

The Urgency and Impact of Cardiovascular Critical Care

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The topic of critical care may seem redundant when discussing cardiovascular medicine: After all, can't all forms of heart disease be considered critical? But the changes occurring in cardiovascular critical care are moving at such rapid-fire speed that they may well be outpacing most other medical specialties. Patients in the cardiovascular critical care unit now have access to 24/7 intensivists to monitor care and intervene at the slightest hemodynamic change. Physicians and ancillary staff can rely on in-house ethicists to help manage expectations for patients on life support and guide the medical teams through difficult end-of-life interactions. Enhanced recovery after surgery pathways are being implemented to reduce surgical stress in patients and speed the return to health. New support devices are improving the delivery of cardiovascular critical care. And time-sensitive "bundled" interventions are being implemented to prevent and treat sepsis, the bane of every hospital setting. All positive changes for cardiovascular critical care, to be sure, but at what cost, and with what impact on outcomes? In this issue of the *Methodist DeBakey Cardiovascular Journal*, we highlight the breakthroughs, concerns, and controversies around caring for the sickest cardiac patients, all organized into the most current and pressing issues in cardiovascular critical care.

We open with a topic that is shifting the paradigm of perioperative care and challenging traditional surgical doctrine. Enhanced recovery after surgery programs, known as ERAS, have already proven to improve clinical outcomes and reduce healthcare costs in colorectal surgery and other surgical subspecialties, and its applicability to cardiac care has been confirmed through the publication of expert consensus guidelines from the ERAS Cardiac Care Society. Drs. Jessica Brown, Karanbir Singh, and colleagues guide us through the history of ERAS programs and explain the recent consensus statement that incorporates nutrition and functional status, fluid management, opioid-sparing analgesia, minimally invasive surgery, and early postoperative feeding and ambulation to optimize clinical outcomes and decrease length of stay, complications, and healthcare costs. With the new cardiac ERAS pathway developed earlier this year, the authors describe the elements of pre-, peri-, and postoperative care that, when implemented in tandem, help facilitate a faster return to the patient's preoperative functional state.

Reducing hospital-related sepsis is one of the highest priorities in any ERAS pathway and is the focus of a separate review by Dr. Deepa Gotur. Newly defined as a life-threatening organ dysfunction rather than a range of inflammatory responses,

sepsis accounts for roughly 30 million cases and 6 million deaths annually across the globe. It is so insidious that the World Health Organization has made it a global health priority. Since prompt and accurate diagnosis is critical, Dr. Gotur raises awareness of this worldwide health crisis by describing the global burden of sepsis, risk factors specific to critical care patients, secondary effects of sepsis, screening tools used to identify initial signs, and new patient management bundles to guide clinicians through time-sensitive interventions such as antimicrobial therapy, source control, fluid resuscitation, blood transfusion, and inotrope therapy.

We shift to the topic of mechanical support devices with three reviews that highlight how these technologies impact both the delivery of care and patient/family expectations. The advent of cardiopulmonary bypass more than 60 years ago spurred the development of emergency devices, temporary and short-term circulatory assist devices, and long-term ventricular assist devices to support failing cardiac and/or respiratory systems. Many have been used in patients with circulatory shock to improve hemodynamics and avoid the cardiotoxicity of chemical support, while extracorporeal membrane oxygenation (ECMO) is routinely used as a bridge to recovery or to transplant in those with acute respiratory failure. Authors Asma Zainab, Iqbal Ratnani and colleagues offer an overview of established and novel mechanical support devices, their role in the delivery of critical care, and how a multidisciplinary team approach can lead to improved outcomes in these patients.

One circulatory assist device traditionally used in end-stage lung disease and circulatory collapse has been adopted for use in right heart failure, as a bridge to heart and lung transplantation, and as rescue therapy for both sepsis and post-organ transplantation. In fact, ECMO is now considered a mainstream lifesaving treatment modality in critical care medicine because it allows for more aggressive lung rest strategies and cardiovascular support than could be provided otherwise. In their review, Drs. Iqbal Ratnani, Divina Tuazon, and coauthors discuss the indications, management, complications, and challenges of ECMO in critical care and reveal how their multidisciplinary team approach and application of strategic initiatives—such as developing selection criteria, a pharmacy-managed anticoagulation protocol, and weaning and early ambulation efforts—resulted in a 30% drop in ECMO mortality.

We close this section with a focus on the emotional and ethical issues that arise for patients on ECMO support. ECMO

can be extremely overwhelming for families, and its initiation often prompts ethical questions and/or discordance among all involved parties. In particular, it can be especially difficult to maintain consistent communication between the medical team, patient, and family. As an ethicist with Houston Methodist Hospital, Courtenay Bruce helps patients and clinicians identify and navigate value-laden conflict and ethical uncertainties by monitoring and optimizing communication. In conjunction with academic colleague Ashley Stephens, Ms. Bruce walks the reader through an actual patient encounter and describes how ethicists help align patient/family understanding of ECMO, encourage realistic expectations for possible outcomes, and proactively mitigate the moral distress of providers involved in complex ECMO cases.

The final two reviews deal with two of the most debated issues in critical care: mainly, the role of telemedicine-supported intensive care units (tele-ICUs) and the medical necessity of around-the-clock in-house ICU intensivist staffing. In the first review, Drs. Nadeem Rahman, Chiedozie Udeh, and coauthors describe how tele-ICUs were developed to address the increasingly complex and aging patient population as well as an insufficient supply of intensivists, and how they may fit within a hybrid model of care to support high-intensity coverage and bridge the gap for nocturnal ICU care. Although tele-ICUs are associated with improved ICU mortality and decreased length of stay, there are several limitations that hinder their implementation. The authors discuss these limitations, highlighting the benefits and potential setbacks of tele-ICU; summarize data on tele-ICU structure, operations, and costs; and review the relevant meta-analyses and systematic reviews of tele-ICU outcomes.

In the final review, we explore one of the most controversial questions in critical care: is 24/7 in-house intensivist staffing necessary in the ICU? The demand for more ICU beds has spurred a hotbed of debate around how best to structure ICUs in terms of staffing and cost. With patient outcomes and efficient resource allocation at the center of the debate, experts have yet to agree on whether or not 24/7 in-house intensivist staffing is beneficial. Several studies have shown that intensivist-staffed ICUs lead to overall economic benefits and improved patient outcomes. At the Houston Methodist DeBakey Heart & Vascular Center, 24/7 in-house staffing has demonstrated meaningful reductions in sepsis mortality, infections, and ECMO mortality and improved physician satisfaction. Likewise, 24/7 in-house ICU intensivist staffing has been demonstrated to have a positive impact on the quality of care for critically ill patients in high-acuity, high-volume centers. However, as of yet, these benefits have not been extrapolated to low-acuity, low-volume facilities enough to justify the increased staffing needs and costs. My colleagues Tina Lam, Sahar Fatima, and I explore the history of intensivists and critical care staffing, the Leapfrog Group recommendations as well as other arguments for 24/7 ICU staffing, outcomes in various ICU settings, and our own experience with this controversial staffing model.

This issue is intended to present a broad picture of the current state of critical care medicine with the goal of enlightening readers on some of the most crucial topics being debated around the country. For further discussion and CME opportunities, I invite you to visit the journal's website at <http://journal.houstonmethodist.org>, where you can log in and use the "Dialogue with Authors" link to have an open Q&A with the authors of this issue.