SECTION 1 RESPIRATORY CRITICAL CARE

321 Approach to the Patient with Critical Illness

John P. Kress, Jesse B. Hall

The care of critically ill patients requires a thorough understanding of pathophysiology and centers initially on the resuscitation of patients at the extremes of physiologic deterioration. This resuscitation is often fast-paced and occurs early, without a detailed awareness of the patient's chronic medical problems. While physiologic stabilization is taking place, intensivists attempt to gather important background medical information to supplement the real-time assessment of the patient's current physiologic conditions. Numerous tools are available to assist intensivists in the accurate assessment of pathophysiology and management of incipient organ failure, offering a window of opportunity for diagnosing and treating underlying disease(s) in a stabilized patient. Indeed, the use of invasive interventions such as mechanical ventilation and renal replacement therapy is commonplace in the intensive care unit (ICU). An appreciation of the risks and benefits of such aggressive and often invasive interventions is vital to ensure an optimal outcome. Nonetheless, intensivists must recognize when a patient's chances for recovery are remote or nonexistent and must counsel and comfort dying patients and their significant others. Critical care physicians often must redirect the goals of care from resuscitation and cure to comfort when the resolution of an underlying illness is not possible.

ASSESSMENT OF ILLNESS SEVERITY

In the ICU, illnesses are frequently categorized by degree of severity. Numerous severity-of-illness (SOI) scoring systems have been developed and validated over the past three decades. Although these scoring systems have been validated as tools to assess populations of critically ill patients, their utility in predicting individual patient outcomes is not clear. SOI scoring systems are important for defining populations of critically ill patients. Such systematic scoring allows effective comparison of groups of patients enrolled in clinical trials. In verifying a purported benefit of therapy, investigators must be confident that different groups involved in a clinical trial have similar illness severities. SOI scores are also useful in guiding hospital administrative policies, directing the allocation of resources such as nursing and ancillary care and assisting in assessments of quality of ICU care over time. Scoring system validations are based on the premise that age, chronic medical illnesses, and derangements from normal physiology are associated with increased mortality rates. All existing SOI scoring systems are derived from patients who have already been admitted to the ICU.

SOI scoring systems cannot be used to predict survival in individual patients. No established scoring systems that purport to direct clinicians' decision-making regarding criteria for admission to an ICU are available, although such models are being developed. Thus the use of SOI scoring systems to direct therapy and clinical decision-making cannot be recommended at present. Instead, these tools should be used as a source of important data to complement clinical bedside decision-making.

The most commonly utilized scoring systems are the APACHE (Acute Physiology and Chronic Health Evaluation) and the SAPS (Simplified Acute Physiology Score) systems.

THE APACHE II SCORING SYSTEM

The APACHE II system is the most commonly used SOI scoring system in North America. Age, type of ICU admission (after elective surgery vs. nonsurgical or after emergency surgery), chronic health problems, and 12 physiologic variables (the worst values for each in the first 24 h after ICU admission) are used to derive a score. The predicted hospital mortality rate is derived from a formula that takes into account the APACHE II score, the need for emergency surgery, and a weighted, disease-specific diagnostic category **(Table 321–1)**. The relationship between APACHE II score and mortality risk is illustrated in **Fig. 321-1**. Updated versions of the APACHE scoring system (APACHE III and APACHE IV) have been published.

THE SAPS SCORING SYSTEM

The SAPS II score, used more frequently in Europe than in the United States, was derived in a manner similar to the APACHE score. This score is not disease specific but rather incorporates three underlying disease variables: AIDS, metastatic cancer, and hematologic malignancy. SAPS 3, which utilizes a 1-h rather than a 24-h window for measuring physiologic derangement scores, was developed in 2005.

SHOCK

See also Chap. 324.

INITIAL EVALUATION

Shock, a common condition necessitating ICU admission or occurring in the course of critical care, is defined by the presence of multisystem end-organ hypoperfusion. Clinical indicators include reduced mean arterial pressure (MAP), tachycardia, tachypnea, cool skin and extremities, acute altered mental status, and oliguria. Hypotension is usually, though not always, present. The end result of multiorgan hypoperfusion is tissue hypoxia, often with accompanying lactic acidosis. Since the MAP is the product of cardiac output and systemic vascular resistance (SVR), reductions in blood pressure can be caused by decreases in cardiac output and/or SVR. Accordingly, once shock is contemplated, the initial evaluation of a hypotensive patient should include an early bedside assessment of the adequacy of cardiac output **(Fig. 321-2)**. Clinical evidence of *diminished* cardiac output includes a narrow pulse pressure—a marker that correlates with stroke volume—and cool extremities with delayed capillary refill. Signs of *increased* cardiac output include a widened pulse pressure (particularly with a reduced diastolic pressure), warm extremities with bounding pulses, and rapid capillary refill. If a hypotensive patient has clinical signs of increased cardiac output, it can be inferred that the reduced blood pressure is from decreased SVR.

In hypotensive patients with signs of reduced cardiac output, an assessment of intravascular volume status is appropriate. A hypotensive patient with decreased intravascular volume status may have a history suggesting hemorrhage or other volume losses (e.g., vomiting, diarrhea, polyuria). Although evidence of a reduced jugular venous pressure (JVP) is often sought, static measures of right atrial pressure do not predict fluid responsiveness reliably; the *change* in right atrial pressure as a function of spontaneous respiration is a better predictor of fluid responsiveness **(Fig. 321-3)**. Patients with fluid-responsive (i.e., hypovolemic) shock also may manifest large changes in pulse pressure as a function of respiration during mechanical ventilation **(Fig. 321-4)**. A hypotensive patient with increased intravascular volume and cardiac dysfunction may have S_3 and/or S_4 gallops on examination, increased JVP, extremity edema, and crackles on lung auscultation. The chest x-ray may show cardiomegaly, widening of the vascular pedicle, Kerley B lines, and pulmonary edema. Chest pain and electrocardiographic changes consistent with ischemia may be noted **(Chap. 326)**.

In hypotensive patients with clinical evidence of increased cardiac output, a search for causes of decreased SVR is appropriate. The