Vital Signs

- Why do vital signs?
  - Determine relative status of vital organs
  - Establish baseline
  - Monitor response to Rx, meds
  - Observe trends
  - Determine need for further evaluation, Rx, intervention

Vital Signs

- 4 classic vital signs (VS)
  - Temperature (T)
  - Pulse (P)
  - Respiratory rate (RR, f)
  - Blood pressure (BP)
Vital Signs
- Also important are
  - SpO2
  - Height
  - Weight
  - Level of consciousness (LOC)
  - Sensorium

Vital Signs
- Standard vital sign package usually also include
  - IV, A-line catheter insertion sites
  - Traumatic or surgical wounds
  - Extremity checks

Vital Signs
- Frequency
  - Depends on condition of patient
  - Severity of disorder
  - Procedures, therapies being performed
  - At minimum
    - Can be q4h, q2h, q30m, q15m
Vital Signs
- Single measurement gives info at that time
  - compare to normal
- Serial measurements allow for trending
  - far more important than any single measurement
  - always compare a measurement to previous measurements
  - correlate to other subjective and objective data
  - recorded on a multiple day graph

Vital Signs
- Comparison of multiple signs & symptoms to arrive at Dx is called “differential diagnosis”
- Takes time to learn
  - knowledge first, than ability to assess & compare subjective & objective data over time to ID patterns
- Key is to be constantly aware & to look for change
  - look
  - listen
  - touch
  - reassess and analyze
  - trend, trend, trend

Height & Weight
- Routinely measured on admission, every day or so
- May also record daily I & O until weight is stable
- Weight used to calculate medication dosages
- May be weighed in kilograms
  - Kg =
Sensorium (LOC)

- Simple but important
- To be awake, alert, conscious, well oriented, you must be getting adequate O2 to the brain
- Orient to time, place, person

An alert, well-oriented patient is said to be

Sensorium (LOC)

- Abnormal sensorium & loss of consciousness may occur when cerebral perfusion is inadequate or when there is not enough O2 in the blood delivered to brain (hypoxemia)
- Initially, patient is restless, confused, disoriented progressing to comatose

- Can patient participate in their own care? May need to adjust Rx plan based on sensorium evaluation

Sensorium (LOC)

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye opening</td>
<td>4</td>
</tr>
<tr>
<td>Spontaneous eye opening to speech</td>
<td>3</td>
</tr>
<tr>
<td>Spontaneous eye opening to painful stimulation (e.g., endotracheal suctioning)</td>
<td>2</td>
</tr>
<tr>
<td>Does not open eyes in response to any stimulation</td>
<td>1</td>
</tr>
<tr>
<td>Motor response</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>5</td>
</tr>
<tr>
<td>Makes localized movement in response to painful stimulus</td>
<td>4</td>
</tr>
<tr>
<td>Makes nonpurposeful movement in response to various stimulus</td>
<td>3</td>
</tr>
<tr>
<td>Responsive to verbal commands</td>
<td>2</td>
</tr>
<tr>
<td>Make nonverbal/nonverbal movement in response to pain</td>
<td>1</td>
</tr>
<tr>
<td>Makes no response to visual stimuli</td>
<td>1</td>
</tr>
<tr>
<td>Initial response</td>
<td></td>
</tr>
<tr>
<td>Responds to name, place, and time</td>
<td>5</td>
</tr>
<tr>
<td>Statements, may be confused</td>
<td>4</td>
</tr>
<tr>
<td>Replies with inappropiate words</td>
<td>2</td>
</tr>
<tr>
<td>Makes incomprehensible sounds</td>
<td>1</td>
</tr>
<tr>
<td>Makes no response</td>
<td>1</td>
</tr>
</tbody>
</table>
Temperature

- Normal body temp & is normally higher by 1-2° in late afternoon
- Most metabolic functions perform best in
- Maintained by balancing heat prod with heat loss

Temperature

- To lower temp
  -
  -
  -
- To raise or maintain temp
  -

Temperature - Fever

- If have fever from disease =
  - Most often results from infection somewhere in the body (esp. if temp > 102°)
  - Remember, not all patients with an infection develop fever
Temperature - Fever
• Fever increases metabolic rate with resulting increase in O2 consumption and CO2 production
  • every 1° increase →
  • increases must be met by increases in

(charACTERIZED BY Elevated RR & P)

Temperature - Hypothermia
• Body temp below normal
• Not common
  •
  •
• Hypothalamus promotes shivering and peripheral vasoconstriction

Temperature - Hypothermia
• Result of hypothermia:
  •
  •
• RR may be slow and shallow with decreased HR
Temperature - Measurement

- Recorded in degrees Fahrenheit (°F) or degrees Celsius (°C)
- Normals vary with measurement site and method
- Most often measured at 1 of 4 sites
  - rectal
  - axillary
  - oral
  - tympanic
  - temporal

Temperature - Rectal

- Accurate core temp, difficult to obtain
- For use when comatose, in ICU, confused
- Average temp –
  - Requires at least 2 minutes for glass thermometer
  - Not uncommon in ICU to use rectal probe

Temperature - Axillary

- Safe for infants & small children
- Avoids injury to rectal tissues
- Neonates –
- Adults –
  •
  • Lower reading than oral or rectal
  • Can take up to 11 minutes in adults and 5 minutes in kids
  • Rarely done in adults
Temperature - Oral
- Most convenient and acceptable for awake adult patients
- Not used with infants, comatose patients, orally intubated patients
- Tip of thermometer must be in posterior sublingual pocket
- Alcohol thermometers require -
- Not affected by oxygen therapy

Temperature - Tympanic
- Uses a hand-held probe placed in ear canal to detect infrared emissions from the surface of the eardrum and ear canal
- No direct contact with tympanic membrane
- Takes less than
- Fast, clean, noninvasive
- Commonly used in
- If measured close to eardrum, temp is close to

Temperature - Temporal
- Called a temporal scanner
- Takes temperature with a light stroke across the forehead
- Based on infrared readings of
  - Can be used for all patients, newborns through geriatrics
  - Reads temp in seconds
  - Proven more accurate than ear thermometers
Pulse
• Evaluated for rate, rhythm, strength
• Normal pulses vary with
• Adult: 60 - 100 beats/min (BPM)
  • > 100 BPM =
    • anxiety, fear, fever, low BP, anemia, hypoxemia, meds
  • < 60 BPM =
    • less common
    • heart disease, meds, well-conditioned athletes

Pulse
• Amount of O2 delivered to the tissues depends on the ability of the heart to pump oxygenated blood
  • cardiac output = volume of blood pumped per minute
    •

Pulse
• When the O2 content of arterial blood falls below normal, the heart tries to compensate by increasing cardiac output to maintain adequate oxygen delivery to tissues
• : HR is important to monitor in patients with lung disease
Measurement of Pulse Rate

- Radial artery is most common site for evaluation
- Patient’s arm & wrist should be relaxed, below heart level
- Use pads of index & middle finger placed lightly over pulse point
- Compress until maximum pulsation felt
- Ideally - count for 1 minute to evaluate rate, rhythm & strength
- Other sites: brachial, femoral, carotid arteries

Pulse Rhythm & Pattern

- Rhythm should be regular vs. irregular
- If very irregular - may need to count with stethoscope placed over heart
- Volume of pulse = how strong pulse feels
  - pulse should be easy to feel, not fading in & out
  - normal, bounding, full, weak, thready, absent

Pulse Rhythm & Pattern

- Fullness of pulse can be decreased by
  - 
  - 

- Spontaneous ventilation can influence strength of pulse → if decreases with inhalation = pulsus paradoxus
Respiratory Rate
- Vary by age & condition of patient
- Normal adult = 12-20 breaths/min (BPM)
- > 20 BPM =
  - exercise, fever, decreased arterial O2 content, metabolic acidosis, anxiety, pain
- < 12 BPM =
  - uncommon
  - head injuries, hypothermia, meds

Respiratory Rate
- Assess the pattern & depth of breathing
  - hypopnea
  - hyperpnea
  - apnea
  - periodic
  -
- Also assess use of accessory muscles, presence of retractions, flaring nostrils, external sounds

Measurement of RR
- Count by watching rise and fall of abdomen or chest wall
- Never tell patient to “breathe normally” to count rate
- Better technique is to count HR for 30 sec. the count RR for 30 sec. while pretending to count HR
Blood Pressure

- BP = force exerted against arterial walls as blood moves through vessel
- Systolic = peak force during contraction of left ventricle
  - normal =
- Diastolic = force against walls when heart is relaxed
  - normal =
- Pulse pressure = systolic - diastolic

Blood Pressure

- BP determined by
  - force of LV contraction
  - peripheral resistance to blood flow
  - blood volume
- Sustained BP < 90/60 =
  - peripheral vasodilation
  - left ventricular failure
  - hypovolemia
  - perfusion of vital organs is significantly reduced

Blood Pressure

- Sustained BP > 140/90 =
  - increases risk of heart, vascular, renal disease
  - most modifiable risk factor
  - cause usually unknown, although the following may contribute
    - genetics
    - environment
    - smoking
    - weight
    - stress level
    - sleep apnea
Measurement of Blood Pressure

- Most common method uses a sphygmomanometer and stethoscope
- Measures BP indirectly by measuring the pressure required to collapse artery
- Made in different sizes to fit various sizes & ages of patient - selection of proper size is essential

Measurement of Blood Pressure

- Technique
  - place cuff firmly around upper arm
  - pump up cuff to a number greater than expected systolic pressure (~200 mmHg) - blood flow is occluded
  - place stethoscope over brachial artery
  - gradually release air from cuff while listening for heart tones (Karotkoff sounds)
  - when blood flow begins, heart beat is heard = 
  - listen for when sound of heart beat disappears (artery is without restriction to flow) = 

Measurement of Blood Pressure

- Normal for BP to drop slightly during inspiration
- If drops more than 10 mmHg systolic – pulsus paradoxus
  - inspiration (neg.press) → enhances venous return, decreases LV outflow → RV filling increases → pushes on intraventricular septum → reduced LV output → reduced BP
- Occurs in restrictions around heart (cardiac tamponade, constrictive pericarditis), acute asthma