VITAL SIGNS

Academic Success Center
Vital Signs

- Temperature, pulse, respiration, blood pressure (B/P) & oxygen saturation are the most frequent measurements taken by a nurse.

- Because of the importance of these measurements they are referred to as Vital Signs. They are important indicators of the body’s response to physical, environmental, and psychological stressors.
Vital Signs

- Vital Signs may reveal sudden changes in a patient’s condition in addition to changes that occur progressively over time. A baseline set of Vital Signs are important to identify changes in the patient’s condition.

- Vital Signs are part of a routine physical assessment and are not assessed in isolation. Other factors such as physical signs & symptoms are also considered.

- Important Consideration:
  - A client’s normal range of vital signs may differ from the standard range.
When to take Vital Signs?

1. On a client’s admission
2. According to the physician’s order or the institution’s policy or standard of practice
3. When assessing the client during home health visit
4. Before & after a surgical or invasive diagnostic procedure
5. Before & after the administration of meds or therapy that affect cardiovascular, respiratory & temperature control functions.
6. When the client’s general physical condition changes LOC, pain
7. Before, after & during nursing interventions influencing vital signs
8. When patient reports symptoms of physical distress
Assessing Body Temperature

- **CORE TEMPERATURE**: Temperature of the body tissues, is controlled by the hypothalamus (control center in the brain) and maintained within a narrow range.

- Skin temperature rises & falls in response to environmental conditions & depends on blood flow to skin & amount of heat lost to external environment.

- The body’s tissues & cells function best between the range from 36 oC to 38 oC

- Temperature is lowest in the morning, highest during the evening.
Types of Thermometers

There are 3 types of thermometers:

- **GLASS MERCURY**: Mercury expands or contracts in response to heat.

- **ELECTRONIC**: Heat sensitive probe, (reads in seconds) there is a probe for oral/axillary use (red) & a probe for rectal use (blue). There are disposable plastic cover for each use. Relies on battery power – return to charging unit after use.

- **INFRARED TYMPANIC (Ear)**: Sensor probe shaped like an otoscope in external opening of ear canal. Ear canal must be sealed & probe sensor aimed at tympanic membrane return to charging unit after use.
## Different Body Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>Methodology</th>
<th>Notes</th>
<th>Duration</th>
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</table>
| Oral     | Oral temperature is taken by placing a thermometer behind the tongue.       | - No hot or cold drinks or smoking 20 min prior to temp.  
           | Posterior sublingual pocket – under tongue (close to carotid artery)        | - Must be awake & alert.  
           |                     | - Not for small children (bite down)                                           | Leave in place 3 min |
| Axillary | Axillary temperature is taken by placing a thermometer in the armpit.       | - Non invasive – good for children. Less accurate (no major blood vessels nearby)  
           | Bulb in center of axilla                                                    |                                                                                                            | Leave in place 5-10 min.  
           | Lower arm position across chest                                            | Measures 0.5°C lower than oral temp.                                                                      |           |
| Rectal   | Rectal temperature is taken by inserting a thermometer into the rectum.    | - When unsafe or inaccurate by mouth (unconscious, disoriented or irrational)                          | Leave in place 2-3 min.  
           | Side lying with upper leg flexed, insert lubricated bulb (1-1 1/2 inch adult) (1/2 inch infant) | Measures 0.5°C higher than oral                                                                                 |           |
| Infant   | Infant temperature is taken by placing a thermometer in the ear.           | - Rapid measurement  
           | Close to hypothalmus – sensitive to core temp. changes                         | - Easy assessibility  
           | Adult - Pull pinna up & back                                                 | - Cerumen impaction distorts reading  
           | Child – pull pinna down & back                                               | - Otitis media can distort reading  
           |                                                                 |                                                                                                            | 2-3 seconds |
Assessing Radial Pulse

- Left ventricle contracts causing a wave of blood to surge through arteries, called pulse. Felt by palpating artery lightly against underlying bone or muscle.
  - Carotid, brachial, radial, femoral, popliteal, posterior tibial, dorsalis pedis pulse.
- Assess: rate, rhythm, strength by using palpation & auscultation.

- PULSE DEFICIT: The difference between the radial pulse and the apical pulse. It indicates a decrease in peripheral perfusion from some heart conditions. Ex: Atrial fibrillation.
Procedure for Assessing Pulses

- **PERIPHERAL**: Place 2\textsuperscript{nd}, 3\textsuperscript{rd} & 4\textsuperscript{th} fingers lightly on skin where an artery passes over an underlying bone. Do not use your thumb (feel pulsations of your own radial artery). Count 30 seconds X 2, if irregular, count radial for 1 min. and then apically for full minute.

- **APICAL**: Beat of the heart at it’s apex or PMI (point of maximum impulse), in the 5\textsuperscript{th} intercostal space, midclavicular line, just below lt. nipple – listen for a full minute “Lub-Dub”
  - Lub – close of atrioventricular (AV) values – tricuspid & mitral valves
  - Dub – close of semilunar valves – aortic & pulmonic valves
Assess: rate, rhythm, strength & tension

- **RATE**: Normal: 60-100, average 80 bpm
  - Tachycardia: greater than 100 bpm
  - Bradycardia: less than 60 bpm

- **RHYTHM**: The pattern of the beats (regular or irregular)

- **STRENGTH OR SIZE**: Or amplitude, the volume of blood pushed against the wall of an artery during the ventricular contraction
  - weak or thready (lacks fullness)
  - Full, bounding (volume higher than normal)
  - Imperceptible (cannot be felt or heard)

0----------------- 1+ -----------------2+------------------- 3+ -----------------4+
Absent Weak NORMAL Full Bounding
# Normal Heart Rate

<table>
<thead>
<tr>
<th>Age</th>
<th>Heart Rate (Beats/min)</th>
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<tbody>
<tr>
<td>Infants</td>
<td>120-160</td>
</tr>
<tr>
<td>Toddlers</td>
<td>90-140</td>
</tr>
<tr>
<td>Preschoolers</td>
<td>80-110</td>
</tr>
<tr>
<td>School agers</td>
<td>75-100</td>
</tr>
<tr>
<td>Adolescent</td>
<td>60-90</td>
</tr>
<tr>
<td>Adult</td>
<td>60-100</td>
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Assessing pulse

- TENSION: Or elasticity, the compressibility of the arterial wall, is pulse obliterated by slight pressure (low tension or soft).

- Stethoscope
  - DIAPHRAGM: High pitched sounds, bowel, lung & heart sounds – tight seal
  - BELL: Low pitched sounds, heart & vascular sounds, apply bell lightly (hint think of Bell with the “L” for Low)
Respirations

- Assess by observing rate, rhythm & depth
  - INSPIRATION: Inhalation (breathing in)
  - EXPIRATION: Exhalation (breathing out)
    - Inspiration & Expiration is automatic & controlled by the medulla oblongata (respiratory center of brain)
    - Normal breathing is active & passive
    - Women breathe thoracically, while men & young children breathe diaphramatically usually
    - Asses after taking pulse, while still holding hand, so pt is unaware you are counting respiratons
Assessing Respiration

<table>
<thead>
<tr>
<th>Rate</th>
<th>Number of breathing cycles/minute (inhale/exhale-1cycle)</th>
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<tbody>
<tr>
<td></td>
<td>NORMAL: 12-20 breaths/min - adult - Eupnea - normal rate &amp; depth breathing</td>
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<tr>
<td></td>
<td>Abnormal increase – tachypnea</td>
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<td></td>
<td>Abnormal decrease – bradypnea</td>
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<table>
<thead>
<tr>
<th>Depth</th>
<th>Absence of breathing – apnea</th>
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<tbody>
<tr>
<td></td>
<td>Amount of air inhaled/exhaled</td>
</tr>
<tr>
<td></td>
<td>normal (deep &amp; even movements of chest)</td>
</tr>
<tr>
<td></td>
<td>shallow (rise &amp; fall of chest is minimal)</td>
</tr>
<tr>
<td></td>
<td>SOB shortness of breath (shallow &amp; rapid)</td>
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<thead>
<tr>
<th>Rhythm</th>
<th>Regularity of inhalation/exhalation</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Normal (very little variation in length of pauses b/w Inspiration &amp; Expiration)</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Character</th>
<th>Digressions from normal effortless breathing</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Dyspnea – difficult or labored breathing</td>
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<tr>
<td></td>
<td>Cheyne-Stokes – alternating periods of apnea and hyperventilation, gradual increase &amp; decrease in rate &amp; depth of resp. with period of apnea at the end of each cycle.</td>
</tr>
</tbody>
</table>
Blood Pressure

- Force exerted by the blood against vessel walls. Pressure of blood within the arteries of the body – lt. ventricle contracts – blood is forced out into the aorta to the large arteries, smaller arteries & capillaries
  - Systolic - force exerted against the arterial wall as lt. ventricle contracts & pumps blood into the aorta – max. pressure exerted on vessel wall.
  - Diastolic – arterial pressure during ventricular relaxation, when the heart is filling, minimum pressure in arteries.

○ Factors affecting B/P
  - lower during sleep
  - Lower with blood loss
  - Position changes B/P
  - Anything causing vessels to dilate or constrict - medications
Blood Pressure

● Measured in mmHg – millimeters of mercury
● Normal range
  ■ Systolic: 110-140 Diastolic: 60-90
  ■ Hypertensive: >160, >90
  ■ Hypotensive: <90

● Non invasive method of B/P measurement
  ■ Sphygmomanometer, stethoscope
  ■ 3 types of sphygmomanometers
    ■ Aneroid – glass enclosed circular gauge with needle that registers the B/P as it descends the calibrations on the dial.
    ■ Mercury – mercury in glass tube - more reliable – read at eye level.
    ■ Electronic – cuff with built in pressure transducer reads systolic & diastolic B/P
Blood Pressure

- **CUFF:** Inflatable rubber bladder, tube connects to the manometer, another to the bulb, important to have correct cuff size (judge by circumference of the arm not age)
  - Support arm at heart level, palm turned upward - above heart causes false low reading
    - Cuff too wide – false low reading
    - Cuff too narrow – false high reading
    - Cuff too loose – false high reading

- Listen for **Korotkoff sounds** – series of sounds created as blood flows through an artery after it has been occluded with a cuff then cuff pressure is gradually released.

- **Do not take B/P in**
  - Arm with cast
  - Arm with arteriovenous (AV) fistula
  - Arm on the side of a mastectomy. Ex: right mastectomy, right arm
Blood Pressure Lower Extremity

- Best position prone – if not – supine with knee slightly flexed, locate popliteal artery (back of knee).

- Large cuff 1 inch above artery, same procedure as arm. Systolic pressure in legs maybe 10-40 mm hg higher.

- If unable to palpate a pulse – you may use a doppler stethoscope.
Oxygen Saturation (Pulse Oximetry)

- Non-invasive measurement of oxygen saturation

- Calculates SpO2 (pulse oxygen saturation) reliable estimate of arterial oxygen saturation
  - Probes – finger, ear, nose, toe
  - Patient with PVD or Raynauds syndrome – difficult to obtain.

- Normal – 90-100%
  - Remove nail polish
  - Wait until oximeter readout reaches constant value & pulse display reaches full strength
  - During continuous pulse oximetry monitoring – inspect skin under the probe routinely for skin integrity – rotate probe.
Reference

- Created by: Maria Burbano