***Vital Signs***

General Information

* Vital signs
  + Temperature
  + Respirations
  + Pulse
  + Blood pressure
  + Pulse oximetry
  + Growth
    - Height
    - Weight
    - BMI
    - Skin folds
    - Growth velocity curves
      * Things to always keep in mind regarding vital signs
        + Values are averages based on collective bell-shaped curves
        + Individual variation is not uncommon (extremes of the curve)
        + Vital signs are significant indicators of metabolic processes
        + Vital signs are **extremely important to note**
* Temperature
  + Average body temp = 98.6°F (37°C)
  + Measured by oral, axillary, rectal, and tympanic membrane route
  + Diurnal variation of temp
    - Lowest temp at 6:00 am
    - Highest temp between 4:00 pm – 6:00 pm
  + Centigrade is used in many hospitals
* Respiration
  + Rate = number of cycles of inspiration and expiration in one minute
  + Average respiratory rates
    - Adults = 12-20
    - Newborn = 40-60
    - Age 1-3 years = 20-30
    - Age 6-10 years = 16-20
* Pulse
  + Examination of the arterial pulses to determine the rate and rhythm of the heart and systemic blood flow
  + Generally determined in the radial artery
  + If irregular, determine by cardiac auscultation for at least 60 seconds
  + Pulses to evaluate
    - Carotid
    - Brachial
    - Radial
    - Femoral
    - Popliteal
    - Dorsalis pedis
    - Posterior tibial
  + Always evaluate pulses bilaterally, **except for the carotids**
  + ***NEVER palpate the carotids simultaneously!***
  + Average pulse rates
    - Adults = 60-100 bpm
    - Newborn = 120-170 bpm
    - 3 years old = 80-120 bpm
    - 10 years old = 70-110 bpm
  + Rhythm of pulse
    - Defined regular or irregular
    - Sinus arrhythmia = irregular, but in a regular pattern, due to cyclically increased rate with inspiration and decreased with expiration
    - Atrial fibrillation = irregularly irregular
  + Pulse contour
    - Normally dome shaped
      * Upstroke is smooth and rapid, occurring immediately after S1 in the cardiac cycle
      * Summit is smooth and round, at mid-systole; downstroke is less abrupt
  + Pulse amplitude
    - 4+ = bounding
    - 3+ = full, increased
    - 2+ = expected
    - 1+ = diminished, barely palpable
    - 0 = absent, not palpable
  + Pulse oximetry
    - Rapidly estimates arterial oxygen saturation
    - Pulsatile transmission of light through tissues
    - Indicates oxygen saturation of hemoglobin
    - Correlates with PaO2
    - Does not detect problems of poor O2 delivery (anemia, low cardiac output)
    - Several limitations, but useful as a means to evaluate patient, monitor oxygen therapy, diagnose unsuspected O2 desaturation
    - Generally, should be ≥ 94% in adults
* Blood pressure
  + Direct measurement
    - Needle or catheter inserted into the arterial tree and connected to a small calibrated transducer
  + Indirect measurement
    - Occluding cuff is used with a sphygmomanometer
    - May use palpatory or auscultation technique
  + Blood pressure values
    - Adults
      * Average values defined for patients > 18 years old
      * Follow the JNC’s latest guidelines for expected blood pressure
  + Taking a blood pressure
    - Appropriate sized cuff must be used
      * Bladder width 40-50% of upper arm circumference
      * Bladder length 80% of upper arm (2x width)
      * For children, cuff width should cover 2/3 arm or thigh and length be ¾ of circumference
      * Cuff too *wide*, BP is **underestimated**
      * Cuff too *narrow*, BP is **artificially high**
    - Should be measured in both arms at least once
    - Full BP evaluation in children must include all 4 extremities
    - Patient should be at rest
    - Arm should be:
      * Slightly flexed
      * At approximately heart level
      * Supported
    - Not performing the above listed could cause a **false** BP reading
  + Korotkoff
    - Sounds made by the turbulent flow of blood in an artery
      * Phase 1: Pressure at which the first tapping sound is heard = **Systolic BP**
      * Phase 2: Time of murmur or swishing sound
      * Phase 3: Sounds are crisp and increase in intensity
      * Phase 4: Muffling of sounds (*diastolic BP in children*)
      * Phase 5: Pressure at which the last sound is heard = **Diastolic BP** (adults)
  + Orthostatic blood pressure changes
    - After a five minute period of rest in a supine position, BP checked after 2-5 minutes of standing
    - Systolic BP drops *20 mmHg or more*
    - Diastolic BP drops *10 mmHg or more*
    - Symptoms of cerebral hypoperfusion
    - Most often from significant blood loss (also from loss of compensatory mechanisms in autonomic insufficiency)
    - **If symptoms appear, stop test, place patient in supine position**
    - Helpful in evaluation of patients with:
      * GI bleeding
      * Dehydration
      * Trauma patients
      * Positional dizziness
      * Syncope/pre-syncope

Methods

* Respiratory rate
  + Method for evaluating respiratory rate:
    - Respirations are counted by inspection
    - Do not let the patient know you will be observing or counting respirations
    - Observe the rise and fall of the chest
    - Count the number of respiratory cycles (inspiration and expiration) that occur in 1 minute to determine the respiratory rate
    - Note the regularity and rhythm of breathing
* Pulse
  + Method for evaluating a pulse
    - Inspect the area of the pulse first
    - Place the digital pads of the second and third fingers over the area of the pulse
    - If the pulse is not felt, try varying the amount of pressure used and feel throughout the area
    - If the vessel moves when touched with the digits, the thumb may be used to “fix” the vessel in place for palpation
    - Pay attention to the rhythm and contour of the pulse
    - The pulse rate may be determined by either:
      * Counting the pulsation for 60 seconds
      * Counting the pulsation for 30 seconds and multiplying by 2
    - Compare pulses simultaneously bilaterally **(except for the carotids, those are done one at a time)**
    - Compare pulses simultaneously in the upper and lower extremity
* Blood pressure
  + Palpatory technique in an arm
    - Make sure the patient is sitting comfortably with their arm slightly flexed, arm free of clothing, and at approximately heart level
    - Palpate the radial or brachial arterial pulse in that arm
    - Inflate the cuff 20-30 mmHg above pulse obliteration
    - Deflate the cuff until you palpate 2+ beats of pulse (this is the palpable systolic BP)
    - Deflate the cuff completely
  + Auscultation technique
    - Make sure the patient is sitting comfortably with their arm slightly flexed, free of clothing, and at approximately heart level
    - Attach the cuff and place your stethoscope over the brachial artery
    - Inflate the cuff 20-30 mmHg above palpable systolic pressure
    - Deflate the cuff slowly (2-3 mmHg sec)
    - Listen for Korotkoff sounds
      * Two consecutive beats indicate the *systolic pressure* (Phase 1)
      * The point at which the crisp sounds (Phase 3) become muffled is the *first diastolic sound* (Phase 4)
      * The point at which the sounds disappear is the *second diastolic sound* (Phase 5)
      * Video Link
        + <https://www.youtube.com/watch?v=8Xyk09K2p_s>