

FELLOWS-IN-TRAINING & EARLY CAREER PAGE

# Cardiac Critical Care

## Training Pathways and Transition to Early Career



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Since the inception of the cardiac intensive care unit (CICU) in the early 1960s (1), the patient population has drastically evolved (2-4). CICU hospitalizations complicated by multiorgan failure are frequent, while patient admissions with isolated primary cardiac dysfunction (e.g., acute coronary syndrome, arrhythmias) are becoming less common (3). With increasing patient complexity, skills and knowledge not routinely obtained during cardiology fellowship are now more important for fellows-in-training (FITs) who are pursuing the relatively new field of cardiac critical care (Figure 1) (5,6). Previous FIT/early career (EC) pages in the *Journal* have discussed the clinical experience needed for a cardiac intensivist and detailed a paradigm for integrated critical care and cardiology training (7,8). In this page, we will review the currently available training paths (Figure 2), including advantages and disadvantages, and share our perspective as EC critical care cardiologists. Given the current lack of integrated training pathways and the multitude of options for FITs, we aim to provide experiential advice for other trainees who are interested in cardiac critical care.

### CURRENT STATE OF CRITICAL CARE CARDIOLOGY TRAINING

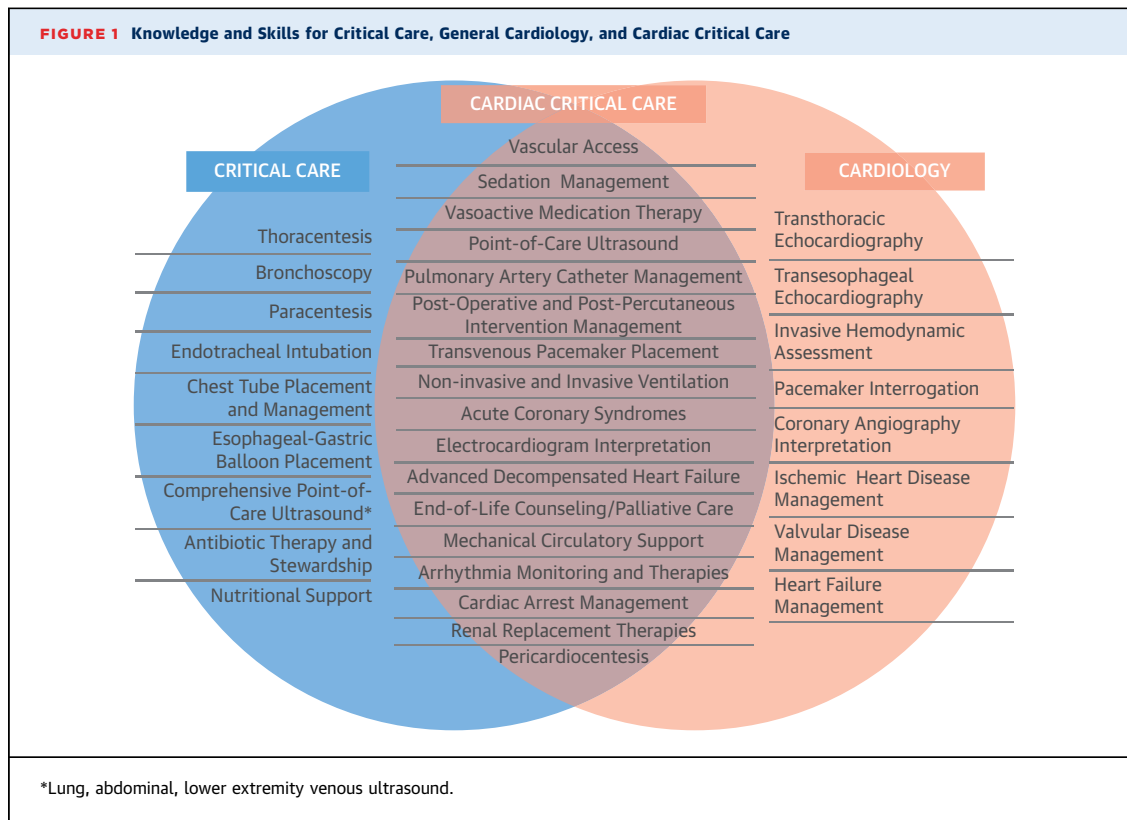
The development of specific critical care cardiology training pathways has lagged the ongoing clinical and academic development of the discipline. Both the American Heart Association and the American College of Cardiology have released recommendations for

training in critical care cardiology (6,9). These training recommendations have largely defined level III advanced training as the completion of a 1-year clinical fellowship in critical care medicine in addition to cardiovascular fellowship. However, the dissemination of cardiovascular critical care training in the United States has faced a broad array of logistical challenges, including a lack of integrated training programs and variations in expectations for clinical competency (5). Individual anecdotes reflect the challenges, as trainees have applied to stand-alone critical care medicine programs, established temporary institution-specific training pathways, or pursued experiential training outside of accredited programs (7,10,11). Most trainees must decide between matching at “stand-alone” 2-year critical care fellowships or arranging a critical care fellowship at the institution where they completed cardiology training. Ultimately, FITs must make difficult decisions with significant professional, personal, and financial ramifications. We present 3 potential training pathways for pursuing critical care cardiology in the contemporary era.

### CRITICAL CARE AFTER CARDIOLOGY

Pursuing critical care medicine training after completion of cardiology fellowship potentially allows for more targeted cardiac critical care training while requiring maintenance of cardiology-specific procedural competency. During cardiology fellowship, FITs can achieve level II training in critical care cardiology and establish familiarity with circulatory shock, invasive pressure monitoring (including pulmonary artery waveform evaluation), mechanical circulatory support, and both transthoracic and transesophageal echocardiography. Critical care medicine education can be layered on top of this strong foundation of cardiac physiology and pathophysiology. As a clinical example, FITs could focus on

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biventricular hemodynamic effects of mechanical ventilation in circulatory shock (12). Additionally, a strong knowledge of echocardiography may enable rapid integration of point-of-care critical care ultrasound into clinical practice.

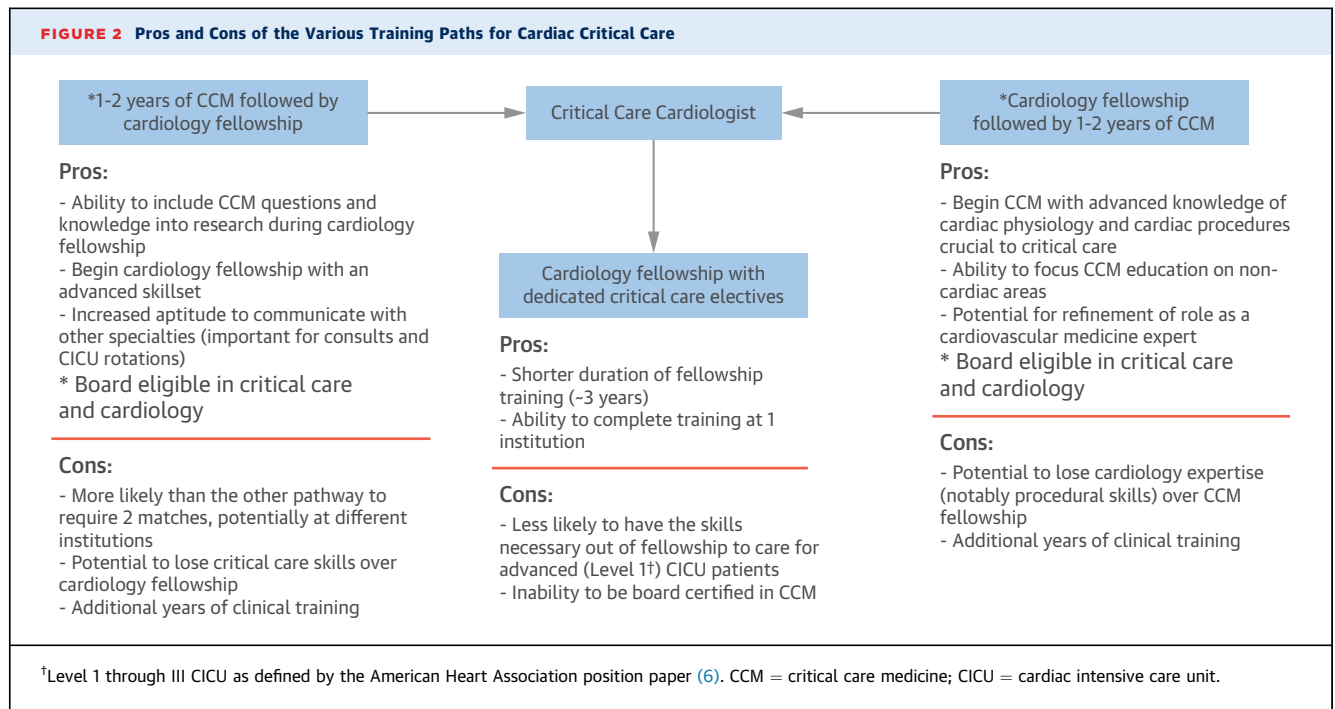
However, maintenance of cardiac clinical knowledge and procedural competency in echocardiography and, possibly, cardiac catheterization is critical. Limited evidence from medical resident education suggests that echocardiography skill is maintained after training (13). Notably, interested trainees can incorporate ultrasound and vascular access into daily critical care practice, which may facilitate ongoing competency. Additionally, the FIT schedule can include CICU time, and elective time can be spent in the cardiac echocardiography laboratory. Moreover, the trainee will likely study for and take cardiology boards in the months after completion of cardiology fellowship, which ensures maintenance of cardiology knowledge. Whereas training availability has previously been uncertain, a number of critical care and combined pulmonary and critical care medicine programs now offer 1- or 2-year critical care training for cardiologists (select training programs available at the American College of Cardiology website) (14).

### CRITICAL CARE TRAINING BEFORE CARDIOLOGY

Although less common, pursuing critical care before cardiology offers several advantages given the overlapping skills and knowledge needed for both fellowships (Figure 1) (9). After completing critical care fellowship, an FIT has considerable experience triaging critically ill patients as well as performing invasive procedures. Both skills are invaluable during numerous cardiology rotations, notably the catheterization laboratory, CICU, consults, and while on-call. The intensivist-trained FIT will also have extensive experience participating in and leading end-of-life discussions, which are important in the aging and medically complex CICU patient population (15). For FITs interested in academic cardiac critical care, completion of critical care first allows more precise tailoring of research during cardiology fellowship.

Although there are several benefits, completing critical care training first has potential disadvantages. This training pathway is more likely to require 2 fellowship matches, including the associated interview/travel costs, and up to 3 moves from residency

**FIGURE 2** Pros and Cons of the Various Training Paths for Cardiac Critical Care



to cardiology fellowship (assuming completion at different institutions). Second, if the FIT does not remain committed to maintaining critical care skills, the potential exists to lose these skills over the course of a 3- to 4-year cardiology fellowship. Finally, compared with adding critical care electives into a cardiology fellowship, this pathway adds upward of 2 years onto clinical training.

### ADDITIONAL CRITICAL CARE TRAINING DURING CARDIOLOGY

Instead of completing a second fellowship, experiential learning through addition of critical care electives is an option during a standard cardiology fellowship. This path offers the benefit of fewer training years and the ability to complete training at 1 institution. These electives may detract focus from general cardiology training though, and need to be negotiated with the training program. Unlike the other 2 pathways, the FIT would likely not receive training necessary to care for advanced (level 1) CICU patients and would not be board eligible in critical care (6).

### TRANSITION TO EARLY CAREER

Regardless of the pathway to attain cardiac critical care training, the transition from fellowship to clinical practice is marked with opportunities and challenges. The EC cardiac intensivist is entering a clinical

practice environment that is in a state of evolution. Practice patterns are variable and can range from traditional coronary care units to integrated cardiac ICUs with mixed surgical and nonsurgical patients. Furthermore, the clinical staffing patterns are heterogeneous and can vary from noncritical care cardiologists providing primary care with critical care consult support, to models that are primarily supported by pulmonary or anesthesia critical care staff (16,17).

Recent studies have demonstrated that the presence of a trained intensivist (either as a non-cardiologist consultant or a cardiologist with critical care training) improved patient outcomes in the CICU (18,19). Although these studies represent 2 different models of staffing, the results clearly support the need for strengthening the involvement of critical care training professionals in the CICU. Further, the development of the next generation of cardiac intensivists will be crucial to ensure that knowledgeable leadership is available to navigate the continued evolution of the modern CICU.

Because practice patterns are heterogeneous, the EC cardiac intensivist must thoroughly reflect on his/her ideal practice environment. Understanding which patient demographics (primarily nonsurgical vs. mixed post-cardiothoracic surgical) and management models (“open” vs. “closed” units) best suit individual career aspirations is crucial for personal satisfaction. In addition, the EC cardiac intensivist must

understand the future vision of the practice he/she may join. Is the goal to create an intensive care unit exclusively staffed by cardiac intensivists, or to develop a multidisciplinary critical care team that incorporates pulmonary or anesthesia critical care (19,20)? Given that the landscape of CICU medicine is evolving, it is perhaps most important that the EC cardiac intensivist seeks a center with departmental leadership willing to invest resources in promoting and strengthening their CICU practice.

EC intensivists also must weigh the focus of their critical care practice with noncritical care responsibilities that may be required by potential employers. For example, is maintaining an outpatient practice vital for a “balanced” clinical experience? Some EC cardiac intensivists may want to maintain an outpatient practice in a specific clinical area such as pulmonary hypertension or cardiomyopathy to further research interests.

In addition to defining patient care requirements, EC cardiac intensivists should determine if their ideal practice includes cardiac procedural laboratory time. If so, developing a work schedule that balances patient care with adequate cardiac catheterization or echocardiography time to maintain procedural competency is crucial. The EC cardiac intensivist should

clearly define their service time to avoid being unavailable in the CICU due to other duties. The successful transition from fellowship to clinical practice requires a clear vision of intended career trajectory, and professional goals with respect to patient care and procedural practice.

## CONCLUSIONS

Cardiac critical care is a specialized clinical practice that is rapidly developing within cardiovascular medicine. We describe 3 training paths, 2 of which offer dual American Board of Internal Medicine certification, as well as unique advantages and disadvantages that must be weighed on an individual basis. Regardless of the chosen training pathway, EC cardiac intensivists must evaluate how their career aspirations integrate with the various models for delivery of care in the quickly evolving practice of the CICU.

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# **RESPONSE:** Transition to Early Career in Critical Care Cardiology

## Know Who You Want to Be

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Dr. Miller and colleagues eloquently capture challenges that are common for fellows making the transition to early careers in a field that is on rapidly shifting ground. They also provide a pragmatic summary of training pathways for trainees pursuing a professional focus in critical care cardiology (CCC). Indeed, continued attention to maturing such pathways is essential to prepare our trainees for practice in the complex cardiac intensive care unit (CICU) environments of the future (1-3).

However, I wish to concentrate on their advice for trainees embarking out as early career critical care cardiologists. Their advice to find “a clear vision of intended career trajectory, and professional goals” is important. As I sit with fellows from inside and outside of our cardiovascular training program, my guidance is consistent. Although there are many challenges on a path less trodden, I counsel them to “do what you love” and “know who you want to be” in your professional life. I echo the observation that the current practice of CCC is extremely heterogeneous, not only because of the spectrum of CICU structures, which span from dedicated medical CICUs, to combined cardiovascular medical and surgical intensive care units (ICUs), and to all-purpose general medical surgical ICUs, but also because of the array of compensation models and clinical commitments that characterize CICUs across the country. As such, knowing what you want for your professional life is crucial to finding a good fit in your first job.

By the nature of its typical clinical rotations, CCC lends itself to protected time for pursuit of excellence

in other aspects of your professional career, whether teaching, research, quality improvement, or administration. You are on when you are on, and off when you are off. However, trainees need to consider carefully who they want to be when not in the CICU and how their salary will be covered to “make them whole.” Fortunately, in many environments, 3 to 4 months of clinical CICU time can cover a competitive salary. Nevertheless, the clinical needs in some systems demand  $\geq 50\%$  of the critical care cardiologist's time to be devoted to rotations in the CICU. Other systems may ask for additional time in imaging, non-CICU services, or outpatient cardiology. As a trainee seeking an early career position, establishing a clear understanding of expectations in this regard from your potential job is essential. Expect that the model will differ between community-based hospitals and tertiary academic centers. Moreover, the availability of potential mentors and collaborators in CCC is an important ingredient for the development of the early career professional.

Despite the challenges, there is good news for cardiovascular fellows-in-training and early career practitioners in CCC. The practice of CCC is intensely rewarding and can provide immense professional satisfaction. The growing gap between the needs of centers shifting to staffing by critical care cardiologists and the number of trainees with advanced training has increased the number of job opportunities. This fledgling field requires nurturing and self-reflection. In doing so, the field will continue to benefit from the insight and thoughtful reflection of its emerging members.

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