

THE ACUTELY ILL OR INJURED CHILD

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CHAPTER 38

Assessment
and Resuscitation

INITIAL ASSESSMENT

Initial assessment (the **ABCs—airway, breathing, and circulation**) of an acutely ill or injured child requires rapid identification of physiologic derangements in **tissue perfusion and oxygenation**. Once identified, immediate resuscitation must be implemented before pursuing the usual information needed to develop a differential diagnosis. Initial resuscitation measures are directed at improving and maintaining normal tissue perfusion and oxygenation. **Oxygen delivery** depends on cardiac output, hemoglobin concentration, and hemoglobin-oxygen saturation. The last-mentioned depends on air movement, alveolar gas exchange, pulmonary blood flow, and oxygen-hemoglobin binding characteristics.

HISTORY

In the resuscitation phase, access to historical information may be limited. Characterization of onset of symptoms, details of events, and a brief identification of underlying medical problems should be sought by members of the team not actively involved in the resuscitation. Attempts at identifying historical issues that affect the ABCs are useful but should not delay intervention if tissue oxygenation and perfusion are markedly impaired.

PHYSICAL EXAMINATION

Initial examination must focus rapidly on the **ABCs** (Table 38-1) to address the issues of oxygen delivery to tissues systematically. Airway patency is the first to be addressed, including assessment of the neurologically injured child's ability to protect the airway. Protection of the cervical spine also should be initiated at this step in any child with traumatic injury or who presents with altered mental status of uncertain etiology. Assessment of breathing

includes auscultation of air movement and application of a pulse oximeter (when available) to identify current oxygenation status. Circulatory status is assessed by palpation for distal and central pulses, focusing on the presence and quality of the pulses. Bounding pulses and a wide pulse pressure are often the first sign of the vasodilatory phase of shock and require immediate resuscitation measures. Weak, thready, or absent pulses are indicators for fluid resuscitation, initiation of chest compressions, or both. When assessment of the **ABCs** is complete and measures have been taken to achieve an acceptable level of tissue oxygenation, a more complete physical examination is performed. The sequence of this examination depends on whether the situation involves an acute medical illness or trauma. In trauma patients, the examination follows the **ABCDE pathway**. **D** stands for disability and prompts assessment of the neurologic system and evaluation for major traumatic injuries. **E** stands for exposure; the child is disrobed and searched for evidence of any life-threatening or limb-threatening problems. For the acutely ill and the injured child, the subsequent physical examination should identify evidence of organ dysfunction starting with areas suggested in the chief complaint and progressing to a thorough and systematic investigation of the entire patient.

COMMON MANIFESTATIONS

The physiologic responses to acute illness and injury are mechanisms that attempt to correct inadequacies of tissue oxygenation and perfusion. When initial changes, such as increasing heart and respiratory rates, fail to meet the body's needs, other manifestations of impending cardiopulmonary failure occur (Table 38-2). **Respiratory failure**, the most common cause of acute deterioration in children, may result in inadequate tissue oxygenation and in respiratory acidosis. Signs and symptoms of respiratory failure (tachypnea, tachycardia, increased work of breathing, abnormal mentation) progress as tissue oxygenation becomes more inadequate. Inadequate perfusion (shock) leads to inadequate oxygen delivery and a resulting metabolic acidosis. **Shock** is characterized by signs of inadequate tissue perfusion (pallor, cool skin, poor pulses, delayed capillary refill, oliguria, and abnormal mentation). The presence of any of these symptoms demands careful assessment and intervention to correct the abnormality and to prevent further deterioration.

TABLE 38-1 Rapid Cardiopulmonary Assessment

AIRWAY PATENCY
Able to be maintained independently
Maintainable with positioning, suctioning
Unmaintainable, requires assistance
BREATHING
Rate
Mechanics
Retractions
Grunting
Use of accessory muscles
Nasal flaring
Air movement
Chest expansion
Breath sounds
Stridor
Wheezing
Paradoxical chest motion
Color
CIRCULATION
Heart rate
Peripheral and central pulses
Present/absent
Volume/strength
Skin perfusion
Capillary refill time
Skin temperature
Color
Mottling
Blood pressure
CENTRAL NERVOUS SYSTEM PERFUSION
Responsiveness (AVPU)
Recognition of parents or caregivers
Pupil size
Posturing

AVPU, alert, responds to voice, responds to pain, unresponsive.

INITIAL DIAGNOSTIC EVALUATION

Screening Tests

During the initial phase of resuscitation, monitoring vital signs and physiologic status is the key screening activity (Table 38-3). Continuous monitoring with attention to changes may indicate response to therapy or further deterioration requiring additional intervention. During the initial rapid assessment, diagnostic evaluation often is limited to pulse oximetry and bedside measurement of glucose levels. The latter is important in any child with altered mental status or at risk for inadequate glycogen stores (infants, malnourished patients). After resuscitation measures, further diagnostic tests and imaging are often necessary.

Diagnostic Tests and Imaging

The choice of appropriate diagnostic tests and imaging is determined by the mechanism of disease and results of evaluation after initial resuscitation. The initial evaluation

TABLE 38-2 Warning Signs and Symptoms Suggesting the Potential Need for Resuscitative Intervention*

System	Signs and Symptoms
Central nervous system	Lethargy, agitation, delirium, obtundation, confusion
Respiratory	Apnea, grunting, nasal flaring, dyspnea, retracting, tachypnea, poor air movement, stridor, wheezing
Cardiovascular	Arrhythmia, bradycardia, tachycardia, weak pulses, poor capillary refill, hypotension
Skin and mucous membranes	Mottling, pallor, cyanosis, diaphoresis, poor membrane turgor, dry mucous membranes

*Action would seldom be taken only if one or two of these signs and symptoms were present, but the occurrence of several in concert foreshadows grave consequences. Intervention should be directed at the primary disorder.

TABLE 38-3 Elements of Acute Care

EXAMINE
Perform an initial assessment followed by complete and systematic evaluation
Focus examination on areas of chief complaints; determine life-threatening and organ-threatening conditions
MONITOR
Monitor vital signs
Monitor the physiologic parameters required to
1. Make a diagnosis
2. Ascertain response to therapy or progression of disease
INTERVENE
Before initiating therapy, determine therapeutic goals and endpoints
Prioritize life-threatening and organ-threatening conditions
Initiate therapy based on recognized pathophysiologic derangements
ANTICIPATE
Anticipation requires understanding of the underlying pathophysiology
Always plan for the "worst-case" scenario

of major trauma patients is focused on identifying evidence of hemorrhage and organ and tissue injury. For an acutely ill child with respiratory distress, a chest x-ray is important. Appropriate cultures should be obtained when sepsis is suspected. A complete blood count may also be helpful despite poor sensitivity and specificity of the white blood cell and band counts. Children with historical or physical evidence of inadequate intravascular volume should have serum electrolyte levels obtained, including bicarbonate, blood urea nitrogen, and creatinine.