Chapter 20
Secondary Assessment

Lesson 20.1
Physical Examination
Learning Objectives

• Define the purpose of secondary assessment.
• Describe physical examination techniques commonly used in prehospital settings.
• Describe examination equipment commonly used in prehospital settings.

Learning Objectives

• Describe the general approach to physical examination.
• Outline steps of a comprehensive physical examination.
• Detail components of the mental status examination.

Learning Objectives

• Distinguish between normal and abnormal findings in the mental status examination.
• Outline the steps in the general patient survey.
• Distinguish between normal and abnormal findings in the general patient survey.
Secondary Assessment

• Components
  – Physical examination techniques
  – Measurement of vital signs
  – Assessment of body systems
  – Skilful use of examination equipment

• Physical examination techniques vary by patient, depending on chief complaint, present illness, and history

Secondary Assessment

• Appropriate assessment of patient depends on
  – Stability of patient
  – Complaint and history
  – Patient’s ability to communicate
  – Potential for unrecognized illness

Examination Techniques

• Commonly used
  – Inspection
  – Palpation
  – Percussion
  – Auscultation
Inspection

• Visual assessment of patient and surroundings
  – Can alert paramedic to patient’s mental status, possible injury, or underlying illness
  – Patient hygiene, clothing, eye gaze, body language and position, skin color, and odor are significant inspection findings
  – EMS response may be to patient’s home
    • Make visual inspection for cleanliness, prescription medicines, illegal drug paraphernalia, weapons, and signs of alcohol use

Palpation

• Technique in which paramedic uses the hands and fingers to gather information by touch
  – Use the palmar surface of fingers and finger pads to palpate for texture, masses, fluid, and crepitus and to assess skin temperature
    • Dorsal and ulnar hand surfaces may also be used
  – May be either superficial or deep
  – Form of invasion of patient’s body
    • Approach should be gentle and should be initiated with respect
Percussion

- Used to evaluate the presence of air or fluid in body tissues
  - Performed by striking one finger against another to produce vibrations and sound waves of underlying tissue
  - Sound waves are heard as percussion tones (resonance)
- Determined by density of tissue being examined
  - Denser the body area, the lower the pitch of the percussion tone

Percussion

- To percuss, paramedic places first joint of middle finger of nondominant hand on patient, keeping rest of hand poised above the skin
  - Fingers of other hand should be flexed and wrist action loose
  - Paramedic then snaps wrist of dominant hand downward with tip of middle finger tapping joint of finger that is on body surface
    - Tap should be sharp and rigid, percussing same area several times to interpret tone
    - Requires practice to obtain skill needed for physical examination
Auscultation

• Calls for use of stethoscope
  – Used to assess body sounds made by movement of various fluids or gases in patient’s organs or tissues
  – Best performed in quiet environment to focus on each body sound being assessed
  – Isolate particular area to note characteristics of intensity, pitch, duration, quality

Auscultation

• Calls for use of stethoscope
  – In prehospital setting, auscultation is most often used to assess BP and evaluate breath sounds, heart sounds, and bowel sounds
  – To auscultate, paramedic should place diaphragm of stethoscope firmly against patient’s skin for stabilization
  – If bell end piece is used, should be positioned lightly on body surface
  – Prevents damping of vibrations
Examination Equipment

• Basic equipment
  – Stethoscope
  – Ophthalmoscope
  – Otoscope
  – BP cuff

Stethoscope

• Used to evaluate sounds created by cardiovascular, respiratory, and gastrointestinal systems

• Types
  – Acoustic
  – Magnetic
  – Electronic
Stethoscope

• Acoustic stethoscope
  – Transmits sound waves from source to paramedic’s ears
  – Most have rigid diaphragm
    • Transmits high-pitched sounds
    • Bell-end piece transmits low-pitched sounds

Stethoscope

• Magnetic stethoscopes
  – Have a single diaphragm end piece
    • Contains iron disk and permanent magnet
  – Air column of diaphragm is activated as magnetic attraction is established between iron disk and magnet
  – Frequency dial adjusts for high-, low-, and full-frequency sounds

Stethoscope

• Electronic stethoscopes
  – Convert sound vibrations into electrical impulses that are amplified
    • Impulses are transmitted to speaker, where they are converted to sound
  – Can compensate for environmental noise
    • May be beneficial for use in prehospital setting
Ophthalmoscope

• Used to inspect structures of eye
  – Retina
  – Choroid
  – Optic nerve disk
  – Macula (oval, yellow spot at center of retina)
  – Retinal vessels

Ophthalmoscope

• This device has a battery light source, two dials, and a viewer
  – Dial at top of battery changes light image
  – Dial at top of viewer allows for selection of lenses
    • Five lenses are available, but large white light is generally used
Otoscope

• Used to examine deep structures of external and middle ear
  – Basically an ophthalmoscope with special ear speculum attached to battery tube
  – Ear specula come in number of sizes to conform to various ear canals
    • Choose largest one that fits comfortably in patient’s ear
  – Light from otoscope allows paramedic to visualize tympanic membrane

Blood Pressure Cuff

• Sphygmomanometer
  – Most commonly used along with stethoscope to measure systolic and diastolic BP
  – Cuff used in prehospital setting consists of
    • Pressure gauge that registers millimeter calibrations
    • Synthetic cuff with Velcro closures that encloses inflatable rubber bladder
    • Pressure bulb with release valve
Blood Pressure Cuff

- Available in a number of sizes
  - Adult widths should be 1/3 to 1/2 circumference of limb
  - For children, width should cover about 2/3 of upper arm or thigh

Electronic Equipment

- Electronic devices that automatically measure patient’s vital signs are used by hospitals and EMS agencies
  - Monitor patient’s
    - BP
    - Pulse rate
    - Body temperature
    - End-tidal carbon dioxide
    - Oxygen saturation at regular intervals
Physical Examination: General Approach

- Physical examination is performed as a step-by-step process
  - Special emphasis placed on patient’s present illness and chief complaint
  - Most patients view a physical examination with some anxiety
    - Feel vulnerable and exposed
    - Establish professional trust early in encounter
    - Ensure patient’s privacy and comfort when possible

Comprehensive Physical Examination

- Systematic assessment of body
  - Components
    - Mental status
    - General survey
    - Vital signs
    - Skin
    - Head, eyes, ears, nose, and throat
    - Chest
    - Abdomen
    - Posterior body
    - Extremities (peripheral vascular and musculoskeletal)
    - Neurological examination

Mental Status

- First step in any encounter with patient is to note patient’s appearance and behavior
  - With this step, should assess for level of consciousness
  - A healthy patient is expected to be alert and responsive to touch, verbal instruction, and painful stimuli
Appearance and Behavior

• Abnormal findings
  – Drowsiness
  – Inability to respond to painful stimuli
• Terms used
  – Obtundation
    • Decreased level of consciousness usually produced by anesthetics or analgesics

Appearance and Behavior

• Terms used
  – Stupor
    • State of lethargy and unresponsiveness
    • Usually unaware of surroundings
  – Coma
    • State of profound unconsciousness
    • No spontaneous eye movements
    • Cannot be aroused

Posture, Gait, and Motor Activity

• Observe patient’s posture, gait, and motor activity
  – Assessing pace, range, character, and appropriateness of movement
  – Abnormal findings
    • Ataxia (uncoordinated movement)
    • Paralysis
    • Restlessness
    • Agitation
    • Bizarre body posture
    • Immobility
    • Involuntary movements
Dress, Grooming, and Personal Hygiene

• Should be appropriate for the patient’s age, lifestyle, and occupation
  – Dress should be appropriate for environmental temperature and weather conditions
  – Medical jewelry should be noted
  – Hair, fingernails, cosmetics may reflect patient’s lifestyle, mood, personality
    • Can point to decreased interest in appearance
    • Can help to estimate length of illness

Dress, Grooming, and Personal Hygiene

• Breath or body odors can point to underlying conditions or illness
  – Alcohol
  – Acetone (seen with some diabetic conditions)
  – Feces (seen with bowel obstruction)
  – Halitosis from throat infections and poor dental and oral hygiene
  – Renal and liver disease and poor hygiene also may result in body odor

Facial Expression

• May reveal anxiety, depression, elation, anger, withdrawal, fear, sadness, or pain
• Paramedic should be alert to changes in facial expression while patient is at rest, during conversation, during examination, when asking questions
  – Should be appropriate to the situation
Mood, Affect, and Relation to Persons and Things

• Mood and affect should be appropriate to event
  – Describe patient’s emotional state and outward display of feelings and emotions
  – Expressed verbally and nonverbally
  – Abnormal findings
    • Unusual happiness in presence of major illness
    • Indifference
    • Thoughts of suicide
    • Responses to imaginary persons or objects
    • Unpredictable mood swings

What physical clues do you look for in your friends or your partner that tell you about their mood?

Speech and Language

• Patient’s speech should be understandable and of moderate pace
  – Assess quantity, rate, loudness, fluency of patient’s speech patterns
  – Abnormal findings
    • Aphasia (loss of speech)
    • Dysphonia (abnormal speaking voice)
    • Dysarthria (poorly articulated speech)
    • Speech and language that change with mood
Thoughts and Perceptions

• Healthy person’s thoughts and perceptions are logical, relevant, organized, coherent
  – Patients should have insight into their illness or injury
  – Show level of judgment in making decisions or plans about their situation and care
  – Abnormal thought processes
    • Flight of ideas
    • Incoherence
    • Confabulation
    • Blocking
    • Transference

Thoughts and Perceptions

• Healthy person’s thoughts and perceptions are logical, relevant, organized, coherent
  – Abnormal thought content:
    • Obsessions
    • Compulsions
    • Delusions
    • Suicidal ideations
    • Homicidal thoughts
    • Feelings of unreality
  – Abnormal perceptions
    • Illusions
    • Visual/auditory hallucinations

Memory and Attention

• Healthy persons
  – Oriented to person, place, and date (“oriented times 3”)
  – Aware of event that initiated EMS response (“oriented times 4”)
• Methods to assess
  – Ask the patient to count from 1 to 10 using only even or odd numbers (digit span)
  – Multiply by sevens (serial sevens)
  – Spell simple words backward (e.g., “world”)
Memory and Attention

• Paramedic should assess
  – Patient’s remote memory (e.g., birthdays)
  – Recent memory (e.g., events of the day)
  – Patient’s new learning ability
    • Give patient new information, ask to recall later

General Survey

• Evaluate for
  – Signs of distress
  – Apparent state of health
  – Skin color and obvious lesions
  – Height and build
  – Sexual development
  – Weight
  – Vital signs

Signs of Distress

• Obvious signs include those that result from cardiorespiratory insufficiency, pain, anxiety
  – Cardiorespiratory insufficiency
    • Labored breathing
    • Wheezing
    • Cough
  – Pain
    • Wincing
    • Sweating
    • Protectiveness of a painful body part or area
Signs of Distress

- Obvious signs include those that result from cardiorespiratory insufficiency, pain, anxiety
  - Anxiety
    - Restlessness
    - Anxious expression
    - Fidgety movement
    - Cold, moist palms

Apparent State of Health

- Can be assessed by observation
- Note patient’s basic appearance as being
  - Acutely or chronically ill
  - Frail
    - Impaired mental judgment
  - Feeble
    - Weakness or lack of strength
  - Robust
    - Strong and healthy
  - Vigorous
    - Full of energy

Skin Color, Obvious Lesions

- Can vary by body part and from person to person
  - Normal skin color depends on race
    - Can range from pink or ivory to deep brown, yellow, or olive
    - Skin color best assessed by evaluating skin that usually is not exposed to sun or has less pigmentation
  - Obvious skin lesions that can indicate illness or injury
    - Rashes
    - Bruises
    - Scars
    - Discoloration
Height and Build

• Describe as
  – Average, tall, short
  – Slender, lanky, muscular, or stocky build
  – All factors can reflect overall health
• Age and lifestyle also may affect height and body build

Sexual Development

• Sexual characteristics should be appropriate for patient’s age and sex
  – Normal changes associated with puberty:
    • Facial hair and deepening of the voice in men
    • Increased breast size in women
    • Hair growth in axillary and groin areas in both sexes
  – As a rule, healthy men are taller, heavier, more muscular than healthy women
Weight

- Should be proportionate to height and sex
  - Conditions easily observed
    - Emaciated
    - Plump
    - Obese
  - Recent gain or loss is key finding and may be clinically important
  - Can reflect health, age, lifestyle

Think about three medical conditions that might result in significant weight loss and then three that might cause a significant weight gain.
Vital Signs

• Baseline measurement of function

• Respiration
  - Normal for adults: 12-24 breaths/min
  - Assessed by
    • Watching patient breathe
    • Feeling for chest movement
    • Auscultation of lungs
  - Count respirations for 30 seconds, multiple by 2
  - Rhythm and depth assessed by visualization and auscultation of thorax

Vital Signs

• Vital signs
  - Abnormal findings:
    • Shallow, rapid, noisy, or deep breathing
    • Asymmetrical chest wall movement
    • Use of accessory muscles of respiration
    • Congested, unequal, or diminished breath sounds

Vital Signs

• Pulse
  - Normal resting pulse rate for adult: 60 to 100 beats/minute
    • May be affected by patient’s age and physical condition
    • Factors such as pregnancy, anxiety, fear may produce a higher-than-normal rate in healthy individuals
Vital Signs

• Pulse
  – May be obtained at carotid artery in neck or at any site where artery lies close to skin
  – To evaluate radial pulse, place pads of index and middle fingers at distal end of patient’s wrist, just medial to radial styloid
    • If pulsations are regular, count for 15 seconds, multiply by 4 to determine number of beats/minute
  – Regularity and strength are important
  • Can be regular or irregular, weak or strong
  – Application of ECG monitor is useful in evaluating cardiovascular status after initial assessment of pulse

Vital Signs

• Blood pressure
  – Systolic
    • Pressure exerted against arterial walls when heart contracts
    • Should be < 120 mm Hg
  – Diastolic
    • Pressure exerted against arterial walls when heart relaxes
    • Should be < 80 mm Hg

Vital Signs

• Blood pressure
  – Best measured by auscultation or electronic device
    • Cuff is placed on patient’s arm with lower end of cuff positioned 2 to 5 cm (1 to 2 inches) above antecubital (AC) space
    • If measured manually, cuff is inflated to point about 30 mm Hg above where brachial pulse can no longer be palpated
    • Stethoscope placed over brachial artery and cuff slowly deflated at a rate of 2 to 3 mm Hg per second
    • Observe gauge and note
      – Where first sound or pulsation is heard (systolic pressure)
      – Where sounds change in quality or become muffled (diastolic pressure)
Vital Signs

• Blood pressure
  – May be estimated by palpation when vascular sounds are difficult to hear with stethoscope because of environmental noise
    • Less accurate
    • Only estimates systolic pressure
    • Locate brachial or radial pulse and apply cuff
    • Finger contact should be maintained at pulse site as cuff slowly deflates
    • When pulse becomes palpable, gauge reading denotes systolic pressure

Vital Signs

• Blood pressure
  – Reasons for high BP
    • Fear
    • Anxiety
    • Patient’s age
    • Normal level of physical activity
  – Alternate sites can be used, readings vary from those taken in arm
Skin Examination

- Assessment:
  - Skin color
  - Temperature
  - Moisture
- Skin color and presence of bruises, lesions, rashes may indicate serious illness or injury

Skin Examination

- Skin temperature
  - May be normal (warm), hot, or cold
  - Evaluations of temperature may have specific applications in some patient situations
    - Hot to touch indicates possible fever or heat-related illness or injury
    - Cold skin may indicate decreased tissue perfusion and cold-related illness or injury

Skin Examination

- Skin temperature
  - Dorsal surface of hand is more sensitive than palmar surface and should be used to estimate body temperature
    - Normal body temperature = 98.6°F (37°C)
    - Oral, axillary, tympanic, or rectal temperatures can be measured using electronic, digital, temporal (artery), digital dot, or tympanic-membrane thermometers
    - Temperature probe should be covered by disposable sheath, helps to prevent cross-contamination
Skin Examination

• Oral measurement
  – Oral temperature usually measured in patients over the age of 6
  – Readings may be affected by
    • Crying
    • Eating, drinking
    • Smoking
    • Oxygen administration by mask
    • Nebulizer treatments
    • Position of thermometer in patient’s mouth

Skin Examination

• Axillary measurement
  – Often used to take temperature in children less than 6 years of age
  – Indications
    • Uncooperative children
    • Diseases that suppress immune system
    • Altered level of consciousness
Skin Examination

- Axillary measurement
  - Measured by placing electronic probe firmly in center of patient’s axillary space
  - Patient’s arm should be held against side of chest
  - Tone will sound when measurement is complete
  - Temperature assessed at this site is usually 1°F (0.6°C) less than core body temperature

Skin Examination

- Tympanic measurement
  - Tympanic membrane is close to hypothalamus
    - Ideal place to measure core temperature
  - Place tip of probe into patient’s ear canal
  - Ear canal should be straightened by gently pulling pinna of ear down and back in children less than 3 years of age or up and back in patients more than 3 years of age

Skin Examination

- Tympanic measurement
  - When thermometer is in correct position and activated, temperature reading is obtained within seconds
  - Associated with significant variability in measurements
  - Can be inaccurate in patients who
    - Have had ear surgery
    - Have otitis media or excessive ear wax
    - Have recently exercised
    - In situations with extremes of temperature
    - In children less than 3 years of age
**Skin Examination**

- Rectal measurement
  - Poses risk of perforation
  - Distressing for patient
  - Reserved for young children and patients who have altered level of consciousness
    - Place patient in supine position or in left lateral recumbent position with legs raised
    - Insert lubricated probe no more than 2.5 cm (1/2 to 1 inch) in rectum
    - Hold securely in place until alarm sounds
  - Most accurate
  - Impractical for prehospital use

**Skin Examination**

- Skin moisture
  - Classified as dry or wet
  - Dry skin is normal
  - Wet skin is clammy or diaphoretic
    - Diaphoretic may indicate volume problem such as hypovolemia
    - May indicate other illness or injury that results in decreased tissue perfusion or increased sweat gland activity

**Pupils**

- Examining pupils for response to light may yield information on neurological status of some patients
  - Unequal pupils (anisocoria) may be normal finding in some patients
  - Pupils are usually equal and constrict when exposed to light
  - When testing pupils for light response, shine penlight directly into one eye
    - Normal reaction is for pupil exposed to light to constrict
    - Occurs with consensual constriction of opposite eye
Lesson 20.2
Specific Body Regions

Learning Objectives

• Describe physical examination techniques used for assessment of specific body regions.
• Distinguish between normal and abnormal findings when assessing specific body regions.

Anatomical Regions

• Anatomical and physiological aspects of human body are age-related
  – Vary by person
  – Should be guided by patient’s chief complaint
Skin

- Texture and turgor
  - Texture
    - Normally smooth, soft, flexible
    - In older adults, may be wrinkled and leathery from decreases in collagen, subcutaneous fat, sweat glands
    - Abnormal skin texture may result from lesions, rashes, tumors, localized trauma

Skin

- Texture and turgor
  - Turgor
    - Elasticity of skin
    - Normally decreases with age
    - To test, pinch ("tent") fold of skin and assess ease and speed at which skin returns to its normal position
    - Tented skin that does not quickly return to its normal position may indicate dehydration
Hair

• Inspect and palpate patient’s hair
  – Note quantity, distribution, texture
  – Key findings:
    • Recent change in growth or loss of hair
    • May result from chemotherapy or hormone and endocrine disorders
  – Thinning hair is common in older patients

Fingernails and Toenails

• Note color, shape, and presence or absence of lesions when assessing
  – Uncolored nails usually are transparent
  – Healthy nails are smooth and firm on palpation
  – With age, nails often develop longitudinal striations and may have yellow tint because of insufficient calcium

Head and Face

• Head
  – Inspect skull for shape and symmetry, keeping in mind that hair can hide abnormalities
    • Hair should be parted in several places to assess for scaliness, lumps, other lesions
    • Use systematic palpation, moving from front to back
    • Note any swelling, tenderness, indentations, depressions
    • Scalp should move freely over skull
    • Patient should be free of pain or discomfort during examination
Head and Face

- Face
  - Inspect for symmetry, expression, contour
    - Note any asymmetry, involuntary movements, masses, edema
    - Evaluate facial skin for color, pigmentation, texture, thickness, hair distribution, lesions

Eyes

- Verify that both eyes can see
  - Visual acuity assessed by
    - Asking patient to read printed material or count fingers at distance
    - Demonstrating ability to distinguish light from dark through use of various eye charts
Eyes

• Both eyes should move equally well in six cardinal fields of gaze
  – To evaluate patient’s gaze:
    • Hold patient’s chin
    • Patient’s eyes should be observed as they track penlight or finger (or a toy, in the case of a child) when it moves through six visual fields in H pattern
    • Nystagmus or disconjugate gaze should be noted

Eyes

• Check visual fields
  – Ask patient to look at his or her nose
    • Paramedic then extends his or her arms with elbows at right angles and wiggles both index fingers at same time to test peripheral vision
    • Asking patient to identify finger movements and to track a moving object can demonstrate visual fields are grossly normal
  – Test should be performed in four quadrants (up, down, right, left)
  – Eyes should also be assessed for normal position and alignment
Eyes

- Assess orbital area for edema and puffiness
- Eyebrows should be free from scaliness

- Eyelids
  - Note
    - Width of palpebral fissures (the elliptical opening between the upper and lower lids)
    - Edema
    - Color
    - Lesions
    - Condition and direction of eyelashes
    - Adequacy of lid closure
    - Drainage
    - Inspect regions of lacrimal gland and lacrimal sac for swelling
    - Note excessive tearing or dryness

- Conjunctiva and sclera are examined by asking patient to look up while paramedic depresses both lower lids with thumbs
  - Sclera should be white
  - Cornea and iris should be clearly visible
  - Pupils should be of equal size, round, reactive to light
  - Palpating patient’s lower orbital rim determines structural integrity
- Be alert to the presence of contact lenses and ocular prostheses when examining patient’s eyes
Ophthalmoscope Examination

• Used to assess
  – Cornea for foreign bodies, lacerations, abrasions, infection
  – Anterior chamber for presence of blood or pus
  – Fundus to assess retinal vessels, the optic nerve, retina
  – Vitreous
  – For foreign bodies under eyelid
• Should be performed in darkened room so that pupils are dilated
• Contact lenses do not need to be removed

Ophthalmoscope Examination

• Steps
  – Ask patient to fixate on distant object
  – Sit facing patient at same seat height
  – Turn on ophthalmoscope light and select lens setting
  – Use right hand and eye to examine patient’s right eye, and left hand and eye to examine patient’s left eye
  – Direct patient to look over your shoulder, keeping both eyes open

Ophthalmoscope Examination

• Steps
  – Hold scope against your face and shine light on patient’s pupil at distance of about 10 inches from face and at a 45-degree angle
    • Bright orange glow in pupil (“red reflex”) normally is visible
  – Move light slowly toward pupil to see structures of fundus
• Rotate lens to improve focus as needed
Ophthalmoscope Examination

- Steps
  - Inspect size, color, clarity of disk and integrity of vessels
  - Assess for retinal lesions and appearance of macula
  - Normal examination will reveal
    - Clear, yellow optic nerve disk
    - Yellow to creamy-pink retina (depending on patient’s race)
    - Light red arteries and dark red veins
    - 3:2 vein-to-artery ratio in size proportion
    - Avascular macula
Ears

- Inspect external ear and surrounding tissues for signs of bruising, deformity, discoloration
  - No discharge should come from either ear canal
  - Pulling gently on ear lobes should not produce pain or discomfort
  - Skull and facial bones surrounding ear should be palpated
  - Mastoid area should be inspected for tenderness or discoloration

Otoscopic Examination

- Used to evaluate inner ear for discharge and foreign bodies and to assess eardrum
  - Steps
    - Select appropriate size of speculum
    - Check ear for foreign bodies before inserting speculum
    - Instruct patient not to move during examination to avoid injury to canal and tympanic membrane
    - Turn on otoscope and insert speculum into ear canal, slightly down and forward
    - To ease insertion, pull auricle up and backward in adults; back and downward in infants
Otoscopic Examination

- Steps
  - Identify cerumen and look for foreign bodies, lesions, discharge
  - Visualize and inspect tympanic membrane for tears or breaks
  - Normal examination will reveal
    - Cerumen will be dry (tan or light yellow) or moist (dark yellow or brown)
    - Ear canal should not be inflamed (sign of infection)
    - Tympanic membrane should be translucent or pearly gray (pink or red indicates inflammation)

Nose

- Inspected for shape, size, color, stability
  - Column of nose should be midline with face and nares positioned symmetrically
    - Slight asymmetry of nares considered normal
    - Palpate column of nose and surrounding soft tissues for pain, tenderness, deformity
    - Frontal and maxillary sinuses may be inspected for presence of swelling
    - Palpate for tenderness along bony brow on each side of nose and zygomatic processes
Nose

• Causes of discharge from nose
  – Cerebrospinal fluid may be present as result of head trauma
  – Bloody discharge (epistaxis) may result from trauma or from mucosal erosions involving blood vessels, hypertension, or bleeding disorders
  – Mucous discharge commonly results from allergy, upper respiratory tract infection, sinusitis, or cold exposure

Mouth and Pharynx

• Inspect lips for symmetry, color, edema, skin surface irregularities
  – Lips should be pink
    • Pallor of lips is associated with anemia
    • Cyanosis is associated with cardiorespiratory insufficiency
    • Red lips sometimes are late finding in carbon monoxide poisoning
    • Lips should show no swelling, deformity, pain on palpation

Mouth and Pharynx

• Healthy gums in oral cavity are pink and free of lesions and swelling
  – Patchy areas of pigmentation in mouths of African Americans are not uncommon
  – Enlarged gums may indicate pregnancy, leukemia, poor oral hygiene, puberty, or use of some medications (e.g., phenytoin)
• Mouth should be free of loose or broken teeth
  – Dental appliances may be present
Mouth and Pharynx

• Tongue should be inspected for size and color
  – Should be positioned in midline of oral cavity and appear nonswollen, dull red, moist, glistening
• To inspect oropharynx, tongue blade is used to depress patient’s tongue
  – Normal palate is white or pink

Mouth and Pharynx

• If oral cavity is inflamed or covered with exudate, an infection may be present
  – Tonsils normally are pink and smooth without edema, ulceration, or inflammation
  – Patient with typical sore throat often has a reddened and edematous uvula and tonsillar pillars
  – Yellow exudate is sometimes present

Neck

• Inspect neck in patient’s normal anatomical position
  – If trauma is suspected, use spinal precautions
  – Trachea should be midline
  – No use of accessory muscles or tracheal tugging should occur during respiration
  – To palpate neck, place both thumbs along sides of distal trachea and systematically move hands toward head
  – Care should be taken not to apply bilateral pressure to carotid arteries, as syncope or bradycardia may result
Neck

- Lymph nodes should not be tender
- Thyroid and cricoid cartilages should be free of pain and should move when patient swallows
  - Bubbling or crackling sensations that can be palpated in soft tissues of neck may indicate the presence of subcutaneous emphysema
    - Presence of air in subcutaneous tissues
- Note distended neck veins or prominent carotid arteries

Head and Cervical Spine

- Temporomandibular joint connects mandible of jaw to temporal bone of skull
  - Can become painful or dislocated
  - Patient should be able to open and close mouth without pain or limitation in movement
  - Temporomandibular joint dysfunction is a common complaint
**Head and Cervical Spine**

- For patient with no trauma, inspect cervical spine by palpating for tenderness or deformities
- Test range of motion
  - Flexion: touching chin to chest
  - Rotation: touching chin to each shoulder
  - Lateral bending: touching each ear to each shoulder
  - Extension: tilting head backward

**Head and Cervical Spine**

- Neck of a trauma patient may need to be moved for general or neurological examination
  - Any such movement must be accompanied by application of continuous manual protection and stabilization techniques for suspected cervical spine injury

**Chest**

- Thorough knowledge of structure of thoracic cage is needed to perform an adequate respiratory and cardiac assessment
  - Ribs protect vital organs within thorax
  - Offer support for respiratory movements of diaphragm and intercostal muscles
  - Damage to actual bony structure of thoracic cavity, such as flail chest, can prevent or limit respiratory function
Chest

- Thorough knowledge of structure of thoracic cage needed to perform an adequate respiratory and cardiac assessment
  - Ribs of thorax also are used as an anatomical landmark in locating specific areas for examination
  - Thorax can be evaluated by using imaginary lines to note examination
  - Assessed through inspection, palpation, percussion, auscultation
Chest Inspection

- Chest wall should be inspected for symmetry on anterior and posterior surfaces
  - Thorax not completely symmetrical
    • Visual inspection of one side should offer reasonable comparison to the other
  - Chest wall diameter often increased in patients with obstructive pulmonary disease
    • Results in barrel-shaped appearance of thorax
Evaluate breathing in a supine patient or friend while standing to the person’s side, then at the head, and finally at the feet. Which position provides the best view of the symmetry of the thorax?

Chest Inspection

• Other causes for chest wall deformities or asymmetry
  – Funnel chest (an indentation of lower sternum above xiphoid process)
  – Pigeon chest (prominent sternal protrusion)
  – Thoracic kyphosis (posterior deviation of spine that results in increased convexity of chest)
  – Scoliosis (lateral deviation of the spine that results in abnormal curvature)
Chest Inspection

• Inspect skin and nipples for cyanosis and pallor
  – Note
    • Presence of suture lines from chest wall surgery
    • Skin pockets enclosing implanted pacemaker devices
    • Implanted central venous lines or ports
    • Dermal medication patches
  – Assess pattern or rhythm of respirations
    • Note any use of accessory respiratory muscles
    • Observing rise and fall of patient’s chest during breathing provides rough measurement of tidal volume

Chest Palpation

• Palpate thorax for pulsations, tenderness, bulges, depressions, crepitus, subcutaneous emphysema, unusual movement and position
  – Note position of patient’s trachea, which should be midline and directly above the sternal notch
  – Starting with patient’s clavicles, both sides of patient’s chest wall are firmly palpated at same time, front to back and right side to left side
  – Proceed systematically without pain or discomfort

• To evaluate anterior chest wall for equal expansion during inspiration
  – Place both thumbs along patient’s costal margin and xiphoid process
  – Palms should be lying flat on chest wall
  – Equal movement should occur as patient inhales and exhales
  – Posterior chest wall should be examined for symmetrical respiratory movement by placing thumbs along spinous processes at level of the 10th rib
Chest Percussion

- Perform percussion in symmetrical locations from side to side to compare percussion note
  - Resonance usually heard over all areas of healthy lungs
    - Hyperresonance associated with overinflation, or hyperinflation, of lungs
    - May indicate pulmonary disease, pneumothorax, or asthma
    - Dullness or flatness suggests fluid or pulmonary congestion
    - Level and movement of diaphragm during breathing may be limited by disease or pain
Chest Auscultation

• Thorax is best auscultated with patient sitting upright (if possible)
  – Patient should breathe deeply and slowly through open mouth during examination
  – Be alert to chance of resulting hyperventilation and fatigue that may occur in ill and older patients

Chest Auscultation

• Diaphragm of stethoscope is used to auscultate the high-pitched sounds of patient’s lungs
  – Stethoscope held firmly on patient’s skin and paramedic listens carefully as patient breathes
  – Chest auscultation should be systematic and thorough
  – Auscultation should allow evaluation of anterior and posterior lung fields

Chest Auscultation

• Breath sounds
  – Air movement creates turbulence as it passes through respiratory tree and produces breath sounds during inhalation and exhalation
  – During inhalation, air moves first into trachea and major bronchi
    • Then air moves into progressively smaller airways
    • Next, air moves to its final destination, the alveol
  – During exhalation, air flows from small airways to larger ones
    • Creates less turbulence
    • Normal breath sounds generally are louder during inspiration
Chest Auscultation

• Normal breath sounds
  – Classified as vesicular, bronchovesicular, and bronchial
  – Vesicular breath sounds are heard over most of lung fields and are major normal breath sound
  – Lungs considered “clear” make normal vesicular breath sounds
    • Sounds are low pitched and soft and have a long inspiratory phase and shorter expiratory phase

Chest Auscultation

• Vesicular breath sounds
  – Classified as harsh or diminished
  – Harsh sounds may result from vigorous exercise
    • With vigorous exercise, ventilations are rapid and deep
  – Also occur in children who have thin and elastic chest walls in which breath sounds are more easily audible
  – May be diminished in older persons who have less ventilation volume
  – May be diminished in obese or muscular persons, whose additional overlying tissue muffles sound
Chest Auscultation

• Bronchovesicular breath sounds
  – Heard over major bronchi and over upper right posterior lung field
    • Sounds are louder and harsher than vesicular breath sounds
    • Considered to be of medium pitch
    • Have equal inspiration and expiration phases
    • Heard throughout respiration

Chest Auscultation

• Bronchial breath sounds
  – Heard only over trachea and are highest in pitch
  – Coarse, harsh, loud sounds with short inspiratory phase and long expiration
  – Bronchial sound heard anywhere but over trachea is considered abnormal breath sound

Chest Auscultation

• Abnormal breath sounds
  – Classified as absent, diminished, incorrectly located bronchial sounds and as adventitious breath sounds
  – Absent breath sounds may indicate total cessation of breathing process
  – Breath sounds also may be absent in only a specific area
  – Causes of localized absent breath sounds include endotracheal tube misplacement, pneumothorax, hemothorax
Chest Auscultation

• Abnormal breath sounds
  - Diminished breath sounds
    • May result from any condition that decreases airflow
    • Usually indicate that some portion of alveolar tissue is not being ventilated
  - Bronchial breath sounds
    • Auscultated in peripheral lung field indicate presence of fluid or exudate in alveoli
    • Both conditions may block airflow
    • Diseases that contribute to this condition are tumors, pneumonia, pulmonary edema

Chest Auscultation

• Adventitious breath sounds
  - Abnormal sounds
    • Heard in addition to normal breath sounds
    • May be divided into two categories: discontinuous and continuous
  - Result from obstruction of large or small airways
  - Most commonly heard during inspiration
  - Classified as crackles (rales), wheezes, rhonchi
Chest Auscultation

• Discontinuous breath sounds
  – Crackles are high-pitched, discontinuous sounds that usually are heard during end of inspiration
  – Sound is similar to sound of hair being rubbed between fingers
  – Crackles are caused by disruptive passage of air in small airways or alveoli or both, may be heard anywhere in the peripheral lung field

Chest Auscultation

• Continuous breath sounds
  – Wheezes also known as sibilant wheezes
    • High-pitched musical noises that usually are louder during expiration
    • Caused by high-velocity air traveling through narrowed airways
    • May occur because of asthma and other constrictive diseases and congestive heart failure
    • When occurs in a localized area, suspect foreign body obstruction, tumor, or mucous plug
    • Classified as mild, moderate, or severe
    • Should be described as occurring on inspiration or expiration or both
Chest Auscultation

• Rhonchi
  – Also known as sonorous wheezes
  – Continuous, low-pitched, rumbling sounds usually heard on expiration
  – Do not involve small airways
  – Less discrete than crackles and are auscultated easily
  – Caused by passage of air through airway obstructed by thick secretions, muscular spasm, new tissue growth, or external pressure collapsing the airway lumen
  – May result from any condition that increases secretions

Chest Auscultation

• Stridor
  – Usually is inspiratory, crowing-type sound that can be heard without aid of stethoscope
  – Indicates significant narrowing or obstruction of larynx or trachea
  – May be caused by epiglottitis, viral croup, anaphylaxis, foreign body aspiration
  – Heard best over site of origin, usually larynx or trachea
  – Often indicates airway compromise that may be life-threatening, especially in children
  – Calls for careful observation for ventilatory failure and hypoxia

Chest Auscultation

• Pleural friction rub
  – May be considered an adventitious breath sound
  – Low-pitched, dry, rubbing or grating sound
  – Caused by movement of inflamed pleural surfaces as they slide on one another during breathing
  – May be auscultated on inspiration and expiration and usually is loudest over lower lateral anterior surface of chest wall
  – Presence may indicate pleurisy, viral infection, tuberculosis, or pulmonary embolism
Chest Auscultation

- Vocal resonance
  - Vocal sounds heard on auscultation (vocal resonance) should be assessed to evaluate presence of lung consolidation
    - Usually indicates pneumonia or pleural effusion
    - Any change in character of spoken voice that is higher pitched and less muffled than normal during auscultation should be noted
    - Normally, sound of patient’s voice becomes less distinct as auscultation moves peripherally
    - Vocal sounds may remain loud at periphery of lungs or sound louder than usual over distinct area when consolidation is present

- Bronchophony
  - Test in which patient is asked to whisper “toy boat” or “blue balloons” while auscultating lungs
  - Vocal sounds will be louder where consolidation is present

- Egophony
  - Test in which patient is asked to say letter “e-e-e”
  - If vocal sounds more closely resemble letter “a,” lung consolidation may be present
Chest Auscultation

- Whispered pectoriloquy
  - Test in which patient is asked to whisper as posterior lungs are auscultated
  - If vocal sounds are transmitted clearly or there is increased loudness of whispering during auscultation, often sign of lung consolidation

Heart

- In prehospital setting, heart must be examined indirectly
- Skilled assessment can collect information about size and effectiveness of heart’s pumping action
  - This assessment includes palpation and auscultation

Heart Palpation

- Apical impulse
  - Visible and palpable force
  - Produced by contraction of left ventricle
  - Palpation may be useful to compare relationship of peripheral pulses with pulse produced by ventricular contraction
    - By palpating or auscultating the apical impulse and the pulse at the same time, paramedic can note these pulse deficits
    - Factors such as obesity, large breasts, muscularity may make this landmark hard to see or palpate
Heart Auscultation

- Heart sounds may be auscultated for
  - Frequency (pitch)
  - Intensity (loudness)
  - Duration
  - Timing in cardiac cycle
Heart Auscultation

- Paramedic may assess two heart sounds quickly
  - S1 and S2
    - Normal sounds that occur when heart contracts
    - Best heard toward apex of heart at fifth intercostal space
- For evaluation of heart sounds, patient should be sitting up and leaning slightly forward, supine, or in a left lateral recumbent position
  - Bring heart closer to left anterior chest wall
Heart Auscultation

- To listen for S1, paramedic should ask patient to breathe normally and hold breath in expiration
- To listen for S2, paramedic should ask patient to breathe normally again and hold breath in inspiration

Muffled heart sounds
- May be caused by obesity or obstructive lung disease
- May occur as result of the presence of fluid in pericardial sac surrounding heart muscle
  - Accumulation of fluid usually is the result of penetrating or severe blunt chest trauma, cardiac tamponade, or cardiac rupture and is considered a true emergency
  - Other causes include infectious uremic pericarditis and malignancy

Pericardial friction rub
- Inflammation of pericardial sac may cause rubbing sound audible with a stethoscope
- May result from
  - Infectious pericarditis
  - Myocardial infarction
  - Uremia
  - Trauma
  - Autoimmune pericarditis
Heart Auscultation

• Pericardial friction rub
  – Have scratching, grating, or squeaking quality
  – Tend to be louder on inspiration
  – Can be differentiated from pleural friction rubs by their continued presence when patient holds breath

Heart Auscultation

• Extra sounds
  – Heart murmurs
    • Prolonged sounds caused by disruption in flow of blood into, through, or out of heart
    • Most are caused by valvular defects
    • Some are serious, others are benign with no apparent cause
    • Can be detected during auscultation of heart

Heart Auscultation

• Extra sounds
  – Bruits
    • Abnormal sound, murmur heard during auscultation of the carotid artery or another organ/gland
    • May indicate local obstruction
    • Low pitched, difficult to hear
  – To assess blood flow in carotid artery, place bell of stethoscope over carotid artery at medial end of clavicle
    • Patient is then asked to hold his or her breath
Lesson 20.3
Specific Body Regions, Patient Assessment, and Age-Related Exams

Learning Objectives

• Describe physical examination techniques used for assessment of specific body regions.
• Distinguish between normal and abnormal findings when assessing specific body regions.
Heart Auscultation

- Extra sounds
  - Thrills
    - Fine vibrations or tremors that may indicate blood flow obstruction
    - May be palpable over site of aneurysm or on precordium
    - May be serious or benign

Abdomen

- Divided by two imaginary lines
  - Separate abdominal region into four quadrants
    - Upper right
    - Lower right
    - Upper left
    - Lower left

RUQ  LUQ
RLQ  LLQ
Abdomen Examination

- When examining abdomen
  - Ensure patient is comfortable, in supine position
  - Paramedic’s hands and stethoscope should be warm
  - Approach patient slowly, respectfully
  - Examine painful area last to avoid “guarding”
    - Discoloration in flank or around umbilicus may indicate possible injury or disease

Abdomen Inspection

- Inspect visually for signs of cyanosis, pallor, jaundice, bruising, discoloration, swelling (ascites), masses, and aortic pulsations
- Note surgical scars or implanted medical devices
- Should be round and symmetrical
Abdomen Inspection

• Symmetrical distention results from obesity, enlarged organs, fluid, or gas
• Asymmetrical distention may result from hernias, tumor, bowel obstruction, or enlarged abdominal organs

Abdomen Inspection

• Flat abdomen is common in athletic adults
• Convex abdomens are common in children and in adults with poor exercise habits
• Umbilicus should be free of swelling, bulges, signs of inflammation
• Normal umbilicus usually is inverted or may protrude slightly

Abdomen Inspection

• Abdominal movement during respiration should be smooth and even
  - Males have more abdominal involvement than females during respiration
    • Limited abdominal movement in male patients with symptoms may indicate pathological abdominal condition
  - Visible pulsations produced by blood flow through aorta in upper abdomen may be normal in thin adults
    • Marked pulsations may indicate abdominal aortic aneurysm
### Abdomen Auscultation

- **Bowel sounds**
  - Noting presence/absence to assess motility has little value in prehospital setting
  - Do not affect or determine approach to patient care
  - Time needed for completion exceeds justifiable scene time
  - If auscultation is performed, should precede palpation

### Abdomen Auscultation

- **Bowel sounds**
  - To auscultate, hold diaphragm of stethoscope on abdomen with light pressure
  - If present, gurglings, rumbles
  - Should occur irregularly
  - Should be performed in all four quadrants
  - Increased sounds may indicate gastroenteritis or intestinal obstruction
  - Decreased/absent sounds may indicate peritonitis or ileus

### Abdomen Percussion and Palpation

- **Palpation** may help detect presence of fluid, air, and solid masses
  - Use systematic approach, side to side or clockwise
  - Note rigidity, tenderness, abnormal skin temperature or color
  - Observe face for signs of discomfort
  - Begin with light palpation, using even pressing motion
  - Palpation may be done simultaneously with percussion
Abdomen Percussion and Palpation

• Percussion evaluates all four quadrants for tympany and dullness
  – Proceed from area of tympany to dullness
    • Change in sound easier to detect
  – Individual assessments of liver and spleen performed if indicated by patient complaint or mechanism of injury
  – If surgery is required for abdominal illness or injury, patient best served by rapid assessment, stabilization, and rapid transport

Liver Percussion and Palpation

• Start just above umbilicus in right midclavicular line in area of tympany
  – Percussion should continue in an upward direction until change from tympany to dullness occurs
    • Usually occurs slightly below costal margin
    • Indicates lower border of liver

Liver Percussion and Palpation

• Start just above umbilicus in right midclavicular line in area of tympany
  – For upper border, begin in same midclavicular line at midsternal level, proceeding downward until tympany from lung area changes to dullness
  – Liver size and span (usually 6 to 12 cm or 2 to 5 inches) is related to age and sex
    • Proportionately larger in adults than children
    • Larger in males than females

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Liver Percussion and Palpation

• Palpation
  – Patient should be supine and comfortable and should have relaxed abdomen
  – Perform examination from patient’s right side and should begin by placing left hand under patient in area of 11th and 12th ribs
  – Right hand should be placed on abdomen, with fingers pointing toward patient’s head and extended, resting just below edge of costal margin

Liver Percussion and Palpation

• Palpation
  – Conscious patient should be instructed to breathe deeply through mouth
    • During exhalation, paramedic presses upward with hand under patient and gently pushes in and up with right hand
  – If liver is felt, should be firm and nontender
Spleen Percussion and Palpation

• For percussion, patient must be lying supine or in right lateral recumbent position
  – Should begin at area of lung tympany, just posterior to midaxillary line on left side
  – Whenpercussing downward, change from tympany to dullness should be audible between the 6th and 10th ribs
  – Large areas of dullness suggest enlarged spleen
  – Stomach contents and air-filled or feces-filled intestines make splenic assessment by percussion difficult
    • May affect percussion tones of dullness and tympany

Spleen Percussion and Palpation

• Palpation is more useful assessment technique for evaluating the spleen
  – Patient should be lying supine with paramedic positioned at patient’s left side
  – Paramedic places left hand under patient, supporting lower left rib cage
  – Places right hand just below patient’s lower left costal margin

Spleen Percussion and Palpation

• Palpation is a more useful assessment technique for evaluating spleen
  – Area should be gently palpated by lifting up left hand and pressing down with right hand
  – Palpation of spleen can produce rupture of organ
    • Performed with caution
Female Genitalia

- Examination of genitalia of either sex of patient can be awkward
  - Patient and paramedic may feel uncomfortable
  - When possible, paramedics of same sex as patient should perform these examinations
  - If not possible, second person who acts as chaperone should be present during the examination

Why is it advisable to examine a patient’s genitalia in the presence of another prehospital care provider?
Female Genitalia

- Inspect visually to note swelling, redness, discharge, bleeding, or evidence of trauma
  - Discoloration or tenderness of genital tissue may be the result of traumatic bruising
  - Ulcers, vesicles, discharges (with or without pain) indicate sexually transmitted disease
  - If touching anal area is necessary, paramedic should change gloves afterward to prevent bacteria from being introduced into vaginal area

Male Genitalia

- Inspect area visually
  - Note bleeding, signs of trauma
  - Shaft of penis should be nontender and flaccid
  - Urethral opening should be free of blood and discharge
  - Scrotum should be nontender and slightly asymmetrical
  - Swollen or painful scrotum may result from infection, herniation, testicular torsion, or trauma
  - Discoloration of genitals is called Cooper's sign
  - May indicate peritoneal bleeding

Anus

- Examination indicated for rectal bleeding or trauma to area
  - Can be performed with patient in one of several positions
    - Side-lying position most comfortable
  - Inspection of sacrococcygeal and perineal areas should consider abnormal findings, which may include lumps, ulcers, inflammation, rashes, and excoriations
  - Inflamed external hemorrhoids are common in adults and pregnant women
Extremities

- Pay attention to function and structure
  - General appearance
  - Body proportions
  - Ease of movement
  - Note limitation in range of motion or unusual increase in mobility of joint

Extremities

- Abnormal findings
  - Signs of inflammation
    - Swelling
    - Tenderness
    - Increased heat
    - Redness
    - Decreased function
  - Asymmetry
  - Crepitus
  - Deformities
  - Decreased muscular strength
  - Atrophy

Upper and Lower Extremity Examination

- Includes evaluation of skin and tissue overlying muscles, cartilage, bones, examination of joints
  - Each extremity should be assessed for soft tissue injury, discoloration, swelling, masses
  - Should be symmetrical in structure and muscularity
  - Assess circulatory status of each extremity by determining skin color, temperature, sensation, and presence of distal pulses
Upper and Lower Extremity Examination

- Assess bones, joints, and surrounding tissues of extremities for structural integrity and continuity
  - Muscle tone should be firm and nontender
  - Joints are assessed for function by moving each joint through its full range of motion
    • Normal range of motion occurs without pain, deformity, limitation, or instability

Hands and Wrist

- Inspect both hands and wrists for contour and positional alignment
  - Wrists, hands, joints of each finger should be palpated for tenderness, swelling, or deformity
  - To determine range of motion, patient should be asked to flex and extend wrists, make a fist, and touch thumb to each fingertip.
    • All movements should be performed without pain or discomfort
Elbows

• Should be inspected and palpated in flexed and extended positions
• To determine range of motion of elbow, patient should be asked to rotate hands from palm up to palm down
• Inspect grooves between epicondyle and olecranon by palpation
  — Pain and tenderness should not be present when pressing on lateral and medial epicondyle

Shoulders and Related Structures

• Shoulders should be inspected and palpated for symmetry and integrity of clavicles, scapulae, and humeri
• Pain, tenderness, or asymmetrical contour may indicate fracture or dislocation
• Ask patient to shrug shoulders and raise and extend both arms
  — Should be made without pain or discomfort
Shoulders and Related Structures

- The following regions should be palpated, noting any tenderness or swelling
  - Sternoclavicular joint
  - Acromioclavicular joint
  - Subacromial area
  - Bicipital groove

Ankles and Feet

- Inspect for contour, position, size
  - Tenderness, swelling, deformity are abnormal findings on palpation
- Toes should be straight and aligned with each other
Ankles and Feet

- Range of motion can be determined by asking patient to bend toes, point toes, and rotate feet inward and outward from ankle
  - These movements should be possible without pain or discomfort
- Inspect all surfaces of ankles and feet for deformities, nodules, swelling, calluses, corns, and skin integrity

Pelvis, Hips, and Knees

- Structural integrity of pelvis should be verified
  - To palpate iliac crest and symphysis pubis, paramedic places both hands on each anterior iliac crest and presses downward and outward
  - To determine stability, heel of hand should be placed on patient’s symphysis pubis, pressing downward
    - Deformity and point tenderness of pelvis may be signs of fracture
    - Signs may mask major structural and vascular injury
Pelvis, Hips, and Knees

- Hips should be inspected for instability, tenderness, and crepitus
  - Examine supine or unconscious patient by assessing structural integrity of iliac crest
  - Mobile patient should be able to walk without discomfort
  - Supine patient should be able to raise legs and knees and rotate legs inward and outward

- Knees should be inspected and palpated for swelling and tenderness
  - Patella should be smooth, firm, nontender, and midline in position
  - Patient should be able to bend and straighten each knee without pain
Peripheral Vascular System

- Includes arteries, veins, and lymphatic system and lymph nodes
- Includes fluids exchanged in capillary bed
  - Can be evaluated during physical examination of upper and lower extremities

Arms

- When evaluating, inspect from fingertips to shoulders, noting size, symmetry, swelling, venous pattern, color of skin and nail beds, and texture of skin
  - If arterial insufficiency is noted because of weak radial pulse, brachial pulse should be palpated
  - Epitrochlear nodes and brachial nodes should be nonswollen and nontender
  - Fine venous network on upper and lower extremities often is visible
  - Be alert for enlargement of superficial veins during examination
## Legs

During examination of lower extremities, patient should be supine and draped for privacy

- Inspect visually from groin and buttocks to feet, noting
  - Size and symmetry
  - Swelling
  - Venous pattern and venous enlargement
  - Pigmentation
  - Rashes, scars, or ulcers
  - Color and texture of skin
  - Presence or absence of hair growth (indicating compromised arterial circulation)

### Legs

Superficial inguinal nodes in groin should be palpated to assess for swelling and tenderness

Assess all lower extremity pulse sites for circulation, strength, and regularity

- Femoral pulse
- Popliteal pulse
- Dorsalis pedis pulse
- Posterior tibial pulse

### Legs

Temperature of feet and legs should be warm, indicating adequate circulation

Evaluate for pitting edema over dorsum of each foot, behind each medial malleolus, and over shins

- Can be done by pressing firmly on skin with thumb for at least 5 seconds
- Edema is said to be “pitting” when depression of tissue remains after removal of pressure
Peripheral Vascular Assessment

- Abnormal findings
  - Swollen or asymmetrical extremities
  - Pale or cyanotic skin
  - Weak or diminished pulses
  - Skin that is cold to touch
  - Absence of hair growth
  - Pitting edema

Spine

- Begins with visual assessment of cervical, thoracic, and lumbar curves
  - From patient’s side, any curvature of spine, including curvature associated with abnormal lordosis, kyphosis, and scoliosis, should be noted
  - Look for any differences in height of shoulders or iliac crests (hips) that may result from abnormal spinal curvature
Cervical Spine

- Neck should be in midline position
- If patient is alert and denies neck pain, palpate posterior aspect for point tenderness and swelling
  - Only palpable landmark should be spinous process of 7th cervical vertebra at base of neck
  - In absence of suspected injury, test range of motion by directing patient to bend head forward, backward, and from side to side
    - These movements should not cause pain or discomfort

Thoracic and Lumbar Spine

- Should be inspected for signs of injury, swelling, discoloration
  - Palpation should begin at first thoracic vertebra and move downward to sacrum
  - Under normal conditions, spine is nontender to palpation
  - Evaluate range of motion by asking patient to bend at waist forward and backward and to each side and also to rotate upper trunk from side to side in a circular motion
Nervous System

- Details of appropriate neurological examination vary greatly
  - Examination usually depends on origin of patient’s complaint
  - Assessment and examination of nervous system may be performed separately
  - Neurological assessment often is completed during other assessments

Nervous System

- Neurological examination may be organized into five categories
  - Mental status and speech
  - Cranial nerves
  - Motor system
  - Sensory system
  - Reflexes

Mental Status and Speech

- Should be able to organize thoughts and converse freely
  - Abnormal findings include
    - Unconsciousness
    - Confusion
    - Slurred speech
    - Aphasia
    - Dysphonia
    - Dysarthria
Cranial Nerves

• 12 cranial nerves can be categorized as sensory, somatomotor and proprioceptive, and parasympathetic
• Cranial nerve I
  – Olfactory: Test sense of smell with aromatic substance (Jarvis)

Cranial Nerves

• Cranial nerve II
  – Optic: Test for visual acuity
• Cranial nerves II and III
  – Optic and oculomotor: Inspect size and shape of pupils; test pupil response to light

Cranial Nerves

• Cranial nerves III, IV, and VI
  – Oculomotor, trochlear, abducens: Test extraocular movements by asking patient to look up and down, to left and right, and diagonally up and down to left and right (six cardinal directions of gaze)
• Cranial nerve V
  – Trigeminal: Test motor movement by asking patient to clench the teeth while you palpate temporal and masseter muscles; test sensation by touching forehead, cheeks, and jaw on each side
Cranial Nerves

- Cranial nerve VII
  - Facial: Inspect face at rest and during conversation, noting symmetry, involuntary muscle movements (tics), or abnormal movements
  - Ask patient to raise eyebrows, frown, show upper and lower teeth, smile, and puff out both cheeks
  - Assess strength of facial muscles by asking patient to close eyes tightly so they cannot be opened and gently attempting to raise eyelids
    - Observe for weakness or asymmetry

- Cranial nerve VIII
  - Acoustic: Assess hearing acuity

- Cranial nerves IX and X
  - Glossopharyngeal and vagus: Assess patient’s ability to swallow with ease; to produce saliva; and to produce normal voice sounds
  - Instruct patient to hold breath, and assess for normal slowing of heart rate
  - Testing for gag reflex will also test cranial nerves

- Cranial nerve XI
  - Spinal accessory: Ask patient to raise and lower shoulders and to turn head

- Cranial nerve XII
  - Hypoglossal: Ask patient to stick out tongue and to move it in several directions
Why should abnormal findings of one or more of the cranial nerves concern you?

Motor System

- Includes observing patient during movement and at rest
  - Evaluate abnormal involuntary movements for quality, rate, rhythm, and fullness of range
  - Other body movement assessments include posture, level of activity, fatigue, and emotion

Muscle Strength

- Should be bilaterally symmetrical
- Should be able to provide reasonable resistance to opposition
- Evaluate muscle strength in upper extremities by asking patient to extend elbow, then instruct patient to pull arm toward chest against opposing resistance
Muscle Strength

- Muscle strength in lower extremities is assessed by asking patient to push soles of feet against paramedic’s palms
  - Then direct patient to pull toes toward head while paramedic provides opposing resistance
    - Should be able to perform both of these actions easily without evident fatigue
- Other methods to evaluate muscle strength and agility include testing for flexion, extension, and abduction of upper and lower extremities
Coordination

• Assess patient’s ability to perform rapid alternating movements
  – Include point-to-point movements, gait, and stance
• One point-to-point movement that patient can perform easily is to touch finger to nose, alternating hands

Coordination

• Another test is to ask patient to touch each heel to opposite shin
  – Both movements should be done numerous times and quickly to assess coordination, which should be smooth, rapid, accurate

Coordination

• Gait
  – Healthy patient should be able to perform each of the following tasks without discomfort or losing balance
    • Walk heel to toe
    • Walk on toes
    • Walk on heels
    • Hop in place
    • Do shallow knee bend
    • Rise from sitting position without assistance
Coordination

• Stance and balance can be evaluated by using Romberg’s test and pronator drift test
  – To perform Romberg’s test, ask patient to stand erect with feet together and arms at sides
    • The patient’s eyes initially should be open and then closed
    • Slight swaying is normal, loss of balance is abnormal (a positive Romberg’s sign)
    • Patient should be able to stand in this position with one foot raised for 5 seconds without losing balance

Coordination

• Pronator drift test (also known as an arm drift test)
  – Performed by having patient close eyes and hold both arms out from body
    • Normal test will reveal that both arms move the same or both arms do not move at all
    • Abnormal findings include one arm that does not move in concert with the other or one arm that drifts down compared with other
Sensory System

• Sensory pathways of nervous system conduct sensations of pain, temperature, position, vibration, touch
  – Healthy patient is expected to be responsive to each of these stimuli
  – Common assessments of sensory system include evaluating patient's response to pain and light touch

Sensory System

• In conscious patients, perform sensory examination with light touch on each hand and each foot
  – If patient cannot feel light touch or is unconscious, sensation may be evaluated by gently pricking hands and soles of feet with sharp object
  – Ensure object will not penetrate skin
  – Should proceed from head to toe
  – Should compare symmetrical areas on each side of body and distal and proximal areas of body
  – Lack of sensory response may indicate spinal cord damage
Reflexes

• Testing patient’s reflexes can evaluate the function of certain areas of the nervous system as they relate to sensory impulses and motor neurons
  – Reflexes may be categorized as superficial reflexes and deep tendon reflexes
  – Both types of reflexes should be tested as part of a thorough neurological examination

Superficial Reflexes

• Elicited by sensory afferents from skin
  – Include upper abdominal, lower abdominal, cremasteric (for males), plantar reflexes
  – All superficial reflexes are tested using edge of tongue blade (or similar object) or end of reflex hammer
    • An absent reflex may indicate an upper or lower motor neuron disorder

Superficial Reflexes

• Upper and lower abdominal reflex
  – Place patient supine
  – Gently stroke each quadrant of abdomen with tongue blade
  – Normal reflex is slight movement of umbilicus toward each area that is stroked

• Cremasteric reflex
  – Place patient supine
  – Gently stroke inner thigh (proximal to distal)
  – Testicle and scrotum should rise on side that is stroked
Superficial Reflexes

• Plantar reflex
  – Place patient with legs extended
  – Gently stroke lateral side of foot from heel to ball and then across foot to medial side
  – Fanning of all toes should occur with direction of stroke
  – Babinski sign is present when there is dorsiflexion of the great toe with or without fanning of other toes
    • Abnormal finding in older children and adults, but normal response in children less than 2 years of age

Deep Tendon Reflexes

• Elicited by sensory afferents from muscle rather than bone
  – Include biceps reflex, brachioradial reflex, triceps reflex, patellar reflex, and Achilles reflex
    • Should be tested on each extremity with reflex hammer and comparison made for visible and palpable responses
    • Diminished or absent reflexes may indicate damage to lower motor neurons or spinal cord
    • Hyperactive reflexes may suggest a motor neuron disorder
Deep Tendon Reflexes

- All reflexes are tested with patient in sitting position in the following manner
  - Biceps reflex
    - Flex patient’s arm to 45 degrees at elbow
    - Palpate biceps tendon in antecubital fossa
    - Place your thumb over tendon and your fingers under elbow
    - Strike your thumb with reflex hammer
    - Contraction of biceps muscle should cause visible or palpable flexion of elbow

Deep Tendon Reflexes

- All reflexes are tested with patient in sitting position in the following manner
  - Brachioradial reflex
    - Flex patient’s arm up to 45 degrees
    - Rest patient’s forearm on your arm with hand slightly pronated
    - Strike brachioradial tendon (about 1 to 2 inches above wrist) with reflex hammer
    - Pronation of forearm and flexion of elbow should occur

Deep Tendon Reflexes

- All reflexes are tested with patient in sitting position in the following manner
  - Triceps reflex
    - Flex patient’s arm at elbow up to 90 degrees and rest patient’s hand against side of body
    - Palpate triceps tendon and strike it with reflex hammer, just above elbow
    - Contraction of triceps muscle should cause visible or palpable extension of elbow
Deep Tendon Reflexes

• All reflexes are tested with patient in sitting position in the following manner:
  – Patellar reflex
    • Flex patient’s knee to 90 degrees, allowing lower leg to hang loosely
    • Support leg with your hand
    • Strike patellar tendon just below patella
    • Contraction of quadriceps muscle should cause extension of the lower leg

Deep Tendon Reflexes

• All reflexes are tested with patient in sitting position in the following manner:
  – Achilles reflex
    • Flex patient’s knee to 90 degrees
    • Keep ankle in neutral position and hold heel of patient’s foot in your hand
    • Strike Achilles tendon at level of ankle malleoli
    • Contraction of gastrocnemius muscle should cause plantar flexion of foot
Learning Objectives

• Outline the process of patient reassessment.
• State modifications to the physical examination that are necessary when assessing children.
• State modifications to the physical examination that are necessary when assessing older adults.

Reassessment

• Refers to ongoing assessment that follows paramedic’s initial evaluation of patient
• Purpose of reassessment is twofold
  – “Refocuses” primary assessment to ensure that patient continues to be stable and that initial interventions continue to be successful
  – Allows paramedic to “trend” patient’s condition
    • Is patient’s condition improving or is it deteriorating while at scene and during transport?

Reassessment

• Includes second look at
  – Patient’s level of consciousness
  – Patient’s vital signs
  – Patient’s response to initial care and treatment
  – Positive or negative trends in patient’s condition
  – Care interventions that may need to be changed or altered
Reassessment

- Other examples
  - Reevaluating pulse and sensation in extremity that has been splinted
  - Verifying lung sounds before and after moving patient who has been intubated
  - Monitoring ECG after administering drugs
  - Monitoring pulse oximetry readings in patient receiving airway support

Reassessment

- Allows the paramedic to verify that nothing was missed or overlooked in primary or secondary assessments, where focus of patient care was on identifying and managing life-threatening conditions
- Important aspect of providing good patient care

Infants and Children: Physical Examination

- Children differ physiologically, psychologically, and anatomically from adults
- Pediatric patient assessment must take age and development into account
Approaching Pediatric Patient

- Initial encounter with sick or injured child sets tone for entire patient care episode
  - Paramedic must consider patient’s age
  - Must be sensitive to how child perceives emergency environment

Approaching Pediatric Patient

- Guidelines
  - Remain calm and confident
    - Parent’s anxiety is infectious
    - Stay under control and take charge of situation in gentle but firm manner
  - Do not separate child from the parent unless absolutely necessary
    - Once parents are reassured, encourage them to touch, hold, or cuddle child when such actions are practical
    - Comforts parents and child

Approaching Pediatric Patient

- Guidelines
  - Establish rapport with parents and child
    - Much of child’s fear and anxiety reflects parent’s behavior
    - When family is calm, child is reassured and is less fearful
  - Be honest with child and parent
    - In simple, direct, nonmedical language, explain to parent and child what is happening as it occurs
    - When procedure is going to hurt, inform child
    - Never lie
    - Do not give impression that there are options when none exist
Approaching Pediatric Patient

• Guidelines
  – Whenever possible, assign one paramedic to stay with child
    • Should obtain history and be primary person to initiate therapy
    • Even in a few moments, one person who remains on child’s level can establish trusting relationship
  – Observe patient before physical examination
    • If possible, first assess alert child with no touching
    • After physical examination begins, child’s behavior may change radically

Approaching Pediatric Patient

• Guidelines
  – Observe patient before physical examination
    • This may make it difficult to assess whether behavior is reaction to physical state or to perceived intrusion
    • Usually can assess patient’s general appearance, skin signs, level of consciousness, respiratory rate, and behavior easily before approaching patient
    • During this observation, paramedic also should note any area of body that looks painful and avoid manipulating this area until end of examination
    • Inform child that paramedic will give warning before he or she touches the area

General Appearance

• Assessed best at distance
  – While patient is in safe, familiar surroundings, visually should assess child’s level of consciousness, spontaneous movement, respiratory effort, skin color
  – Body position also can offer helpful information
  – Other clues may help determine child’s willingness to cooperate during examination
    • Crying, eye contact, concentration, distractibility
General Appearance

- Appearance is a fairly reliable indicator of patient’s need for emergency care
  - Children who are seriously ill or injured usually do not attempt to hide their state
    - Actions generally reflect severity of situation
    - Appearance is valuable tool for paramedic

The next time you are in the room with an infant or small child, try this “across the room” assessment technique. What can you tell about the level of distress and cardiopulmonary function by doing this?

Physical Examination

- Best conducted with knowledge of development of children and changes that occur within age groups
  - Guidelines that follow vary according to child’s development
    - May be used as a reference during the examination
    - Parents and family members also may be source of information
    - Direct questions regarding “normal” behavior and activity levels to parents
Birth to 6 Months

• Children under 6 months of age typically are not frightened by approach of a stranger
  – Physical examination is fairly easy
  – During examination, maintain child’s body temperature

Birth to 6 Months

• Healthy and alert infants usually are in constant motion
  – Have lusty cry
  – If patient is less than 3 months of age, poor head control is normal
  – Are “abdominal breathers”
    • Causes stomach to protrude and infant’s chest wall to retract during inspiration
    • May give impression of labored breathing
    • Skin color, nasal flaring, and intercostal muscle retraction are best indicators of respiratory insufficiency

Birth to 6 Months

• Assessing fontanelles is particularly important
  – Sutures between flat bones of skull are fairly wide to allow “give” in skull during birth process
Birth to 6 Months

- Assessing fontanelles is particularly important
  - Anterior fontanelle, known as soft spot, usually is present up to 18 months of age
  - Should be level with skull or slightly depressed and soft
  - Usually bulges during crying and may feel firm if child is lying down
  - In absence of injury, best examined with child in upright position
  - Sunken fontanelle may indicate dehydration
  - Bulging fontanelle in noncrying upright infant may indicate increase in intracranial pressure

7 Months to 3 Years

- Difficult to evaluate
  - Have little capacity to understand emergency event
  - Likely to experience emotional problems as a result of illness, injury, or hospitalization
  - Fears strangers and may show separation anxiety
  - If possible, parents should be present and should be allowed to hold child during examination
  - Approach child with quiet, reassuring voice
  - If time permits, allow patient to become accustomed to examination environment
7 Months to 3 Years

• During physical assessment, each activity should be explained in short, simple sentences
  – Give this explanation even though it may not improve cooperation
  – Best approach is to be gentle and firm and to complete examination as quickly as possible
  – If physical restraint is necessary and if patient care activities will not be hindered, restrain child with hands rather than mechanical devices

4 to 10 Years

• Developing capacity for rational thought
  – May be cooperative during physical examination
  – Depending on child’s age and emergency scenario, child may be able to provide a limited history of event
  – May experience separation anxiety and may view their illness or injury as punishment
    • Approach child slowly and speak in quiet and reassuring tones
  – Questions should be simple and direct
4 to 10 Years

- During examination, allow child to take part by holding stethoscope, penlight, or other pieces of equipment
  - This "helping" activity may lessen the child's fear
  - Helping also may improve paramedic–patient relationship
  - Have limited understanding of their bodies
  - Reluctant to allow paramedic to see or touch their "private parts"
  - Explain all examination procedures simply and completely
  - Advise child of any expected pain or discomfort

Adolescents

- Generally understand what is happening
  - Usually are calm, mature, and helpful
  - More adult than child and should be treated as such
  - Preoccupied with their bodies
    - Concerned about modesty, disfigurement, pain, disability, death
    - Reassurance should be provided about these concerns during examination

Adolescents

- Respect patient’s need for privacy
  - Some adolescents may hesitate to reveal relevant history in presence of family and friends
  - If adolescent gives vague answers or seems uncomfortable, parents and patient should be interviewed privately
  - Possibility of alcohol or other drug use should be considered, as well as possibility of pregnancy
Older Adults: Physical Examination

- Do not assume that all older adults are victims of age-related disorders
- Individual differences in knowledge, mental reasoning, experience, personality influence how these patients respond to examination

Communicating with Older Adults

- Some have sensory losses
  - May make communication more difficult
  - Hearing and visual impairments not uncommon
  - Some experience memory loss and may become easily confused
  - Extra time may be needed to communicate effectively

Communicating with Older Adults

- Remain close to patient during interview
  - Generally perceives reassuring voice and gentle touch as comforting
  - Short and simple questions are best
  - Speaking more loudly than usual may be necessary and questions may need to be repeated
  - Be patient and careful not to patronize or offend patients by assuming that they have hearing impairment or cannot understand a particular line of questioning
Patient History

• Older patients often have multiple health problems present at the same time
• May be vague and nonspecific when describing their chief complaint, making it difficult to isolate a nonapparent injury or illness
• Normal signs and symptoms of illness or injury may be absent because of decreased sensory function in some older adult patients

Patient History

• Older patients with many health problems often take several medications
  – Increase risk of illness from use and misuse
  – Try to gather full medication history and must be alert to relationship among drug interactions, disease, and aging process

Patient History

• Assess patient’s functional abilities and any recent changes in instrumental activities of daily living (IADLs)
  – Many older adults attribute these changes to age
  – May not mention them unless asked
  – Help indicate patient conditions that are not readily observable
  – May also reveal need for other pertinent lines of questioning
Patient History

- Functional abilities and instrumental activities to be discussed with patient
  - Walking
  - Getting out of bed
  - Dressing
  - Driving a car
  - Using public transportation
  - Preparing meals
  - Taking medications
  - Sleeping habits
  - Bathroom habits

Physical Examination

- Ensure comfort for older adult patient
  - All examination procedures should be explained clearly
  - All questions should be answered sensitively
  - Perception of pain may be different from that of other patients
  - Observe for signs such as grimacing or wincing during examination
    - May indicate pain or possible injury site
    - If situation permits, perform examination slowly and gently with consideration to patient’s feelings and needs

Physical Examination

- Many older adults believe they will die in a hospital
  - If transportation is needed, patients may become fearful and anxious
  - Be sensitive to these concerns
    - If appropriate, patients should be reassured that their condition is not serious
    - Attempt to calm these patients and advise them that they will be well cared for in the hospital
    - All examination findings should be carefully recorded
Summary

• Secondary assessment integrates patient assessment findings with knowledge of epidemiology and pathophysiology to form a field impression and to identify an appropriate treatment plan
• Examination techniques commonly used in the physical examination are inspection, palpation, percussion, and auscultation

Summary

• Equipment used during the comprehensive physical examination includes the stethoscope, ophthalmoscope, otoscope, and blood pressure cuff
• Physical examination is performed in a systematic manner
  – Examination is a step-by-step process
  – Emphasis is placed on patient’s present illness and chief complaint

Summary

• Physical examination is a systematic assessment of the body that includes
  – mental status, general survey, vital signs, skin, head, eyes, ears, nose and throat, chest, abdomen, posterior body, extremities, and neurological examination
Summary

- First step in any patient care encounter is to note patient’s appearance and behavior
  - Includes assessing for level of consciousness
    - Assessment of posture, gait, and motor activity; dress, grooming, hygiene, and breath or body odors; facial expression; mood, affect, and relation to persons and things; speech and language; thought and perceptions; and memory and attention

Summary

- During the general survey, evaluate patient for signs of distress, apparent state of health, skin color and obvious lesions, height and build, sexual development, and weight
  - Assess vital signs

Summary

- A comprehensive physical examination should include an evaluation of the texture and turgor of the skin, hair, and fingernails and toenails
- Examination of the structures of the head and neck involves inspection, palpation, and auscultation
Summary

• Full knowledge of structure of thoracic cage is needed
  – Aids in performing good respiratory and cardiac assessment
  – Air movement creates turbulence as it passes through the respiratory tree and produces breath sounds during inhalation and exhalation
  – In prehospital setting, paramedic must examine heart indirectly
    • Can obtain details about size and effectiveness of pumping action through skilled assessment that includes palpation and auscultation

Summary

• Four quadrants of the abdomen and their contents provide the basis for inspection, auscultation, percussion, and palpation of this body region
• Examination of the genitilia of either sex can be awkward for the patient and the paramedic
  – Should inspect the genitilia for bleeding and signs of trauma (if indicated)

Summary

• Examination of the anus is indicated in the presence of rectal bleeding or trauma to the area
• When examining the upper and lower extremities, the paramedic should direct his or her attention to function
  – Should pay attention to structure
Summary

• Assessment of the spine begins with a visual assessment of the cervical, thoracic, and lumbar curves
  – Assessment continues with a region-by-region examination for pain, swelling, and range of motion

Summary

• Neurological examination may be organized into five categories: mental status and speech, cranial nerves, motor system, sensory system, and reflexes
  – Reassessment is the ongoing assessment of the patient to determine changes in condition and response to treatment

Summary

• When approaching a pediatric patient, the paramedic should remain calm and confident
  – Observe the child before beginning the physical examination
  – Avoid separation of the child and parent
  – Establish a rapport with parents and child and be honest
  – One caregiver should be assigned to the child
Summary

• The paramedic should not assume that all older adults are victims of disorders related to aging
  – Individual differences in knowledge, mental reasoning, experience, and personality influence how these patients respond to examination

Questions?