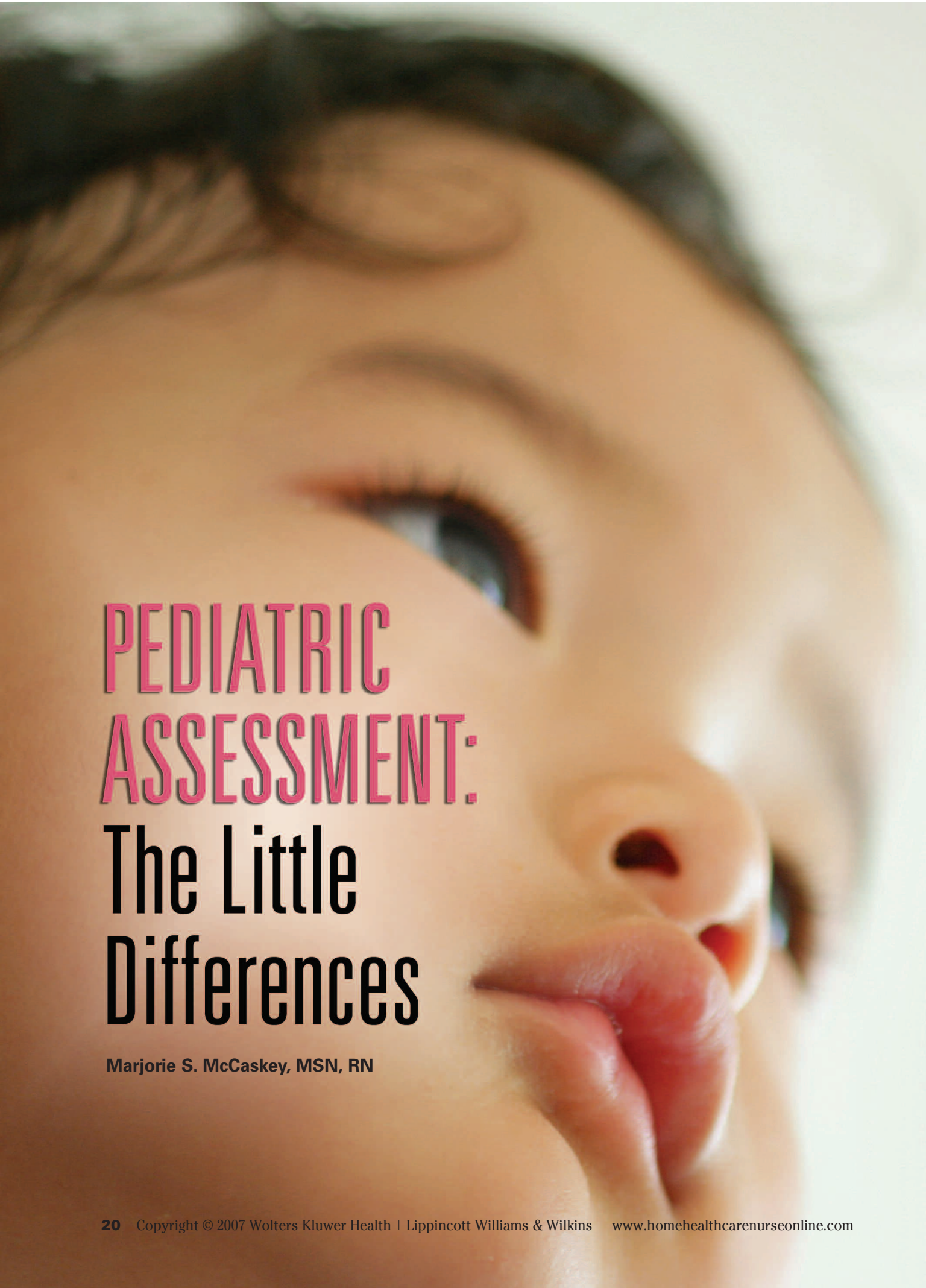

PEDIATRIC ASSESSMENT: The Little Differences

Marjorie S. McCaskey, MSN, RN

Description

First impressions are the truest; the information obtained in the first 60 seconds of an assessment is paramount to providing a rapid response to deteriorating physical conditions. Children are indisputably unique and require age- and size-specific assessment and care techniques. When assessing a child, the nurse should always keep in mind the physiological differences between children and adults. Although some clinical findings are the same in children and adults, manifestations unique to the younger population do exist. Specifically, pulmonary, cardiovascular, and neurological systems in children are likely to decompensate rapidly in the presence of illness or distress.

Pulmonary

Anatomical Differences

A child's respiratory system continues to develop long after birth. Because the respiratory function is immature, deterioration can occur rapidly when pulmonary disease is present or is in a progressive state. Several anatomical features of the child's respiratory system contribute to the compromised efficacy of oxygen delivery. Infants less than 4-6 months of age are obligatory nose breathers; therefore, simple conditions causing nasal congestion can lead to airway obstruction. Other anatomical factors influencing airway patency include the child's large tongue in relation to the oropharynx, a narrowed cricoid cartilage, and a cartilaginous larynx. The smaller size of the airway is of particular significance because even 1 mm of mucous accumulation or edema causes an increase in the resistance to airflow by a factor of 16 during quiet breathing and by a factor of 32 during turbulent breathing, crying, or labored breathing (Hazinski, 1999). One way to estimate the size of a child's trachea is to remember that its diameter is roughly equal to the diameter of his or her little finger (Bruck & Mayer, 2005).

A child's respiratory system continues to develop long after birth. Because the respiratory function is immature, deterioration can occur rapidly when pulmonary disease is present or is in a progressive state.

Respiratory rates are inversely related to age; the younger the child, the higher the normal respiratory rate. However, "normal" is always relative to the child's underlying condition. An increased respiratory rate is expected during pulmonary illness; therefore, a "normal" rate may be indicative of exhaustion and impending respiratory failure.

Breath sounds are easily auscultated through the thin chest wall of a child. The sternum and the ribs are cartilaginous, making the chest wall itself more compliant. Subsequently, the child in respiratory distress often presents with intercostal, substernal, or suprasternal retractions. Because of the flat positioning of the diaphragm, any impedance to the movement of the diaphragm from the lungs (as in hyperexpansion with asthma) or from the abdomen (distention) will hinder lung expansion and respiratory effort.

Respiratory Distress Versus Failure

Respiratory distress is defined as an increased work of breathing in the presence of normal state and oxygenation abilities. When assessing the respiratory status, always watch first for three indicators of increased work of breathing: position, retractions, and adventitious breath sounds. To maximize the opening of his or her airway, the child may assume a "sniffing" position with the chin tilted slightly upward and when upper airway obstruction is present. In an attempt to improve air movement through the use of accessory muscles, a child may sit in the "tripod" position, leaning forward on outstretched arms. Infants achieve this with a "head-bobbing" motion. Retractions or visible sinking of the soft tissue of the chest wall during inspiration occur when the child is using greater muscle effort to promote effective air movement. The depth and location of the retractions indicate the severity of the respiratory distress. Nasal flaring or isolated intercostal retractions (between the ribs) may indicate mild distress, whereas subcostal, suprasternal, and supraclavicular retractions appear as the distress increases. In severe respiratory distress, retractions are evident in these locations, and accessory muscles are used. Adventitious breath sounds such as wheezing, stridor, or grunting can indicate problems in either the upper or the lower airway. Wheezing, or a musical "high-pitched" noise often associated with asthma, is caused by a narrowing of the airway by bronchospasm,

edema, or mucous. Stridor is a high-pitched sound heard in the upper airway from either muscle spasm or swelling near or in the vocal cords. Stridor is commonly associated with laryngotracheobronchitis or croup (Salati, 2004). Grunting is an expiratory noise made as the child attempts to generate positive end-expiratory pressure by expiring against a closed glottis. Grunting may help to prevent atelectasis and to maintain patency of smaller airways.

Respiratory failure develops when the increased work of breathing is no longer effective in maintaining adequate oxygenation. Progressive changes from respiratory distress to respiratory failure include alterations in the depth and pattern of respirations with an increase in adventitious noises; changes in heart rate; alteration in mental status caused by euphoria or depression; and central nervous system signs of hypoxia such as headache, anxiety, or restlessness. These evident signs of abnormal appearance and/or significant changes in work of breathing are indicative of inadequate oxygenation or ventilation and require immediate attention (Table 1).

Cardiovascular

Anatomical Differences

Cardiac output and oxygen delivery are greater in children than in adults per kilogram of body weight; however, oxygen consumption is also high. Therefore, with less oxygen reserve, any stress that increases oxygen demand or decreases oxygen availability can quickly lead to deterioration.

Cardiac output in children, like in adults, is the product of heart rate and stroke volume. Normal stroke volume in children is 1.5 ml of blood per kilogram body weight per minute (Hazinski, 1999). However, children do not possess the capability of increasing stroke volume to maintain cardiac output. Children rely on an increased heart rate to maintain good cardiac perfusion. Skin temperature, skin color, and capillary refill time may be affected, however, as the child's compensatory mechanisms shunt blood to the vital core organs (brain and heart) and away from the periphery.

Circulating blood volume in children exceeds that of an adult by 10-20 ml/kg. Small quantities of blood loss can therefore trigger a compensatory reaction (increased heart rate) and symptoms of low cardiac output. Hypotension in children is a late sign of cardiac failure requiring approximately 25% loss of circulating volume to develop (American Heart Association, 2002).

Table 1.

Clinical Signs of Respiratory Failure

Tachycardia
Tachypnea
Increased work of breathing • Retractions • Nasal flaring • Grunting
Changes in skin color
Altered level of consciousness
Decreased systemic perfusion

Cardiovascular Compromise

When assessing cardiovascular status, first observe the resting appearance of the child. Is he or she comfortable, quietly awake or asleep with easy respirations, or is there a state of agitation, irritability, anxiety, and/or restlessness, even during sleep? Further cardiovascular assessment can then be made by assessing systemic perfusion through pulses, skin color and temperature, and capillary refill time. Central pulses, brachial or femoral in infants less than 1 year of age, and carotid in older children should be strong and regular. Vasoconstriction and increased heart rate are a child's compensatory mechanisms for decreased cardiac output; therefore, peripheral pulses become weak as peripheral blood vessels constrict. Also, related to a decrease in peripheral blood flow, arms and legs may feel cool and appear pale or mottled. Mottling in infants, however, can be normal; cardiac status should not be determined based on skin condition alone.

Capillary refill time is the easiest, most reliable indicator of cardiovascular function. Like adults, capillary refill of older children can be assessed by pressing on the nail beds. In infants and young children, however, small nail beds may demonstrate brisk capillary refill time in the presence of poor perfusion (Hockenberry et al., 2003). In this population, check capillary refill time by pressing on the fleshy parts of the palm, sole of the foot, or forehead. Normal capillary refill time should be less than 3 seconds.

In addition to tachycardia and changes in skin color/temperature, other clinical signs of poor circulatory perfusion include decreased urine output over time and changes in responsiveness. Remember, bradycardia is a late, ominous sign of circulatory failure.

Table 2.

Clinical Signs of Poor Cardiac Output

Tachycardia
Skin color changes • Mottled • Pallor • Cyanosis
Decreased skin temperature
Prolonged capillary refill
Decreased urine output
Altered level of consciousness
Metabolic acidosis
Hypotension
Bradycardia

Most pediatric arrhythmias can be classified as too fast, too slow, or absent. Auscultation should include the assessment of rate, regularity, and the presence of additional heart sounds. Familiarity with the child's medical history is the key to deciding what impact the heart rhythm will or does have on cardiovascular functions (Table 2).

Neurological System

Anatomical Differences

Neurologically, the child is continuously developing; functions develop over time and are incorporated into developmental milestones at every level. Normal-for-age levels of activity and response should be assessed from a normal-for-age perspective. This assessment requires knowledge of the child's "developmental" versus chronologic age.

- Infants (1-12 months) will respond to verbal or tactile soothing, will make eye contact, and as they grow older, will protest separation from parents or primary caregiver.
- Toddlers (1-3 years) will protest separation, and while developing a sense of autonomy, will resist any form of restraint or, for example, when being positioned supine, will protest with an adamant "NO!"
- Preschoolers (3-6 years) can be engaged in simple conversation and can identify body parts, specifically to identify painful areas of their bodies. As vocabulary increases, preschoolers should know their own name, their siblings' names, and speak in short, understandable sentences.
- Schoolagers (6-12 years) expand their world to include friends and adults other than parents (teachers, neighbors, etc.). They can exhibit a good command over language and can converse about many topics.
- Adolescents (12-18 years) are not yet adults, although they may struggle with the concept of independence. They tend to be extremely private, are able to make decisions related to their medical needs, and want to be involved in planning their care.

Altered Neurological Function

To quickly assess neurological function in the child, focus on the level of consciousness and activity. Neurological assessments should also be considered in relation to the child's developmental abilities. Interviewing the primary caregiver for medical history and asking, "Is this normal behavior?" can provide an insight and alleviate unrealistic expectations.

Consciousness is a state of full awareness appropriate for age. A child with lethargy is easily distracted, has periods of decreased wakefulness, can exhibit faulty memory, and yet retains the ability to communicate. As the child's level of consciousness diminishes, communicative abilities and awareness of surroundings decrease. Preverbal children (<3 years of age) can be assessed neurologically by observing consolability, eye contact, and quality of cry (Wong et al., 2001). Sudden changes in neurological status may be indicative

Table 3.

Clinical Signs of Increased Intracranial Pressure

Change in consciousness • Irritable • Lethargic • Confused, disoriented
Change in responsiveness • Decreased eye contact • Decreased response to caregivers • Inability to follow simple commands
Dilated pupils with decreased reaction to light
Changes in body movement
Changes in vital signs • Hypertension • Bradycardia • Apnea

of increased intracranial pressure and should prompt follow-up and response (Table 3).

Conclusion

When a child can no longer sustain vital organ functions, deterioration can be fast and catastrophic. Rapid observation of a child's appearance and respiratory and circulatory status should allow the nurse to formulate that first impression and decide what follow-up, if any, is needed. But then what? Determining whether a patient requires additional intervention is a skill that develops over time. Using simple criteria to guide consistent decision making can ensure rapid response for the deteriorating pediatric patient.

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Book review

Clinical Manual for the Oncology Advanced Practice Nurse (Second Edition). Camp-Sorrell, D., & Hawkins, R. A. (Eds.). Pittsburgh, PA: Oncology Nursing Society, 2006.

This book is an excellent clinical guide not only for the oncology advanced practice nurse (APN) but also for APNs working for adult and family health. It is extensive and comprehensive, but its outline format allows for quick and easy referencing. No less than 44 contributing authors and 2 editors wrote the book. The authors and editors come from all over the country and, clearly, have tremendous expertise in oncology.

The book is divided by system as follows: head and neck, integumentary, respiratory, cardiovascular, gastrointestinal, genitourinary, musculoskeletal, lymphatic, hematologic, neurologic, and metabolic. Within each section are short, concise chapters on conditions/diagnoses common to oncology patients. Sample chapters include skin metastasis, lymphedema, and neutropenia. However, the information within the majority of the chapters could be applied to nononcology patients, such as the chapters on herpes zoster, otitis media, urinary incontinence, and headache. Specifics relating to the oncology patients are added.

Every chapter includes the definition of the condition/disease followed by a brief outline describing the physiology and pathophysiology of the condition/disease, clinical features, etiology, history, signs and symptoms, physical examination, diagnostic tests, differential diagnoses, treatment, follow-up, patient education, and suggested referrals. Current references are included at the end of each chapter.

This book makes it easy for the APN to quickly locate a condition or a disease, review the pertinent points regarding it, and proceed with the history, physical examination, and treatment of the patient. I consider it to be an invaluable tool and highly recommend it to both oncology APNs and other APNs working for adult or family health.

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