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, <u>not</u> palpable
- Pulse oximetry
  - Rapidly estimates arterial oxygen saturation
  - Pulsatile transmission of light through tissues
  - Indicates oxygen saturation of hemoglobin
  - Correlates with PaO_2
  - Does <u>not</u> detect problems of poor O_2 delivery (anemia, low cardiac output)
  - Several limitations, but useful as a means to evaluate patient, monitor oxygen therapy, diagnose unsuspected O_2 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 <u>must</u> 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