

PANEL DISCUSSION

Subspecialty Exposure in Interventional Cardiology Training

Reflections on approaches to training as the IC field, and structural heart specifically, evolves to encompass new therapies, including core competencies for all, ensuring adequate exposure, weighing the benefits of additional training, and the main challenges facing trainees today.

With Laura Flannery, MD, and Isida Byku, MD



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Dr. Flannery: As the field of interventional cardiology both expands and deepens, it's essential that fellowship programs focus on ensuring graduates are prepared for independent practice in core clinical competencies. Fellows should be adept in guide and wire selection, wire and balloon escalation strategies, use of microcatheters and guide extensions, thrombectomy, intravascular lithotripsy (IVL), drug coated balloons, vein graft percutaneous coronary intervention (PCI), pressure wire assessment, and intracoronary imaging—with intravascular ultrasound (IVUS)-guided PCI as the standard. In addition to these fundamental PCI techniques, fellows should be independently proficient in ultrasound-guided femoral access and closure devices, mechanical circulatory support placement and management, hemodynamics, and pericardiocentesis. While fellows should be comfortable with the basic techniques and troubleshooting of more advanced skills such as atherectomy, brachytherapy and laser, chronic total occlusion (CTO) crossing techniques, perforation management, and peripheral bailout strategies, it is more realistic that full autonomy in these areas develop postfellowship with additional mentorship and experience or with an advanced fellowship.

By the end of a dedicated year of advanced structural interventional training, fellows should independently master a straightforward transfemoral transcatheter aortic valve replacement (TAVR), patent foramen ovale (PFO) closure, and be well-versed in structural heart disease evaluation and procedural candidacy, includ-

As the field of interventional cardiology (IC) continues to broaden and encompass new and evolving therapies, it will become increasingly challenging, if not impossible, to expose fellows to the full spectrum of clinical practice. What core clinical competencies should every graduate of an accredited IC fellowship acquire by the end of their year of training? And for a structural fellowship?

ing advanced invasive hemodynamics and CT planning. However, most structural procedures—including mitral and tricuspid edge-to-edge repair, alternative access and valve-in-valve TAVR, leaflet modification, paravalvular leak closure, transcatheter mitral valve repair (TMVR), transcatheter tricuspid valve repair (TTVR), congenital interventions, and septal ablation—will need to be approached with senior collaboration early in practice due to their complexity and variability in volume and approach across institutions.

Dr. Byku: Over the past decade—and particularly in the 5 years since I completed my training—the complexity of transcatheter interventions in both the coronary and structural heart/valve arenas has increased dramatically. This evolution has prompted the establishment of dedicated, additional non-ACGME (Accreditation Council for Graduate Medical Education) fellowship years for both Structural Heart and CHIP/CTO specialties.

It is virtually impossible to master the full breadth of these skills within a single year of IC training, especially given the current level of complexity in both complex coronary and structural heart interventions. In the initial IC year, the focus is on learning to evaluate patients for the appropriateness of cardiac catheterization and/or coronary intervention, in both inpatient and outpatient settings. This includes developing expertise in patient counseling—discussing the nature of their condition, engaging in shared decision-making, and weighing the potential risks and benefits of invasive treatment.

In the cath lab, fellows must first master the fundamentals: consistently and safely obtaining vascular access, performing the full range of diagnostic procedures, and advancing to coronary interventions. Coronary work is frequently complex, often requiring adjunctive techniques such as atherectomy, intravascular lithotripsy, and mechanical circulatory support. Acquiring these essential building blocks to safely and effectively perform coronary interventions typically occupies the first 6 to 9 months of training. Trying to achieve meaningful exposure to structural heart interventions in parallel is logistically very challenging.

For many incoming structural fellows, it can be humbling to realize—despite being fully trained and board-eligible interventional cardiologists—that there exists an entire world of structural heart and valve interventions they have yet to encounter. My own coronary-focused training had not prepared me for the complexity of structural procedures or their multidisciplinary nature, which integrates advanced imaging, large-bore access skills, three-dimensional (3D) visualization, and

an in-depth understanding of other cardiac pathologies. These intersections are not part of the typical coronary interventional curriculum, nor are they skills you emerge with after a single IC year.

Mastery of structural heart and valve interventions requires a deep understanding of imaging, the pathophysiology of structural disease, emerging treatment modalities, and both commercially available and investigational devices. The field is dynamic, with an ever-changing landscape and steep learning curve. Today's graduating fellows cannot safely and effectively perform complex structural procedures without completing a dedicated structural fellowship year. Mere exposure is no longer sufficient.

A decade or more ago, structural heart intervention was largely synonymous with TAVR, a skill you could reasonably acquire on the job. Now, the field encompasses interventions on all cardiac valves, both repair and replacement, often involving highly challenging anatomy and technically demanding devices. Preparing for this breadth of practice—both its advanced complexities and fundamental techniques—requires a solid, structured training pathway.

What strategies do you employ to ensure your trainees are adequately exposed to the various subspecialties in IC so they can choose a career path?

Dr. Byku: Exposure to structural heart interventions should be integrated into general cardiology training, much like the rotations fellows complete in the cath lab for diagnostic and coronary interventions.

At Emory, we offer an elective rotation specifically for fellows interested in structural heart intervention. This experience is intentionally multifaceted, emphasizing both diagnostic and intraprocedural imaging, as well as outpatient evaluation of patients in the valve clinic.

The elective has proven to be both highly valuable and popular. Initially designed as a 1-month rotation, it has since been extended—at fellows' request—to up to 3-6 months, allowing for deeper immersion in transesophageal echocardiography (TEE), cardiac CT, cardiac MRI, and the complex evaluation of patients with valvular heart disease.

Early and repeated exposure is key. Providing fellows with rotations early in their training, as well as again in their final year—when their understanding of complex cardiovascular disease is more advanced—ensures both familiarity and mastery in the evolving field of structural heart intervention.

Dr. Flannery: I work in a program that offers a general cardiology fellowship but does not currently have

interventional fellows. For the general cardiology fellows, I prioritize early and consistent exposure to IC. Whether I'm rounding on the inpatient service, seeing patients in clinic, or in between coronary cases during the fellows' diagnostic training, I make it a point to share both routine and cutting-edge structural cases. I always review CTs from TAVR cases with them to enhance their understanding of anatomy and procedural planning. For fellows who commit to pursuing IC, we actively involve them in structural cases during their third year. I also believe there's tremendous value in seeing structural heart patients in clinic, which provides key context and longitudinal insight into procedural benefit and outcomes.

What advice might you have given yourself in the early stages of IC training, knowing what you know now?

Dr. Flannery: It's not the hands-on skills that feel the most daunting when you're finally practicing independently—it's the preprocedural planning and intra-procedural decision-making. Even decisions that seem routine, like stent diameter or length, can feel weightier when you're the final decision-maker. If I could go back, I would ask more nuanced questions during training to better understand the thought process behind each clinical and technical decision my attendings made.

Also: take notes! You may feel you'll never forget how to deploy a filter wire or the ideal rotational speed for atherectomy, but these advanced tools often aren't used frequently. I found it invaluable to have a quick-reference note on my phone, and I still use a Google document I built during fellowship. I documented every step of less common structural procedures (eg, atrial septal defect closures) and have been grateful many times over to my past self for doing so.

Finally, take full advantage of industry-sponsored medical education and conferences. They offer a wealth of practical knowledge about emerging devices and best practices.

Dr. Byku: If I could revisit my training, I would devote significantly more time to dedicated rotations in complex cardiac imaging, with a particular emphasis on mastering 3D cardiac assessment through multiple modalities, including 3D TEE, cardiac CT, and cardiac MRI. As a structural interventionalist, you quickly recognize the necessity of interpreting these studies on a daily basis—before, during, and after procedures.

I would also have spent more time in the outpatient clinic. Fellows with an early interest in intervention often dedicate the bulk of their elective time to the

cath lab, believing that hands-on procedural experience is the primary pathway to securing an advanced fellowship. While procedural training is important, the value of outpatient evaluation, patient workup, and preprocedural imaging interpretation is often underestimated.

I frequently tell fellows that the most critical decision-making occurs first in the clinic and then during preprocedural planning. By the time you reach the procedure itself, the steps should be clearly defined, anticipated, and mentally rehearsed. A well-trained fellow can execute those steps skillfully, but true excellence in procedural outcomes lies in the ability to foresee challenges, anticipate complications, and make informed decisions long before entering the procedure room.

Nowhere is the proliferation of evolving technologies and therapies more evident than in the field of structural heart. What advice would you give to a graduating fellow or early career operator interested in maintaining their structural skills while gaining experience and developing expertise? Is it realistic to be a jack-of-all-trades in the current era?

Dr. Flannery: With just a single year of structural training, it's difficult to master everything right away. I recommend focusing on one structural area and striving to become an expert there. For me, that focus was TAVR. Once I felt confident in that space, I expanded my focus to include mitral work.

I've also benefited greatly from working in a highly collaborative environment with awesome partners, which has allowed me to double scrub cases and maintain exposure to a broad range of structural procedures. Early in your career—especially if you have a protected salary or lighter case load as you are building your practice—make it a priority to scrub in with senior partners and maintain those hard-earned skills.

Dr. Byku: If we already knew the definitive answer to this question, we wouldn't be having this conversation. As a field, we continue to work toward defining the essential knowledge base and determining how to maintain proficiency in this rapidly evolving specialty. For both CHIP/CTO and Structural Heart Intervention, I firmly believe the first step is completing a dedicated fellowship year. This immersive training is essential for developing a comprehensive understanding of all the therapeutic options available to patients.

If you are in an academic medical center, take full advantage of the opportunities to participate in complex procedures and trial-based therapies. For those entering community practice, it is equally important

to maintain strong ties with your training institution. These relationships create opportunities to return for advanced training or observerships. Many former fellows return to our institution—sometimes to collaborate on complex patient cases, other times to observe novel techniques or procedures that were not part of their training.

Those who remain connected tend to stay well-informed about emerging treatments and innovations. Our patients depend on us to guide them toward the most appropriate therapy, and that responsibility is significant. It is our duty to understand every option available and to direct patients toward the right pathway—especially when their care requires a second opinion or the highest level of expertise.

Many fellows who are considering additional training in structural heart are concerned about future job opportunities that will enable them to utilize their specialized skills. What advice would you give someone weighing whether to pursue additional training in structural heart, given this uncertainty?

Dr. Byku: Under current training guidelines, my advice is simple: if you want to pursue structural intervention—do the training. You will never regret being more prepared. It is also never too late. We have had fellows who spent several years in practice before returning for a dedicated structural year. With time, they recognized gaps in their training and technical exposure, and given the increasing complexity of cardiac disease requiring cutting-edge intervention, they understood the need for additional preparation.

Many colleagues have told me, “I wish I had learned that during my training” or “I wish I could go back and do a fellowship year now.” While training is already lengthy, life only becomes more complicated afterward—with family, spouse careers, children, and financial responsibilities—so the best time for extra training is before you settle into more permanent commitments.

This is a rapidly evolving, increasingly complex field. You should be as well-equipped and up to date as possible from day one. While learning will be lifelong, a dedicated structural year establishes a strong foundation for that journey. Job considerations should not dissuade you if this is truly the field you want. The only exception is if you are undecided between structural and peripheral intervention and are concerned about job availability in a specific region. Otherwise, do not skip the training year expecting to learn structural intervention on the job—that era has passed.

Dr. Flannery: This is a difficult but important consideration. The reality is, structural job opportunities can be limited, and we may be training more structural fellows than there are positions available. I consider myself very fortunate to have landed a position that aligns so well with my training and interests.

That said, if you truly enjoy structural interventions and feel that your career wouldn’t be fully satisfying without them, the additional year of training is worth it. You may not get your ideal structural volume or mix right away, but if you can find a position that allows you to maintain those skills—while waiting for the right opportunities to grow—then you’ll be well positioned for long-term success.

What do you view as the main challenges currently facing trainees considering a career in IC?

Dr. Byku: The length of training—and the costs that accompany it—are undeniable hurdles. In IC, we often discuss the physical and logistical barriers posed by additional fellowship years, especially when they intersect with the timing of building a family. Advanced training frequently requires relocation for just one year—for example, completing an IC fellowship at one institution, then moving to another state for a structural year. This can be enormously taxing on trainees and their families.

Practical considerations, such as where a significant other might work during that year, how childcare will be managed, and whether a support system will be available in a new and unfamiliar location, can be daunting. The question many face is: how do you build the family you want while also building the career you have worked so hard to achieve? This burden often falls disproportionately on women trainees, who face the physical demands of pregnancy and caring for newborns while in the midst of rigorous training. The sacrifices required are immense.

Concrete issues need addressing—most notably, that trainee salaries do not realistically cover both daytime childcare and nighttime coverage for when interventional fellows take overnight or weekend call. Current PGY-8 salaries fall far short of these costs. From personal experience, starting interventional fellowship as the mother of an 8-week-old, I could not have completed my 2-year IC/structural pathway without the tireless support of my parents, who provided around-the-clock childcare. My story is far from unique; nearly every interventional cardiologist I know can recount a similar narrative involving relocation, a partner’s career disruption.

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tion, reliance on extended family, and financial strain from prolonged training.

These challenges affect every facet of life. Balancing passion for the field against these logistical obstacles is not easy. For this reason, it may be time to rethink the structure and duration of training—moving toward earlier procedural specialization, much like the integrated models in surgical subspecialties. Rather than completing a full internal medicine residency followed by general cardiology and then interventional cardiology, a more streamlined pathway that reduces redundant years and accelerates entry into interventional training could help condense and focus preparation while maintaining excellence.

Dr. Flannery: One of the biggest challenges is the sheer volume of knowledge and skills required in just 1 to 2 years of interventional training. Despite spending around 8 years in postgraduate training, only a fraction of that time is truly procedural. Ideally, internal medicine and general cardiology training could be more

focused, allowing for expanded procedural exposure earlier on.

If you're considering a career in IC, try to spend as much time as possible in the cath lab during general fellowship. Talk with as many interventional attendings as you can to understand not just the procedures but also the lifestyle and career realities.

I also want to acknowledge the unique challenges faced by women entering the field. IC is still male dominated, and fellowship and early career also often coincide with a time in life when many are hoping to start families, a challenging chapter of life on its own. These realities can be daunting. I would encourage women not to be discouraged—our numbers are growing, and I believe women bring unique strengths that make them incredibly well-suited to this field. Increasing gender diversity in IC will benefit all of us. ■

Disclosures

Dr. Flannery: None.

Dr. Byku: Speaker bureau and consultant to Edwards Lifesciences.