

THE PRESENT AND FUTURE

STATE-OF-THE-ART REVIEW

The Genesis, Maturation, and Future of Critical Care Cardiology



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ABSTRACT

The cardiac intensive care unit (CICU) has changed considerably over time and now serves a unique patient population with a high burden of cardiovascular and noncardiovascular critical illness. Patient complexity and technological evolutions in the CICU have catalyzed the development of critical care cardiology, a fledgling discipline that combines specialization in cardiovascular diseases with knowledge and experience in critical care medicine. Numerous uncertainties and challenges threaten to stymie the growth of this field. A multidisciplinary dialogue focused on the best care design for the CICU patient is needed as we consider alternative approaches to clinical training, staffing, and investigation in this rapidly evolving arena. (J Am Coll Cardiol 2016;68:67-79) © 2016 by the American College of Cardiology Foundation.

*“If you always do what you always did,
you will always get what you always got.”*

—Albert Einstein (1)

Driven largely by transformative technologies and an expanding collection of novel pharmacotherapies, outcomes of cardiovascular diseases have substantially improved over the last several decades. As a result of our ability to alter favorably the natural history of cardiac maladies once considered terminal, we now find ourselves caring for an increasingly older and more diverse population of hospitalized patients with escalating illness severity.

Consequently, patients who occupy the modern cardiac intensive care unit (CICU) are at greater risk for adverse events and death than ever before (2). In 2007, a call to action alerted the cardiovascular community to the growing complexities of care within the contemporary CICU and an impending crisis in appropriate CICU staffing (3). This topic found additional focus in 2012 when a collaborative scientific statement created a roadmap for addressing the needs of cardiac patients with critical illness (4). Guided by an admittedly small evidence base, these investigators put forward recommendations for optimal training, staffing, and care delivery in the CICU.

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ABBREVIATIONS AND ACRONYMS

- ACCA** = Acute Cardiac Care Association
- CCM** = critical care medicine
- CCU** = coronary care unit
- CICU** = cardiac intensive care unit
- ICU** = intensive care unit
- MCS** = mechanical circulatory support
- MI** = myocardial infarction

Although critical care cardiology is recognized as an emerging discipline, additional maturation of this field now faces numerous uncertainties and challenges (**Central Illustration**). In this paper, we highlight the historical underpinnings of this field, discuss key care processes and team dynamics essential to contemporary critical care delivery, evaluate potential training models for the CICU specialist, and emphasize the importance of research initiatives and collaborations in the modern CICU. Our purposes are to consider real and perceived barriers to future progress and to endorse continued critical examination of this developing specialty.

HISTORICAL PERSPECTIVES AND THE ORIGIN OF A DISCIPLINE

The coronary care unit (CCU) was established in the early 1960s, following the creation and implementation of continuous cardiac monitoring, cardiopulmonary resuscitation, and external defibrillation (5). These specialized units were founded on the principle that specially trained nurses could monitor, identify, and rapidly treat life-threatening arrhythmias following acute myocardial infarction (MI). The CCU

was lauded for its ability to improve patient outcomes. In a landmark study by Killip and Kimball (6), for instance, a nearly 20% reduction in post-MI mortality rate was attributed to CCU care.

In 1967, Lown et al. (7) transformed the CCU from a place of reactive care to a setting focused on prevention of adverse events, including cardiac arrest. Although the strategy of arrhythmia suppression following MI that was proposed by these investigators was later dismissed (8), the idea that post-infarction complications could be proactively addressed had vast appeal, particularly at a time when clinicians had little more to offer their MI patients than analgesia and prolonged convalescence. Technological innovation promoted further conceptual shifts in the CCU and within the emerging field of critical care cardiology. Coronary reperfusion therapies, hemodynamic monitoring tools, echocardiography, mechanical circulatory support (MCS), implantable defibrillators, and new drug development have facilitated care for patients with increasing disease severity and greater baseline comorbidity. As the CCU evolved into a complex care environment catering to patients with a myriad of conditions, many institutions began to use the term CICU to represent this multidimensional care setting more accurately. Today's CICU bears little resemblance to the CCU of the 1960s and instead

CENTRAL ILLUSTRATION Evolution and Maturation of Critical Care Cardiology and the Myriad of Obstacles That Threaten to Stymie its Growth

Keys to Sustainable Growth and Maturation of Critical Care Cardiology				Challenges and obstacles
Foundations	Care Delivery in Cardiac Intensive Care Unit	Education and Training	Research	
<ul style="list-style-type: none"> Evolving comorbidity Increasing disease severity Greater susceptibility for critical illness 	<ul style="list-style-type: none"> Structure, staffing and team dynamics Resources Care standardization Protocols Performance metrics 	<ul style="list-style-type: none"> Skill acquisition Defining competency Leadership Credentialing Continued medical education 	<ul style="list-style-type: none"> Identifying gaps Collaborative networks Funding Novel trial design Enriched trial populations Expertise 	<ul style="list-style-type: none"> Nomenclature Costs of care Research skills Validation Interest Fractionation of care

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The prosperous growth of this young field hinges on identifying, implementing, and validating optimal care pathways, training models, and research initiatives. However, many challenges must be overcome to promote the successful maturation of this discipline.

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