstructive or nonobstructive, complexities in HCM management abound. Regardless, the combination of increased PROs, clinical trial data, clinician training, and patient-provider collaboration will help patients with HCM live longer and more fulfilling lives.

The 2023 HCM Forum addressed issues and clinical questions in managing and treating HCM. ASE will host a second, invitation only, Forum on March 8, 2024, in New York, NY, that will include a wider audience of field experts for a deeper dive into all aspects of HCM.

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