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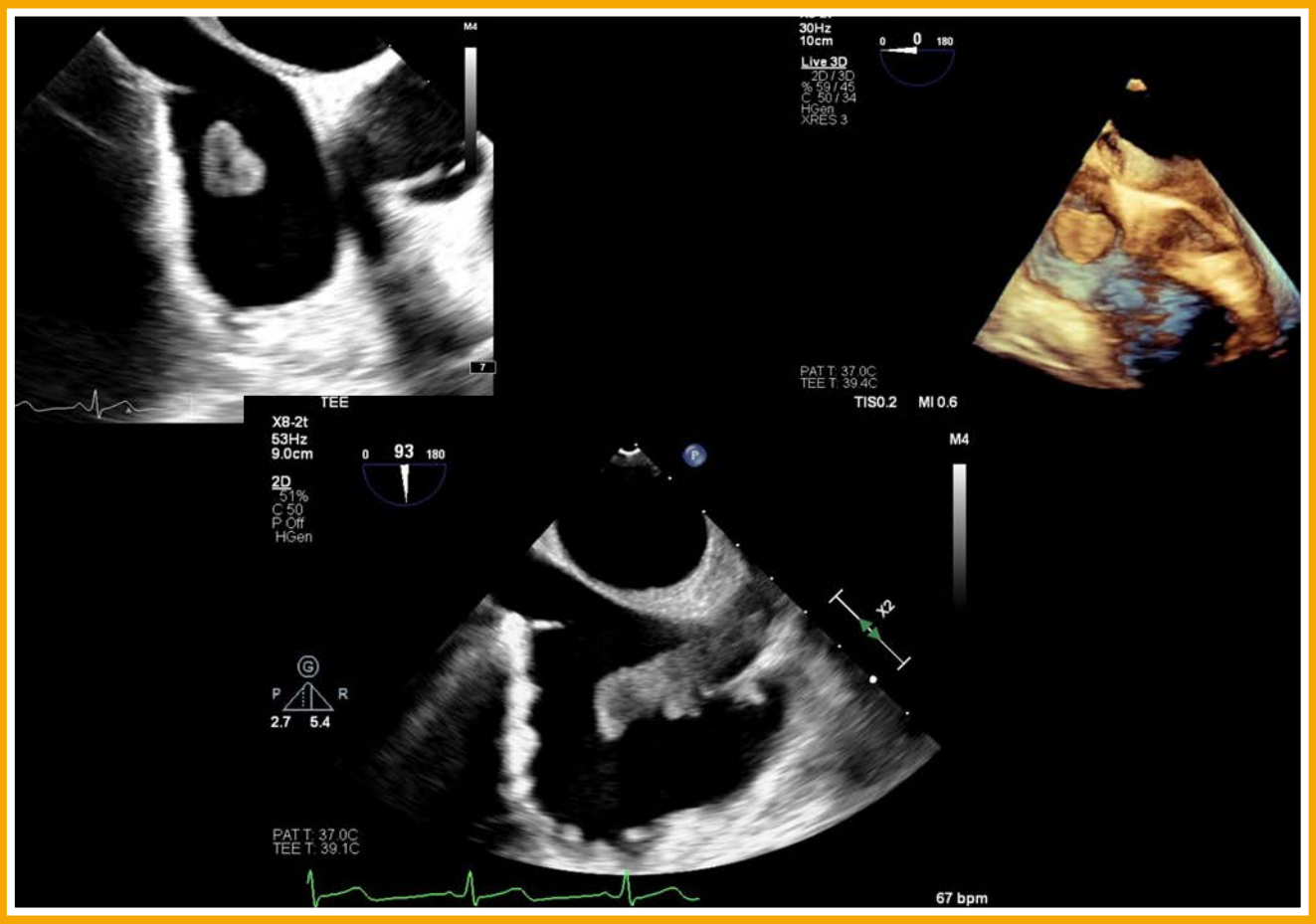

VOLUME 13 ISSUE 1 **JANUARY 2024**

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

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

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

Contents

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American Society of Echocardiography

Cover art: "I Love My Teddy Bear with All My Heart" Kelsie Drain, RCS, Hospital of Central Connecticut/Hartford Healthcare Heart and Vascular Institute Central Region, New Britain, Connecticut

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.

ASE'S FLAGSHIP TRIO OF JOURNALS—EXTRAORDINARY PUBLICATIONS FOR ALL MEMBERS OF OUR SOCIETY

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*

It has been my distinct honor and privilege to participate in editorial roles for all three of ASE's flagship journals. I find it remarkable how each of these journals can produce monthly content that is vital to our Society's mission and core values. I want to personally express my gratitude to each of these editors and their dedicated editorial teams and have asked them to update our membership on each of their journal's activities and highlights over the past year.

I find it remarkable how each of these journals can produce monthly content that is vital to our Society's mission and core values.

ECHO **MAGAZINE** *(Editors Meryl Cohen, MD, FASE, and Kelly Thorson, ACS, FASE)*

Echo magazine, a monthly update for the ASE community, began having consistent monthly installments approximately two years ago. The mission of Echo magazine is to provide educational articles, interviews, and updates on all of the extraordinary activities that ASE has to offer. Over the course of that time, articles have been published on a regular basis from the ASE Councils and Steering Committees and the Special Interest Groups giving updates on the amazing work that they do representing their constituents. We have also been fortunate to have Alan Pearlman write several articles on the history of our field. Echo magazine features regular sonographer content, including professional journeys and development and the Sonographer Volunteer of the month. Lastly, we have had the honor to publish in memoriam articles for the members we have lost over the past two years. Echo magazine is a home for the ASE family to be updated on all exciting ASE events

and the amazing work our members do for the echocardiography community.

CASE *(Vincent L. Sorrell, MD, FASE, Editor-In-Chief)*

It is my pleasure to update you on the recent highlights and developments for CASE: Cardiovascular Imaging Case Reports Journal. We continue to receive high-quality submissions from leading institutions around the globe. The total number of submissions increased 20% in 2022 compared to the prior year and accepted manuscripts increased by 30%. Those numbers have fallen slightly in the past year as we stabilize during the post-COVID submission practices. One of our primary objectives is to provide authors with a quick response time, and we have continued to prioritize cutting our time to a first decision. Over this same period, CASE has witnessed a tremendous worldwide interest as demonstrated in article downloads which exceeded 212,000 in 2022. This is fully appreciated when you simply look at the TOP three requested CASE manuscripts alone. In 2018, these TOP three reports totaled less than 1,000 CASE website download requests; in 2020 that number reached 1,250; and in 2021 it reached nearly 6,000 requests (meaning each report was individually requested more than twice as often as the ENTIRE top three just a few years earlier). Based on recent data, we're on track to hit 240,000 total downloads in 2023! Another highlight of CASE has been the global interest—we are proud that CASE website usage is now even more common outside of the US (60%) compared to within the US (40%).

Our CASE editorial leadership team has grown to meet the needs of the Journal and includes experts from all echocardiographic modalities and non-echo CV Imaging. We meet regularly to make sure we are maximizing the value of the Journal to our Society. I am grateful for the many volunteer hours that are dedicated to this endeavor. Some of the amazing by-products that have arisen from these think-tanks are the Sonographer Sound-off, Unlock the CASE, and Letter to the Editor options, as well as the Special Focus Issues on POCUS in 2022 and ACHD in 2024 (coming in March). We have learned that authors enjoy seeing their images on the cover of CASE, and we plan to continue to promote their work in this manner as well as via social media. In fact, @VLSorrellImages promoted 20 CASEs alone that received more than two MILLION views since January 2023. Our success remains closely tied to high-quality peer reviews, and we could not succeed without those dedicated volunteers from our editorial board and peer-reviewer list. Finally, no journal editor should take credit for the work of so many, and ASE is fortunate to have an incredibly skilled and dedicated Managing Editor (Deborah Meyer), Deputy Managing Editor (Andie Piddington) and Publications Assistant (Caroline Ward).

JASE *(Patricia A. Pellikka, MD, FASE, Editor-In-Chief)*

It is hard to believe that it has already been a year since I began my tenure as JASE Editor-in-Chief in January of 2023. I inherited an amazing journal that has been shaped and elevated by my three predecessors, Drs. Harvey Feigenbaum, Alan Pearlman, and Michael Picard. This past year, I have been working hard to continue this shaping and elevating, and am excited to share our efforts with you. I have many more ideas and of course, welcome your ideas for this echocardiography journal that we all appreciate.

Several changes for JASE were implemented in 2023. We have increased the amount and quality of the graphics in the Journal, recommending the inclusion of a central illustration for full-length papers. We have included more editorial comments from experts that help place the original investigations in the context of clinical practice and other research. We have continued to cultivate focus issues including an issue on echo in valve disease, and in early 2024 will provide an issue on precision imaging with echocardiography. Additionally, we have included focus topics within issues on the subjects of structural heart disease; left atrial remodeling and mechanics; and tricuspid regurgitation, right atrial and right ventricular pressure. To enhance our promotion of our authors' work, we have been inviting authors to submit a tweet and in November, added an interview with authors to coincide with publication of their paper. We have reduced the time to first decision by four days, an important part of our effort to improve the publishing experience of our authors. We continue to publish ASE Guidelines and Standards documents and published a total of six in 2023. We have expanded the size of our editorial board, recruiting an even more diverse international group. We have expanded a procedure by which editorial board members may recommend junior faculty as reviewers. The quality of papers that we receive and publish continues to improve as reflected by a constantly growing number of citations per year of JASE articles. We are indebted to our excellent team of Associate Editors, Editorial Board, JASE staff (Debbie Meyer, Andie Piddington, and Caroline Ward), reviewers, authors, and readers – *thank you all!*

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

Benjamin W. Eidem,
MD, FASE
ASE President

Sonographer

VOLUNTEER OF THE MONTH-JANUARY

Congratulations

Bernadette Richards, BS, RDCS, FASE

Program Manager, Nationwide Children's Hospital, Columbus, OH

Q&A

When and how did you get involved with cardiovascular ultrasound?

I enrolled in Ultrasound School in 1998, marking the beginning of my journey into echocardiography. From the outset, my passion was clear—I aspired to specialize in pediatric echo. My first position was at the University of Florida (JAX) performing all of the adult echoes in the institution with one other new graduate sonographer! Together, we immersed ourselves in the demanding field, tackling not only adult echoes but also venturing into the NICU. It was so busy and I am very thankful that I was "forced" to learn right-handed scanning in this lab. It was there that I crossed paths with a local pediatric cardiologist, a fateful encounter which ultimately steered my career. I patiently waited for an open position at the local Children's Hospital and was hired despite having little to no experience or training in congenital heart disease. I embraced the chance and never looked back. After a fruitful period in Florida, I decided to return to my roots in Ohio, where I continued my dedicated work in the realm of pediatric echocardiography.

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

Since 2002, Nationwide Children's Hospital in Columbus, Ohio, has been my professional home. I am so thankful to have had the opportunity to grow in my congenital imaging skills and learn a new skill, fetal echocardiography. My current position is Program Manager for the Echo Department.

When and how did you get involved with the ASE?

Dr. Craig Fleishman encouraged me to attend my very first professional meeting in 2004 and we chose the ASE Scientific Sessions. The sessions were incredible, and I was super thankful to meet many people and learn about novel research, techniques, and concepts which improved my skills as a sonographer.

> **"My dedication to volunteering for ASE emanates from a profound belief in the transformative power of continuous learning."**

> I am looking forward to integrating artificial intelligence (AI) to alleviate the time and physical strain associated with manipulating the probe, image acquisition, and performing measurements

Why do you volunteer for ASE?

My dedication to volunteering for ASE emanates from a profound belief in the transformative power of continuous learning. I am steadfast in the conviction that an unwavering pursuit of knowledge invariably enhances our skills, ultimately contributing to the best patient outcomes. Additionally, my involvement is fueled by a sense of gratitude for the privilege of shaping sonography into a fulfilling career. Motivated by this gratitude, I am driven to extend a helping hand to fellow sonographers, aspiring to broaden their professional horizons and transcend the conventional confines of being perceived merely as "the tech."

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

I currently serve on the leadership for the Targeted Neonatal Specialty Interest Group (TnEcho SIG). I am also involved with the local ultrasound schools giving talks and collaborating on programming.

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

For members aspiring to deepen their engagement, I recommend actively participating in the forums, and attending in-person meetings. The apex of joy for sonographers is often found at the Scientific Sessions, where collaboration and mutual support flourish. Interacting with sonographers from diverse laboratories provides invaluable learning experiences, fostering a dynamic exchange of knowledge. Subsequently, this interconnected community often unveils rewarding volunteer opportunities, further enriching one's professional journey.

What is your vision for the future of cardiovascular sonography?

Thinking of the future of cardiovascular ultrasound, I am looking forward to integrating artificial intelligence (AI) to alleviate the time and physical strain associated with manipulating the probe, image acquisition, and performing measurements. The prevalent incidence of injuries and discomfort among sonographers is disconcertingly high. My aspiration is to forge collaborative partnerships both within and beyond the imaging domain, working collectively to innovate solutions which specifically target the reduction of hand, wrist, elbow, and shoulder injuries.

Amidst escalating healthcare costs and a scarcity of healthcare professionals, I envision the establishment of a Pediatric Advanced Sonographer (ACS) or a specialized Sonographer Practitioner akin to the nurse practitioner model. This adaptation could offer a valuable solution, addressing the growing demands of pediatric care within the constraints of evolving healthcare dynamics.

My Path to a Career in Interventional Echocardiography: A Cardiology Fellow's Perspective

*Contributed by **Kifah Hussain, MD**, Northshore University Health System, Evanston, Illinois*

I was quite frankly left stunned by the multifarious aspects of the interventional echocardiographer's role and surely enough, inspired to go down the path of becoming one myself.

DURING MY GENERAL cardiology fellowship training, having gone through all the necessary transesophageal echocardiography simulation training and participated in multiple cases, I felt at ease when asked by a patient what to expect during a routine transesophageal echocardiogram. Soon after, I had an opportunity to participate in my first transcatheter mitral edge-to-edge repair case with the interventional echocardiographer. Having spent the previous night watching videos of the procedure and carefully studying the patient's preprocedural images, I was hopeful that I would be able to effectively contribute to intraprocedural imaging. The next day, as you can imagine, I was simply dumbfounded by the sheer complexity of the interventional echocardiographer's role during the procedure. Not only were they guiding the interventionalist through various aspects of the procedure but they were also making measurements on the fly, getting high-quality three-dimensional images, and aiding in appropriate device selection, all the while efficiently communicating findings with multiple members of the heart valve team. I was quite frankly left stunned by the multifarious aspects of the interventional echocardiographer's role and surely enough, inspired to go down the path of becoming one myself.

So, what did I need to pursue this dream of being competent in interventional echocardiography (IE)? Firstly, I realized that procedures requiring IE are not available at all ACGME-accredited cardiology training programs in equal volume, and given the complexity of these procedures, I would have to participate in

as many procedures as possible to gain confidence in an IE career. Secondly, with constant evolution in the IE field where new devices and transcatheter strategies are being rapidly developed, volume alone would not be sufficient to advance IE skills and it would be paramount to gain exposure to various technologies both commercial and under research. With a recent IE expert consensus statement and ASE guidelines outlining training requirements to achieve Level III competency in IE, it became clear to me that to gain both adequate case volume and comfort working with various transcatheter devices, it would be beneficial to pursue additional training at a dedicated IE training program.[1,2]

Then came the question of whether it would be enough to just gain experience with procedural volume and heterogeneity of structural heart procedures and devices. To answer this question, I spent most of my elective time as a general cardiology fellow in cardiac imaging-based rotations. As I went through these rotations and spent time with more and more cardiac imagers, the role of multimodality imaging became apparent to me. Both cardiac computed tomography and cardiac magnetic resonance imaging, are able to provide excellent anatomic and hemodynamic data to guide pre-procedural planning of structural heart interventions as well as post-procedural imaging to assess device success and potential complications. This made me see the value of looking for a training program that could also provide the opportunity to train in multimodality imaging as this would only help enhance my skill as an interventional echocardiographer. In addition to this, I was fascinated to find that both at multiple institutions across the country, there was increased utilization of intracardiac echocardiography for certain structural heart procedures. While current intracardiac echocardiography technology remains limited in its ability to provide high image quality when compared to transesophageal echocardiography, with its ability to help obviate the need for endotracheal intubation and possible reduction in procedure times and cost,[3] it felt necessary to look for an IE training program, where I could gain experience with the same. Multimodality imaging and exposure to intracardiac echocardiography felt like important aspects of getting holistic training in IE.

While searching for a program that would be able to provide me with the skills to pursue a successful career as an interventional echocardiographer, I was keenly aware that one important aspect of the IE dynamic is the ability to communicate with interventional cardiologists, cardiothoracic surgeons, and anesthesiologists. In order to do so, I saw fit to look for an IE training program where the faculty was not only well experienced in IE but also well versed in the art of managing an environment of strong and efficient communication in the high-stress environment of the interventional suite. I truly believe that when it comes down to it, the search for a good IE training program should involve a search for sufficient procedure volumes, heterogeneity in procedures, ability to work with intracardiac echocardiography, opportunities for multimodality imaging, and, most importantly, supportive faculty who would be able to provide excellent guidance in this fast-evolving cardiology subspeciality.

It became clear to me that to gain both adequate case volume and comfort working with various transcatheter devices, it would be beneficial to pursue additional training at a dedicated IE training program.

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Listen and Learn-

It's All in a Pod

*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*

This article showcases a few of the podcasters in our pediatric cardiology community and explores some interesting questions about their experience.

ALTHOUGH THEY SEEM to have always been available, podcasts actually got their start in 2003 when an MTV video jockey, Adam Curry, and software developer Dave Winer posted their first "audio blog." In 2004, Ben Hammersley, a writer for the Guardian, coined the term "podcast" by combining "iPod" and "broadcast" while writing a column on the internet radio blogs that provided a new boom for amateur radio. In his article, "Audible Revolution," Hammersley quotes Christopher Lydon, a former *New York Times* and National Public Radio journalist as saying, "Everything is inexpensive. The tools are available. Everyone has been saying that anyone can be a publisher, anyone can be a broadcaster." And from those humble beginnings, a new means for reaching a large audience on any topic was born. It was only a matter of time before this new platform was utilized for educating patients and healthcare providers. This article showcases a few of the podcasters in our pediatric cardiology community and explores some interesting questions about their experience.

Interviewees:

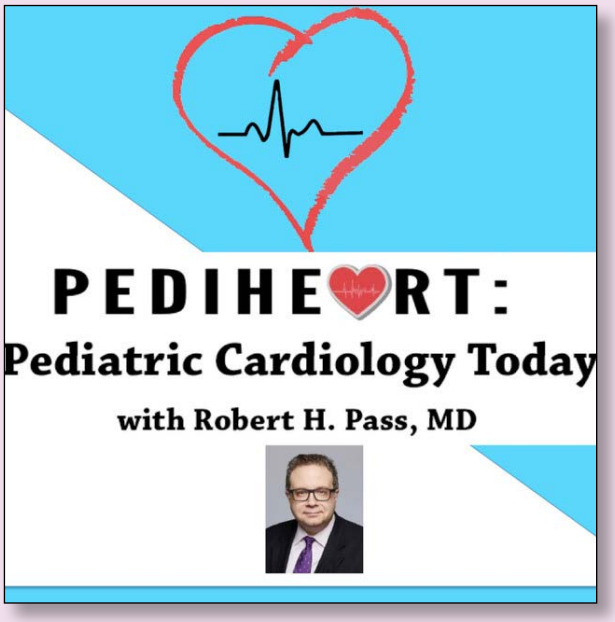
Robert Pass (RP), MD Professor of Pediatrics and Chief of the Division of Pediatric Cardiology, Icahn School of Medicine, Mount Sinai and Co-Director of the Mount Sinai Kravis Children's Heart Center, New York, NY

David Werho (DW), MD, Associate Clinical Professor of Pediatrics, Program director of the Pediatric Cardiology fellowship and Pediatric Cardiac Intensivist, Rady Children's Hospital, San Diego, CA

Rabah Daoud (RD), MD Pediatric Cardiology Fellow, Washington University School of Medicine, St. Louis, MO (joining Children's Mercy, Kansas City as an Assistant Professor in Pediatrics in the Division of Cardiology, Summer 2024)

Q: What's the title of your podcast, and what's it about?

RP: *Pediheart: Pediatric Cardiology Today*. The goal of the podcast is to review some of the important articles in all areas of pediatric cardiovascular science. Clearly, we cannot but touch on a tiny bit, but I try hard to mix the topics around so that all congenital cardiac specialists will find something of interest no matter their area of expertise, including surgeons.



DW: *The PCICS Podcast: The Podcast for Pediatric Cardiac Critical Care*. The podcast includes discussions on various topics in pediatric cardiac intensive care, cardiology, cardiac surgery, and anesthesia. Episodes include challenging cases, new science, journal clubs, humanity topics, current events, education, and novel ICU therapies with guests from pediatric cardiac ICUs across the world and other leaders in the field.

RD: The title of our podcast is *3pedsinapod* and it is mostly about general pediatrics. We take every day pediatric topics such as fevers, GERD and breastfeeding and turn them into easy and accessible episodes.

Q: How did you come up with the idea for your podcast- what is the goal you hope to accomplish?

RP: Podcasts became increasingly popular in the late 20-teens and I started listening to personal finance ones as I am getting older and thought I should be more knowledgeable as I approach retirement in the not-too-distant future. I looked to see if there was a podcast on pediatric cardiology and there was not. My other main goal was to highlight the work that we all do in our field to help children and adults with congenital heart disease. I have been frustrated by 'awards' shows like the Oscars or Tony awards where someone is honored in front

of millions of people for work that they did for 3-6 months on a show or a movie. It is wonderful that these artists are honored and recognized but people in our field spend their entire lives working to better the lives of patients and some do so without any notice or recognition. I feel like one of the important goals of the podcast is to highlight some of the really astonishing efforts and accomplishments of our own, if even for just a few minutes.

DW: Our podcast is the longest running podcast in the field of pediatric cardiology and pediatric cardiac critical care. We first began the podcast to offer a free open access forum for education in our field, with an early focus on discussing challenging CICU cases and educating physicians, nurses, and others about unique management for difficult cases. Over the years, our curriculum planning process has broadened to include not only challenging cases, but also a variety of other topics including news and current events in the field, reviewing landmark publications and journal clubs, speaking with physician and nursing leaders from across the world, and more.

RD: We came up with the idea for our podcast during residency after encountering many parents who would present to our clinics and emergency department with concerns related to misinformation they had gathered from online resources. There is a lot of information out there for parents to filter through and it's not always easy to know what you can trust. We started our podcast with the goal of providing reliable, evidence-based information for parents in a fun and interactive way.

Q. Who is your target audience, and why did you choose to focus on that group?

RP: The target audience are the people who all work in our field, whether nurses, doctors, respiratory therapists, pharmacists, social workers, cardiologists, surgeons or even perfusionists. I think we all know that our field is a team sport and so I felt that it would have more broad appeal if all the varied disciplines that work together might find things in the podcast of interest.

DW: Our audience is made up of a broad group including cardiac intensivists, trainees, cardiologists, nurses and advanced practice providers, anesthesiologists, general intensivists, cardiac surgeons, neonatologists, and parents of children with congenital heart disease. We initially started the podcast to focus on cardiac intensivists, trainees, and nurses, but the audience has broadened over the years, and we aim to make sure that we approach nearly every topic with the lens of having something for everyone to learn from.

RD: Our target audience is parents and families who use technology. Based on our listener demographics this tends to be the Millennial and Gen Z age group. This was a natural target audience for us as we are millennials who consume a large amount of information such as daily news and education from podcasts. Interestingly enough, we had initially set out to target mostly American parents, as we thought that would be the predominant audience. However, we have gathered a fairly large international following which has been exciting to see and shows how these subjects universally resonate with parents and families.

Q. What has been your favorite episode and why?

RP: I have many favorite episodes but probably one of my favorites was when Dr. Tony Rossi of Nicklaus

Children's Hospital first came on and spoke with us about his 1980's paper on how he and his team learned how to balance systemic and pulmonary vascular resistance and used mixed venous saturations in assessing single ventricle patients and how understanding these critical concepts raised the outcomes of his program so profoundly. His work and those of others at that time helped teach the world about this important concept. I had done a rotation with Dr. Rossi as a 4th year medical student back in 1990 and found that his 'teaching' on that episode really reminded me of why he inspired me to be a cardiologist while I was a student.

DW: It's hard to pick just one, so I'll give you my top three. Episode 83, Mental Health in the CICU, is an important episode discussing a topic that touches anyone who sets foot in a CICU and is one that I've gotten a great deal of positive feedback about. Episode 73, High Quality CPR, is an episode that I've learned the most from and that has impacted my own practice during resuscitations. Episode 1, Paracorporeal Device in Pulmonary Hypertension, was our very first episode that I recorded back when I was a fellow at Stanford about a patient of mine and it holds a special place in my heart because it's the beginning of such an amazing journey.

RD: My favorite episode thus far is probably our "Got Milk" episode where we interview a fellow pediatrician about her personal experience with breastfeeding and current guidelines. I had not had my own child at the time and looking back now I realize how important and relevant the episode was. It was one of our highest rated episodes with many new moms reaching out with additional questions and even thanking us for the information. Having had my own experience now, we plan to record a follow up episode which should be pretty entertaining, to say the least.

Q: What barriers have you encountered and what advice would you give to someone interested in starting their own?

RP: The biggest barrier is the time needed to prepare and actually do the podcast. I do every aspect of it including reading the papers, contacting the guests, preparing a script and questions for the guest and then all the technical aspects of recording and engineering it (which I do very poorly). I also single handedly 'hawk' it on social media. I think to do this, one needs to have a passion for it and an interest in teaching. I enjoy knowing that others are learning more by listening and hope that maybe something they have heard has helped a patient along the way. I know that for me, the amount of reading I have done for this podcast has definitely positively benefited my patients.

DW: Time is always the major barrier. When I started the podcast back in 2017, I was doing everything by myself and learning how to do everything with absolutely no background or experience, with no protected time. I spent countless nights and weekends to create it. Over the years, I've been able to train over 20 different nurses, advanced practice providers, and physicians on the process and have been able to hand off the podcast to three amazing women (Lillian Su, Saidie Rodriguez, and Deanna Tzanetos are the current executive producers) who I emphatically trust to continue growing and developing it further. My #1 piece of advice to anyone starting their own podcast is: don't do it alone. It's so much richer to have collaborators to bounce ideas off of and to help share the workload.

RD: Most of the barriers I have encountered have been related to finding the time to record and edit episodes. Podcasting is a full-time job for some people and being a physician and a trainee significantly limits your ability to focus on episode production. My advice would be to outsource editing as much as you can as this can take up the bulk of your time! Most importantly, make sure to choose topics that excite you and have fun recording. Podcasting should feel like a casual conversation with a friend.

If you have not already given these a listen, tune in on that next commute, run or ride. You may just be inspired to join their ranks and provide your own platform to give back to our patients and community.

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ASE REPRESENTING YOU

Contributed by
Kameswari Maganti, MD, FASE, Rutgers Robert Wood Johnson Medical School, and ASE's Advocacy Committee AMA Liaison

The American Medical Association's interim House of Delegates meeting was held in November 2023. Approximately 95% of delegates attended the meeting. The mood was somewhat somber given the looming 3.37% Medicare cuts that went into effect on January 1, 2024, that were announced by CMS on November 2, 2023. There was a great deal of discussion and urgency to stop Medicare physician pay cuts, reform the Medicare payment system, right size prior authorization, reduce physician burnout and protect patients from inappropriate scope of practice expansions. The AMA called for a fix to the flawed Medicare Payment System.

This meeting brings together state societies, medical societies, and student leaders from across the country to address issues that will shape the future of healthcare. Over 100 resolutions were considered, focusing on topics impacting patient care and the practice of medicine. There were a limited number of resolutions pertinent to cardiology community broadly and the following are of particular interest to ASE members.

- The House business started with Medicare physician payment reform. Temporary patches, ongoing payment cuts, freezes, and redistribution of Medicare physician payment system have left physician practices and patient access to care at serious risk. When adjusted for inflation, Medicare physician payment has effectively declined 26% from 2001 to 2023. This led to a new AMA campaign to get Washington D.C. to listen.

- AMA continues to encourage advocacy to federal and state legislatures, federal and state regulators, physician credentialing organizations, hospitals, and other interested parties to define physician board certification as the medical profession establishing specialty-specific standards for knowledge and skills, using an independent assessment process to determine the acquisition of knowledge and skills for initial certification and recertification.

- It was noted that there has been recent discussion regarding creation of a new certification examination called America Board of Cardiovascular Medicine, and move away from ABIM's MOC.

Kameswari Maganti, MD, FASE, attended the AMA House of Delegates Interim Meeting in November 2023.

- There was a resolution that addressed Physician burnout and shortages that was recommended for referral or decision.

- The AMA discussed an increase in recent years in healthcare related fraud. Although individuals from various backgrounds have been affected, it was noted that the elderly population has been particularly vulnerable to fraudulent healthcare related events. In addition, marginalized and minoritized populations were disproportionately impacted due to factors such as language barriers. The House passed a resolution encouraging on-going patient and physician education on recognizing and avoiding healthcare related scams.

- AMA continues to strongly oppose any encroachment of administrators upon the medical decision making of attending physicians that is not in the best interest of patients.

- There was a debate on "Professionalism in the Use of Social Media."

- Requested the AMA conduct a comprehensive study defining the appropriate role of digital interaction between patients and their doctors, including models for compensation.

- There were reports regarding the mental health crisis, drug shortages band, cannabis marketing practices and health departments and local governments to partner with public safety entities and organizations to make firearm safe storage devices accessible (available at low or no cost) in communities in collaboration with schools, hospitals, clinics, physician offices, and through other interested stakeholders.

- They addressed LGBQ+ inclusive safe sex practices. AMA urges television broadcasters and online streaming services, producers, sponsors, and any associated social media outlets to encourage education about heterosexual and LGBTQ+ inclusive safe sexual practices.

- Reaffirm AMA's support of lowering out-of-pocket maximums in insurance plans.

- The HOD felt more needs to be done to support strong protections of physicians responding as Good Samaritans, regardless of location within the United States and regardless of the type of medical emergency they are called upon to address.

- Dealt with scope of practice and access, and in particular the impacts of requiring an on-site physician in emergency departments.

- Reforming Stark law's blanket self-referral ban.

In summary, there was a huge volume of resolutions presented but the vast majority of them did not have direct impact on ASE members

In summary, there was a huge volume of resolutions presented but the vast majority of them did not have direct impact on ASE members and the vast majority did not have direct impact on cardiovascular disease or medical imaging. However, resolutions 814 and 235 regarding site neutrality and Medicare payment cuts respectively impact all of us and need to be watched closely. We will be following these resolutions intently at the annual AMA 2024 meeting and will provide updates accordingly.

A more detailed report of the resolutions is available to ASE members in the ASE Member Portal.

Peter Rahko, MD, FASE (left) and Kameswari Maganti, MD, FASE, are ASE's Representatives to the AMA on the Advocacy Committee.

A Comprehensive Imaging Approach to Prosthetic Valve in 2024

Insights into the Newly Published Guideline for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging

*Contributed by **Pei-Ni Jone, MD, FASE**, Lurie Children's Hospital and **Mohammed Chamsi-Pasha, MD, FASE**, Houston Methodist Hospital*

There has been over the years significant evolution in the treatment of valvular heart disease, but in addition, we realize the need for integrating multimodality imaging to provide accurate assessment of prosthetic valve structure and function. Since 2009, there has been a significant growing role in advanced cardiac imaging, particularly cardiac CT and cardiac MRI, and evaluating valvular heart disease patients, hence the need for this comprehensive update.

This updated guideline addresses several important developments since the 2009 guideline:

1. **Percutaneous valves** (catheter-based valve implantation) have developed rapidly in the last decade, so understanding percutaneous valves function is critical in taking care of these patients. In the new guideline, we update the new percutaneous valves in each of the respective valve positions such as aortic, pulmonary, tricuspid, and mitral valves. The advent of Transaortic Valve Implementation (TAVI) has rapidly changed the field of structural heart interventions. In addition, percutaneous valves are also used in pediatric patients with congenital heart disease and in adults with structural heart disease.
2. Emerging imaging modalities such as **three-dimensional echocardiography and intracardiac ultrasound** with 3D capabilities are also highlighted in the document. These modalities are used in conjunction with 2D transesophageal echocardiography (TEE) to guide percutaneous valve implementation; a comprehensive assessment of prosthetic valve function includes 2D and 3D imaging, Doppler imaging, and pertinent clinical information.
3. New addition since 2009 is the **inclusion of CT and MRI (a multimodality imaging approach** to evaluate prosthetic valves). CT and cardiac MRI (CMR) have emerged as important modalities for assessment of prosthetic valve function that complement echocardiography. CT is helpful in providing valve anatomy with a particular advantage in mechanical valves and in pre-interventional valve planning. CMR is better at providing hemodynamic evaluation.
4. **Table 2** highlights the comparative advantages and disadvantages of each of the imaging modalities when assessing cardiac valves to aid the clinician in deciding what advanced modality to use and what condition.
5. This guideline also addresses **prosthetic valves evaluation in patients with congenital heart disease** and their specific, more complex assessment depending on the underlying pathology.

TABLE 2 **Multimodality imaging of prosthetic valves after initial transthoracic echocardiographic evaluation: advantages and limitations**

	ADVANTAGES	LIMITATIONS
TEE	• High spatial and temporal resolution in real time of valvular structure and function • Doppler quantitative hemodynamic assessment of valve function • Best visualization and assessment for mitral valves (en face) followed by aortic, tricuspid, and pulmonary valves:Valve and occluder/leaflet motion, etiology of dysfunction, gradient; localization and severity assessment of regurgitation (trans- or paravalvular) • 3D TEE, using en face views and/or MPR, may offer more definitive assessment of valve structure, leaflet/occluder motion, localization of PVL, and baseline assessment prior to structural intervention. • Detection of valvular vegetations (small, mobile) • Identification of paravalvular complications (dehiscence, abscess, pseudoaneurysm) • Portable, feasible to use in ICU/emergency department setting and intubated patients • No contraindications in renal dysfunction	• Optimal valve visualization and assessment depends on valve and probe position • Reverberation/shadowing from near field prosthetic valve structures prevent visualization of far-field structures; changing acoustic windows may allow imaging of previously shadowed structures. • Less able to assess pulmonary valve structure and function; special views needed
ICE	• Best modality to evaluate the pulmonary valve and TV and anterior structures of the heart • 3D ICE can show en face views of the pulmonary valve and TV as well as the mitral valve (when performed from the left atrium) • Simultaneous biplane imaging using 3D ICE has higher temporal and spatial resolution compared with 3D volume-rendered images	• Narrow sector width of 3D ICE volume-rendered images with limited temporal and spatial resolution • Color Doppler in 3D ICE has low spatial and temporal resolution with current systems
CT	• Excellent spatial resolution • Good visualization of occluder/leaflet motion, pannus, and leaflet calcification/thickening irrespective of valve position • Identification of paravalvular complications (dehiscence, abscess, pseudoaneurysm) • Useful in the context of multiple prosthetic valves where artifact may affect TEE quality	• Lack of hemodynamic evaluation • Valve regurgitation severity is inferred from anatomic defect; mild regurgitation or shunt may not be detected. • Beam-hardening artifact, particularly in mechanical valves, may interfere with identifying vegetations, thrombus, pannus, small dehiscence • Nephrotoxic contrast agents needed for angiography (noncontrast CT can be used for mechanical valve motion) • Full R-R acquisitions contribute to higher radiation doses • Temporal resolution may be limited
CMR	• Quantitation of peak velocity and gradients (in bioprosthetic valves), irrespective of valve position • Quantitation of regurgitant volume and fraction in regurgitant valves • Identification of anatomic valve area and leaflet pathologies in bioprosthetic valves (thickening, flail) • Identification of large paravalvular complications (e.g., dehiscence, pseudoaneurysm)	• Limited spatial and temporal resolution • Artifact from prosthesis interferes with evaluation of mechanical valves and some bioprosthetic valves • Inability to detect small, highly mobile vegetations • Irregular rhythm and atrial fibrillation effect on valve visualization (potential to overcome with real-time cines) and flow quantitation

PVL, Paravalvular leak, ICU, Intensive care unit; *MPR*, multiplanar reconstruction.

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Key in assessing all prosthetic valves is the knowledge of the type and the size of the valve implanted. This has implications regarding the hemodynamic profile of such valves and the rate of complications. The valve type also affects the amount of artifacts seen with echocardiography, as well as on CT and MRI. Surgical heart valves are prone to dysfunction, and we try in the guidelines to provide objective data in concordance with the Valve Academic Research Consortium.

1. Structural valve dysfunction is usually related to wear and tear causing leaflet disruption, leaflet fibrosis or calcification. Structural valve degeneration with calcification is the most common cause of bioprosthesis degeneration.
2. Nonstructural valvular dysfunction can be seen due to patient prosthesis mismatch or paravalvular leak.
3. Endocarditis of the prosthetic valve with paravalvular extension causing abscess can be seen, more commonly in the aortic valve in the mitral position. The prevalence of endocarditis is 1 to 6% anytime after surgery.
4. Thrombus formation has a prevalence of 0.3 to 8%. CT scan is critical in evaluating both bioprosthetic and mechanical heart valves showing hypoattenuation leaflet thickening, or hypodensities consistent with thrombus formation.

Prosthetic Aortic Valve assessment

The echocardiographic assessment of prosthetic aortic valve starts with standard views, but in addition, sweeping the imaging plane on both the parasternal long and short axis would be necessary to detect valve regurgitant jets. Of note, 3DTEE of the prosthetic aortic valve cusps would be extremely challenging due to the orientation, hence precise motion and excursion of the prosthetic (particularly metallic) leaflets might not be well-delineated. Additional Doppler parameters that have been incorporated in the guidelines include the acceleration time, acceleration time over injection time, along with specific Doppler parameters for transcatheter aortic valve taking into consideration the change in mean gradient (which is flow dependent), DVI and EOA (which are less flow dependent) changes from baseline. Collectively, the diagnosis of prosthetic aortic valve stenosis should not rely on a measurement of a single parameter and should incorporate assessments from two or more serial echocardiograms when available.

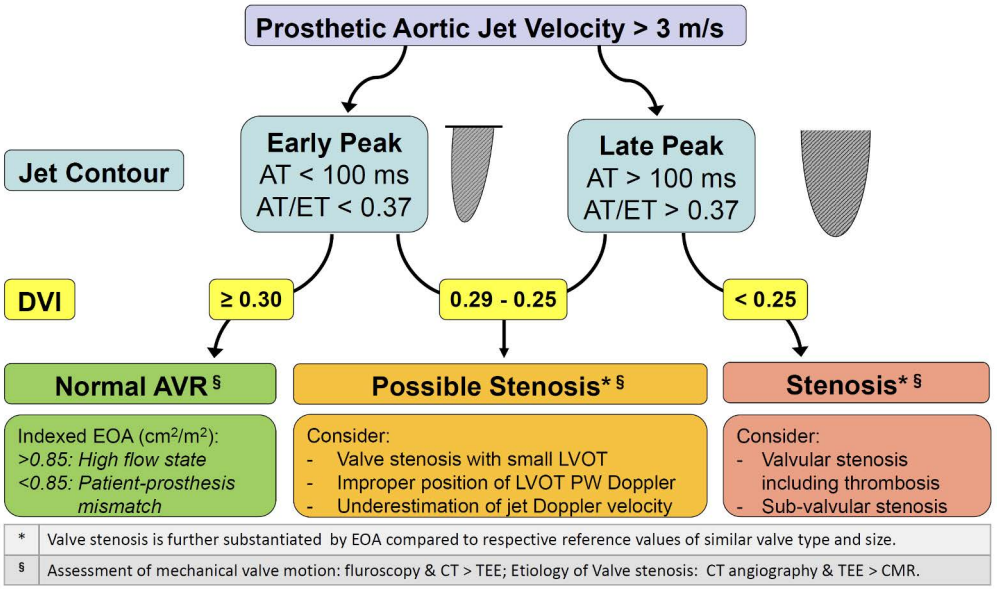

Figure 13 Algorithm for initial evaluation of elevated peak prosthetic aortic jet velocity incorporating DVI, jet contour, and measures of acceleration time(AT) and the ratio of AT to ejection time(ET). Improper PW Doppler sample volume influences both DVI and EOA calculations: too close to the valve will increase DVI and EOA, while too far(apical) will decrease them. AVR, Aortic valve replacement.

(This figure is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Cardiac CT on the other side provides superior anatomical delineation of structural valve degeneration, particularly mechanical disc dysfunction, prosthesis dehiscence, large vegetations, perivalvular annular extension, and leaflet thrombosis. Cardiac MRI provides both anatomical and physiological data by assessing anatomical valve area (usually 10 to 20% larger than the EOA provided by echocardiography), and using phase-contrast imaging to estimate peak velocity across the valve.

TABLE 9 Potential role of CT in various complications of prosthetic aortic valves

COMPLICATION	POTENTIAL ROLE OF MDCT
Mechanical leaflet dysfunction	• Can evaluate motion and opening angle of mechanical leaflet(s) and compare it with manufacturer's specifications • Normal opening angle is 73°-90° for bileaflet valves and 60°-80° for monoleaflet valves
PPM	• Small EOA, normal leaflet motion, lack of masses, and a small geometric orifice area[115]
Structural failure	• Detects valvular calcification despite normal gradients[116]
Prosthesis dehiscence	• Identifies a gap between the annulus and prosthesis sewing ring • For the aortic valve prosthesis, excessive sewing ring motion with rocking >15° implies significant paravalvular regurgitation[1]
PVL	• Contrast material–filled channel in the paravalvular region that connects the lumina proximal and distal to the valve (e.g., for the aortic valve, aorta, and LVOT) • Helps distinguish from pseudoaneurysm and abscess[117] • Helps distinguish from pledget material (the HU of a pledget are significantly higher than those of contrast material [383-494 vs 202-367 HU][118])
Endocarditis	• Large vegetations (>1 cm) seen on the valve leaflet or sewing ring, usually on the ventricular side of the aortic valve[119]; generally inferior to TEE for small vegetations (<4 mm) and perforations (<2 mm) but superior in evaluating paravalvular and extracardiac extension[120] • CT may show other manifestations of infection such as aortic wall thickening, mediastinal gas, fat stranding, collections[119,120]
Pseudoaneurysm	• Contrast material–filled saccular or fusiform outpouchings arising from the annulus, which may contain thrombus • With infection, adjacent soft tissue inflammatory changes may be seen
Thrombus	• Irregular mass commonly mobile, without enhancement, attached to a PHV • Distinguishing from pannus is important • Thrombus is seen more commonly early after surgery, adherent usually to the aortic side of an aortic valve prosthesis, and has lower attenuation (<200 HU) • Pannus is seen late after surgery, is usually located on the ventricular side, and has higher attenuation (>200 HU)[121] • A cutoff of 145 HU is useful in distinguishing thrombus from pannus, with 87.5% sensitivity and 96% specificity121 • CT allows prediction of response to thrombolysis. Complete lysis is more common in thrombi with attenuation less than 90 HU vs 90-145 HU[121]
HALT and HAM	• Helps identify HALT, with or without restricted motion, which benefits from anticoagulation[122]
Aortic dissection	• Intimal flap with true and false lumina, internal displacement of intimal calcification, delayed enhancement of the false lumen, widening of the aorta and mediastinum, ulcer-like contrast material projections, and compression of the true lumen[123]

HALT, Hypoattenuated leaflet thickening; *HAM*, hypoattenuation affecting motion; *HU*, Hounsfield unit; *MDCT,* multidetector CT.

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Prosthetic Mitral Valve Assessment

The commonly placed mechanical and stented bioprosthetic mitral valves provide an effective orifice area in the 2 to 3 cm^2 range, with mean gradients that are in the 2 to 3 mmHg range for mechanical valves, and 3 to 5 mmHg range for the bioprosthetic valves. The standard echocardiographic views are used with integration of Doppler hemodynamics that includes peak early velocity, mean pressure gradient, and pressure half-time. EOA and DVI are of particular importance for evaluating stenosis but also can provide a clue to the presence of significant mitral regurgitation. The criterion for prosthetic mitral stenosis remains similar to the 2009 guidelines.

TEE with 3D has the superiority in assessing prosthetic mitral valves for both regurgitation and stenosis, giving en face view.

TEE with 3D has the superiority in assessing prosthetic mitral valves for both regurgitation and stenosis, giving en face view. Cardiac CT scan can provide on both contrast the noncontract enhanced acquisitions of mechanical discs opening and closure, and with contrast-enhanced acquisitions, bioprosthetic leaflet thickening and calcification, pannus, or vegetation can be identified. The geometric orifice area could be measured for these valves. In addition, we have standard normal references for the opening and closure angles of different commercially available mechanical mitral valves.

CMR can provide anatomical data with direct planimetry of the bioprosthetic valve orifice, and physiological data with measurement of peak velocity through the prosthesis. The limitation is susceptibility artifact, particularly with mechanical valves where disc opening and closure cannot be assessed. In regurgitation cases, CMR can provide regurgitant volume and fraction best achieved with the indirect method, and calculating the difference between the total LV stroke volume and aortic forward stroke volume would be the mitral regurgitation volume. [the key points can be in a box or something]

Key Points for Assessing Prosthetic Mitral Valves

1. Assessment of prosthetic mitral valve function begins with knowledge of the type and size of the prosthetic valve implanted.
2. Structural and hemodynamic evaluation with TTE and TEE provides key understanding of the function of the prosthetic mitral valve.
3. From the Doppler interrogation of prosthetic mitral valves, peak velocity, mean gradient, PHT, EOA or DVI, and heart rate should be measured whenever feasible and reported.
4. Because of shadowing and flow masking in the left atrium, particularly in mechanical mitral valves, significant prosthetic MR may be missed with color Doppler on TTE. Clues for significant MR from spectral Doppler include increased mitral peak early velocity, mean gradient, DVI, and a relatively low systemic stroke volume in relation to total LV stroke volume. TEE is indicated in suspected cases of significant MR.
5. TEE (2D and 3D) provides an en face view of the prosthetic mitral valve which allows the evaluation of valve structure, occluder motion, and the presence, location, and extent of valvular regurgitation; the latter are crucial in guiding interventional procedures.
6. CT and CMR provide complementary evaluation of prosthetic mitral valves, particularly when further information is needed regarding prosthetic structure, function, or associated complications. CT allows the evaluation of valve structure and mechanical valve occluder motion, as well as the localization of significant paravalvular regurgitation and identification of associated complications. CMR allows the evaluation of valvular structure of bioprosthetic valves and is particularly helpful in quantitation of prosthetic MR and LV remodeling.

Prosthetic Pulmonary Valve Assessment

It is critically important to understand the different types of prosthetic valves that are placed in the pulmonary position. Understanding how to assess pulmonary valve regurgitation allows the clinicians to know how to manage patients with severe pulmonary insufficiency. ***See Table 16***.

TABLE 16 Echocardiographic evaluation of severity of prosthetic pulmonary valve regurgitation

PARAMETERS	MILD	MODERATE	SEVERE
Valve structure	Usually normal	Abnormal or valve dehiscence	Abnormal or valve dehiscence
RV size	Usually normal	Normal or dilated*	Dilated or progressive dilation†
Jet size by color Doppler (central jets)‡	Thin with a narrow origin; jet width ≤25% of pulmonary annulus	Intermediate; jet width 26%-50% of pulmonary annulus	Usually large, with a wide origin; jet width >50% of pulmonary annulus; may be brief in duration
Jet density by CW Doppler	Incomplete or faint	Dense	Dense
Jet deceleration rate by CW Doppler	Slow deceleration	Variable deceleration	Steep deceleration,§ early termination of diastolic flow
Pulmonary systolic flow compared with systemic flow by PW Doppler¶	Slightly increased	Intermediate	Greatly increased
Diastolic flow reversal in the distal main PA	None	Present	Present

Adapted from Zoghbi *et al.*[1]

*Unless other cause of RV dilatation exists, including residual postsurgical dilatation.

† Unless there are other reasons for baseline RV enlargement. Acute PR is an exception. RV volume overload is usually accompanied with typical paradoxical septal motion.

‡ At a Nyquist limit of 50-60 cm/sec; parameter applies to central jets and not eccentric jets.

§ Steep deceleration is not specific for severe PR, as it may occur with severe RV diastolic dysfunction.

¶ Cutoff values for regurgitant volume and fraction are not well validated.

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Evaluation of different imaging modalities is necessary for different portions of the pulmonary valve that is affected. ***Table 17*** describes the advantages using different imaging modality to assess the pulmonary valve.

TABLE 17 **Prosthetic pulmonary valve assessment and multimodality imaging: advantages and limitations**

	ECHOCARDIOGRAPHY	CMR	CT
Primary valve failure	**Advantages** • Qualitative assessment of regurgitation/stenosis • Assessment of peak/mean gradients • Assessment of RV hemodynamics **Limitations** • Challenging to be coaxial to PVR • Challenging to evaluate PA stenosis	**Advantages** • Spatial resolution • Quantification of stenosis/ regurgitation • Quantification of RV volume/ function • Anatomic visualization of PA/ bifurcation **Limitations** • Some valves can create artifacts	**Advantages** • Spatial resolution • Visualization of leaflets for stenosis • Assessment of calcification of valve/conduit • Anatomic visualization of PA/ bifurcation **Limitations** • Assessment of regurgitation • No hemodynamic assessment • Radiation/contrast use
Thrombosis/Pannus	**Advantages** • Qualitative assessment regurgitation/stenosis • Assessment of peak/mean gradients • Assessment of RV hemodynamics **Limitations** • Difficult to visualize valve structure	Not ideal for assessment	**Advantages** • Good visualization and spatial resolution • Differentiates between thrombus and pannus **Limitations** • Radiation/contrast
Endocarditis	**Advantages** • Temporal resolution • Qualitative assessment of regurgi-tation/stenosis **Limitations** • Dependent on acoustic windows	Not ideal for assessment of small vegetations	Not ideal for assessment of small vegetations

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Prosthetic Tricuspid Valve Assessment

A comprehensive evaluation of TV requires multiple imaging planes in which 2D and 3D and Doppler echocardiography are used to assess valvular structure and function, as well as right heart chamber size and function. Because of shadowing and flow masking in the right atrium, particularly in mechanical TVs, screening for TR should include modified RV inflow and subcostal views as well as PW Doppler interrogation of hepatic vein flow, where feasible. The advantages and limitations of echocardiographic tricuspid valve evaluation are listed in ***Table 20***.

TABLE 20 **Echocardiographic parameters for determining prosthetic TV regurgitation: advantages and limitations**

PARAMETER	ADVANTAGES	LIMITATIONS
TV morphology (e.g., flail leaflet, perforation, dehiscence)	• Abnormalities should be seen if severe TR is present	• Influenced by machine settings and physics of ultrasound (e.g., depth, acoustic artifact by prosthetic material)
RA and RV size and function	• Dilatation of both right atrium and right ventricle is typically seen in significant TR • Absence of RA and RV dilatation argues against severe chronic TR	• Underlying pathology of left and right heart as well as pulmonary hypertension may also cause right heart chamber dilatation
IVC and hepatic vein flow	• In the setting of significant TR, dilatation of the IVC and holosystolic flow reversal in the hepatic vein are seen	• Changes in RA compliance are frequently seen following TVR, resulting in blunting of hepatic vein flow and/or late systolic reversal. • Dilatation of IVC may be seen in other conditions with high RA/RV diastolic pressure
CW Doppler	• Dense systolic spectral recording with triangular, early peaking velocity are suggestive of severe TR	• Jet alignment is required • Diastolic peak and mean gradients are influenced not only by TR but also by RV/LV function and prosthetic stenosis.
Color Doppler jet (size, number of jets, location, eccentricity)	• Real time and rapid • Large central jet (area > 10 cm2) suggestive of severe TR	• Influenced by machine settings and physics of ultrasound (e.g., depth, acoustic artifact by prosthetic material), and hemodynamics • Multiple and eccentric jets are more difficult to interpret
VCW	• Real time and rapid • VCW ≥ 0.7 cm suggestive of severe TR	• May underestimate TR severity in presence of multiple jets, temporal variability or markedly asymmetric orifice shape • Device interference with flow convergence zone limits accuracy
PISA radius and EROA*	• Large flow convergence (>0.9 cm) suggests severe • EROA < 0.2 cm2 usually mild TR; ≥0.4 cm2 usually severe TR	• Limitations of resolution (axial, lateral, and t emporal) as well as blooming artifacts • Accuracy in nonplanar orifices may be limited • 3D reconstruction of each orifice is time consuming • Temporal averaging may be necessary
VC area by 3D planimetry	• May be the most accurate assessment of TR; however, poorly validated	

IVC, Inferior vena cava; PISA, proximal isovelocity surface area; VCW, VC width.

*Not well validated for quantitation in TVR; for PISA, baseline Nyquist limit shift to 25-35 cm/sec.

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Echocardiographic grading of tricuspid valve regurgitation after tricuspid valve regurgitation repair or tricuspid valve repair is outlined in ***Table 21***.

TABLE 21 **Echocardiographic grading of TR after TVR or TV repair**

PARAMETERS	MILD	MODERATE	SEVERE
Qualitative			
Color jet area*	Small, narrow, central	Moderate central	Large central jet or eccentric wall-impinging jet(s) of variable size swirling in right atrium
Flow convergence zone†	Not visible or small	Intermediate in size	Large
TR CW Doppler velocity waveform (density and shape)	Faint/partial/parabolic	Dense, parabolic or triangular	Dense, often triangular
Tricuspid inflow	A-wave dominant	Variable	E-wave dominant‡
Semiquantitative			
VC width, cm*	<0.3	0.3-0.69	≥0.7 or ≥2 moderate jets
PISA radius, cm†	≤0.5	0.6-0.9	>0.9
Hepatic vein flow§	Systolic dominance	Systolic blunting	Systolic flow reversal
Quantitative			
EROA, cm2§	<0.20	0.20-0.39	≥0.40
RVol, mL§	<30	30-44	≥45

PISA, Proximal isovelocity surface area; *RVol*, regurgitant volume.

* With Nyquist limit > 50-60 cm/sec.

† Not well validated for quantitation in TVR; baseline Nyquist limit shift to 25-35 cm/sec.

‡ Nonspecific, influenced by other factors (RV diastolic function, atrial fibrillation, RA pressure).

§ EROA and RVol from 2D PISA need further validation of cutoffs by either PISA or volumetric methods.

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

Multimodality imaging of the tricuspid valve using CMR may be helpful in quantifying the regurgitation volume and fraction; however, validation of its use in the prosthetic valve function is lacking. CT is helpful in identifying mechanism of valve dysfunction, localization of significant PVLs, and is essential in planning percutaneous interventions on the TV.

Prosthetic Valve Assessment in Congenital Heart Disease

Evaluation of prosthetic valves in CHD may require modifications to standard transthoracic and transesophageal echocardiographic views. An understanding of different CHD anatomy, conduits, and hemodynamics is required in the evaluation of PHV in CHD. An understanding of congenital heart disease after primary surgery that requires prosthetic valves evaluation is critical as these patients are surviving into adulthood. Guidance using 3D TEE or 3D ICE to deploy percutaneous valves is changing the field of pediatric congenital heart disease and also affecting structural heart interventions. The advent of these new percutaneous valves is opening up another field of cardiovascular ultrasound such as interventional guidance in congenital and structural heart disease. Three-dimensional echocardiography can provide valuable anatomic information and en face views of the PHV in CHD in addition to providing guidance for percutaneous valves (***Table 24 below***). CT and CMR provide additional means of imaging PHVs in CHD.

The advent of these new percutaneous valves is opening up another field of cardiovascular ultrasound such as interventional guidance in congenital and structural heart disease.

Table 24 Use of 3D echocardiography in patients with CHD*

REGION OF INTEREST	3D MODALITY	INFORMATION	FEASIBILITY
Aortic valve	• GS/color Doppler • TTE: PLAX, PSAX, apical • TEE: ME 60°, 120°	• Prosthetic valve leaflet appearance/motion • Regurgitation origin • Improved LVOT area measurement	Moderate
Mitral valve	• GS/color Doppler • TTE: PLAX, PSAX, apical • TEE: ME 0°, 90°, 120°	• Prosthetic valve leaflet appearance/motion • Regurgitation origin	High
TV	• GS/color Doppler • TTE: apical, RV inflow, subcostal • TEE: ME 0°, 40°-60°, transgastric	• Prosthetic valve leaflet appearance/motion • Regurgitation origin	Moderate
Pulmonary valve/pulmonary homografts	• GS/color Doppler • TTE: PSAX • TEE: high esophageal 0°-40°, transgastric	• Prosthetic valve leaflet appearance/motion • Regurgitation origin • Improves RVOT area measurement	Low

GS, Grayscale; *ME*, midesophageal; *PLAX*, parasternal long-axis view; *PSAX*, parasternal short-axis view.

* Edited from Simpson *et al*.[224]

(This table is from Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in the January 2024 *Journal of the American Society of Echocardiography*. Reprinted with permission from Elsevier Inc.)

In summary, this guideline summarizes how to evaluate each of the respective valves by consolidating critical information gleaned from imaging (summarized in tables/key points) so that the clinician knows when a particular valve is dysfunctional and needs to be replaced or intervened upon. This guideline provides a roadmap for clinicians in evaluating prosthetic heart valves and provides what imaging modality can help with each of the respective valves, especially with the newest valves.

Read the full Guidelines for the Evaluation of Prosthetic Valve Function With Cardiovascular Imaging, published in JASE, January 2024.

This guideline provides a roadmap for clinicians in evaluating prosthetic heart valves and provides what imaging modality can help with each of the respective valves, especially with the newest valves.

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