ANATOMY AND PHYSIOLOGY

The anatomy and physiology of the pulmonary system has been covered in Pattern A: Primary Prevention/Risk Reduction for Cardiovascular/Pulmonary Disorders and Pattern E: Impaired Ventilation and Respiration/Gas Exchange Associated With Ventilatory Pump Dysfunction or Failure.

PATHOPHYSIOLOGY

ACUTE RESPIRATORY FAILURE

Acute respiratory failure (ARF) accounts for more admissions to the ICU than any other organ failure. In the earliest stage of respiratory dysfunction patients may have all, some, or none of the following signs and symptoms as a result of impaired ventilation and respiration/gas exchange: high respiratory rate, nasal flaring, cyanotic lips, abnormal chest movement, and use of the abdominal muscles. While there are innumerable factors that might contribute to the development of respiratory dysfunction, sepsis, aspiration pneumonitis, and trauma are implicated in the vast majority of clinical cases associated with respiratory failure (Table 6-1).2-5

When respiratory dysfunction does develop in patients with any of the commonly associated clinical disorders (see Table 6-1), it is generally rapid and progressive. Half of the patients that will go on to develop significant alveolar damage (acute lung injury [ALI], acute respiratory distress syndrome [ARDS], or ARF) will do so within 24 hours of the onset of the initiating event; 85% will do so by 72 hours. When sepsis is the precipitating event, approximately 20% of patients will have already developed demonstrable lung injury at the time that the sepsis syndrome is identified. Yet, this finding is not quite as bleak as it seems since the ICU mortality is only slightly greater than 3% when the lungs are the only organs to fail. Conversely, when ARF is associated with other failing organs, the ICU mortality rises with each additional organ failure to as much as 75% when more than five organs are involved.1

Respiratory dysfunction is not an all-or-none phenomenon; rather it presents as a continuum with variable degrees of severity. In its mildest form, respiratory dysfunction is characterized by tachypnea and hypoxemia. However, as lung injury progresses and respiratory function deteriorates, diffuse alveolar damage generates a breakdown in the respiratory and nonrespiratory functions of the lung that is manifested as increased work of breathing, hypercapnia, and worsening hypoxemia that can progress to the point of necessitating mechanical ventilatory support. The initial