Basic Assessment Tools

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Physical Examination Techniques

- Inspection
  - Visual observation & comparison
- Palpation
  - Use touch to determine characteristics
- Percussion
  - Cause vibrations to produce a sound
- Auscultation
  - Hear sounds of body organs

Physical Exam: Inspection

- Compare:
  - Size
  - Shape
  - Symmetry
  - Color
  - Position
  - Appearance
- Smell unusual odors

Physical Exam: Palpation

- Use parts of hand for specific assessments
  - Dorsal = body temp
  - Finger pads = moisture, texture, masses, pulses, crepitus, organ size, shape, position, consistency
  - Ball of hand = vibrations
- Types of palpation
  - Light
  - Deep
  - Ballottement

Physical Exam: Percussion

- Each body part has a "normal sound"
- 5 types:
  - Flat
  - Dull
  - Resonance
  - Hyperresonance
  - Tympany
- Technique

- Tap fingers on skin (I.e. assess sinuses)
- Percussion hammer to assess reflexes

Physical Exam: Auscultation

- Classifications
  - Presence
  - Location
  - Intensity
  - Pitch
  - Duration
- Type
  - Direct: ID sounds by ear alone (I.e wheezing)
  - Indirect: stethoscope

Basic Measurement Tools

- Vital Signs
  - Temperature
  - Pulse
  - Respirations
  - Blood pressure
- Height: establish baseline
- Weight – establish baseline; lbs or Kg
  - BMI
    - Estimates total body fat stores in relation to height & weight
    - (Weight in kg) divided by BSA

Common Laboratory Tests

Blood Chemistries

Potassium

- Normal: 3.5 – 5.1 mEq/l
- Functions
- Clinical application
  - ↑ level: renal failure, use of salt substitutes, metabolic acidosis, potassium sparing diuretics, heparin, antibiotics
  - ↓ level: dehydration, v/d, starvation, stress, trauma, burns, diabetic acidosis, gastric suctioning, lactulose, diuretics (lasix)
- Nursing Implications

Sodium

- Norm: 135-145 mEq/l
- Functions
- Clinical application
  - ↑ level: CHF, hepatic failure, severe v/d, DI, laxatives, steroids, antibiotics
  - ↓ level: v/d; gastric suctioning, burns, renal failure, diuretics, mannitol

- Nursing Implications

Calcium
- Norm 4.5 – 5.5 mEq/L
- Multiple functions
- Clinical application
  - ↑ level: cancer, immobility, renal calculi, hyperparathyroid
  - ↓ level: chronic renal failure, alcoholism, pancreatitis, trauma, ↓ Ca+ & vit D intake, hypoparathyroidism
- Nursing Implications

Glucose
- Norm: 70-110 mg/dl
- ID ability to convert glucose to glycogen
- Clinical application
  - ↑ level: diabetes, infection, burns, stress, extensive trauma, Cushing's syndrome, steroids, epinephrine
  - ↓ level: adrenal gland dysfunction, hypoglycemia, malnutrition, alcoholics, liver disease, ↑ insulin taken
- Nursing Implications
  - Observe for signs of hyper or hypoglycemia
  - Strict glycemic control post-op to prevent infections

Magnesium
- Norm: 1.5-2.5 mEq/L
- Multiple actions
- Clinical application
  - ↑ level: renal failure, dehydration, diabetes, magnesium rich antacids or laxatives (MOM)
  - ↓ level: alcoholism, hypokalemia, cardiac dysfunction, dehydration, liver failure, diuretics
- Nursing implications

Renal Lab Studies

Creatinine
- Norm: .5-1.1 (female); .6-1.2 (male)
- ID impaired renal function
- Clinical application
  - ↑ level: impaired renal function (infection, shock, obstruction, dehydration, CHF, rhabdomyolysis)
  - ↓ level: decreased muscle mass (muscular dystrophy, myasthenia gravis), debilitation
- Nursing Implications

- Elderly and children may have low levels d/t decreased muscle mass – masks renal dx
- Consult with pharmacy for drug dosages

BUN (Urea Nitrogen)

- Norm: 5-25 mg/dl
- End product of protein metabolism (in liver)
- Clinical application
  - ↑ level: dehydration, renal failure, diabetes, sepsis, GI bleed, high protein diet, antibiotics, diuretics
  - ↓ level: liver disease, malnutrition, overhydration, pregnancy
- Nursing implications
  - Compare to Creatinine to evaluate renal status (not impacted by liver function)
  - Assess hydration
  - Monitor I & O

Hematology

Hemaglobin (Hgb)

- Norm: male 13.5-17 g/dl; female 12-15 g/dl
- O2 carrying component of RBC
- Clinical applications
  - ↑ level: dehydration, chronic pulmonary disease (hypoxia), burns, polycythemia, high altitudes, gentamycin
  - ↓ level: anemia, renal disease, overhydration, hemorrhage, antineoplastic drugs
- Nursing implications
  - Monitor patient tolerance to activity
  - Assess perfusion
  - Replace with blood transfusions

Hematocrit (HCT)

- Norm: male 40-54%; female 36-46%
- Percent of packed RBCs per 100 ml blood
- Clinical applications:
  - ↑ level: hypovolemia, dehydration, burns, trauma, diabetic acidosis, eclampsia
  - ↓ level: hemorrhage, liver failure, anemias, malnutrition, bone marrow defect, RA, ↓ vitamin B & C
- Nursing implications:
  - Monitor change in vital signs, I & O, orthostatic hypotension

White Blood Cell (WBC)

- Norm: 4500-10,000 cells/ul
- Body's defense system
- Clinical applications:

- ↑ level: infection, tissue injury, necrosis, stress
- ↓ level: anemias, viral infection, malaria, alcoholism, antibiotics, chemo agents, steroids

- Nursing implications:
  - Monitor for s/s of inflammation/infection
  - Monitor bodies response to treatments/therapies

WBC Differential

- 5 types of WBCs provide information on infectious process based upon cell type
- Types:
  - Neutrophils – first at site to kill bacteria – ↑ early production = bands ("shift to the left") – immature PMN
  - Eosinophils – allergic/parasite conditions
  - Basophils (mast cells) – stimulates allergic reactions
  - Monocytes – second response to infection – remove necrotic debris
  - Lymphocytes – T cells (killer cells) & B cells (antibody cells)

Coagulation Studies (Coags)

Platelets

- Norm: 150-400,000
- Responsible for clotting
- Clinical applications
  - ↑ level: polycythemia, acute blood loss, severe infections (inflammatory process), early sepsis
  - ↓ level: cancer, leukemias, liver or kidney dx, DIC, late sepsis, aspirin, chemo agents
- Nursing implications
  - Monitor for bleeding with thrombocytopenia
  - Monitor patient toleration to chemo/radiation therapy

Prothrombin Time (PT)

- Norm: 10-13 seconds; coag range 1.5-2 x normal
- Measures clotting abilities of fibrinogen & effectiveness of **oral anticoag** therapy (coumadin)
- Clinical application
  - ↑ levels: alcohol, liver disease, leukemias, clotting factor deficiencies (DIC), coumadin, ASA, dilantin
  - ↓ levels: PE, AMI, DVT, contraceptives, vitamin K, HRT
- Nursing implications
  - Monitor PT level
  - Monitor s/s bleeding – stools, bruising, back pain
  - Antidote for bleeding = vitamin K
  - Monitor coumadin interaction with other medications

Partial Thromboplastin Time (PTT)

- Norm: 20-35 sec.; 1.5-2.5 x norm for anticoag
- ID clotting deficiencies – effectiveness of heparin & lovenox
- Clinical application
  - ↑ level: clotting deficiencies, cirrhosis, DIC, hodgkins dx, ASA, heparin, enoxaparin (lovenox), garlic, ginger, gingko, horse chestnut, nitroglycerin, NSAIDS
- Nursing Implications
  - Monitor s/s bleeding
  - Report PTT results to MD
  - Maintain dedicated IV line – incompatible with drugs
  - Deliver via IV pump

International Normalized Ratio
(INR)

- Show with PT results
- Standard anticoagulation rate of 2.0-3.5 with INR reporting
- Established by World Health Organization
- Reason:
  - To provide uniform PT results for physicians in different parts of the country and world

D-Dimer

- Assesses both thrombin & plasmin activity
- Is a fibrin degradation fragment made during fibrinolysis (clot dissolution)
- *Highly specific measurement of the amount of fibrin degradation that occurs
- Normally it is <u>not</u> detected in plasma
- Used to confirm DIC when done in combination with FDP (fibrin degradation products) lab test.

Miscellaneous Labs of Interest

Albumin (serum)

- Norm 3.5-5.0 g/dl; 52-68% total protein
- Function:
  - ↑ oncotic pressure for intravascular fluid retention (↓ albumin = fluid shift = tissue edema)
  - Nutritional evaluation
- Clinical application:
  - ↓ levels: liver failure, malnutrition, sepsis, acid/base imbalances, renal disorders, long term illness, elderly
  - ↑ levels: dehydration, severe diarrhea, vomiting
- Nursing Implications

Ammonia
- Norm 15-45 ug/dl
- Product of nitrogen breakdown from protein metabolism – converted into urea by liver
- Clinical application
  - ↑ levels: liver failure, CHF, acidosis, high protein diets w/liver dysfunction, hyperalimentation
  - ↓ levels: renal failure, hypertension
- Nursing implications

Osmolality
- # of particles dissolved in solution
- Source:
  - Serum: 280-300 mOsm/kg H2O
  - Urine: 50-1200 mOsm/kg H2O
- Clinical application
  - ↓ serum: intravascular overload or SIADH, excessive IV fluid administration
  - ↑ serum: dehydration, hypernatremia, hyperglycemia, DI

Osmolality (cont.)
- Clinical application (cont)
  - ↑ urine: SIADH
  - ↓ urine: DI, renal failure, hyponatremia, excessive IV fluid administration
- Nursing Implications
  - Monitor I & O with IV resuscitation

C-Reactive Protein (CRP)
- Norm: negative
- ID inflammatory process
- Clinical Applications
  - ↑ levels: AMI, RA, pyelonephritis, metastatic cancer, IBS, bacterial infections, ? Respiratory disease, oral contraceptives
- Nursing Implications
  - Assess s/s acute inflammatory response
  - Compare other labs – platelets, WBCs, diff

Cerebrospinal Fluid (CSF)
- Measures: protein, WBCs, glucose
- Norm – clear (like water)
- ID: spinal/cerebral diseases and infections
- Clinical issues
  - lumbar puncture required
- Nursing Implications

- Patient consent
- Monitor neuromotor status following procedure
- Instruct patient on side effects – I.e. headache

CEA Serum

- Carcinoembryonic antigen
- ID colon and pancreatic CA; tx effectiveness
- Clinical application
  - ID multiple conditions
- Nursing Implications
  - Give family/patient support

Immunoglobulins (Ig) serum

- Specific antibody-antigen response
- Types
  - IgG: exposure to antiviral/antibody activity
  - IgA: protects mucous membranes from bacterial and viral infections
  - IgM: primary immunity from antigen exposure
  - IgD: unknown
  - IgE: response to allergic & anaphylactic reactions
- Nursing implications

Diagnostic Tests

Computed Tomography (CT)

- Radiographic procedure
- Cross-sectional images of the body
- ID subtle tissue changes
- Types of scans
  - Head
  - Abdomen
    - Drink & IV contrast media

Magnetic Resonance Imaging

- Noninvasive, diagnostic tool
- Create images of multiple body planes
- ID: tissue structures, tears, abnormal masses, vascular/neuro disorders, fluid accumulations
- Requirements:
  - No metal items – including shrapnel, bullets
  - Patient awareness
    - Narrow cylinder, use intercom system to communitcate, will receive sedation & earplugs

Doppler Studies

- Use ultrasonic beam – echoes create three dimensional picture
- Types
  - Echocardiogram
    - Left ventricular function
    - Septal defects
  - Vascular studies
    - ID venous or arterial thrombus

Electrocardiography

- Record electrical activity of heart
- Types:
  - 12 lead – ID specific area damaged
  - Ambulatory
    - Holter monitor
      - Record heart activity over 24 hours – correlate with normal activity to ID frequency, type, rate of arrhythmias
    - Exercise treadmill test
      - Exercise heart to evaluate CAD, arrhythmia development
      - Impacting Meds:
        - Adenosine – no walking – induce stress upon the heart
        - Beta blockers (propanolol) – HR will not reach target

Endoscopy

- Invasive
  - Use sedation
- Fiberoptic scope
- Types:
  - Colonoscopy
  - Bronchoscopy
- Nursing Focus
  - Monitor complications
  - Post procedure conscious sedation protocol

Pulse Oximetry

- Can be intermittent or continuous
- Pass infrared light through tissue to measure O2 sat of blood -
- Norms: >90 or 95% (source)
- Impacted by
  - ↓ Hgb levels
  - Vascular insufficiencies (I.e. cold room, peripheral vasoconstriction)

Capnography (End Tidal CO2)

- Measures exhaled CO2 with each breath – reflects ventilation

- 3 types of equipment
  - Mainstream and/or sidestream (w/artificial airways)
  - Microstream use with nasal cannula
- Problem ID
  - Hypoventilation/apnea immediately (I.e. tube dislodgement, CO2 narcosis development)

This material was developed by Gina Maiocco, PhD, RN, CCRN, CCNS, while she was faculty in the Wright State University-Miami Valley College of Nursing and Health.

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