COVID-19 continues to rampage around the world. Noncritical care-trained physicians may be deployed into the intensive care unit to manage these complex patients. Although COVID-19 is primarily a respiratory disease, it is also associated with significant pathology in the brain, heart, vasculature, lungs, gastrointestinal tract, and kidneys. This article provides an overview of COVID-19 using an organ-based, systematic approach.

Basics of Extracorporeal Membrane Oxygenation

William C. Wrisinger and Shaun L. Thompson

Overview: The use of extracorporeal membrane oxygenation (ECMO) is becoming commonplace worldwide in ICUs for the care of patients with respiratory and/or cardiac failure. Understanding the use of ECMO and the management of these complex patients will be vital to current and future clinicians as ECMO use continues to grow.

Ultrasound and Other Advanced Hemodynamic Monitoring Techniques in the Intensive Care Unit

Samuel Cemaj, Michael R. Visenio, Olabisi Ololade Sheppard, Daniel W. Johnson, and Zachary M. Bauman

The ideal device for hemodynamic monitoring of critically ill patients in the intensive care unit (ICU) or the operating room has not yet been developed. This would need to be affordable, consistent, have a very low margin of error (<30%), be minimally or noninvasive, and allow the clinician to make a reasonable therapeutic decision that consistently led to better outcomes. Such a device does not yet exist. This article will describe the distinct options we, as critical care physicians, currently possess for this Herculean endeavor.
Systemic Anticoagulation and Reversal

Abigail P. Josef and Nicole M. Garcia

An increasing number of patients are on anticoagulation for a variety of indications. Patients on anticoagulation who present to the hospital with life-threatening hemorrhage, whether trauma related or not, must be assessed for the reversal of anticoagulation. Identification of the type of anticoagulation, the timing of the most recent usage of anticoagulation, and the efficacy of the anticoagulation all have an impact on whether reversal agents should be used. There are a variety of reversal agents, both nonspecific and specific, that could be used for reversal; however, not all reversal agents work for all anticoagulation medication. As more anticoagulation medications are used and indications expand, providers must be aware of the reversal agents available and the efficacy and indications for these reversal agents.

Topical Coagulant Agents

Olabisi Ololade Sheppard and Nathan Alan Foje

Topical hemostatic agents have continued to develop as knowledge of coagulation physiology and pathophysiology has evolved. The addition of knowledge of hemostatic agents to a surgeon’s armamentarium helps to push the boundaries of life-saving care. As the understanding of the complex physiology of coagulation and hemorrhage improves, so will the potential for developing hemostatic agents that are safe, affordable, and readily available. This article discusses topical coagulant agents and hemostatic materials currently available in the surgery. The relevant agents/materials, their characteristics, different utility in surgical hemostasis, and their relevant benefits and drawbacks are reviewed.

Critical Care Management of Surgical Patients with Heart Failure or Left Ventricular Assist Devices: A Brief Overview

Mohsin A. Zaidi and Carl R. Christenson

Patients with heart failure, including those with implanted left ventricular assist devices, continue to increase in number. When they require noncardiac surgery, cardiac critical care expertise may not be immediately available to assist. This review serves to provide surgeons and surgical intensivists with a brief overview of the management of this patient population and common clinical scenarios and complications.

Multimodal Analgesia in the Era of the Opioid Epidemic

Thomas Arthur Nicholas IV and Raime Robinson

This article attempts to review the key components of a multimodal analgesic regimen for the treatment of acute pain. Adhering to these key components will help reduce the opioid burden to surgical patients while reducing acute pain. As well, this regimen is intended to reduce further negative contributions to the opioid crisis.
Management of Decompensated Cirrhosis and Associated Syndromes

Shaun Chandna, Eduardo Rodríguez Zarate, and Juan F. Gallegos-Orozco

Patients with cirrhosis account for 3% of intensive care unit admissions with hospital mortality exceeding 50%; however, improvements in survival among patients with acutely decompensated cirrhosis and organ failure have been described when treated in specialized liver transplant centers. Acute-on-chronic liver failure is a distinct clinical syndrome characterized by decompensated cirrhosis associated with one or more organ failures resulting in a significantly higher short-term mortality. In this review, we will discuss the management of common life-threatening complications in the patient with cirrhosis that require intensive care management including neurologic, cardiovascular, gastrointestinal, pulmonary, and renal complications.

Management of Delirium in the Intensive Care Unit

Dih-Dih Huang and Peter E. Fischer

In the intensive care unit, delirium is a major contributor to morbidity and mortality in adult patients. Patients with delirium have been shown to have increased length of stay, decreased functional outcomes, and increased risk for requiring placement at the time of discharge. In addition, decreased cognitive function and dementia have been shown to be long-term complications from delirium. The mainstay of treatment and prevention include therapy- and behavioral-based interventions, including frequent orientation, cognitive stimulation, mobilization, sleep restoration, and providing hearing and visual aids. Refractory delirium may require pharmacologic intervention with antipsychotics or alpha-2 agonists.

Noninvasive Ventilation and Oxygenation Strategies

Patrycja Popowicz and Kenji Leonard

Noninvasive ventilation (NIV) provides respiratory support without the use of invasive ventilation with techniques that do not bypass the upper airway. NIV is particularly attractive given its associated reduced risk of complications associated with intubation. Available NIV modes include nasal cannula, simple mask, nonrebreather, high flow nasal cannula, continuous positive airway pressure (CPAP), and bi-level positive airway pressure (BPAP). Acute exacerbation of COPD, cardiogenic pulmonary edema, and COVID-19 are conditions for which NIV has shown to be beneficial, whereas there is no consensus among the use of NIV in trauma patients and ARDS.

Antibiotic Therapy in the Intensive Care Unit

Mehreen Kisat and Ben Zarzaur

Antibiotic resistance is a public health concern. A critical care clinician is faced with a clinical dilemma of using the appropriate treatment without compromising the antibiotic armamentarium. Postoperative and trauma patients in the intensive care unit (ICU) pose a unique challenge of mounting a systemic inflammatory response, which makes it even more difficult to differentiate inflammation from infection. The decision for type of empirical therapy should be individualized to the patient and local
ecology data and resistance profiles. After initiation of empirical therapy, deescalation should be done once microbiology data are available. Antimicrobial stewardship programs are essential in the ICU.

Mobilization of Resources and Emergency Response on the National Scale

Jana M. Binkley and Kevin M. Kemp

Mass casualty incidents are increasingly common. They are defined by large numbers of patients arriving nearly simultaneously, overwhelming available resources needed for optimal care. They require rapid mobilization of resources to provide optimal outcomes and limit disability and death. Because the mechanism of injury in a mass casualty incident is often traumatic in nature, surgeons should be aware of the critical role they play in planning and response. The coronavirus disease 2019 pandemic is a notable example, resulting in a sustained surge of critically ill patients. Initial response requires local mobilization of resources; large-scale events potentially require a national response.

Management of Acute Kidney Injury/Renal Replacement Therapy in the Intensive Care Unit

Salma Shaikhouni and Lenar Yessayan

Common causes of acute kidney injury (AKI) in the ICU setting include acute tubular necrosis (due to shock, hemolysis, rhabdomyolysis, or procedures that compromise renal perfusion), abdominal compartment syndrome, urinary retention, and interstitial nephritis. Treatment is geared toward addressing the underlying cause. Dialysis may be required if renal injury does not resolve. Early initiation of dialysis based on the stage of AKI alone has not been shown to provide a mortality benefit. Dialysis modalities are based on the dialysis indication and the patient’s clinical status. Providers should pay close attention to nutritional requirements and medication dosing according to renal function and dialysis modality.