Nursing Fundamentals
Vital Signs

CHPTR 11

What are vital signs?

- Body temperature “T”
- Pulse or heart rate “HR”
- Respiratory or breathing rate “RR”
- Blood pressure “BP”

Otherwise known as:

- TPR + BP = body temp, pulse, R.R+ BP
-

Changing VS

- VS are sensitive to alterations in physiology (changing of our environment)

- Therefore…
-
- they need to measured at regular intervals

VS are assessed…

- Generally every 4hours or every 8 hours
- VS can be monitored q 15 mins, q 30 mins, q 1hr, q 2 hrs
- Drs. Order states what is to be done.
- If you are unsure about your pts condition, TAKE THEIR V.S. you are not wrong for doing this

Temperature

- Refers to the warmth of a human body
- Heat is produced from exercise and metabolism of food
- Heat is lost through the skin, the lungs and the body’s waste products

Core Temperature

- Is the body's most inner temperature. This is where the brain and heart are located

- Shell temperature is the surface temperature or the temperature of the outer skin

- The core temperature should be warmer than the shell or outer temperature

How is temperature measured?

- Temperature is measured in the U.S. in:
- Fahrenheit such as 98.6 F
- In Medicine, temperature is measured in Centigrade which we call Celsius, such as 37.0 C

Nurses measure temperature…

- In Celsius
- Normal healthy adult's Core temperature ranges from 36.4 C – 37.3 C
- Remember….

Converting F to C

- $C = \frac{(F-32)}{1.8}$
- 1. Pts temp is 98.6 F
- 2. 98.6 F – 32 = 66.6
- 3. 66.6 divided by 1.8 = 37 F

How is body temperature regulated in the body?

- ***Hypothalamus*** – is a structure within the brain that helps control various metabolic activities

- The hypothalamus acts as a center for temperature regulation
- Hypothalamus = heat

Physics – loss of heat

1. ***Evaporation***- loss of heat due to liquid turning to a gas. (Sweat, Alcohol swab)
2. ***Radiation***- loss of heat to the surrounding air (heat lost from the body to a cold room)
3. ***Conduction***- movement of air across the surface to cause heat to move away from body (when the body is immersed in cold water)
4. ***Convection***- loss of body heat by means of transfer to the surrounding cooler air (wind blowing across exposed skin)

We Increase Body Temp. by…

- Activity = Metabolism
- Shiver
- Vasoconstriction
- Huddle position

Decrease Body Temperature

- Vasodilation
- Sweat
- Decreased Activity=Decreased Metabolism
- Decreased Appetite
- Lungs
- Waste Products

Factors that affect body temperature

- *Food intake* – malnourished have low temps
- *Age* – young and old have no adipose
- *Climate* – colder climate = vasoconstriction
- *Gender* – sl. Higher in women d/t hormones
- *Exercise* – body heat produced from exercise

Factors that affect body temperature

- *Circadian Rhythm* – normal changes in V.S temp is always higher after 4pm
- *Emotions* – anxious pts have hi temps, d/t nervous system
- *Illness* – infection and WBC increase temp
- *Medication* – may change the metabolic rate

Different ways to take temperatures

- Mouth - oral
- Rectum
- Axilla – arm pit
- ear

Oral Temperature

- 3-5 minutes
- Sublingual – under tongue, keep lips closed
- not appropriate for infant, seizures, unconscious or confused pt
- wait 20-30 min after eating, chewing gum, smoking, drinking

Rectal Temperature

- 2 minutes at least
- Insert 1 1/2 inches for adults
- Lubricate
- Maintain control of pt. to prevent injury
- Lay baby on back as if changing diaper, insert and allow some movement
- Side lying position can work also (lateral)

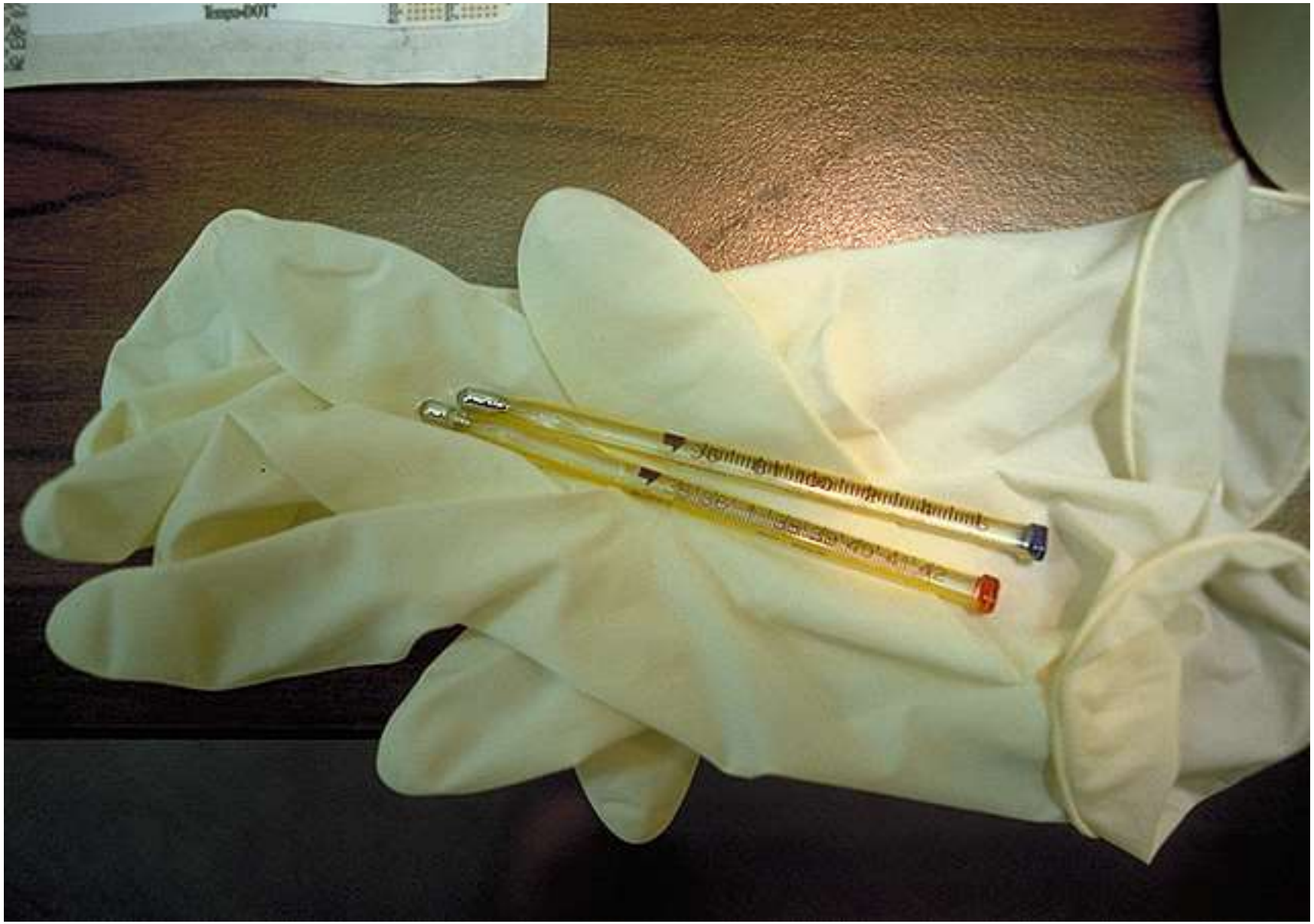
Rectal reading

- Taking temp rectally gives you a core temperature
- Temp. will be sl. higher rectally
- Axilla is least closest to core, can add 1-2 degrees to get more accuracy

- Oral is preferred way is possible

Axillary Temperature

- (Under armpit)
- 7-10 minutes with a mercury thermometer
- Few minutes with a digital type
- Be sure that bulb or tip is in axilla



Red tipped vs. Blue tipped

- Red tipped thermometer IS USED FOR RECTAL---RED---RECTAL---DANGER

- Blue tipped thermometer is for oral

Calibrate a glass thermometer

- You must shake this type of thermometer down in order to get the level of mercury low on the stem

- The stem is the shaft or thin tube of glass where the numbers are
- The end that is silver, goes into the mouth

Digital equipment

- Most hospitals use some form of digital equipment for sanitation of others

- IVAC company provided sheaths to cover the tip so each pt has a clean thermometer


IVAC
97.7


Genuine

Tympanic (Ear) thermometers

- Uses an infrared sensor that detects warmth, cerumen can be a problem for heat detection
- Not as reliable as oral or rectal, are far from the core temp, careful when inserting these
- Another company makes a facial thermometer, rolls from temporal across forehead to temporal, also not reliable

Normal Temperature

- 96.6 - 99.6 F
- 36.4 - 37.3 C
- Avg 98.6 F 37 F

Fever

- A.K.A febrile
- Pyrexia – to be feverish
- body temp that exceeds 37.4 C
- Dr. must be notified

- Afebrile = no fever

- If temperature exceeds 105.8 F or 40.6 C the person is at risk for brain damage or death

- If temperature drops below
- 34 C or 93.2F =death

Signs that accompany fever

- Flushed skin
- Restlessness
- Irritability
- Poor appetite
- Glassy eyes
- Increased perspiration
- Headache
- Elevated pulse and R.R.

disorientation

confusion

seizures

Low temperature related to hypothermia

- Illnesses such as hypothyroidism and starvation cause the core body temp. to be low

- If temperature drops below 93.2 F or 34.0 C, death is likely
- Must use a tympanic thermometer d/t blood flow in mouth, axilla and rectum is so reduced

Symptoms of hypothermia

- Shivering until the body temp is extremely low
- Pale, cool and puffy skin
- Impaired muscle coordination
- Listlessness
- Slow pulse (bradycardia) and slow R.R.
- Diminished ability to feel pain

Antipyretics

- **Aspirin** (ASA)- Lowers temp. Is classified as analgesic, anti-inflammatory, and anti-platelet
- Dose: 325-650 P.O. q 4 hrs
- Side Effects- GI upset, GI Bleeding, Bleeding, tinnitus – ringing in ears
  - Decrease GI effects by taking With food

Antipyretics

- **Tylenol** (acetaminophen)- also an analgesic
  - Dose: 325 – 650mg P.O. q 4 hrs
  - Big Side Effect is LIVER DAMAGE
  - Can be taken every 4-6 hours

Antipyretics

- **Ibuprofen** (Advil, Motrin) is an analgesic, antipyretic
- Dose : 200-600mg q 6 hrs, NOT Q4 hrs

- Causes GI upset/bleeds, take with food

PULSE or Heart rate

- A wavelike sensation that can be palpated or felt in a peripheral artery that is produced by the movement of blood through the aorta and then into smaller arteries during the heart’s contraction

Normal Heart Rate

- 60 – 100 beats per minute for the average adult

- Pts that exercise have lower heart rates due to their vessels are vasodialated and their blood pressure is low

Fast vs. Slow Heartbeat

- **Fast** – TACHYCARDIA or just TACHY, HR is > 100 beats per minute. Beats of greater than 150 mean the heart cannot carry oxygenated blood to feed tissues and organs

- **Slow** – BRADYCARDIA or just BRADY, HR is < 60 beats per minute. Hrt block and increased intracranial pressure cause Hrt block

Arrhythmia

- Irregular heart action which leaves an irregular heart beat

Factors that affect pulse rate

- **Age** – the older you are, the slower your HR will be
- **Gender** – Women have sl. Faster HR than men (probably because we are so busy doing all the work ☺
- **Body build** – tall slender people have slower HR than do short people

Factors that affect pulse rate

- **Exercise** – the heart muscle becomes efficient at supplying blood cells with sufficient oxygenated blood with fewer beats
- **Stress and emotions**- stimulation of the sympathetic nervous system such as fear, anger, and excitement increase the HR. Or if you have pain, HR up

Factors that affect pulse rate

- **Body temp** – for every degree of F elevation, your HR increases 10 beats per minute

- Blood volume – excessive blood loss causes HR to increase to move the smaller volume around. With loss of blood there is decreased oxygenated blood cells, the HR jumps up in an effort to keep cells adequately supplied

-

Factors that affect HR

- **Drugs** – certain drugs slow down or speed up the rate such as caffeine, nicotine, cocaine and adrenaline like epinephrine speed up the heart. Sedatives like valium, slow down the heart rate. Digitalis toxicity causes bradycardia

- Intracranial pressure or heart block can cause bradycardia

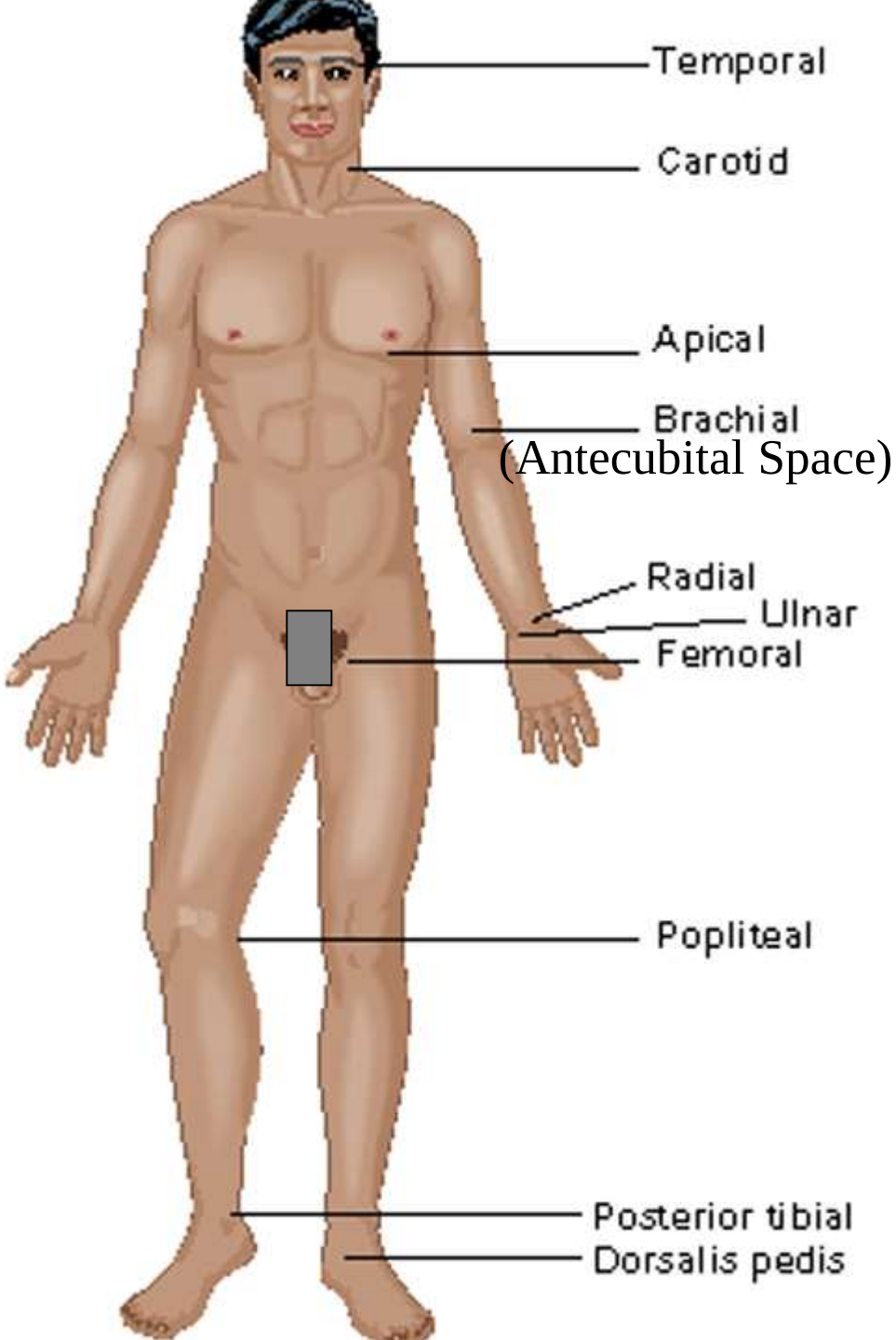
Pulse rates of humans

- Age – newborns have a higher HR than adults
- Newborns: 120-160
- 1-2 year olds : 80-130
- 3-12 year olds: 75-120
- Teens and adults: 60-100
- Know these for life, infant was shocked by mistake

Assessment Sites of the pulse

- The arteries used for pulse assessment lie close to the surface of the skin

- These pulses together are all called ***peripheral pulses*** because they are distant from the heart


Temporal
Carotid
Apical
Brachial
(Antecubital Space)
Radial
Ulnar
Femoral
Popliteal
Posterior tibial
Dorsalis pedis

Most popular pulse site

- The radial artery located on the thumb side of the wrist is the most often used site for a pulse

- YOU CANNOT USE YOUR THUMB TO CHECK ANOTHER PERSON'S PULSE. You will feel you own and you cannot do this. You need to apply your index finger and your middle finger over the pulse on the thumb side

Obtaining Radial Pulse

Adult-
60-100

Infant
120-160

What's wrong here?

Apical Heart Rate

- This is the number of ventricular contractions per minute

Apical heart rate

- Is more accurate than the radial pulse because the sound of a hrt beat is obvious and distinct
- At times, the hrt contraction may not be strong enough to be felt at a peripheral site

- Apical HR is what you will get at clinicals

When is an Apical HR used over a Radial Site Pulse

- When the peripheral pulses are irregular or difficult to feel because of a rapid rate, bounding, or a thready quality, therefore,an apical heart rate is best

How To Perform an Apical Heart Rate Check

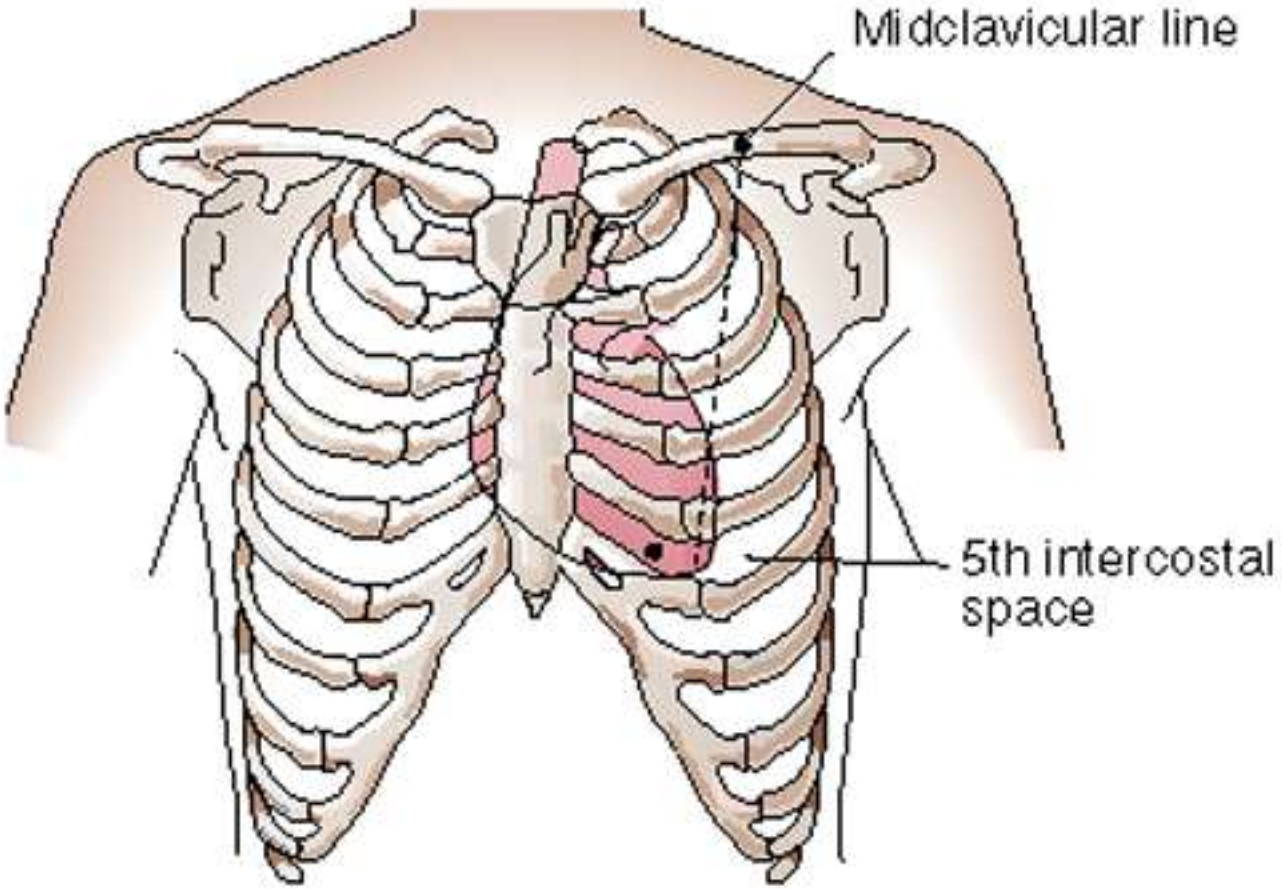
- The rate is counted by listening to the chest with a stethoscope or by feeling the pulsations in the chest (this feeling of the pulsations is known as ***point of maximum impulse***)

- You listen to the heart beat in the chest for 1 full minute (you'll need a watch with a 2nd hand)

What spot on the chest do you listen over?

- Apical = apex of the heart
- This is at the lower tip of the heart and you place your stethoscope slightly below the left nipple in line with the middle of the clavicle (5^{th} intercostal space, mid-clavicular)
- For women, this is directly under the left breast you must lift the breast or slide your stethoscope under the breast

Apical Pulse- count for 1 minute
Is it strong and regular



What To Listen For?

- You will hear a “lub-dub” sound
- This lub-dub sound equals one pulsation at a the apical site, that is 1 beat
- Lub-dub, lub-dub, lub-dub = 3 beats
- If feeling the pulsation on a peripheral site, you will feel one wave and you count each throb separately as 1 hrt beat

To be certain you have it right…

- 2 people can assess the HR together. This is called apical-radial rate

- To do this, one person listens to the heart over the chest with the stethoscope while the other feels the radial pulse. This is done at the same time using 1 watch. The rates should be the same, but at times, they are not. Differences are compared, notify the Dr. if they are significantly different

Pulse Differences

- **Thready pulse** – pulsations are not easily felt and slight pressure causes it to disappear

- **Weak pulse –** pulse is stronger than thready, light pressure causes the pulse to disappear

Pulse Differences

- **Normal pulse** – pulsation is felt easily, moderate pressure causes pulse to disappear, because you put pressure on it

- **Bounding pulse –** pulsation is strong and does not disappear with moderate pressure

Carotid pulse

- Can be felt in the lateral neck area
- Be sure not to press in on this area to hard, pt can pass out from the pressure and the decrease in blood flow to the brain
- Many athletes check this site during exercise, count pulse for 1 minute

Dorsalis Pedis

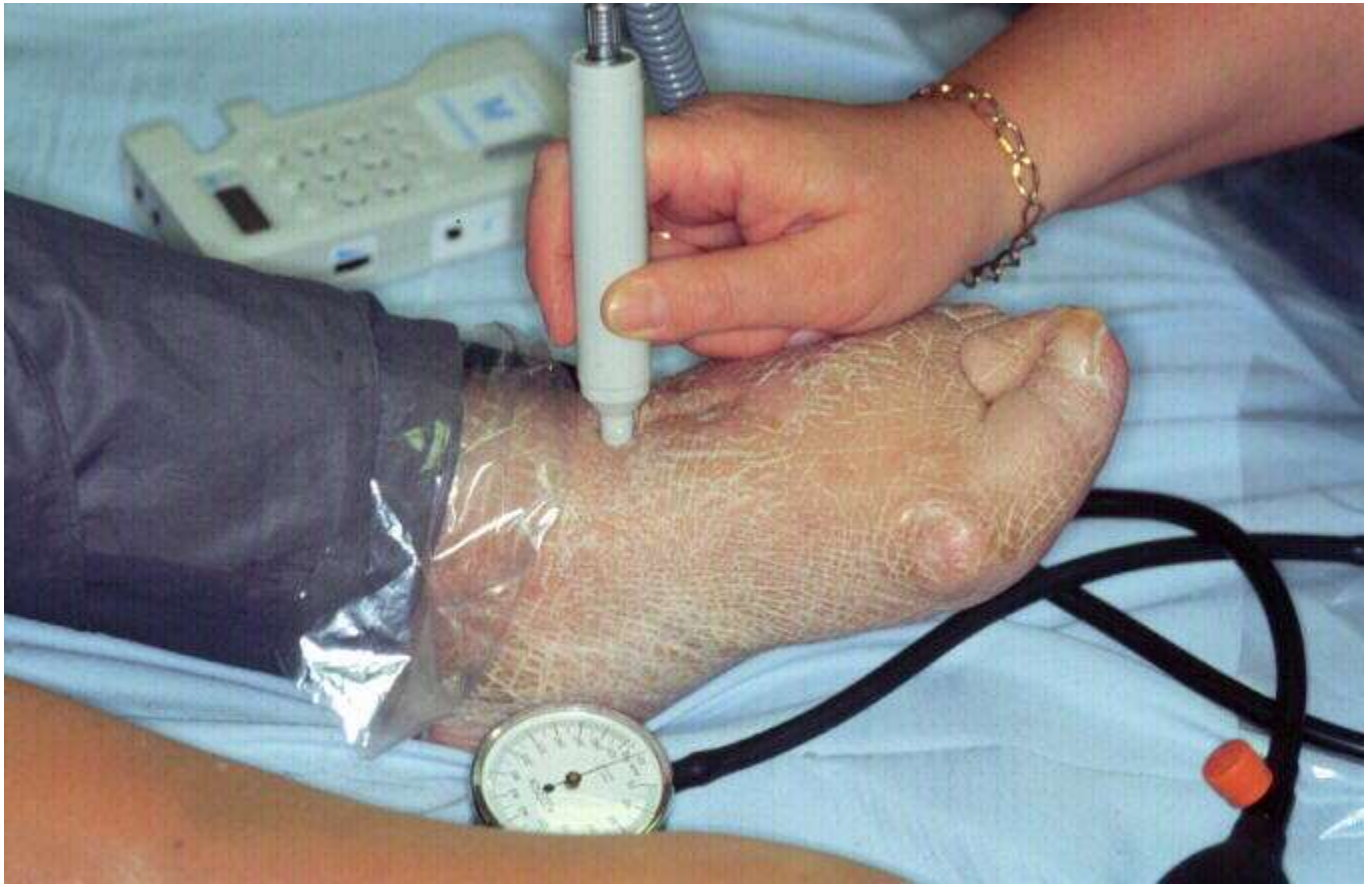
- Another peripheral spot for pulse checks
- This is the most distant pulse from the heart, indicates how blood flow to periphery is
- Periphery is the peripheral or surrounding vessels away from the heart, these need to get blood flow
- Once you find this pulse, you can mark it with a pen for future use

Doppler ultrasound device

- Is an electronic instrument that detects movement of blood through peripheral blood vessels and converts the movement to sound.
- Used after vascular surgery or if a blood clot is questionable
- This device uses clear conductive jelly to aid in sound mechanism
- Record all findings in Nursing notes


VASCULAR & OBSTETRICAL
DOPPLER
CAUTION
Aquasonic
100
ULTRASOUND
TRANSMISSION GEL
PARKER

Doppler Pedal Pulse



Digoxin(Lanoxin)

- Classifications
  - Cardiotonic
- Actions- strengthens contractions and slows the rate
- Side effects-Bradycardia, anorexia, yellow green halos(visual disturbance), confusion
- **Must take apical pulse for one minute**

Respiratory Rate

- Is the exchange of oxygen and carbon dioxide
- Respiration should be automatic, noiseless, effortless…not for some people

- Ventilation – movement of air in and out of the chest, it involves breathing in (inhalation) and breathing out (exhalation)

What controls your breathing?

- The medulla in the brain is the respiratory center

- It is sensitive to carbon dioxide in the blood and adapts the rate of ventilations accordingly

Respiratory Rate

- Is the number of ventilations per minute

- Normal R.R. in adults is 12-20
- As heart beat changes, R.R. changes

- Infants and children have faster R.R. as do they have faster H.R.

How to get a respiratory rate

- The nurse can do this 2 ways:
- Lay the stethoscope over the chest and simply listen for inspiration and expiration…this counts as 1 breath
- Or
- The nurse can simply count the respirations over the pt's chest and count them for 1 minute

- Nurses can count Respirations for 30 seconds by using their watch and double that number to equal respirations/minute

FAST vs. SLOW respirations

- **Tachypnea** – rapid R.R. usually related to increased temperature or disease process

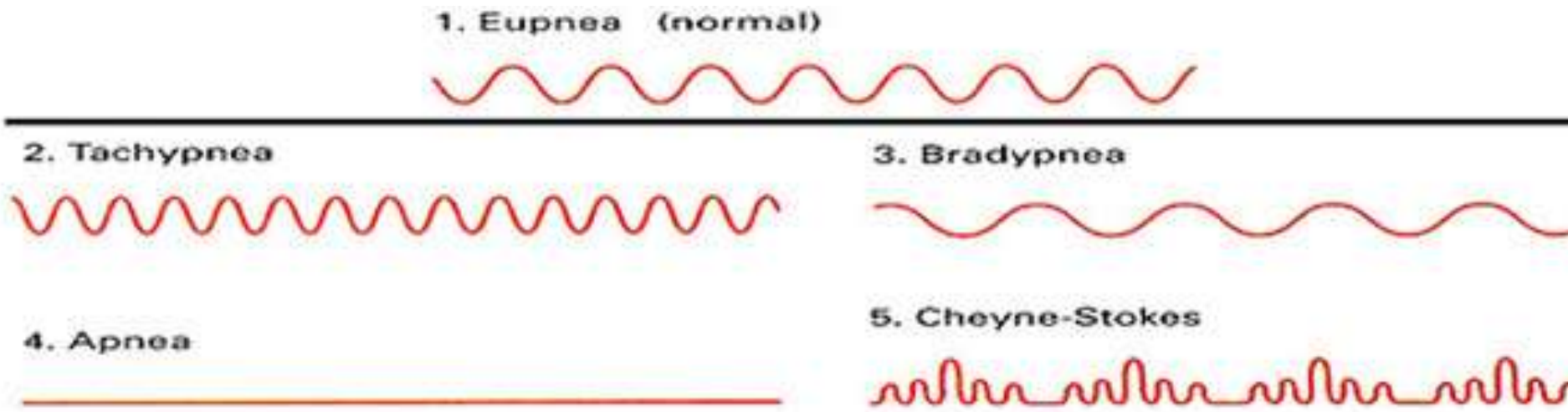
- **Bradypnea** – slower than noraml R.R. can result from narcotics, neurological disorders or hypothermia

Cheyne-stokes respiration

- Where the depth of respirations gradually increases, followed by patterns of gradual decrease, and then periods when breathing stops briefly, before resuming again.

- This is seen before death occurs

Respiratory patterns



- **Hyperventilation** – rapid or deep breathing or both

- **Hypoventilation** – diminished breathing

Dyspnea

- Difficult or labored breathing
- Usually starts out with rapid breathing as pts try to improve their breathing

- These pts appear worried and anxious, have flaring nostrils as they fight to fill the lungs with air, they work hard and even use neck muscles to help get that O2 in

Problems with dyspnea

- If a pt works too hard to breathe, they will tire out and become starving for air, they will flail around in bed, try to sit up and this can lead seizures due to hypoxia

- **Hypoxia** – an O2 deficiency which =
- **Hypercapnea-** too much carbon dioxide in the blood

Orthopenia

- Breathing facilitated by sitting up or standing, occurs with pts who have dyspnea and find it easier to breath this way

- The abdominal cavity moves down leaving more room for the lungs to expand, allowing the person to take in more air

APNEA

- Absence of breathing.
- This is life threatening if it lasts more than 4-6 minutes, causes brain damage
- This is what infants do, they must wear a sleep apnea monitor. Snoring also causes sleep apnea. If airway closes during sleep=snoring=sleep apnea
- Pts receiving narcotics are at risk

Cumulative effects of sleep apnea

- Loss of O2 to tissue, brain and organs such as the heart causes heart damage over time

- M.I. Can occur from weakened heart muscle and lack of O2…this is not reversible

Stridor

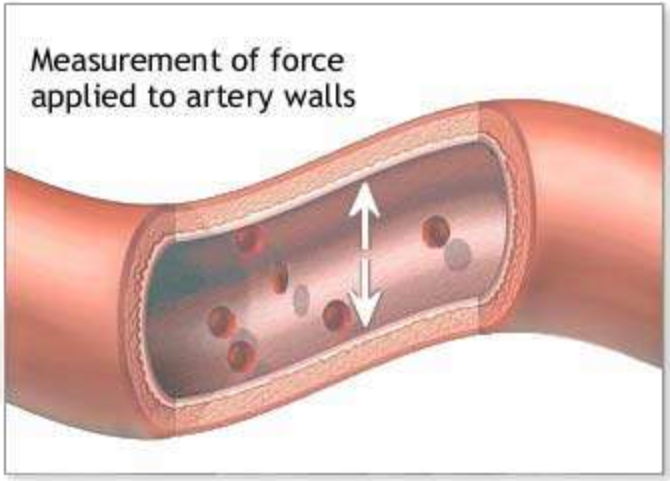
- Is harsh high-pitched sound heard on inspiration when there is laryngeal obstruction

- Children with croup have this – croup is caused commonly by a virus and can be caused by bacteria.
- Swelling around the vocal cords makes it difficult to breathe and causes a “barking” sound

BLOOD PRESSURE

- Is the force that the blood produces within the artery walls

- Blood pressure is related to the health of your heart
- Contractility of the heart is influenced by the stretch of the cardiac muscle fibers, damaged heart muscle will not contract well



How is blood pressure measured

- Systolic
- Diastolic

- Systolic over diastolic

- Think of Sit Down

- Systolic is the maximum pressure within the arterial system when the heart contracts A.K.A systole. This number is higher than the diastolic

- Diastolic is pressure within the arterial system when the heart relaxes and fills A.K.A diastole

Normal Blood Pressure

- Normal adults:

- 120/80

When to worry?

- Concerning BP is 140’s/90’s (eyebrows go up)
- High B.P. is considered to be 150’s/90’s
- This type of pressure should be treated

Remember…

- The bottom number or the diastolic is when the heart is at rest, this number should be low…..< 80

- If the bottom number is high, how much rest is your heart getting between pumps?

How do we measure blood pressure

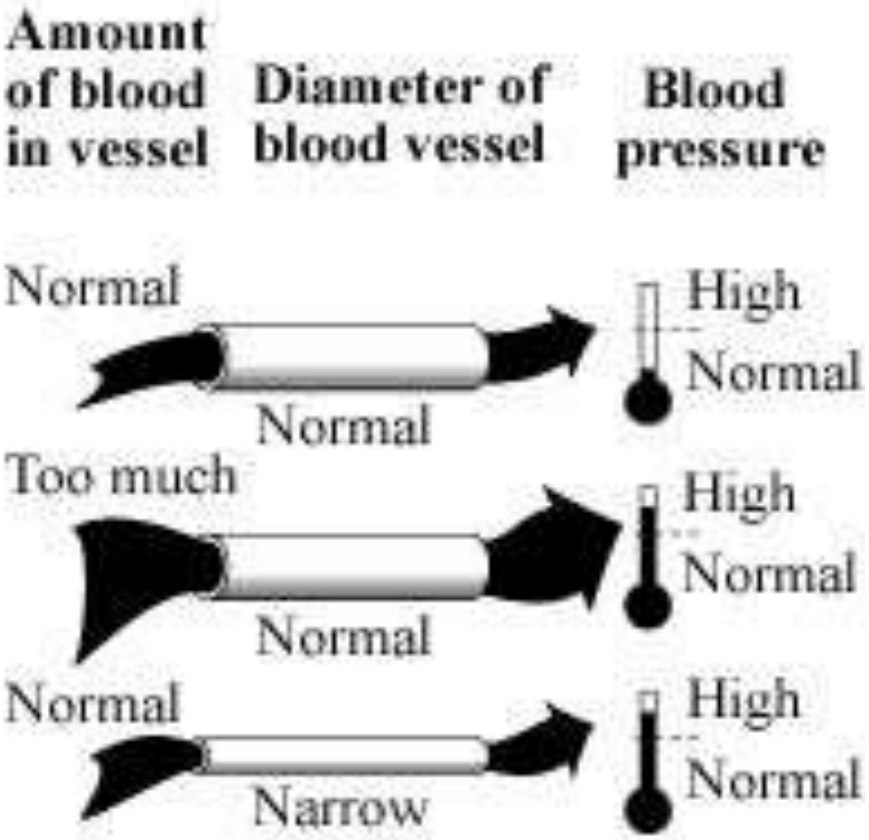
- With a sphygmomanometer
- This is the instrument to measure B.P. using a graduated column of mercury
- BP is measured in mm of mercury or
- mm Hg

What the hospitals use…

- Some hospitals use rolling B.P. machines that are digital – “Robo-nurse”

- Some facilities use manual B.P. machines, you must bring your own stethoscope when using this “old fashioned” type

- If you attempt to use a digital machine and the reading comes out to high or to low, the Dr. may order you to re-check B.P. using a manual cuff


Amount of blood in vessel
Diameter of blood vessel
Blood pressure
Normal
Normal
High
Normal
Too much
Normal
High
Normal
Normal
Narrow
High
Normal

Does size matter?

- Yes it does…
- You must appropriately fit the cuff to your pt's arm

- The width of the cuff (the shorter distance) should cover 75% of the mid-arm circumference. The cuff should cover the pt's arm 80% like a sleeve on a shirt (from shoulder to inner elbow)

Big vs. Small

- If a cuff is too big for the pt pressure= low
- If cuff is too small for the pt pressure = high
- This is an inaccurate way to take B.P.

Where do you place the blood pressure cuff

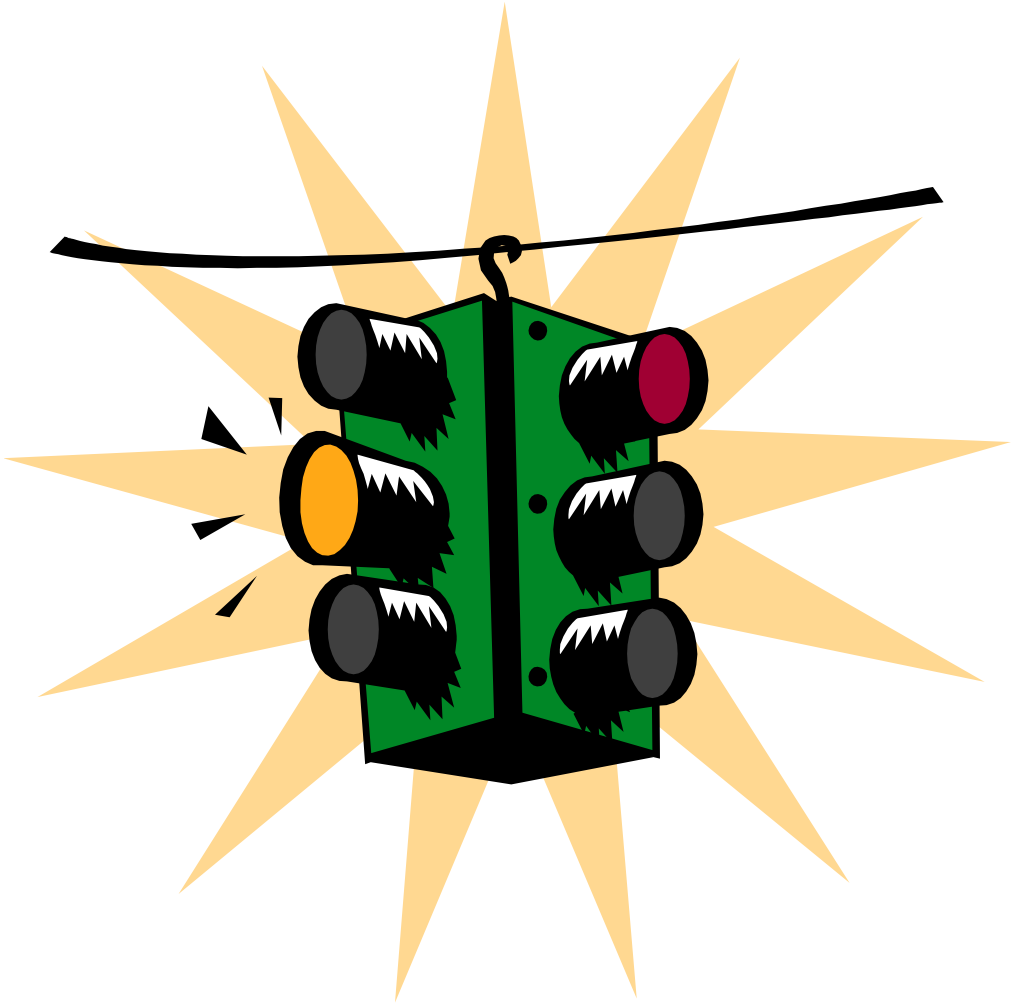
- The usual place is over the inner aspect of the elbow (in the crease of the arm, where blood is drawn)

- This is over the brachial artery

Other places to obtain B.P.

- 1. Around the lateral portion of the ankle
- 2. Around the back of the lower thigh behind the knee (popliteal artery)
- 3. You must document where the site was so that others are aware. B.P. can be different in different places

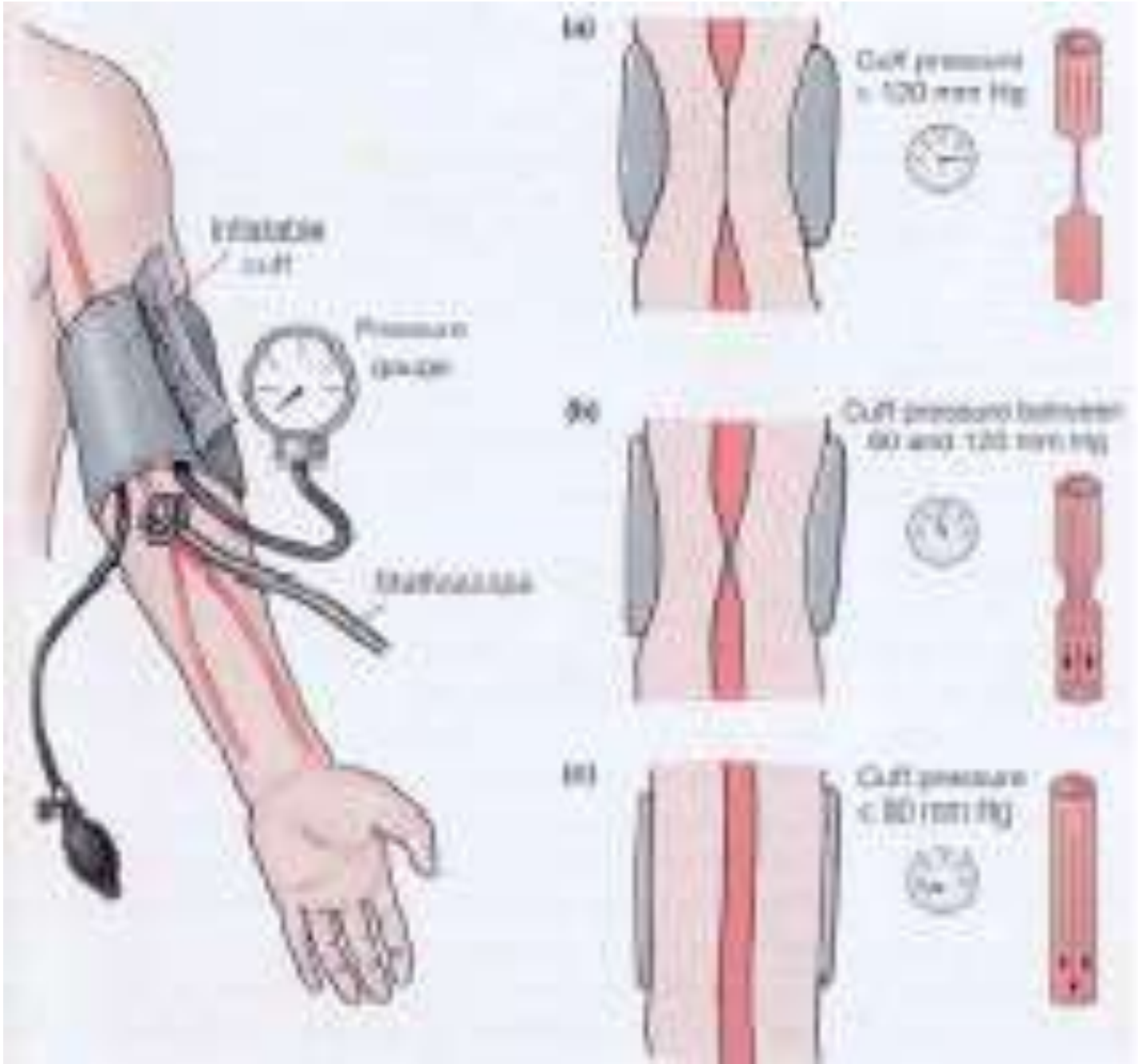
CAUTION



- Never apply a B.P. cuff to a pt's arm when the pt has a fistula for dialysis in his arm

- There should be a sign at the H.O.B. telling you NOT to use pt's arm
- Also, pts who will get a PICC line need antecube space…do not use their brachial artery

AV Fistula



Obtaining Blood Pressure

Systoltic-
90-140

Diastoltic
60-80

120/80
good

Orthostatic BP

- Is a measurement of BP to determine if the pt is hypovolemic or dehydrated

- If the HR and BP change by 20 points during each position change, it is believed that the pt is dehydrated
- Anorexic pts have this problem upon arrival to the inpatient setting

Orthostatic B.P.

- This requires the pt to lay flat for 3 minutes then B.P. is obtained
- Sit for 3 minutes, then BP is obtained
- Stand for 3 minutes, then BP is obtained

Obtaining a BP without the use of the BP cuff

- At times, pts have very weak Korotkoff sounds that cannot be picked up with the stethoscope. You can check systolic another way

- Use of a doppler as your ears
- Palpating the pressure…

- Place the BP cuff on the pt and pump it up
- Position the nurses fingers over the brachial artery while releasing the cuff pressure
- The point at which the nurse feels the 1st pulsation is the systolic pressure
- The diastolic cannot be measured
- When recording, state that you performed BP in this manner

Korotkoff Sounds

- These are the sounds that result from the vibrations of blood within the arterial wall or changes in blood flow

- These are the sounds you hear when you pump up the BP cuff and release it, this becomes your blood pressure reading

5 phases to korotkoffs sounds

- 1. When you pump up the cuff, and release it, there is brief silence, there begins a faint tapping sound, this is the peak pressure in the arterial system during heart contraction. It is measured as the systolic sound

5 phases to korotkoffs sounds

- 2. Characterized by a change in sound from tapping to swishing
- At this time, the diameter of the artery is widening allowing more arterial blood to flow

5 phases to korotkoffs sounds

- 3. Describes crisp knocking sounds
- During this phase, blood flow is relatively free through the artery

5 phases to korotkoffs sounds

- 4. Sounds are muffled and have a blowing sound
- The sound is getting more faint

5 phases to korotkoffs sounds

- 5. The point at which the last sound is heard

- In adults, we use the 1st step and the 5th step to obtain a BP reading

What factors effect B.P.

- Age – BP rises with atherosclerosis, where arteries become narrowed d/t plaque or fat
- Gender – women have lower BP than men
- Exercise – vessels open up to feed the body more O2 while working out, this keeps the heart muscle healthy

What factors effect B.P

- *Emotions and Pain* – central nervous system gets irritated, BP goes up
- A person had lower BP when laying on Left side, helps heart flow better
- People who cross their legs have high BP d/t constriction of vessels in lower extremity
- *Drugs* that stimulate heart, effect BP, they constrict the arteries like nicotine, caffeine and cocaine
- *Full bladder* – BP is higher when bladder is full

Can cause your

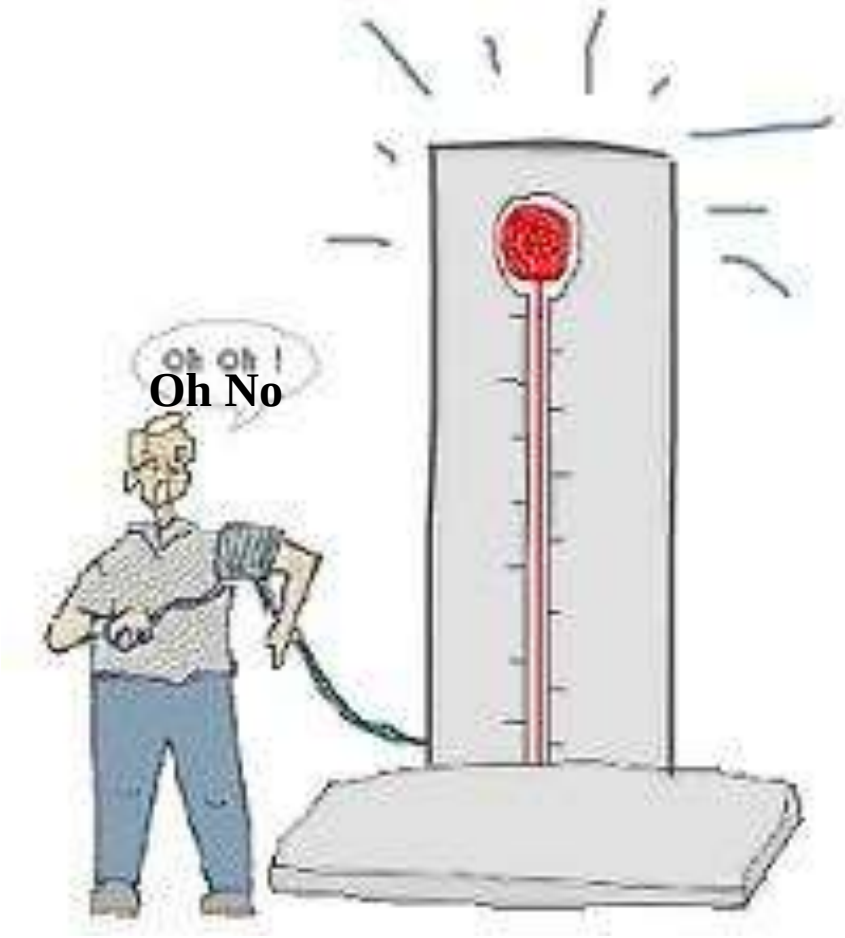
blood pressure to rise

Finding the right parking spot can affect one's blood pressure too!

Fire Hydrant - No Parking! We Mean It!

[redacted]

Hypertension – high BP



Normal BP

- Some Drs. Use 120/80 as normal

- Some Drs use
- 140/90 as high or 150/90 is treatable with meds

- This number varies from Dr. to Dr.

Conditions associated with HTN

- Anxiety
- Obesity
- Vascular disease
- Stroke
- Heart failure
- Kidney disease

Hypotension – low BP

- Is actually good
- Can be caused by too much BP control medication
- Athletes run low
- These pts need to continue to watch their BP even though it’s low, may indicate shock, hemorrhage or medication side effects

Postural or hypotension

- Sudden but temporary drop in BP when rising from a reclining position
- Common in pts with circulatory problems, those who are dehydrated or those who take water pills causing low pressure

- These pts may have dizziness or fainting

Shock

- If a pt gets a bacteria in their body that travels through the bloodstream, your body doesn't like this, this is called sepsis
- Your HR can increase and your BP lowers d/t your vessels opening wide up
- These pts need immediate fluids to give them pressure back and they need antibiotics

Heart Failure

- Your heart is a muscle, it pumps blood filled with O2 and nutrients all around your body. What happens when this pump breaks?
- No nutrients get around, no O2 gets around, organs, cells and tissue starve, you have a back up of fluid, BP is low…too much fluid = too much water, slowing of all organs = congestion of vascular system

74 y.o. male 3 day post-prostatectomy:

- 7 AM
- T: 39.6C p.o. / P:84 / R:16 / BP: 136/86

- 11 AM
- T: 40.8 p.o. / P:104 / R:26 / BP:134/82

Infant whose umbilical hernia will be repaired the following day:

- 11AM
- T: 36.8Ax / P:104 / R:28 / BP: N/A

- 3 PM
- T:39.9Ax / P:106 / R:28 / BP: NA

32YO female immediate postop hysterectomy:

- 1 PM
- T:36.9 / P:84 / R:16 / BP: 124/76

- 5 PM T: 36.1 / HR:24 / R:22 / BP 88/54
- What's wrong with her, what does she need

Recording your data

- ***Must*** use your facilities paperwork
- If you don't write it down, it wasn't done
- Some conditions require VS to be taken Q15 mins…WRITE THEM ALL DOWN such as giving blood transfusion, post-operative pts, septic pts,

Why do you have to record VS

- VS assessment is part of every pt's care
- VS can indicate future problems like dehydration, reaction to blood products
- You must act on abnormal VS, they are a true sign that needs to be followed up on
- Tell the RN or the Dr.

When to not obtain VS

- The Dr. has the ultimate say
- The RN is next in line
- LPN is 3rd… use common sense and follow policy of institution
- NEVER FAKE V.S. = TERMINATION from your facility (LPN CHRIS)
- Make Nursing assistants be accountable for their role on the nursing floor