Chapter 02

Patient Assessment

Objectives

- Discuss the components of a pediatric assessment.
- Describe techniques for successful assessment of infants and children.
- Identify key anatomical and physiological characteristics of infants and children and their implications.
- Identify normal age group related vital signs.
- Discuss the appropriate equipment used to obtain pediatric vital signs.
- Identify the components of pediatric triage.

Initial Evaluation and Triage of the Acutely Ill or Injured Child
Scene Survey

- Hazards or possible hazards
- Relationship/interaction
- Determine need for additional resources

Components of a Pediatric Assessment

- Initial assessment
  - Pediatric Assessment Triangle (general impression)
  - Primary survey (ABCDE assessment)
  - Secondary survey
    * Vital signs
    * Focused history
    * Physical examination

- Reassessment

Initial Assessment
Pediatric Assessment Triangle – General Impression

- "Across-the-room" assessment
- Can be completed in 60 seconds or less
- No equipment required
- Use your senses of sight and hearing to quickly determine if a life-threatening problem exists

Pediatric Assessment Triangle – General Impression

- Purpose
  - Establishes severity of illness or injury
    - Sick or not sick
  - Identifies general category of physiologic abnormality
    - Cardiopulmonary
    - Neurologic
    - Metabolic
    - Toxicologic
    - Trauma
  - Determines urgency of further assessment and intervention

Pediatric Assessment Triangle – General Impression

- Components:
Pediatric Assessment Triangle – General Impression

- Appearance
- Reflects the adequacy of:
  - Oxygenation
  - Ventilation
  - Brain perfusion
  - Homeostasis
  - Central nervous system function

Pediatric Assessment Triangle – General Impression

- Appearance
  - Assessment areas (TICLS):
    - Tone (muscle tone)
    - Interactivity/mental status
    - Consolability
    - Look or gaze
    - Speech or cry

Pediatric Assessment Triangle – General Impression

- Work of breathing
  - Reflects the adequacy of airway, oxygenation, and ventilation
Pediatric Assessment Triangle – General Impression

- Work of breathing
  - Assessment areas:
    - Body position
    - Visible movement (chest/abdomen)
    - Ventilatory rate
    - Ventilatory effort
    - Audible airway sounds

Pediatric Assessment Triangle – General Impression

- Sniffing position

Pediatric Assessment Triangle – General Impression

- Tripod position
Pediatric Assessment Triangle – General Impression

- Circulation
  - Reflects the adequacy of cardiac output and perfusion of vital organs (i.e., core perfusion)
  - Assessment areas:
    - Skin color

- Mottling

PAT – General Impression – Summary

- Appearance
  - Mental status
  - Muscle tone
  - Body position

- Breathing
  - Body position
  - Visible movement of chest/abdomen
  - Work of breathing (ventilatory rate/effort)
  - Audible airway sounds

- Circulation
  - Skin color
**General Impression – Decision**

Based on your first impression, is the child sick (unstable)?

**SICK**

Proceed immediately with rapid assessment of airway, breathing, and circulation:

- If a problem is identified, perform necessary interventions
- “Treat as you find”

**NOT SICK**

Proceed systematically:

- Primary survey (ABCDE)
- Secondary survey
- Vital signs
- Focused history
- Physical exam
- Reassessment

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**Primary Survey**

Focus:

Basic Life Support Interventions

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**Primary Survey - ABCDE**

- Hands-on assessment
- Purpose
  - Determine if life-threatening conditions exist
- Components
  - **A**irway, level of responsiveness, and cervical spine protection
  - **B**reathing (ventilation)
  - **C**irculation (perfusion)
  - **D**isability (mini-neurologic exam)
  - **E**xpose/environment
Primary Survey – Airway

- Assessment
  - Goal – determine if the airway is open, maintainable, or unmaintainable
    - Open – able to be maintained independently
    - Maintainable with positioning, suctioning
    - Unmaintainable – requires assistance

Primary Survey – Airway/Responsiveness

- Assessment – AVPU:
  - Alert
  - Verbal stimuli
  - Painful stimuli
  - Unresponsive

Primary Survey – Airway

- If cervical spine injury is suspected, manually stabilize the head and neck in a neutral, in-line position

- If the child is responsive:
  - And the airway is patent, move on to evaluation of breathing
  - But cannot talk, cry, or cough forcefully, evaluate for possible airway obstruction
Primary Survey – Airway

- If the child is unresponsive:
  - Quickly check breathing
  - If normal breathing is present, continue the primary survey
  - If the child is not breathing (or only gasping), check for a pulse
    - If there is no pulse or you are unsure if there is a pulse, begin chest compressions

Primary Survey – Airway

- If the child is unresponsive and a pulse is present, use manual maneuvers to open the airway
  - Head tilt-chin lift
  - Jaw thrust without head tilt
    - Use if trauma is suspected

Primary Survey – Airway

- If the child is unresponsive and a pulse is present but the airway is not patent, assess for sounds of airway compromise
  - Snoring
  - Gurgling
  - Stridor
Primary Survey – Airway

- Look in the mouth
  - Blood
  - Broken teeth
  - Gastric contents
  - Foreign objects
    - Loose teeth
    - Gum
    - Small toy

Primary Survey – Airway

- Signs of distress may include:
  - Preferred posture
  - Drooling
  - Difficulty swallowing
  - Swelling of lips and/or tissues of the mouth
  - Inadequate air movement
  - Obstruction by tongue, blood, vomitus, foreign body
  - Abnormal airway sounds

Primary Survey – Airway

- Interventions
  - Spinal stabilization as needed for trauma
    - By history or physical exam
  - Jaw thrust without head-tilt
  - Head-tilt/chin-lift
  - Suction
  - Reposition
  - Removal of foreign body
  - Airway adjuncts
Primary Survey – Breathing

- Assessment Goals
  - Adequate gas exchange with no signs of hypoxia
  - Awake and alert
  - Maintain oxygen saturation of at least 94%
  - Skin color normal; warm and dry
  - Breathing is spontaneous, unlabored, and at a normal rate for age
  - Chest expansion is equal bilaterally
  - Breath sounds are present, clear, and equal bilaterally
  - Absence of dyspnea, stridor, increased work of breathing

- Confirm child is breathing

- Determine if breathing is adequate or inadequate

- If breathing adequate, move on to assessment of circulation

- Assess chest and abdomen for ventilatory movement

- Evaluate depth and symmetry of movement with each breath
Primary Survey – Breathing

• Assess for the presence of respiratory distress/failure

• If respiratory distress is observed, *potential* respiratory failure is present

### Normal Ventilatory Rates by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Breaths/min (at rest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant (1 to 12 months)</td>
<td>30 to 60</td>
</tr>
<tr>
<td>Toddler (1 to 3 years)</td>
<td>24 to 40</td>
</tr>
<tr>
<td>Preschooler (4 to 5 years)</td>
<td>22 to 34</td>
</tr>
<tr>
<td>School-age (6 to 12 years)</td>
<td>18 to 30</td>
</tr>
<tr>
<td>Adolescent (13 to 18 years)</td>
<td>12 to 16</td>
</tr>
</tbody>
</table>

• Note signs of increased work of breathing (ventilatory effort)
  > Anxious appearance, concentration on breathing
  > Use of accessory muscles
  > Leaning forward to inhale
  > Nasal flaring
Primary Survey – Breathing

* Note signs of increased work of breathing (ventilatory effort)
  - Retractions

- Note signs of increased work of breathing
  - Seesaw movement

- Note rhythm of breathing
  - Regular
  - Irregular
  - Periodic

- Respiratory Distress
  - Nasal flaring
  - Inspiratory retractions
  - Increased breathing rate
  - Increased depth of breathing
  - Head-bobbing
  - See-saw respirations
  - Restlessness
  - Tachycardia
  - Grunting
  - Stridor

Location of retractions
Primary Survey – Breathing

Signs of Respiratory Distress and Respiratory Failure

<table>
<thead>
<tr>
<th>Respiratory Distress</th>
<th>Respiratory Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal flaring</td>
<td>Cyanosis</td>
</tr>
<tr>
<td>Inspiratory retractions</td>
<td>Diminished breath sounds</td>
</tr>
<tr>
<td>Increased breathing rate</td>
<td>Decreased LOC or response to pain</td>
</tr>
<tr>
<td>Increased depth of breathing</td>
<td>Poor skeletal muscle tone</td>
</tr>
<tr>
<td>Head-bobbing</td>
<td>Inadequate ventilatory rate, effort, or chest excursion</td>
</tr>
<tr>
<td>See-saw ventilations</td>
<td>Tachycardia</td>
</tr>
<tr>
<td>Restlessness</td>
<td>Use of accessory muscles</td>
</tr>
<tr>
<td>Tachycardia</td>
<td></td>
</tr>
<tr>
<td>Grunting</td>
<td></td>
</tr>
<tr>
<td>Stridor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Listen for air movement at the nose and mouth

− Stridor
− Wheezing
− Snoring
− Crowing
− Gurgling

Listen for presence and quality of breath sounds

If breathing is difficult and rate is too slow or too fast:

− Supplemental oxygen
− Positive-pressure ventilation if necessary

Continue primary survey
Primary Survey – Breathing

- If breathing is absent:
  - Insert an airway adjunct
  - Deliver two breaths
  - Ensure chest rise with each ventilation

- Continue the primary survey

Primary Survey – Breathing

- Interventions
  - Suction
  - Oxygen
  - Airway adjuncts
  - Positive-pressure ventilation

Primary Survey – Circulation

- Goals
  - Adequate cardiovascular function and tissue perfusion
  - Effective circulating fluid volume
  - Normal core body temperature
Primary Survey – Circulation

- Assessment
  - Control bleeding
    - Look for visible external hemorrhage
    - Control major bleeding, if present
    - Consider possible areas of major internal hemorrhage

- Assessment
  - Compare strength and quality of central and peripheral pulses
  - Central pulse
    - Newly born
      - Umbilical cord
    - Infant
      - Brachial artery
    - Older child
      - Carotid or femoral artery

Grading of Pulses

<table>
<thead>
<tr>
<th>Description</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full, bounding, not obliterated with pressure</td>
<td>+4</td>
</tr>
<tr>
<td>Normal – easily palpated, not easily obliterated with pressure</td>
<td>+3</td>
</tr>
<tr>
<td>Difficult to palpate, obliterated with pressure</td>
<td>+2</td>
</tr>
<tr>
<td>Weak, thready, difficult to palpate</td>
<td>+1</td>
</tr>
<tr>
<td>Absent pulse</td>
<td>0</td>
</tr>
</tbody>
</table>
Primary Survey – Circulation

Normal Heart Rates by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Beats/min*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant (1 to 12 months)</td>
<td>100 to 160</td>
</tr>
<tr>
<td>Toddler (1 to 3 years)</td>
<td>90 to 150</td>
</tr>
<tr>
<td>Preschooler (4 to 5 years)</td>
<td>80 to 140</td>
</tr>
<tr>
<td>School-age (6 to 12 years)</td>
<td>70 to 120</td>
</tr>
<tr>
<td>Adolescent (13 to 18 years)</td>
<td>60 to 100</td>
</tr>
</tbody>
</table>

*Pulse rates for a sleeping child may be 10% lower than the low rate listed in age group.

- Assessment
  - Evaluate cardiac rhythm
  - Skin color
    - Pink
    - Pale
    - Blue/cyanotic
    - Mottled

Primary Survey – Circulation

- Acrocyanosis in a newborn
Primary Survey – Circulation

- Assessment
  - Skin temperature
  - Skin moisture
  - Skin turgor

Primary Survey – Circulation

- Assessment – Capillary refill
  - Less than 2 seconds = normal
  - 3 to 5 seconds = delayed
    - Poor perfusion
    - Exposure to cool ambient temperatures
  - More than 5 seconds = markedly delayed
    - Suggests shock
Primary Survey – Circulation

- Interventions
  - Oxygen
  - Position
  - Chest compressions
  - Bleeding control
  - Defibrillation

Primary Survey – Disability

<table>
<thead>
<tr>
<th>Glasgow Coma Scale</th>
<th>Adult / Child</th>
<th>Score</th>
<th>Infant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye Opening</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>4</td>
<td>Spontaneous</td>
<td></td>
</tr>
<tr>
<td>To verbal</td>
<td>3</td>
<td>To verbal</td>
<td></td>
</tr>
<tr>
<td>To pain</td>
<td>2</td>
<td>To pain</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>No response</td>
<td></td>
</tr>
<tr>
<td><strong>Best Verbal Response</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oriented</td>
<td>5</td>
<td>Cries, babbles</td>
<td></td>
</tr>
<tr>
<td>Disoriented</td>
<td>4</td>
<td>Irritable</td>
<td></td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
<td>Cries only to pain</td>
<td></td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
<td>Means to pain</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>No response</td>
<td></td>
</tr>
<tr>
<td><strong>Best Motor Response</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obeys commands</td>
<td>6</td>
<td>Spontaneous</td>
<td></td>
</tr>
<tr>
<td>Localizes pain</td>
<td>5</td>
<td>Withdraws from touch</td>
<td></td>
</tr>
<tr>
<td>Withdraws from pain</td>
<td>4</td>
<td>Withdraws from pain</td>
<td></td>
</tr>
<tr>
<td>Abnormal flexion (decorticate)</td>
<td>3</td>
<td>Abnormal flexion (decorticate)</td>
<td></td>
</tr>
<tr>
<td>Abnormal extension (decerebrate)</td>
<td>2</td>
<td>Abnormal extension (decerebrate)</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>No response</td>
<td></td>
</tr>
</tbody>
</table>

Total = E + V + M 3 to 15
Primary Survey – Expose / Environment

- Undress the patient
  - Preserve patient modesty whenever possible
  - Maintain appropriate temperature

The Secondary Survey

Focus:
Advanced Life Support Interventions

Secondary Survey – Overview

- Vital signs, pulse oximeter, ECG, BP monitor
- Obtain focused SAMPLE or CIAMPEDS history
- (Advanced) Airway
- Breathing
- Circulation
- Detailed (or focused) examination, differential diagnosis, diagnostic procedures
- Evaluate interventions, pain management
- Facilitate family presence for invasive and resuscitative procedures
Vital Signs – Temperature

- Obtain the child’s temperature by an appropriate route considering the child’s age and clinical condition
  - Oral
  - Axillary
  - Rectal
  - Tympanic

Vital Signs – Blood Pressure (BP)

- Measure BP
  - Only after assessing pulse and respiration
  - In children older than 3 years
- Width of BP cuff should cover 1/2 to 2/3 the length of the upper arm or upper leg

<table>
<thead>
<tr>
<th>Age</th>
<th>Lower Limit of Normal Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term neonate (0 to 28 days)</td>
<td>&gt; 60 mm Hg or strong central pulse</td>
</tr>
<tr>
<td>Infant (1 to 12 months)</td>
<td>&gt; 70 mm Hg or strong central pulse</td>
</tr>
<tr>
<td>Child 1 to 10 years</td>
<td>&gt; 70 mm Hg + (2 x age in years)</td>
</tr>
<tr>
<td>Child 10 years and older</td>
<td>&gt; 90 mm Hg</td>
</tr>
</tbody>
</table>
Vital Signs – Pulse Pressure

- Pulse pressure
  - Difference between systolic and diastolic blood pressure
  - Indicator of stroke volume
  - Narrowed pulse pressure suggests circulatory compromise

Weight

- Obtain a measured weight when possible
- If a measured weight is not possible:
  - Length-based measuring tape
  - Ask caregiver child’s last weight
- Pediatric weight formula
  - Weight in kg = 8 + (2 x age)

Focused History

**SAMPLE**
- Signs and symptoms
- Allergies
- Medications
- Past medical history
- Last oral intake
- Events prior to illness or injury

**CIAMPEDS**
- Chief complaint
- Immunizations/isolation (communicable disease exposure)
- Allergies
- Medications
- Past medical history/parent’s impression of child’s condition
- Events surrounding illness/injury
- Diet/diapers
- Symptoms
Focused History

Onset

Provocation

Quality

Region/Radiation

Severity

Time

Physical Examination

Purpose

Detect non-life-threatening conditions

Provide care for those conditions/injuries

Detailed Physical Examination

Inspect and palpate each major body area for:

Deformities

Contusions

Abrasions

Penetrations/Punctures

Burns

Lacerations

Swelling/edema

Tenderness

Instability

Crepitus
Detailed Physical Examination – Scalp / Skull

- Inspect for DCAP-BLS

- Palpate
  - DCAP-BLS-TIC
  - Depressions, protrusions
  - Fontanelles

Detailed Physical Examination – Ears

- Inspect
  - DCAP-BLS
  - Battle’s sign
  - Blood or clear fluid in ears

- Palpate for tenderness or pain

Detailed Physical Examination – Face

- Inspect
  - DCAP-BLS
  - Singed facial hair
  - Symmetry of facial expression

- Palpate
  - Orbital rims
  - Zygoma
  - Maxilla
  - Mandible
Detailed Physical Examination – Eyes

- Inspect
  - DCAP-BLS
  - Foreign body
  - Hyphema
  - Eyeglasses/contact lenses
  - Raccoon eyes
  - Color of sclera and conjunctiva
  - Periorbital edema
  - Pupils
  - Eye movement

- Determine Pediatric Coma Scale score or Glasgow Coma Scale score

Detailed Physical Examination – Nose

- Inspect
  - DCAP-BLS
  - Blood or fluid from the nose
  - Singed nasal hairs
  - Nasal flaring

- Palpate nasal bones

Detailed Physical Examination – Mouth

- Inspect
  - DCAP-BLS
  - Blood, absent or broken teeth, gastric contents, foreign objects
  - Injured or swollen tongue
  - Color of the mucous membranes
  - Note presence and character of fluids, vomitus
  - Note sputum color, amount, and consistency

- Listen for hoarseness, inability to talk
- Note unusual odors
Detailed Physical Examination – Neck

- Inspect
  - DCAP-BLS
    - Neck veins – flat or distended
    - Use of accessory muscles
    - Presence of a stoma
    - Presence of a medical identification device

- Palpate
  - DCAP-BLS-TIC
    - Tracheal position
    - Subcutaneous emphysema

Detailed Physical Examination – Chest

- Inspect
  - Work of breathing
  - Symmetry of movement
  - Use of accessory muscles
  - Retractions
  - Note abnormal breathing patterns
  - DCAP-BLS
  - Vascular access devices

- Auscultate
  - Equality of breath sounds
  - Adventitious breath sounds
  - Heart sounds

- Palpate
  - DCAP-BLS-TIC
    - Chest wall tenderness
    - Symmetry of chest wall expansion
    - Subcutaneous emphysema
Detailed Physical Examination – Abdomen

- Inspect
  - DCAP-BLS
  - Distention, scars
  - Use of abdominal muscles during respiration
  - Signs of injury, discoloration

- Auscultate bowel sounds

- Palpate all four quadrants for:
  - DCAP-BLS
  - Guarding or distention
  - Rigidity
  - Masses

Detailed Physical Examination – Pelvis / Genitalia

- Inspect – DCAP-BLS

- Palpate
  - DCAP-BLS-TIC
  - Apply pressure to iliac crests and symphysis pubis
  - Assess strength and quality of femoral pulses

Detailed Physical Examination – Extremities

- Inspect
  - DCAP-BLS
  - Vascular access devices
  - Purpura, petechiae
  - Congenital anomalies
  - Abnormal extremity position
  - Medical identification bracelet

- Palpate
  - DCAP-BLS-TIC
  - Pulses, motor, sensory (PMS)
  - Skin temperature
Detailed Physical Examination – Posterior Body

- Inspect
  - If trauma is suspected, ensure manual stabilization of head and spine during exam
  - DCAP-BLS
  - Purpura, petechiae, rashes, edema

- Auscultate posterior thorax

- Palpate posterior trunk for DCAP-BLS

Secondary Survey

- Differential diagnosis, diagnostic procedures
  - Search for, find, and treat reversible causes
    - Glucose check
    - Laboratory and radiographic studies

- Evaluate
  - Interventions
  - Pain management

- Facilitate
  - Family presence for invasive/resuscitative procedures

Reassessment – Purpose

- Reevaluate the patient’s condition
- Assess the effectiveness of emergency care interventions provided
- Identify any missed injuries or conditions
- Observe subtle changes or trends in the patient’s condition
- Alter emergency care interventions as needed
Reassessment

- Reassessment should be:
  - Performed on EVERY patient
  - Performed after assuring completion of critical interventions
  - Performed after the detailed physical exam, if one is performed
  - Repeated and documented:
    - Every 5 minutes for an unstable patient
    - Every 15 minutes for a stable patient

Reassessment – Components

- Repeat the primary survey
- Reassess and document vital signs
- Repeat the focused assessment regarding patient complaint or injuries
- Reevaluate emergency care interventions

Pediatric Triage in the Emergency Department
**Goals of Triage**

- Rapidly identify patients with life-threatening conditions
- Determine the most appropriate treatment area for patients presenting to the ED
- Optimize use of resources
- Decrease congestion in emergency treatment areas
- Provide ongoing assessment of patients
- Provide information to patients and families regarding services, expected care, and waiting times

**Triage Guidelines**

- Ability to triage patients effectively and accurately is based on:
  - The Pediatric Assessment Triangle
  - Physical assessment findings
  - Patient’s pertinent medical history
  - Appropriate use of guidelines and triage protocols
  - Practical knowledge gained through experience and training

**5-level Triage Classification System**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Definitive Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resuscitation</td>
<td>Immediate</td>
</tr>
<tr>
<td>Emergent</td>
<td>Within 10 min</td>
</tr>
<tr>
<td>Urgent</td>
<td>Within 30 to 60 min</td>
</tr>
<tr>
<td>Semiurgent</td>
<td>Within 1 to 2 hours</td>
</tr>
<tr>
<td>Nonurgent</td>
<td>Within 2 to 3 hours</td>
</tr>
</tbody>
</table>
Questions?