Chapter 11

Techniques of Physical Examination

Chapter Goal

- Explain significance of physical examination findings commonly found in emergencies

Learning Objectives

- Define inspection, palpation, percussion, & auscultation
- Describe techniques of inspection, palpation, percussion, & auscultation
- Describe evaluation of mental status
- Evaluate importance of general survey
Learning Objectives

- Describe examination of skin & nails
- Differentiate between normal & abnormal assessment findings of skin & nails
- Describe examination of head & neck, eyes, ears, nose, mouth, & neck

Learning Objectives

- Differentiate normal & abnormal assessment findings of scalp, skull, eyes, ears, nose, and mouth & neck
- Describe survey of thorax & respiration
- Describe examination of anterior & posterior chest

Learning Objectives

- Describe percussion of chest
- Differentiate percussion sounds & their characteristics
- Differentiate characteristics of breath sounds
- Differentiate normal & abnormal assessment findings of chest examination
Learning Objectives

- Describe examination of:
  - Arterial pulse, including rate, rhythm, & amplitude
  - Jugular venous pressure, & pulsations
  - Heart

- Distinguish normal & abnormal findings of:
  - Arterial pulses
  - Jugular venous pressure, pulsations
  - Heart

- Describe auscultation of heart

---

Learning Objectives

- Differentiate characteristics of normal & abnormal findings associated with auscultation of heart

- Describe examination of abdomen

- Differentiate normal & abnormal assessment findings of abdomen

- Describe auscultation of abdomen

---

Learning Objectives

- Distinguish normal & abnormal findings of auscultation of abdomen

- Describe examination of female external genitalia

- Differentiate normal & abnormal assessment findings of female external genitalia
Learning Objectives
- Describe examination of male genitalia
- Differentiate normal & abnormal findings of male genitalia
- Describe examination of musculoskeletal system, peripheral vascular system, & nervous system

Learning Objectives
- Differentiate normal and abnormal findings of musculoskeletal system, peripheral vascular system, & nervous system
- Discuss considerations of examination of infant or child
- Describe general guidelines of recording examination information

Overview: Examination Techniques & Equipment
- Inspection—visually evaluating
- Palpation—feeling with hands
  - Texture
  - Size
  - Consistency
  - Location
Overview: Examination Techniques & Equipment

- Auscultation—listening
  - Heart
  - Lungs
  - Pleura
  - Intestines
  - Other organs
  - Detect fetal heart sound

Overview: Examination Techniques & Equipment

- Percussion—striking or tapping part of body
  - Size
  - Borders
  - Consistency of internal organs
  - Discover fluid

Overview: Equipment

- Stethoscope
- Blood pressure cuff
- Glucose meter
- Cardiac monitor
- Pulse oximeter
- Peak flow meter
- Capnometer
Overview: Equipment

- Stethoscope—listen to heart & lung sounds

- Blood pressure cuff—blood pressure measured

- Glucose meter—determine amount of glucose in drop of blood

Overview: Equipment

- Electrocardiograph
  - Records heart’s electrical activity
  - Identifies irregularities in heart rhythm or rate
  - Reveals presence of injury, death, or changes in heart muscle
  - Provides continuous monitoring

Overview: Equipment

- Pulse oximeter
  - Determines amount of oxygen in blood
  - ≥95% is normal
Overview: Equipment

- Peak flow meter
  - Measures volume of rapidly exhaled breath

Overview: Equipment

- Capnography
  - Measures ETCO₂
  - Identifies developing airway leaks
  - Evaluates effectiveness of cardiac compression
  - Evaluates ventilatory status
  - Identifies low perfusion states
  - Establishes baseline
  - Gauges severity of hypoventilation—signals need for intervention

General Approach

- Establish systematic routine
- Certain portions of examination may be omitted
- Most patients feel vulnerable, exposed
Comprehensive Examination

- Components of complete physical examination:
  - Mental status
  - General survey
  - Vital signs
  - Skin
  - HEENT
  - Neck
  - Chest
  - Abdomen
  - Posterior body
  - Extremities
  - Neurological examination

Overview: Mental Status

- One of best indicators of person's condition

- Determination based on:
  - Appearance, behavior
  - Speech, language
  - Mood, orientation

- Some patients—altered mental status norm

Overview: Mental Status

- Appearance & behavior
  - Level of consciousness—AVPU
    - Alert
    - Responsive to verbal stimuli
    - Responsive to painful stimuli
    - Unresponsive
  - Descriptive terms:
    - Normal
    - Drowsy
    - Obnubilation
    - Stupor
    - Coma
Overview: Mental Status

- Appearance & behavior
  - Observe patient for restlessness or agitation
    - Hypoxia
    - Psychiatric illness
    - Metabolic disturbances
    - Drugs &/or alcohol ingestion

- Orientation
  - Time
  - Place
  - Person

Overview: Mental Status

- Motor activity, gait, & posture
  - Balance
  - Limp
  - Discomfort
  - Fear of falling
  - Ataxic

Overview: Mental Status

- Movements not controllable by patient
  - Rigidity
  - Tremor
  - Motor tics
Appearance & Behavior
- Dress, grooming, personal hygiene
  - Patient does not pay close attention to:
    - Hygiene
    - Changing clothes
    - Other aspects of personal grooming
  - Appearance & mental status not necessarily related

Facial Expressions & Affect
- Affect—outward manifestation of emotion
- Flat affect—appears emotionally unresponsive
- Nonverbal clues
  - Anxiety
  - Depression
  - Anger
  - Happiness

Speech & Language
- Assess ability to speak by observing
  - Quantity
  - Rate
  - Loudness
  - Fluency
- Look at entire picture before reaching conclusions
- Voice may change with mood, illness, & injury
- Possible findings include:
  - Aphasia
  - Dysphonia
  - Dysarthria
Mood

- Indication of underlying illness
- Moods range from happiness or elation to:
  - Depression
  - Anxiety
  - Anger
  - Indifference
- Suggestion of suicide—serious

Orientation

- Standard evaluation of orientation centers on:
  - Time—what is date, year?
  - Place—where are we now?
  - Person—who are you?
- Assess remote memory & recent memory

General Survey

- Level of consciousness (LOC)
  - Using AVPU scale
    - Alert
    - Verbal
    - Painful
    - Unconscious
- Signs of distress—particular attention to ABCs
- Apparent state of health
- Skin color & obvious lesions
- Weight
General Survey

- Posture, gait, & motor activity
- Dress, grooming, & personal hygiene
- Facial expression
- Vital signs
- Additional assessment techniques:
  - Pulse oximetry
  - Blood glucose monitoring
  - Cardiac monitoring

General Survey

- Tips for examining geriatric patients
  - Temperature-regulating mechanisms
  - Preserve modesty
  - Slowed physical, verbal response times
  - Skin loses elasticity
  - Observe surroundings for clues—abuse, neglect
  - Depression, suicide attempts, & overdoses
  - New-onset wheezing, shortness of breath—likely to be cardiac in cause
  - Hearing loss misconstrued as altered LOC

Anatomical Regions: Skin & Nails

- Techniques of exam
  - Inspect & palpate—skin, fingernails

- Characteristic findings
  - Color
  - Moisture
  - Temperature
  - Texture
  - Mobility, turgor
  - Lesions
Anatomical Regions: Skin & Nails

- Abnormalities
  - Pallor
  - Cyanosis
  - Jaundice
  - Rashes
  - Bruises (ecchymosis)
  - Scars
  - Discoloration

Anatomical Regions: HEENT

- Head
- Eyes
- Ears
- Nose
- Throat

Head

- Inspect & palpate:
  - Head
  - Eyes
  - Ears
  - Nose
  - Throat

- Look for evidence of:
  - Trauma
  - Tenderness
  - Deformity
Head & Eyes

- Head
  - Observe face for deformities
  - Palpate maxilla, mandible for fractures

- Eyes
  - Palpate eyes, orbits, & eyelids
  - Raccoon eyes—skull fracture

Eyes

- Six cardinal directions of gaze

Eyes

- Check
  - Conjugate gaze
  - Size, shape, symmetry, & reactivity of pupils
  - Pupil size classified:
    - Normal
    - Dilated
    - Constricted
    - Unequal
Eyes

- **PERRL**
  - Pupils
  - Equal
  - Round
  - React to Light

- **Dilated pupils**
  - Fear, shock, & cardiac arrest

- **Constricted pupils**
  - Shock, head injury, & poisoning

- **Unequal pupils**
  - Head, eye trauma

- **Direct, consensual reactions**
  - Regardless of eye light shines into—both pupils constrict equally
**Eyes**

- Observe sclera
- Palpate orbits for fractures
- Perform brief visual acuity exam
- Note any blurring, double vision, or blindness

**Ears**

- Examine outer ear
  - Lacerations
  - Bleeding
  - Other evidence of soft tissue trauma
- Visually inspect ear canals
  - Blood
  - Clear, watery fluid

- Check area behind ears for discoloration
  - Bruising—Battle's sign
  - Basilar skull fracture
Nose

- Deformities
- Lacerations
- Drainage of blood, CSF

Mouth & Throat

- Foreign material, broken teeth, & dentures
- Soft tissue injuries
- Breath odor
- Suction
  - Upper airway obstruction

Neck

- Observe for
  - Ecchymosis
  - JVD
  - Open injuries
  - Nuchal rigidity
- Tracheal positioning
  - Palpate anterior neck
  - Ask if patient feels pain
Neck

- Apply collar if cervical spine injury suspected
- Do not remove

- Ecchymosis—trauma
- Neck vein distention
  - CHF
  - Cardiac tamponade
  - JVD
- Subcutaneous emphysema

Chest

Normal chest structures
Chest

- Expose chest & observe for:
  - Symmetrical breathing
  - Equal expansion
  - Obvious injuries
  - Open wounds
  - Scars

- Observe rate, rhythm, depth, & effort

- Check for cyanosis

Chest

- Assess respiratory rate, depth, & quality

- Normal respiratory rates:
  - Newborn—30–50 breaths/min
  - Infant—20–30 breaths/min
  - Child (toddler/school-age)—18–34 breaths/min
  - Adult: 12–20 breaths/min

- Adult patients:
  - Rate is ↓ 10 or ↑ 30—require appropriate care

Chest

- Counting radial pulse:
  - Arm across chest
  - Finish pulse check
  - Continue to count respirations
Chest

- Signs of respiratory distress
  - Nasal flaring
  - Paradoxical, asymmetrical chest movements
  - Use of accessory muscles

Chest

- Signs of respiratory distress
  - Pursed lip breathing
  - Noisy breathing
  - Obvious difficulty in inhalation or exhalation
  - Cyanosis

Chest

- Common breathing patterns
  - Eupnea
  - Apnea
  - Bradypnea
  - Tachypnea
  - Kussmaul
  - Cheyne-Stokes
Chest

- Palpate & auscultate lungs

Chest

- Right lung divided—upper, middle, lower lobes
- Left lung divided—upper & lower lobes
- Associate underlying anatomy with surface markers
- Findings described by region of chest—not by anticipated lobe of lung
Chest

- Associate underlying anatomy with surface markers
- Findings described by region of chest—not by anticipated lobe of lung

Anterior & Posterior Chest

- Inspect chest for:
  - Deformities, asymmetry
  - Impairment of respiratory movement
  - Abnormal retractions

- Determine whether underlying tissues are:
  - Air filled, fluid filled, solid

- Strike finger against knuckle of other hand
Anterior & Posterior Chest

- Percuss each side alternately

Sounds heard:
- Normal resonance
- Dullness
- Hyperresonance

Auscultation of Chest

- Sounds generated by breathing
- Symmetry
- Abnormal sounds present
- Auscultated in 6 different areas
Auscultation of Chest

- Breath sounds equal on each side
- Perform anterior, posterior auscultation
- Normal patterns heard:
  - Vesicular
  - Bronchial
  - Bronchovesicular
  - Tracheal

Auscultation of Chest

- Adventitious lung sounds
  - Discontinuous sounds—crackles
  - Continuous sounds—wheezes, rhonchi
  - Diminished, absent lung sounds

Cardiovascular System

- Evaluation involves examination of:
  - Arterial pulse
  - Blood pressure
  - Jugular venous pressure, pulsation
  - Heart
Arterial Pulse

- Conscious patient—radial pulse used most
- Patients with shock, poor circulation
  - Radial pulse may be absent, difficult to assess
  - Palpate carotid, femoral pulse

Arterial Pulse

- When palpating pulse—3 important characteristics:
  - Rate
  - Regularity
  - Character

Arterial Pulse

- Pulse rate
  - Normal adult rate: 60-100 bpm
  - >100 bpm—tachycardia
  - <60 bpm—bradycardia
- Regularity
  - Normally very regular
  - Irregular pulse—rhythm disturbance
  - Determine frequency & nature
Arterial Pulse

- Character of pulse—described as:
  - Strong—easily palpated
  - Weak—difficult to palpate
  - Bounding—visible through skin
  - Thready—weak, unsteady, rapid

Blood Pressure

- Measurement of force within arteries

- Measured
  - Sphygmomanometer
  - Millimeters of mercury (mm Hg)

- Contraction of heart generates wave of pressure
  - Peak level—systolic pressure
  - Low point—diastolic pressure

- No single BP normal for everyone
- Adult normal systolic BP range—90–140 mm Hg

Blood Pressure

- Diastolic pressure ranges—60–90 mm Hg

- BP ranges affected by:
  - Age—BP usually ↑ in elderly
  - Sex—females ↓ BP
  - Body size—smaller patients ↓ BP

- BP consistently >140/90 in adult—considered high
- BP <90/60 in adult—considered low
- Palpation—certain cases easier, more accurate
Orthostatic Hypotension

- BP drops suddenly when person stands
- More common
  - Smaller females
  - Elderly
  - Dehydrated, bleeding internally
- "Positive" orthostatic changes
  - ↑ Pulse rate of ≥10–20 bpm
  - ↓ Systolic BP of ≥ 10–20 mm Hg
  - Symptoms
    - Weakness
    - Dizziness
    - Going to pass out

Pulse Pressure

- Difference between systolic & diastolic BP
- Normal pulse pressure value—40 mm Hg
Jugular Venous Pressure, Pulsation

- Neck veins bulging—distended
  - Congestive heart failure
  - Cardiac tamponade
  - Rarely palpable

- Level of venous pulsations—changes with position

Heart

- Point of maximum impulse (PMI)—apical beat of heart
- Listen for muffled, distant heart sounds
- Intensity varies
Abdomen

- General approach
  - Patient in supine position
  - Examine tender areas last

- Inspect for:
  - Signs of obvious injury
  - Ecchymosis
  - Swelling

Abdomen

- Assess skin
  - Scars
  - Striae
  - Dilated veins
  - Rashes
  - Lesions

Abdomen

- Contour—general shape
- Pulsations
Abdomen

- Auscultate
  - Before palpation
  - Normal—relatively noisy
  - Sounds may be
    - Absent
    - Increased
    - Decreased
    - Bruits

Abdomen

- Palpate—2 separate stages:
  - Light palpation
  - Deep palpation

- Light palpation—Gently palpate entire abdomen

Abdomen

- Consider organs beneath area being palpated
Abdomen

- Palpate posteriorly

Abdomen

- Deep palpation—same area as light palpation

Abdomen

- Signs of peritonitis
Genitalia

- Prehospital exam is limited
- Inspect external genitalia
- Note any:
  - Inflammation
  - Discharge
  - Bleeding
  - Swelling

Assess Extremities

- Inflammation
- Crepitus
- Deformities
- Muscular strength
- Symmetry
- Atrophy
- Pain
- Tenderness
- Peripheral pulses
- Motor function
- Sensation

Peripheral Vascular System

- Assess the arms
  - Size, symmetry, & swelling
  - Color of skin, nail beds
  - Texture of skin
Assess Arms
- Palpate pulses
  - Increased
  - Normal
  - Diminished
  - Absent
  - Compare amplitude
  - Note differences

Assess Legs
- Size, symmetry, & swelling
- Rashes, scars, ulcers, & wounds
- Color, texture of skin

Assess Legs
- Palpate upper, lower leg
  - Pulse
  - Motor function
  - Sensation
Assess Legs

- Lower extremity pulses
  - Femoral pulse
  - Popliteal pulse
  - Dorsalis pedis pulse
  - Posterior tibial pulse

Assess Legs

- Check for edema—graded on 4-point scale
  - 1+ = slight edema
  - 2+ = more edema
  - 3+ = moderate edema
  - 4+ = marked edema

Assess Legs

- Pitting edema
  - Persists for less than 5 min
  - Check for at least 5 sec
    - Over dorsum of feet
    - Behind medial malleolus
    - Over shins
Spine

- Spine exam encompasses:
  - Head
  - Neck
  - Back
  - Lower extremities
- Trauma—rates high priority

Inspect from side
Inspect from behind

Palpate
  - Gently over spinous processes for:
    - Symmetry
    - Tenderness
    - Spasm
    - Deformities & pain
    - Reduce patient movement
Nervous System

- Examination involves bilateral tests
  - Strength
  - Sensation
  - Reflexes

- Symmetry—organize into 3 categories
  - Mental status, speech
  - Motor system
  - Sensory system

Glasgow Coma Scale

- 3 main areas assessed:
  - Eye opening
  - Verbal response
  - Motor response

- Maximum score 15; minimum score 3

- Adults scoring <9—poor neurological prognosis

Glasgow Coma Scale

- Motor response based on patient's best response to verbal command & painful stimulus—6 pt. max
  - 6—Patient obeys simple command
  - 5—Patient moves limb in attempt to locate painful stimulus
  - 4—Patient attempts to withdraw from painful stimulus
  - 3—Patient flexes arms & wrists in response to painful stimuli
  - 2—Patient extends arms at elbows in response to painful stimuli
  - 1—No motor response to pain on any limb
### Glasgow Coma Scale

- **Verbal response**—best answer to questions of time, place, person—5 pt. max
  - 5—Oriented to time, place, person
  - 4—Able to converse; not oriented to time, place, person
  - 3—Speaks in short phrases
  - 2—Responds with incomprehensible sounds
  - 1—No verbal response

### Glasgow Coma Scale

- **Evaluate eye opening without assistance**—4 pt. max
  - 4—Opens eyes spontaneously
  - 3—Opens eyes in response to your speech
  - 2—Opens eyes only in response to pain
  - 1—Exhibits no response

### Nervous System

- **Assess motor system:**
  - Observe body position
    - During movement
    - At rest
  - Check muscle tone
  - Assess muscle strength
Nervous System

- Assess motor system
  - Uniform grade for muscle strength: 0–5
    - 0—No muscular contraction detected
    - 1—Barely detectable muscle contraction
    - 2—Active movement with gravity eliminated
    - 3—Active movement against gravity
    - 4—Active movement against gravity—some resistance
    - 5—Active movement against full resistance without fatigue

Nervous System

- Assess motor system
  - Muscle coordination
  - Pain sensation
  - Temperature sensation
  - Light touch sensation

Infants & Children

- Similar to adult
- Differences in approach
  - Painful, distressing portions near end of exam
  - Assess areas where patient complains of pain last
**Adult/Child Anatomical Differences**

- Size of pediatric airway—smaller than adult's
- Relative size differences in tongue, epiglottis in children <8 yo
- Internal organs of infants, children larger in proportion to body size
- Head relatively larger in infants
- Bones softer, more flexible than adults
- Nervous system not as well developed

**Differences in Pediatric Patients**

- Airway problems more likely
- More organs in smaller space
- Internal injuries
- Head larger—head injuries
- Bones bend—not break
- Children may respond more slowly

**Approach to Pediatric Patient**

- Unique challenges
  - Fear of strangers & unknown
  - Presence & role of parents
  - Differences—levels of understanding
Initial Evaluation
- Responsiveness
- Respiratory status
- Circulatory status

Infants & Children
- Capillary refill is assessed in children <6 yrs

Summary
- Physical examination
  - Multifaceted process
  - Key in care for patient
- Basic techniques of all examinations
  - Inspection
  - Palpation
  - Percussion
  - Auscultation
Summary

- Measurement of vital signs limited to:
  - Pulse rate
  - Respiratory rate
  - Blood pressure
- Temperature may be important
- Normal test—does not necessarily mean normal patient

Summary

- The comprehensive examination covers:
  - Mental status
  - General survey
  - Vital signs
  - Skin
  - HEENT
  - Neck
  - Chest
  - Abdomen
  - Posterior body
  - Extremities
  - Neurological exam

Summary

- Amount of detail necessary & which areas to cover depend on patient’s circumstances
- Examination techniques
  - Similar in adults, children, infants
  - Several significant anatomical differences in younger patients
- All findings—document appropriately