Blood Pressure Monitoring

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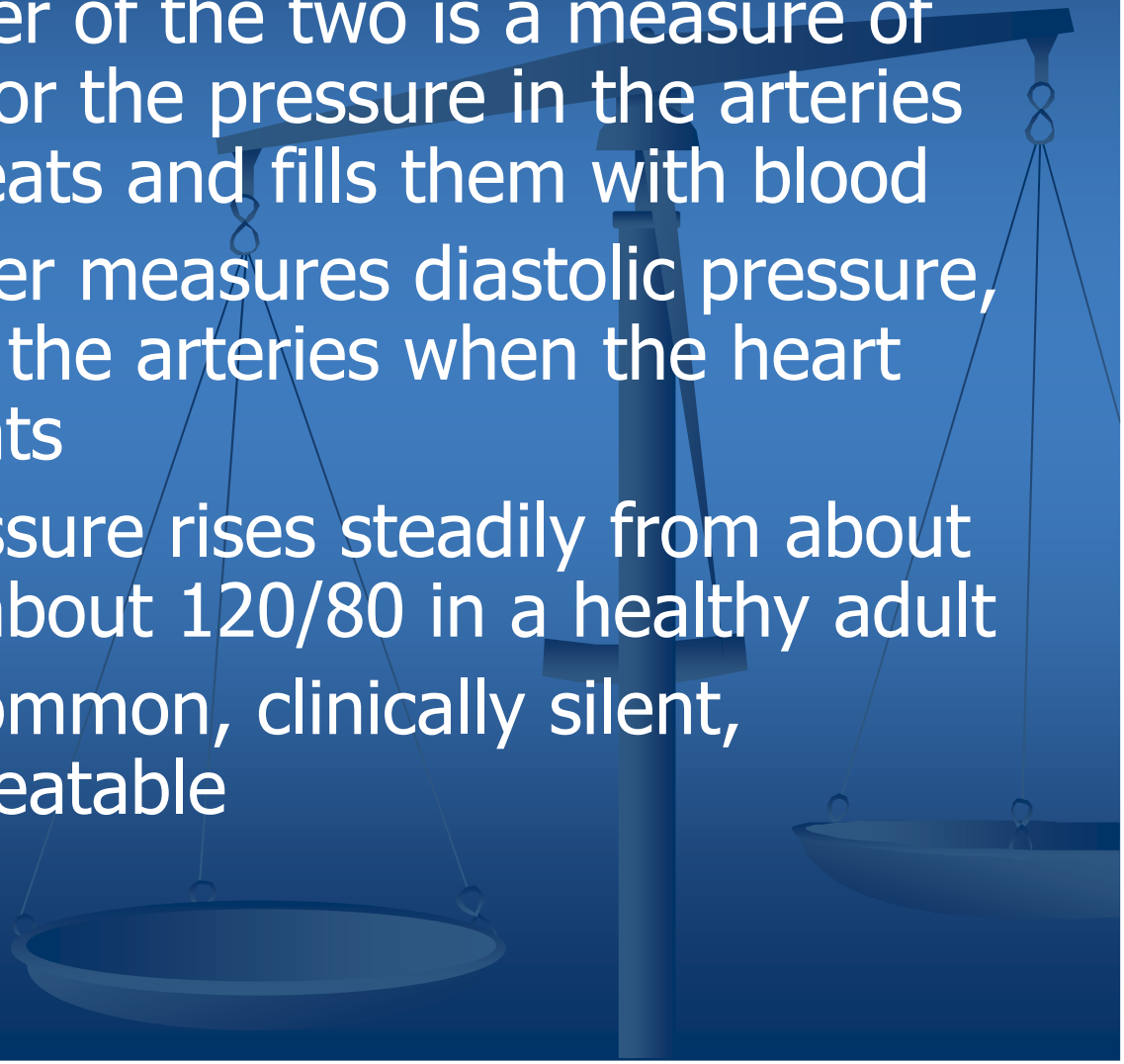
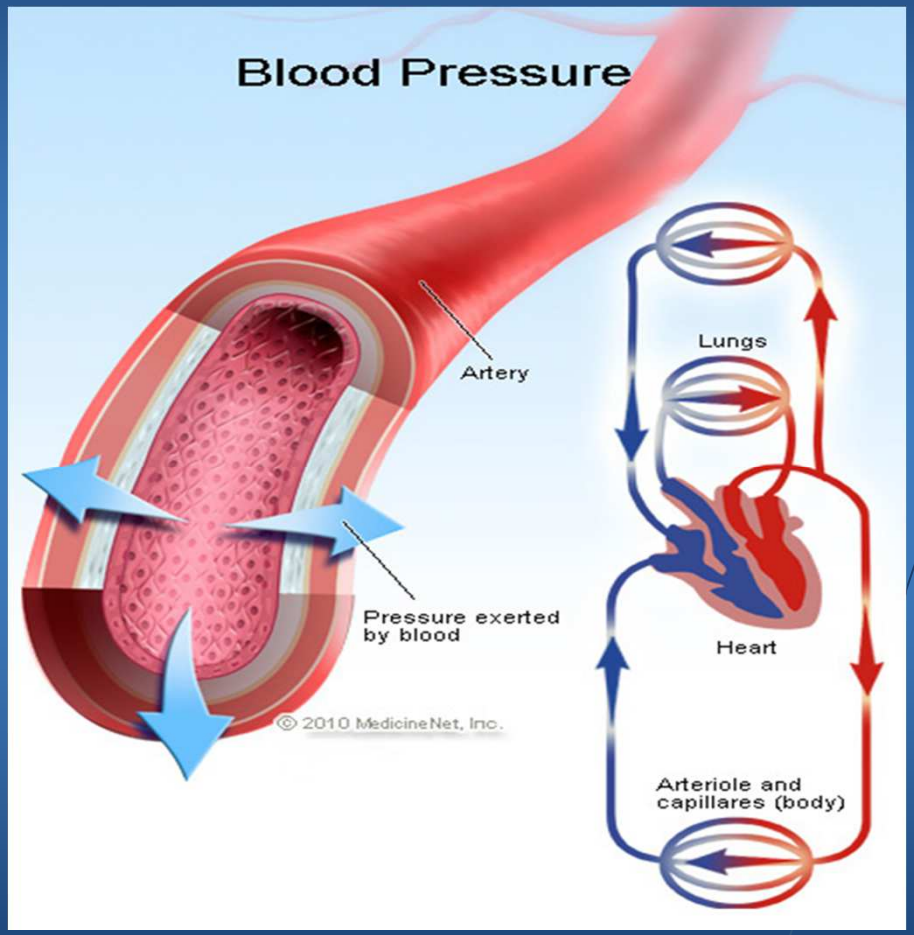
February 21, 2013

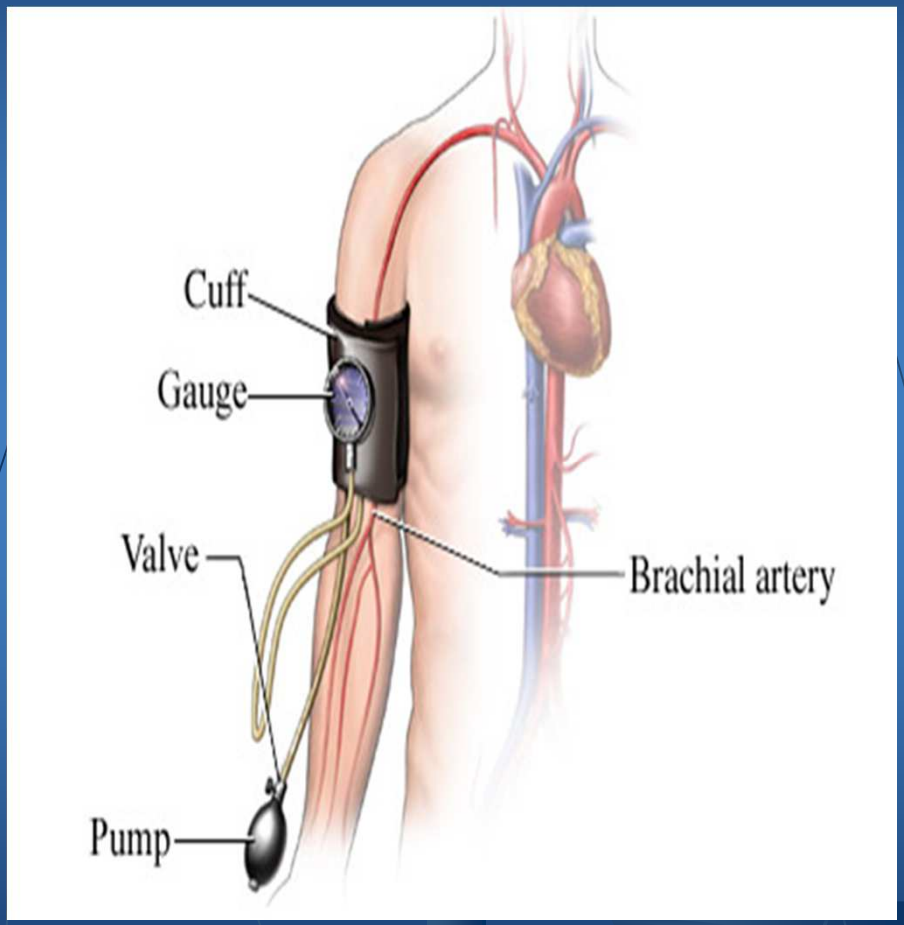
What is Blood Pressure

- The first and higher of the two is a measure of systolic pressure, or the pressure in the arteries when the heart beats and fills them with blood
- The second number measures diastolic pressure, or the pressure in the arteries when the heart rests between beats
- Normal blood pressure rises steadily from about 90/60 at birth to about 120/80 in a healthy adult
- Hypertension is common, clinically silent, dangerous, and treatable



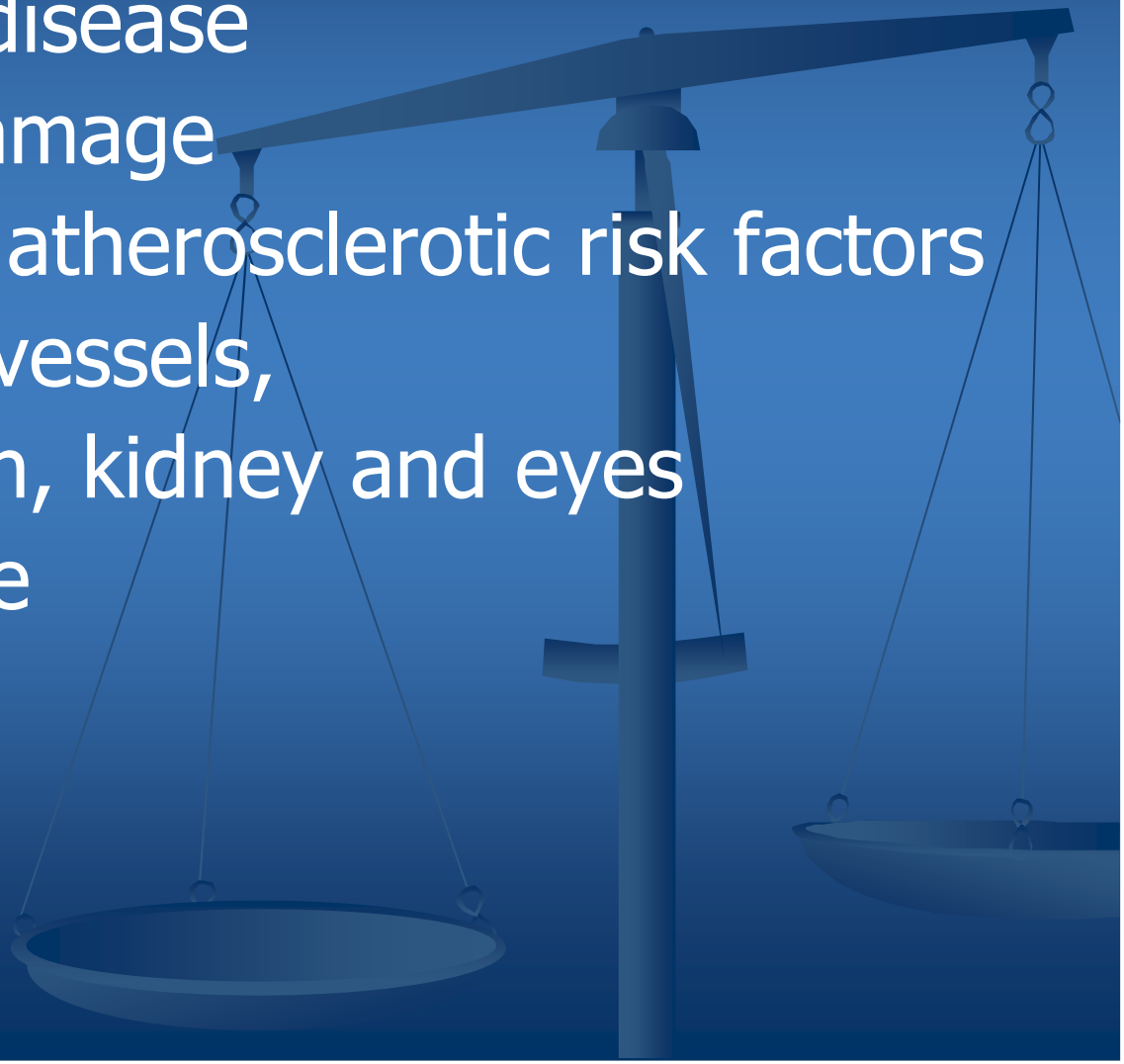
Arterial Blood Flow





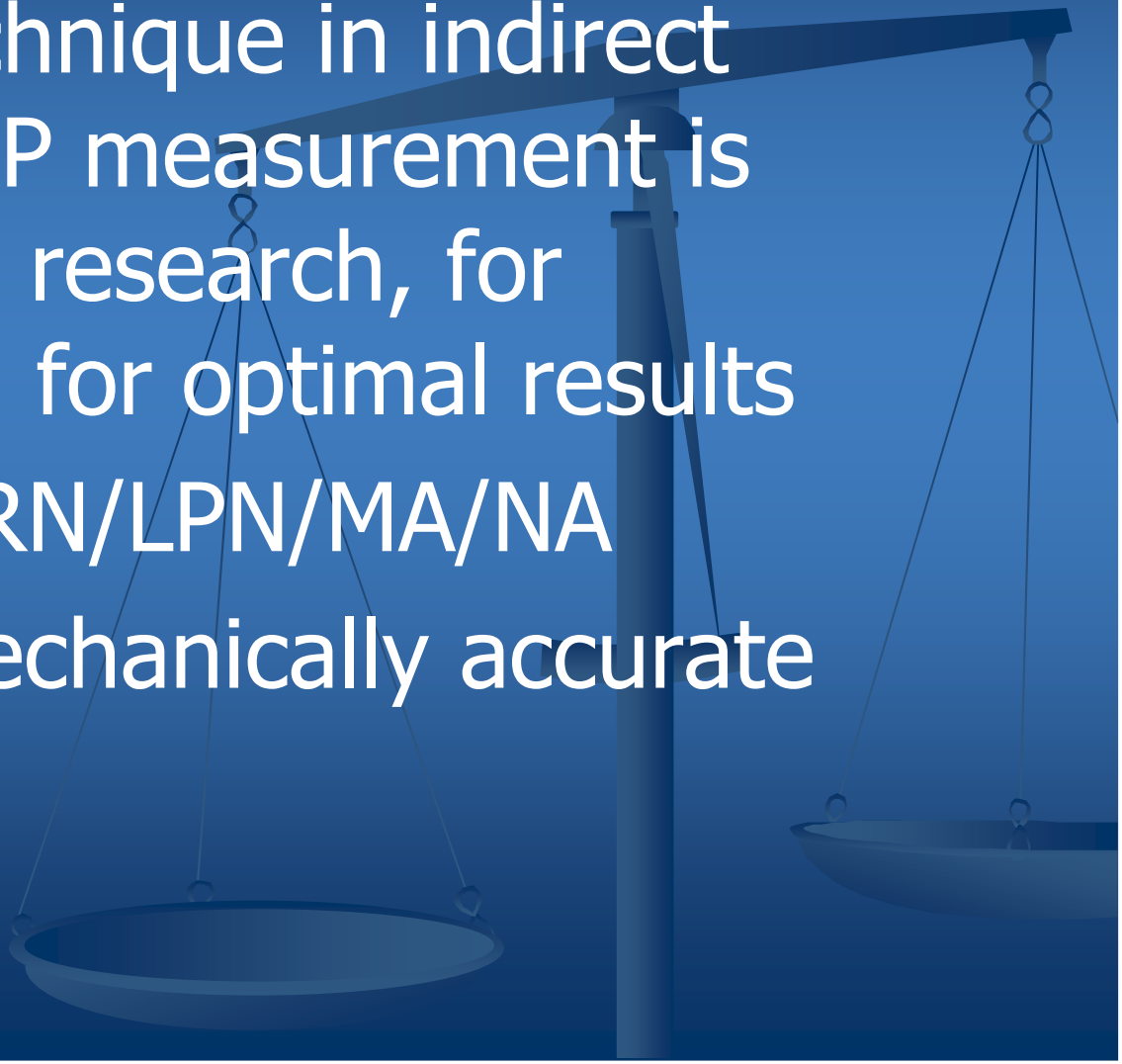
Risks of Hypertension

- Cardiovascular disease
- Target organ damage
- Increase risk of atherosclerotic risk factors
- Injury to blood vessels,
- Damage to brain, kidney and eyes
- Vascular Disease
- Heart Failure
- Stroke



Diagnosis

- Meticulous technique in indirect auscultatory BP measurement is mandatory for research, for diagnosis, and for optimal results
- Physician vs. RN/LPN/MA/NA
- Proper and mechanically accurate equipment

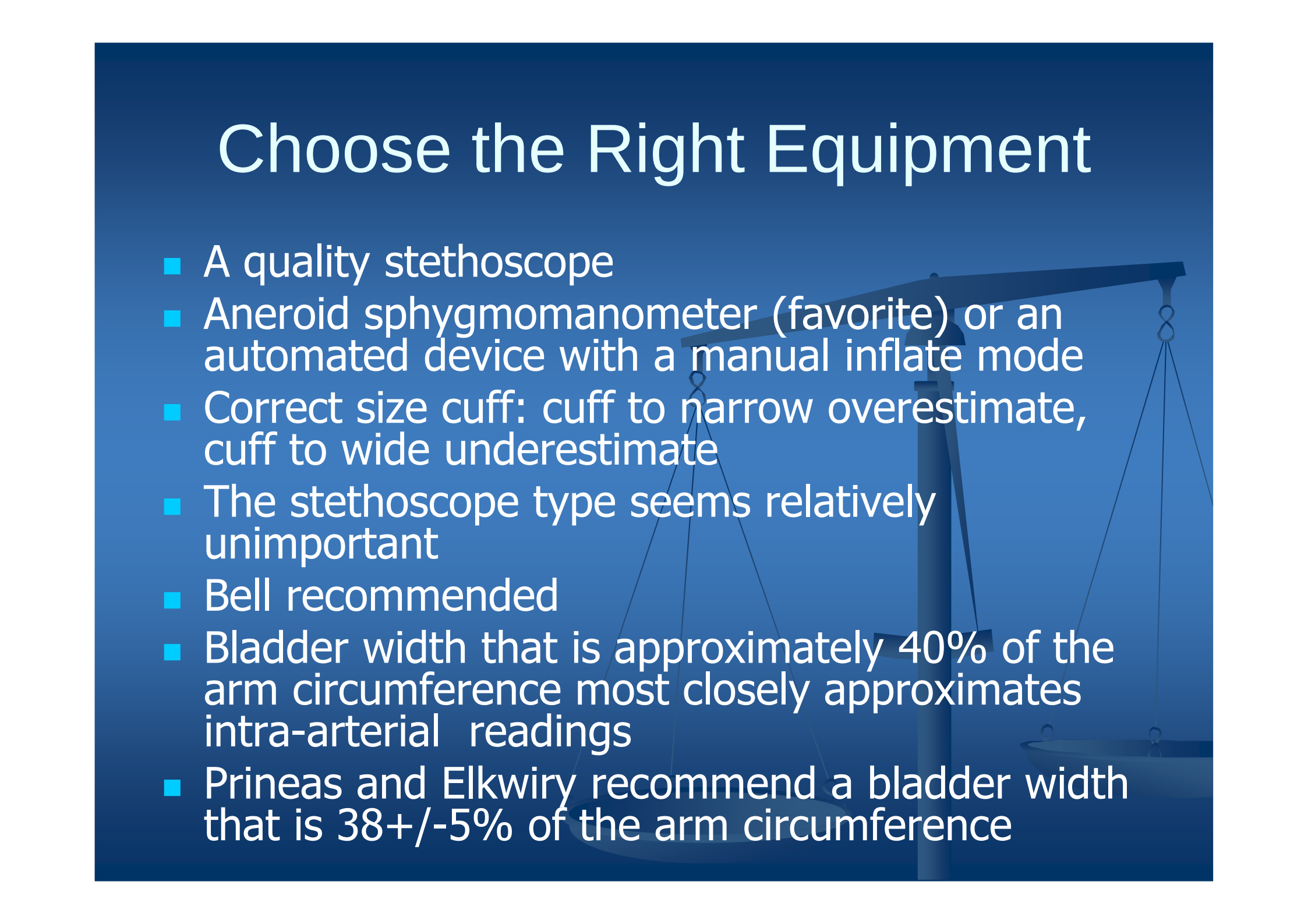


Patient Care Team

- Medical Assistant
- Nursing Assistant
- RN/LPN
- Physician
- Patient

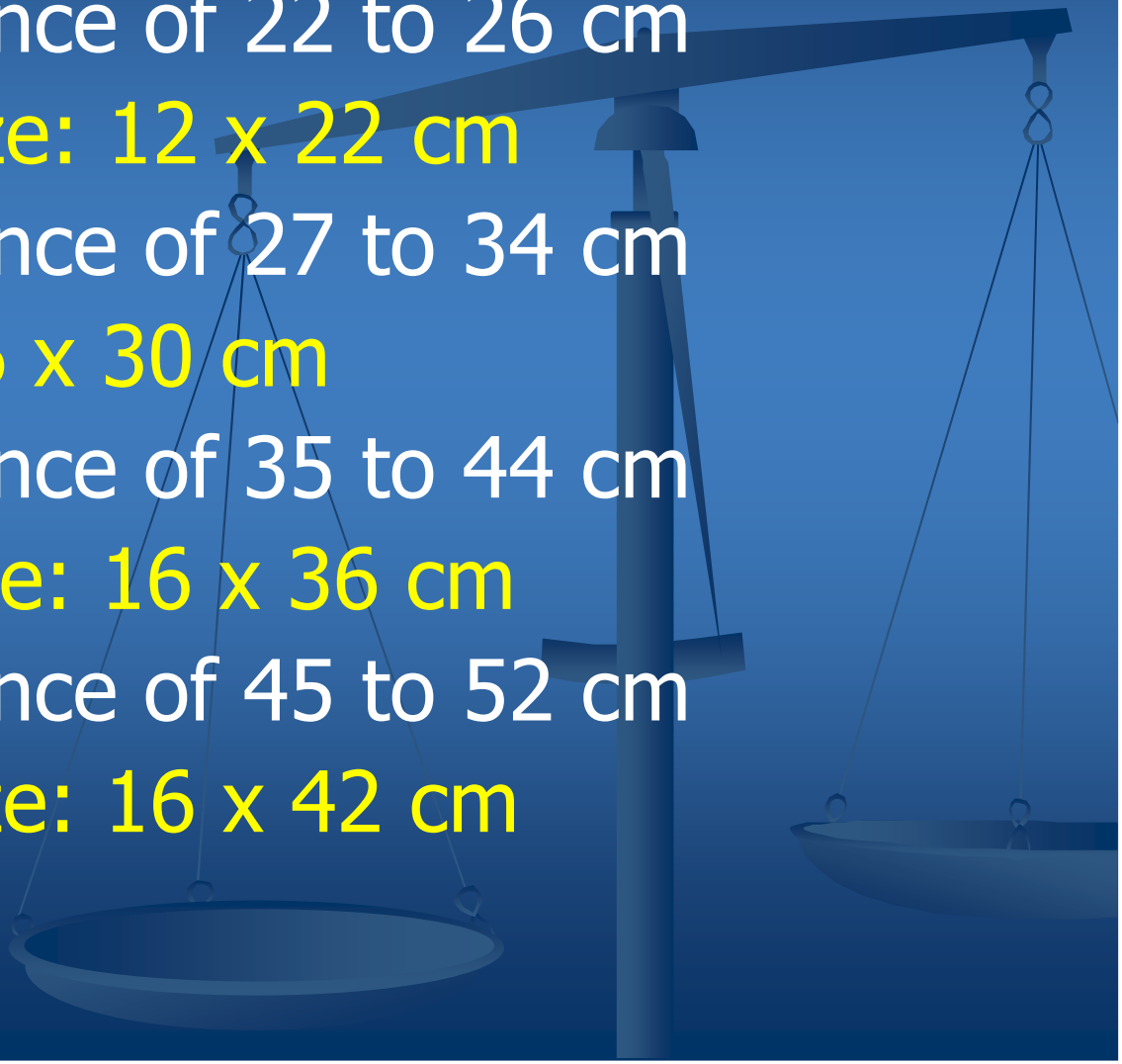
Choose the Right Equipment

- A quality stethoscope
- Aneroid sphygmomanometer (favorite) or an automated device with a manual inflate mode
- Correct size cuff: cuff to narrow overestimate, cuff to wide underestimate
- The stethoscope type seems relatively unimportant
- Bell recommended
- Bladder width that is approximately 40% of the arm circumference most closely approximates intra-arterial readings
- Prineas and Elkwiry recommend a bladder width that is 38+/-5% of the arm circumference



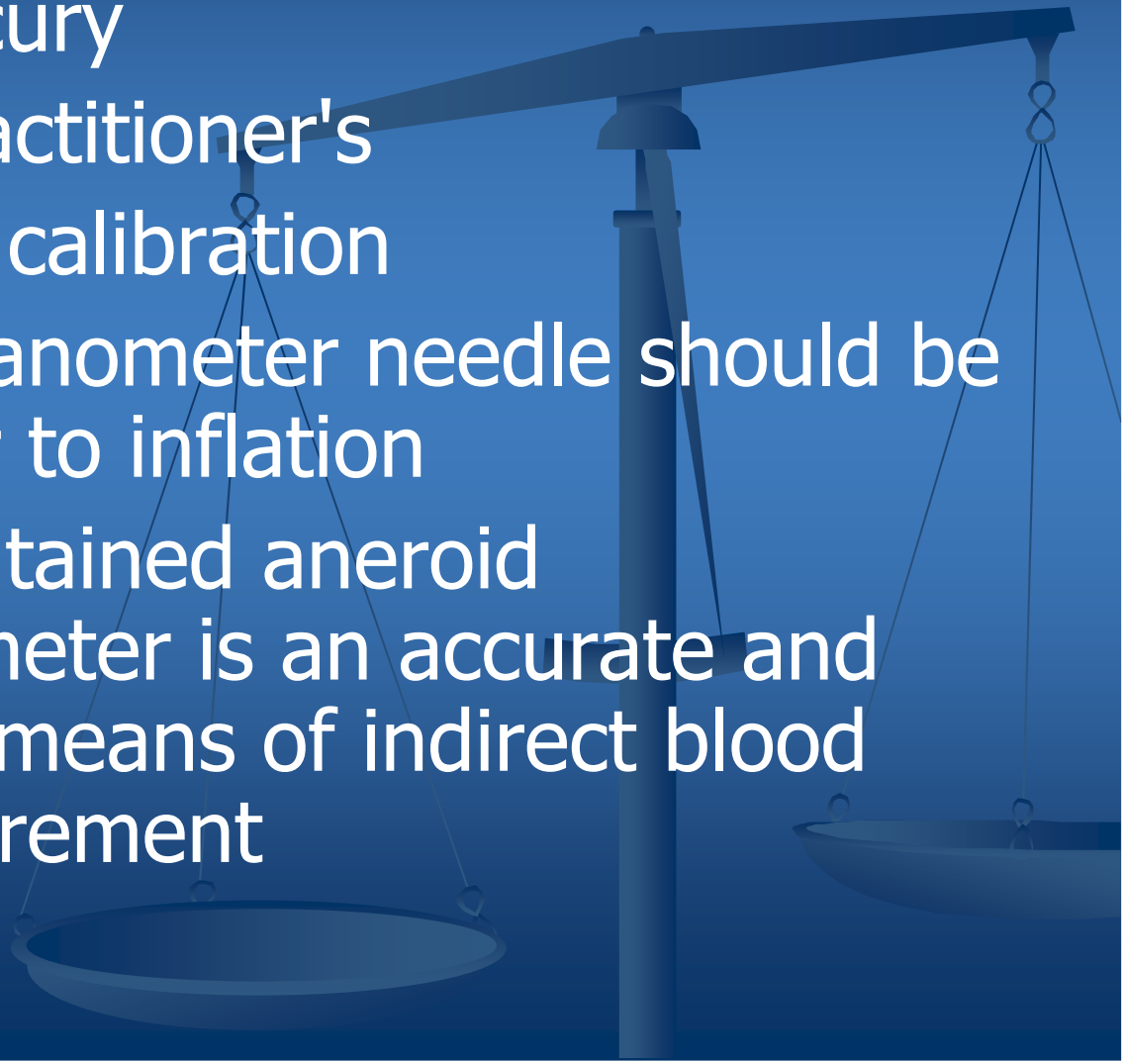
Cuff Size

- Arm Circumference of 22 to 26 cm
  "adult small" size: 12 x 22 cm
- Arm Circumference of 27 to 34 cm
  "adult" size: 16 x 30 cm
- Arm Circumference of 35 to 44 cm
  "large adult" size: 16 x 36 cm
- Arm Circumference of 45 to 52 cm
  "adult thigh" size: 16 x 42 cm



Mechanical Aneroid Sphygmomanometers

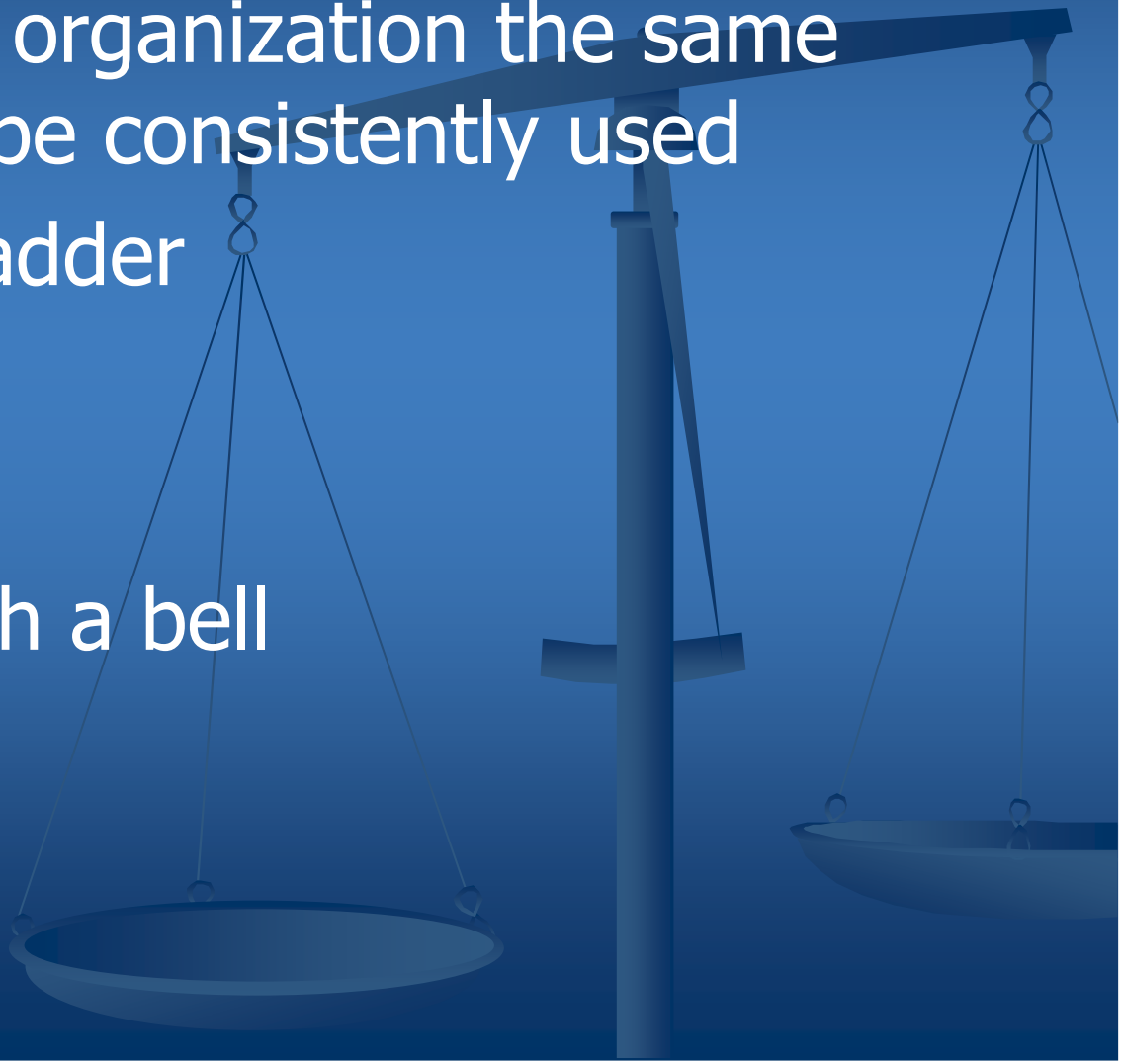
- Safer than mercury
- Preferred by practitioner's
- Require regular calibration
- The sphygmomanometer needle should be set to zero prior to inflation
- A carefully maintained aneroid sphygmomanometer is an accurate and clinically useful means of indirect blood pressure measurement



Aneroid Sphygmomanometers

Consistency in Product Usage

- Throughout the organization the same product should be consistently used
- Type of cuff, bladder
- Type of bladder
- Type of tubing
- Stethoscope with a bell

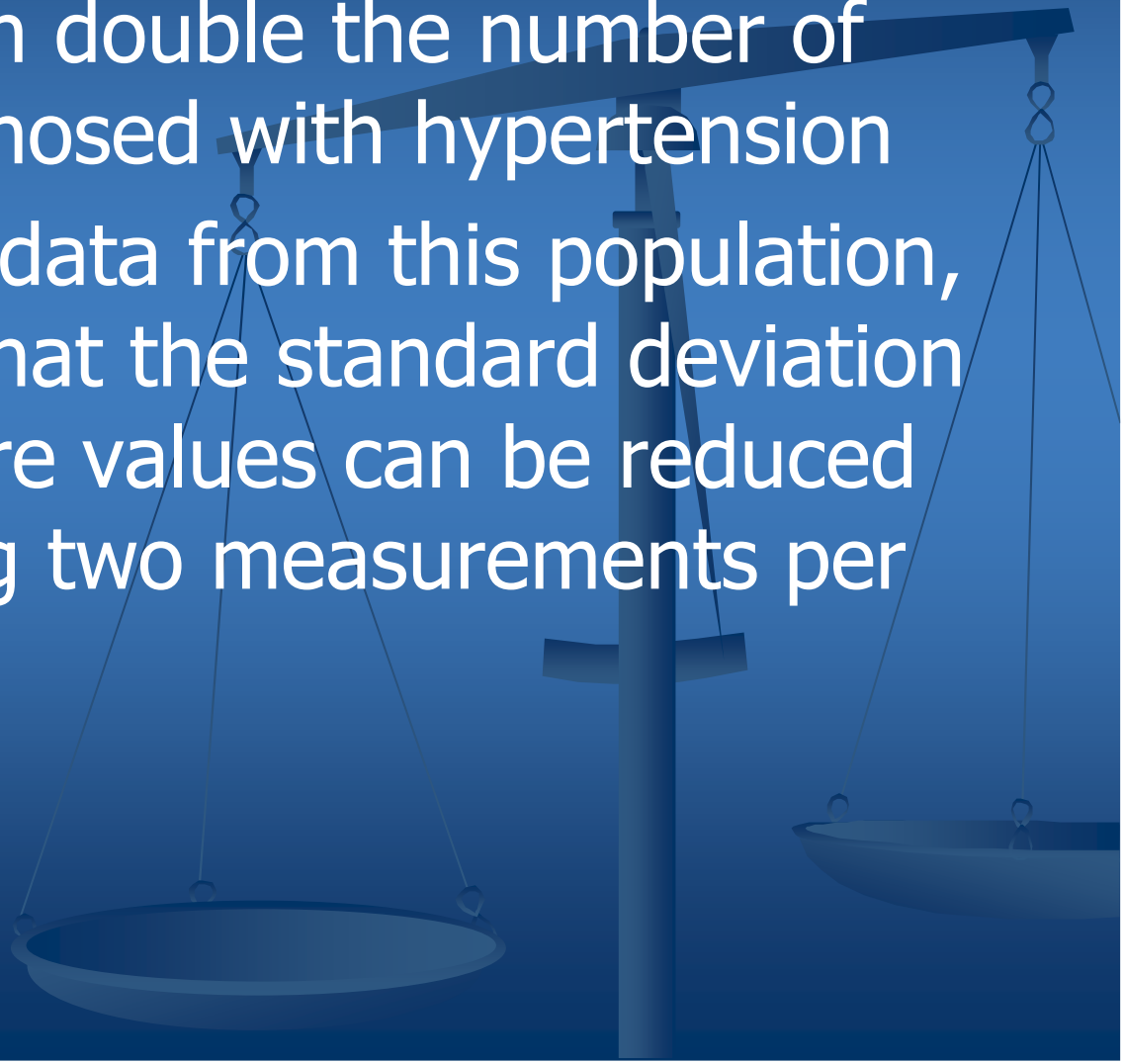


Office BP vs. Usual BP

- Physician's Office
- Workday
- Evening
- Sleep

Clinical Distortion of Blood Pressure reading by > 5 MM

- Could more than double the number of individuals diagnosed with hypertension
- On the basis of data from this population, it is estimated that the standard deviation of blood pressure values can be reduced by 5% by taking two measurements per participant-visit

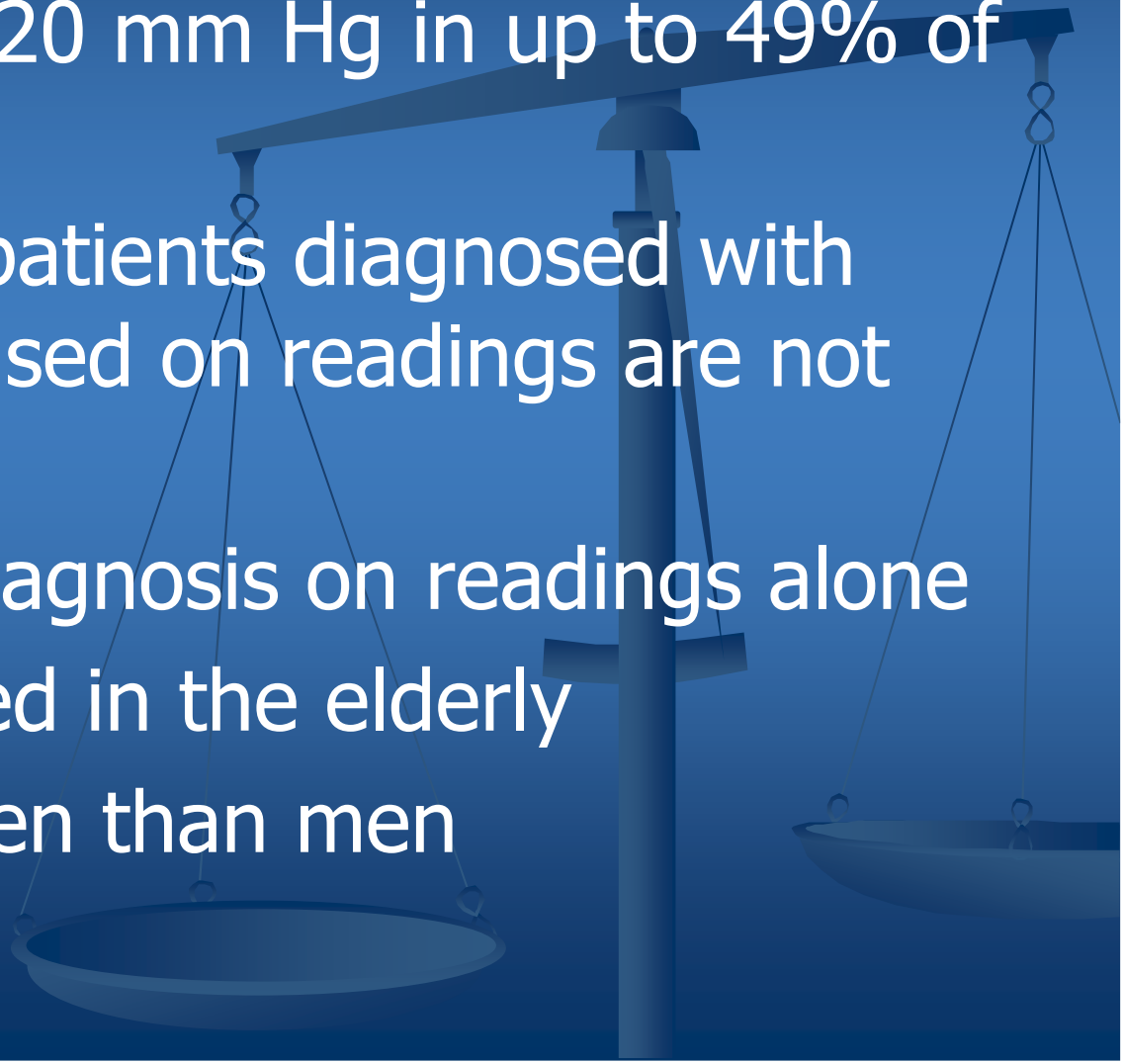


Clinical Distortion of Blood Pressure reading by < 5 MM

- Can deny patient's life saving treatment
- Can deny morbidity preventing treatment
- Can be contributed to user bias

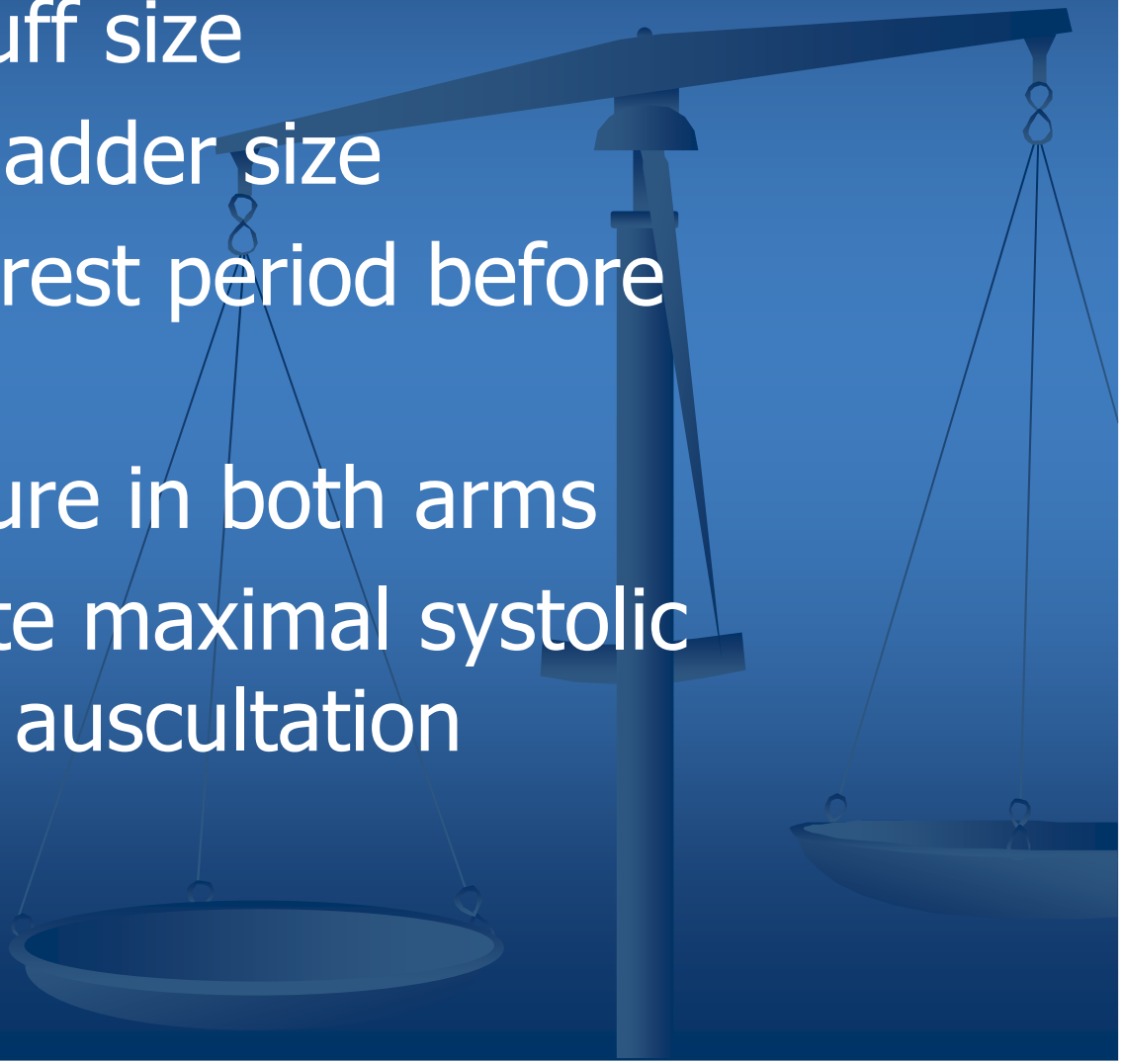
White Coat Syndrome

- Raise BP by 10/20 mm Hg in up to 49% of patients
- Nearly 20% of patients diagnosed with hypertension based on readings are not hypertensive
- Impossible to diagnosis on readings alone
- More pronounced in the elderly
- Greater in women than men

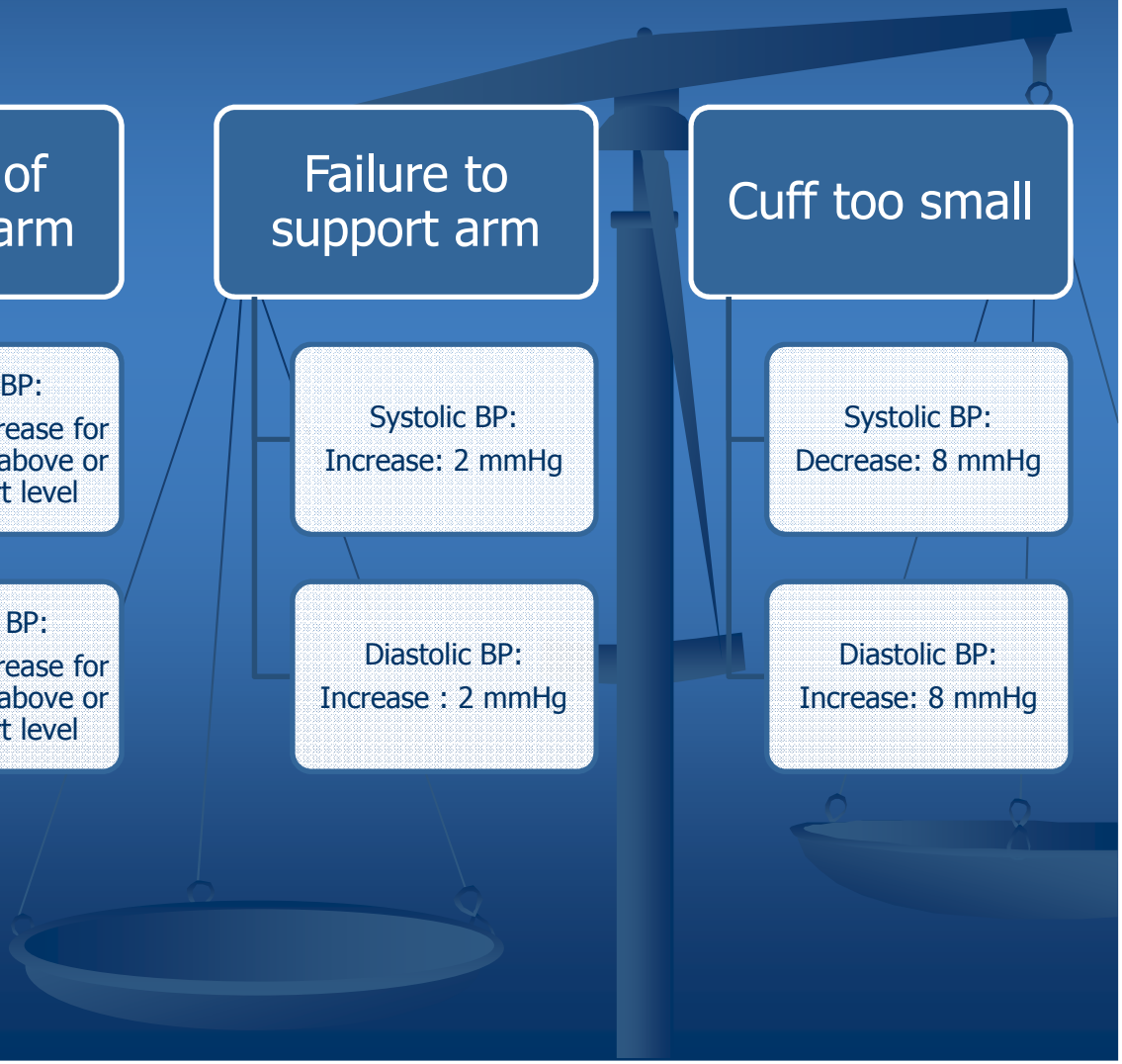


Common Mistakes

- Inappropriate cuff size
- Inappropriate bladder size
- Failure to allow rest period before measurement
- Failure to measure in both arms
- Failure to palpate maximal systolic pressure before auscultation

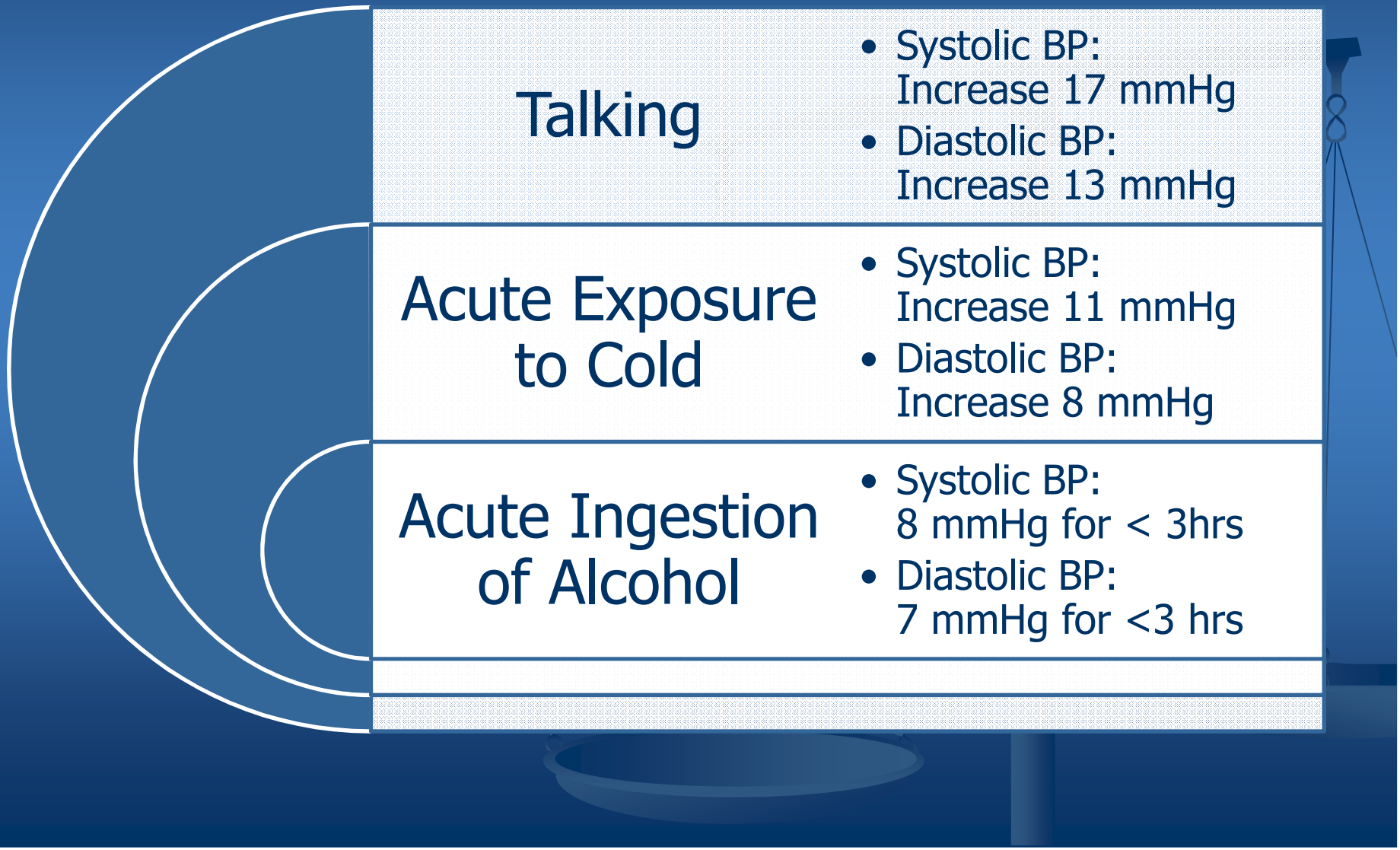


Techniques



Patient supine rather than sitting	Position of patient's arm	Failure to support arm	Cuff too small
Systolic BP: Increase: 3 mmHg	Systolic BP: Increase/decrease for every 10 cm above or below heart level	Systolic BP: Increase: 2 mmHg	Systolic BP: Decrease: 8 mmHg
Diastolic BP: Decrease: 2-5 mmHg	Diastolic BP: Increase/decrease for every 10 cm above or below heart level	Diastolic BP: Increase : 2 mmHg	Diastolic BP: Increase: 8 mmHg

Factors that can Interfere with the Accuracy of Blood Pressure Measurement



Additional Activities that can Effect Blood Pressure

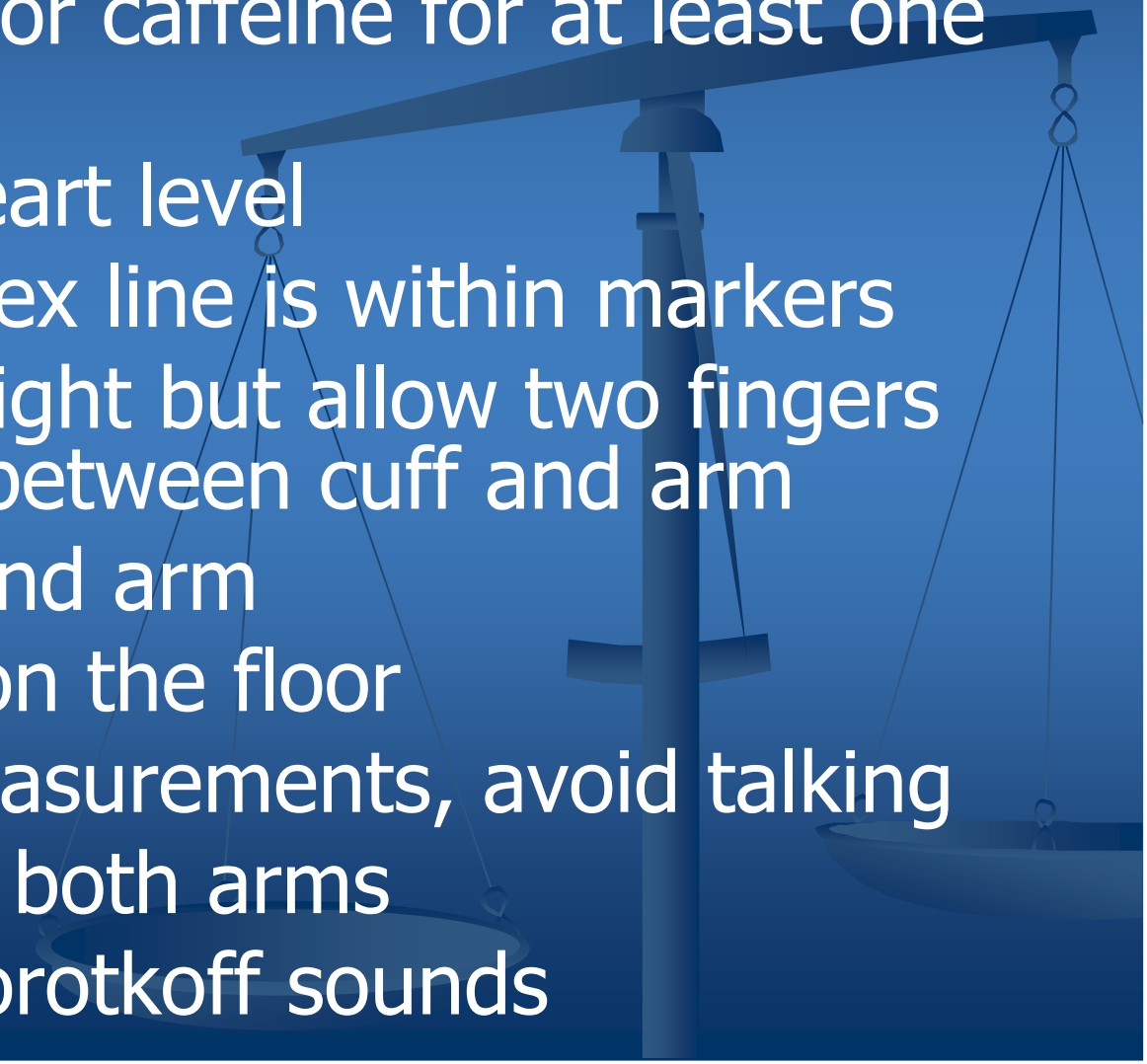
FACTOR	SYSTOLIC BP	DIASTOLIC BP
Full bladder or bowel	Increase 22-27 mmHg	Increase 22-27 mmHg
Attending a meeting	Increase 20 mmHg	Increase 15 mmHg
Commuting to work	Increase 16 mmHg	Increase 13 mmHg
Dressing	Increase 12 mmHg	Increase 10 mmHg
Walking	Increase 12 mmHg	Increase 6 mmHg
Eating	Increase 9 mmHg	Increase 10 mmHg
Doing desk work	Increase 6 mmHg	Increase 5 mmHg

What is a Normal Blood Pressure Reading

Type of BP	Normal BP	Prehypertension	Stage 1 Hypertension	Stage 2 Hypertension
Systolic	Less than 120 mmHg	120- 139 mmHg	140- 159 mmHg	160 mmHg and above
Diastolic	Less than 80 mmHg	80- 89 mmHg	90- 99 mmHg	100 mmHg and above

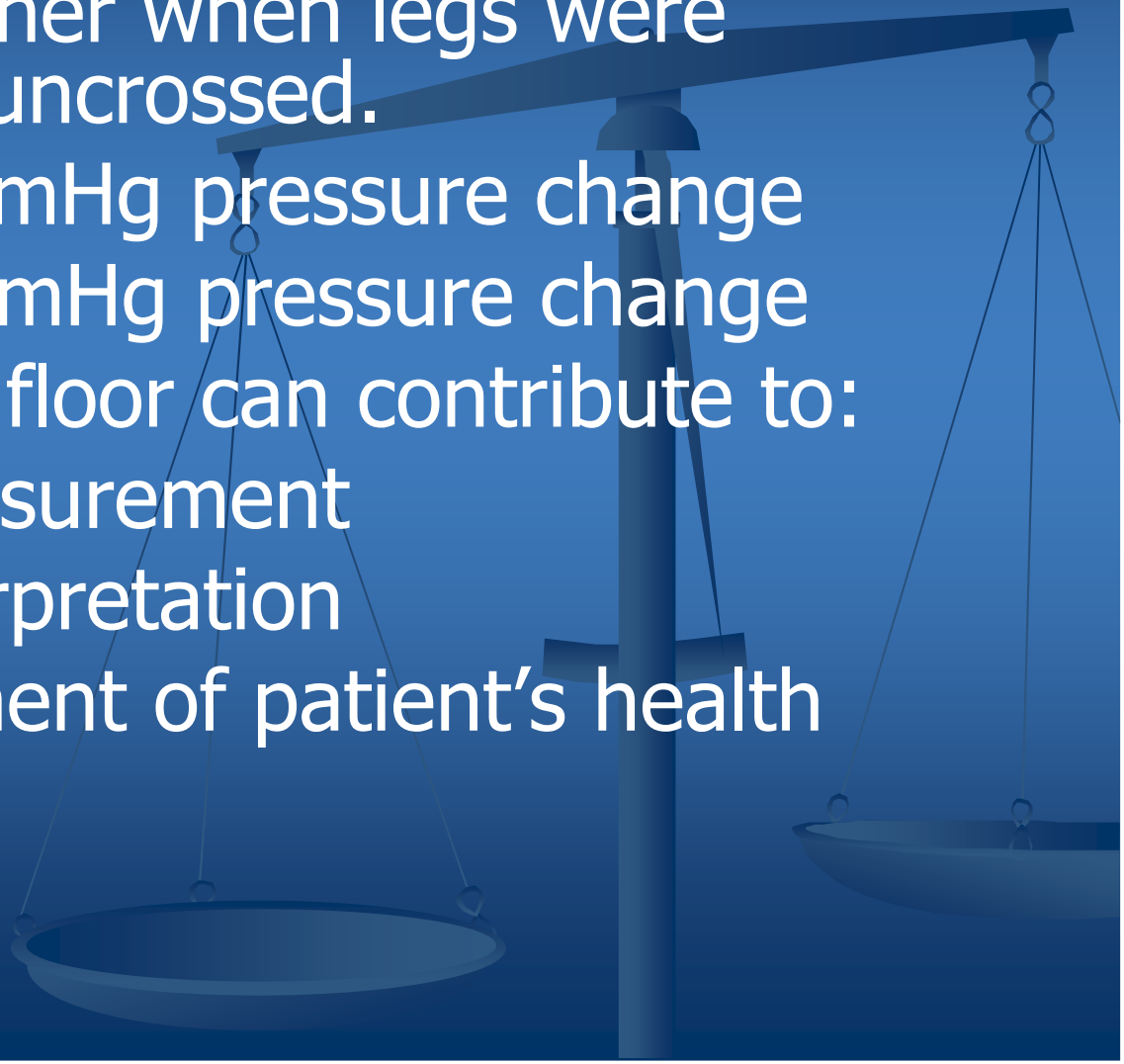
To Obtain Accurate BP Measurements

- Avoid smoking or caffeine for at least one hour
- Place cuff at heart level
- Ensure cuff index line is within markers
- Ensure cuff is tight but allow two fingers to be inserted between cuff and arm
- Support back and arm
- Place feet flat on the floor
- Stay during measurements, avoid talking
- Measure BP on both arms
- Use phase V Korotkoff sounds



Feet Flat vs. Legs Crossed

- Significantly higher when legs were crossed versus uncrossed.
- Systolic : 5-6 mmHg pressure change
- Diastolic: 2-3 mmHg pressure change
- Feet flat on the floor can contribute to:
  - Accurate measurement
  - Accurate interpretation
  - Proper treatment of patient's health



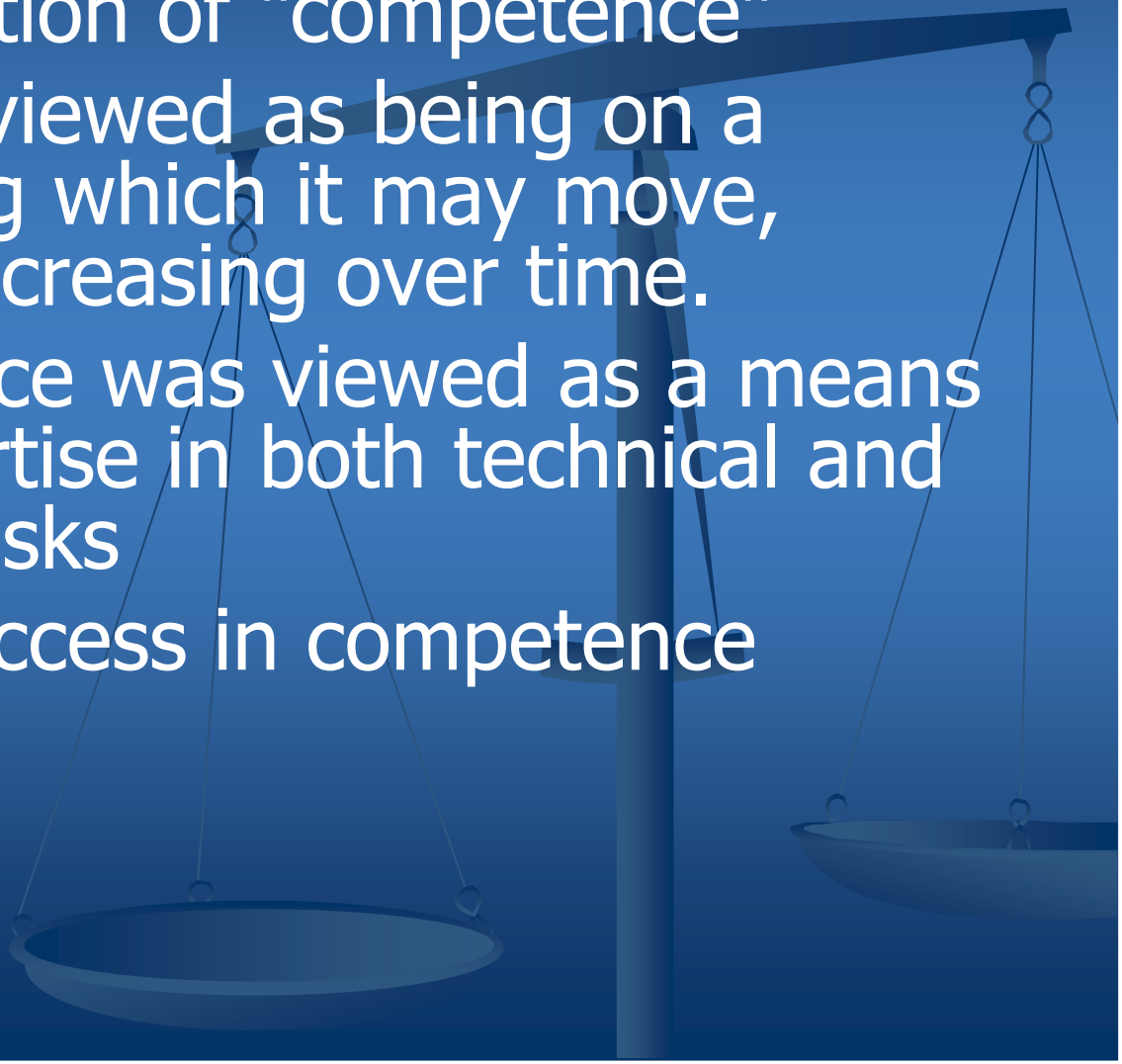
Categories that Influence Competence

- Six categories that influence competence development

1. Experiences
2. Opportunities
3. Environment
4. Personal Characteristics
5. Motivation
6. Theoretical Knowledge

Competency

- The basic definition of “competence”
- Competence is viewed as being on a continuum along which it may move, increasing or decreasing over time.
- Repeated practice was viewed as a means of gaining expertise in both technical and non-technical tasks
- Motivation = success in competence development

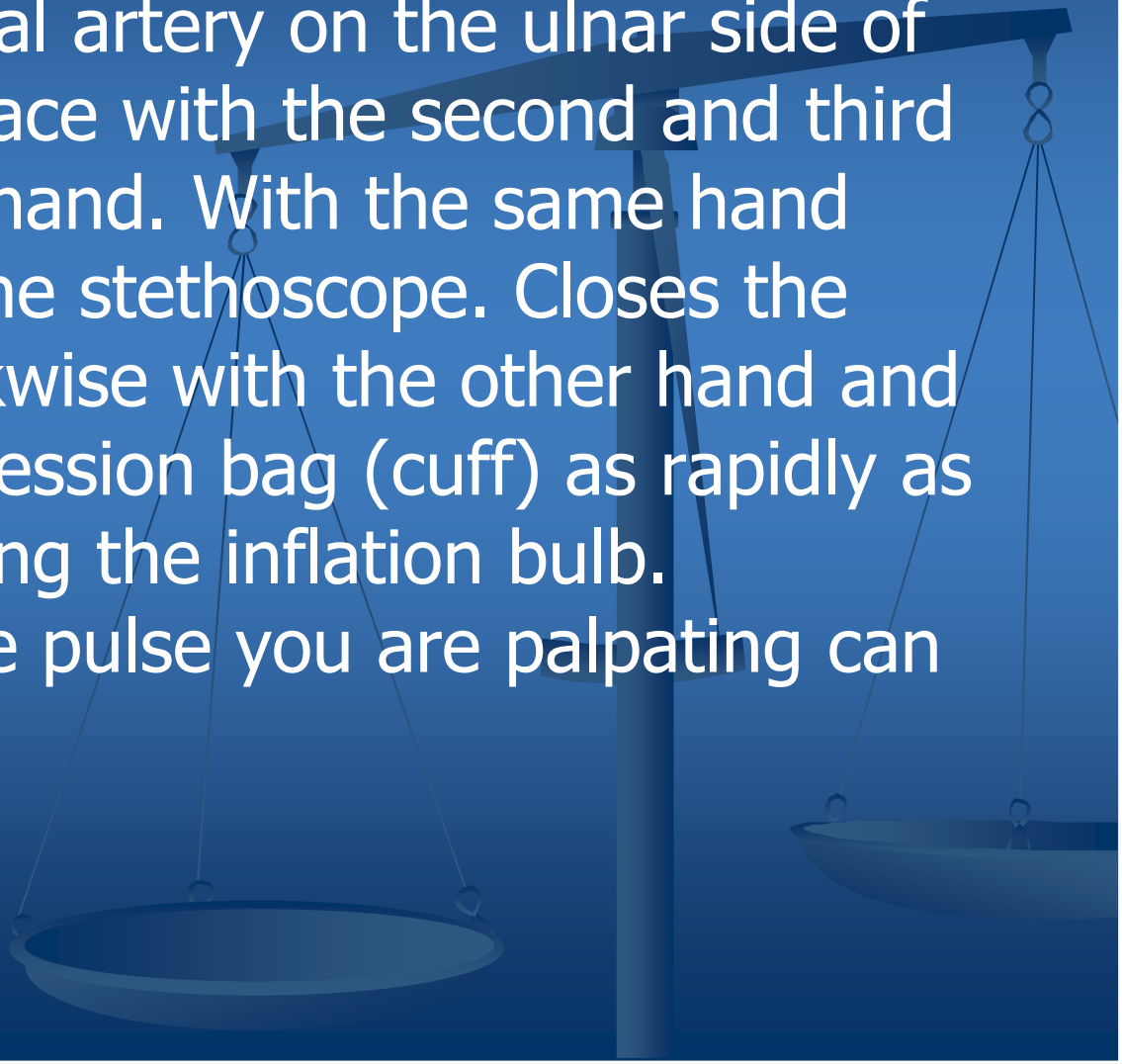


Competency Worksheet: Blood Pressure Measurement

- Blood pressure to be taken while patient is sitting in an upright position in a patient exam room chair. Place entire arm at patient's heart level.
- Blood pressure to be taken just prior to clinical support staff leaving the room.
- Blood pressure to be taken after all questions are answered and documented into the EMR.
- Blood pressure to be taken on a bare arm, wrap appropriate size cuff smoothly and evenly around the arm 1-2 inches above the antecubital space (do not place cuff over clothing ,feet flat on the floor).

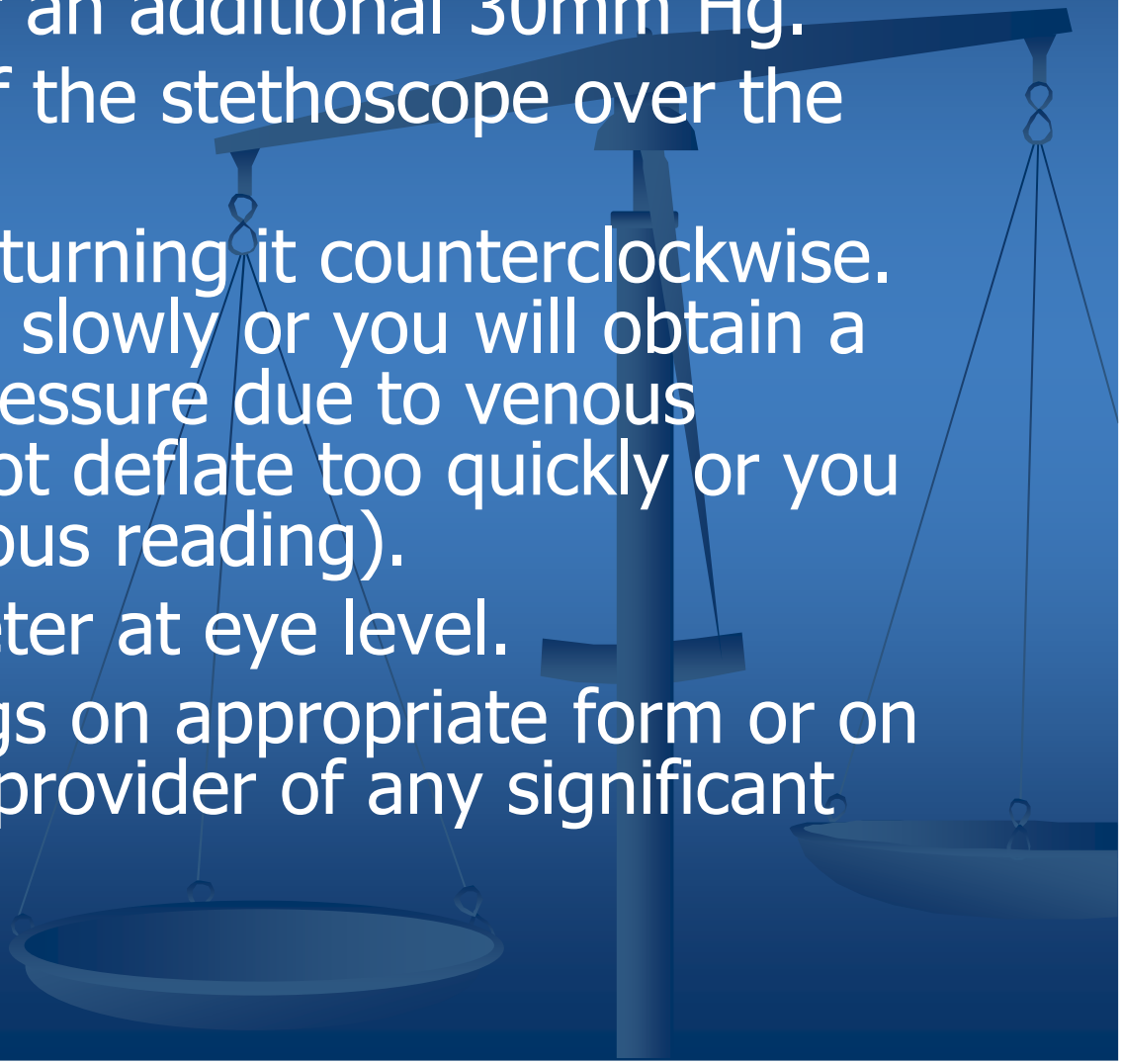
Competency Worksheet: Blood Pressure Measurement

- Palpate the brachial artery on the ulnar side of the antecubital space with the second and third finger tips of one hand. With the same hand holds the bell of the stethoscope. Closes the control valve clockwise with the other hand and inflates the compression bag (cuff) as rapidly as possible by pumping the inflation bulb. Continues until the pulse you are palpating can no longer be felt.



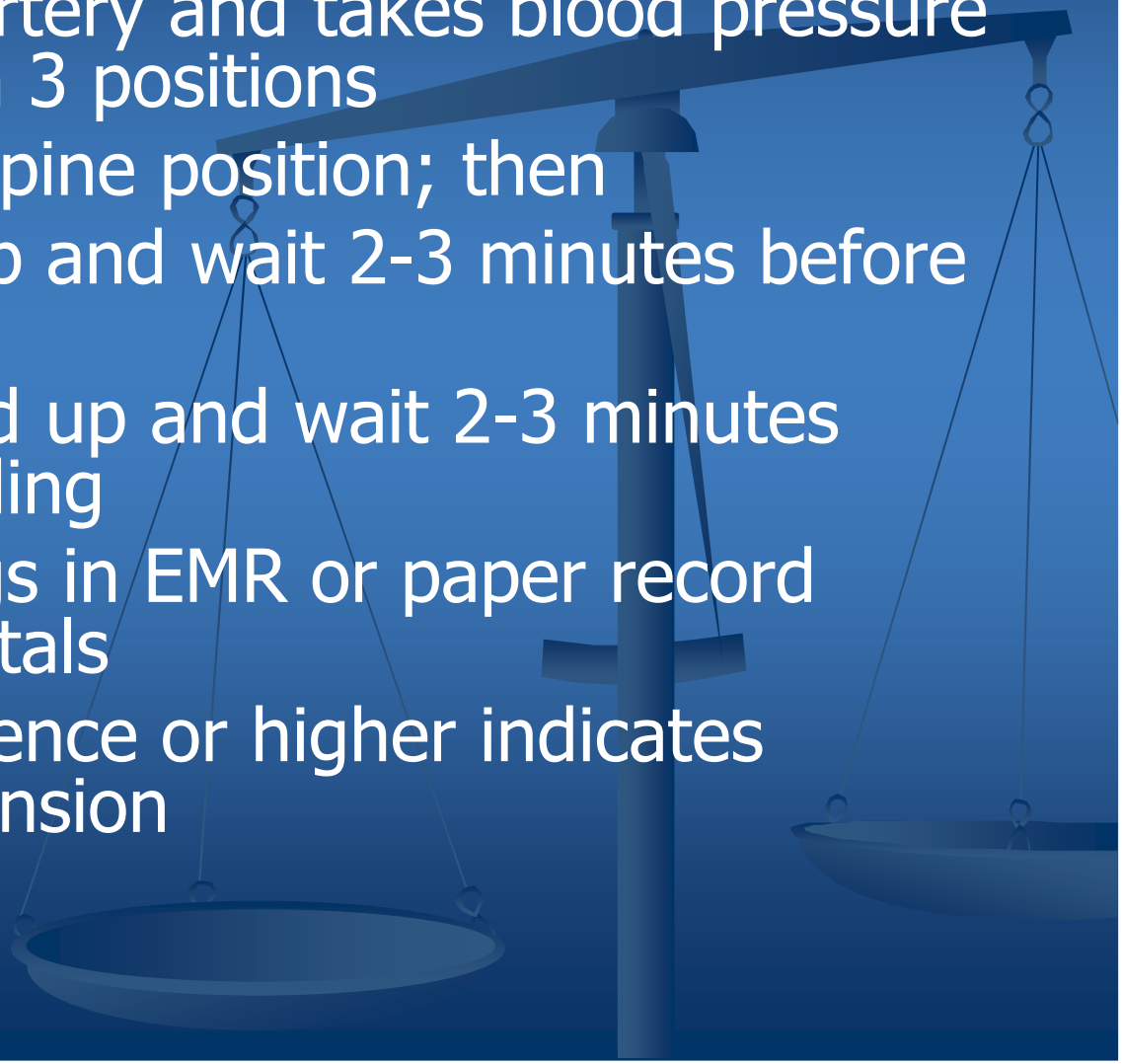
Competency Worksheet: Blood Pressure Measurement

- Inflate the cuff for an additional 30mm Hg.
- Position the bell of the stethoscope over the brachial artery.
- Release the valve turning it counterclockwise. Do not deflate too slowly or you will obtain a falsely elevated pressure due to venous congestion. (Do not deflate too quickly or you will get an erroneous reading).
- Read the manometer at eye level.
- Documents findings on appropriate form or on the EMR. Notifies provider of any significant findings.

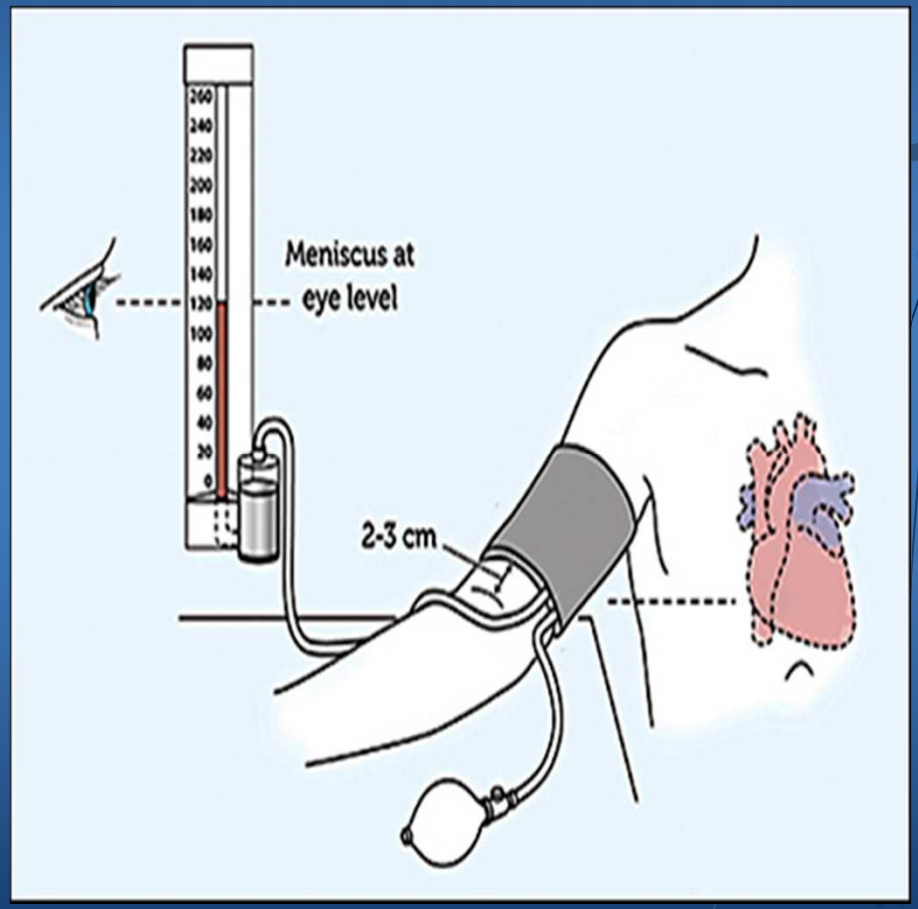


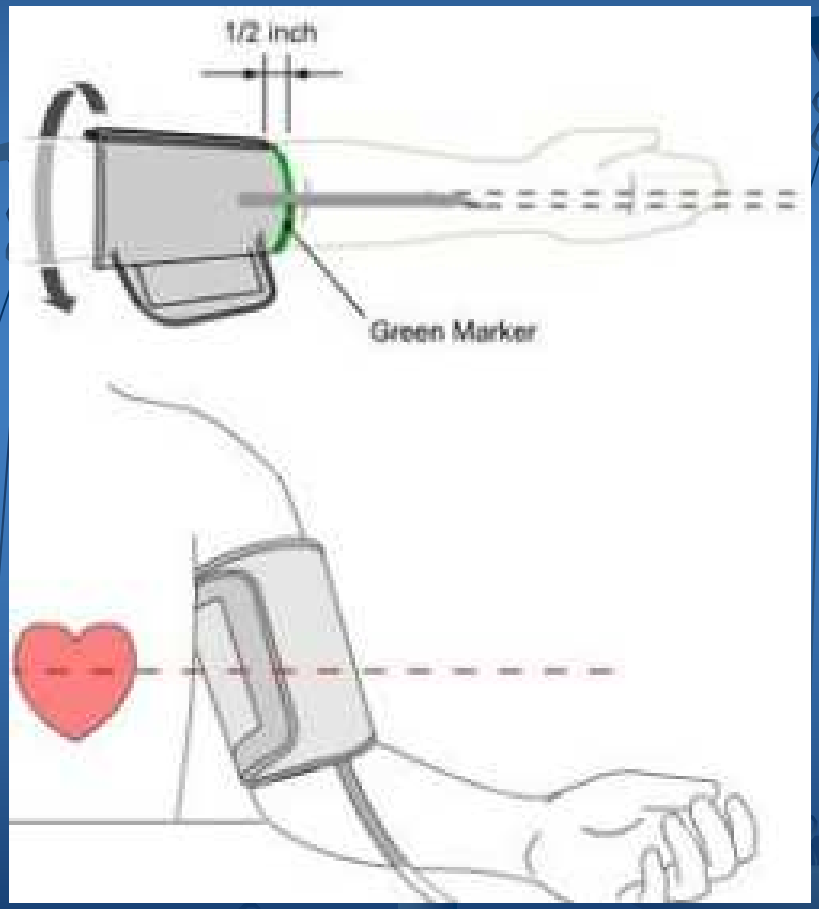
Competency: Orthostatic Blood Pressure

- Locates brachial artery and takes blood pressure and radial pulse in 3 positions
- Have patient in supine position; then
- Have patient sit up and wait 2-3 minutes before taking reading
- Have patient stand up and wait 2-3 minutes before taking reading
- Document readings in EMR or paper record under extended vitals
- A 20 mmHg difference or higher indicates orthostatic hypotension

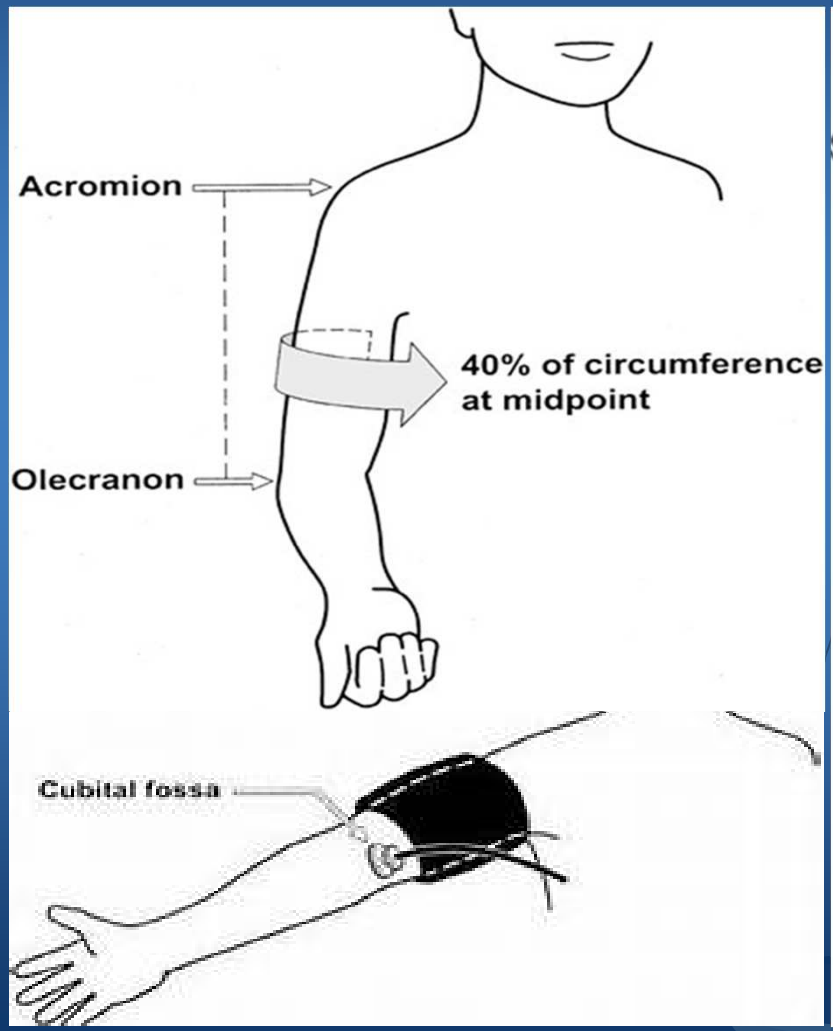


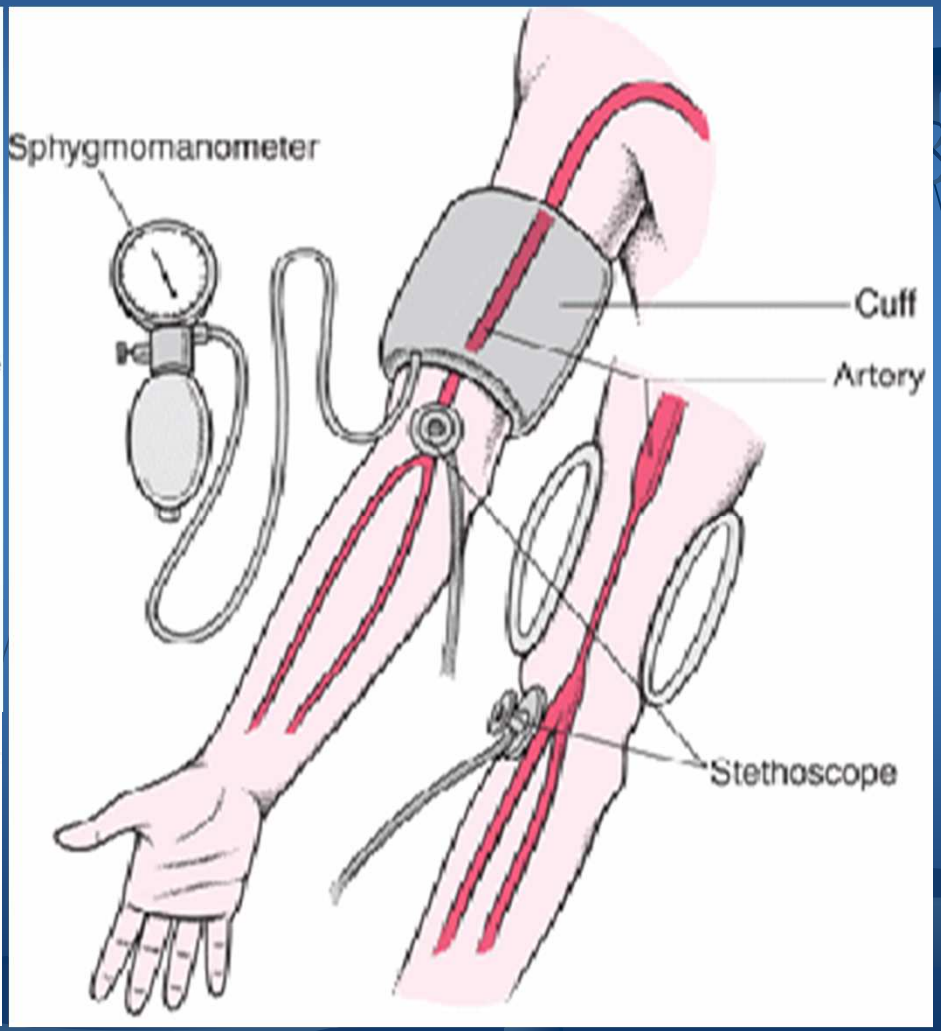
At the HEART Level





How to Place the Cuff

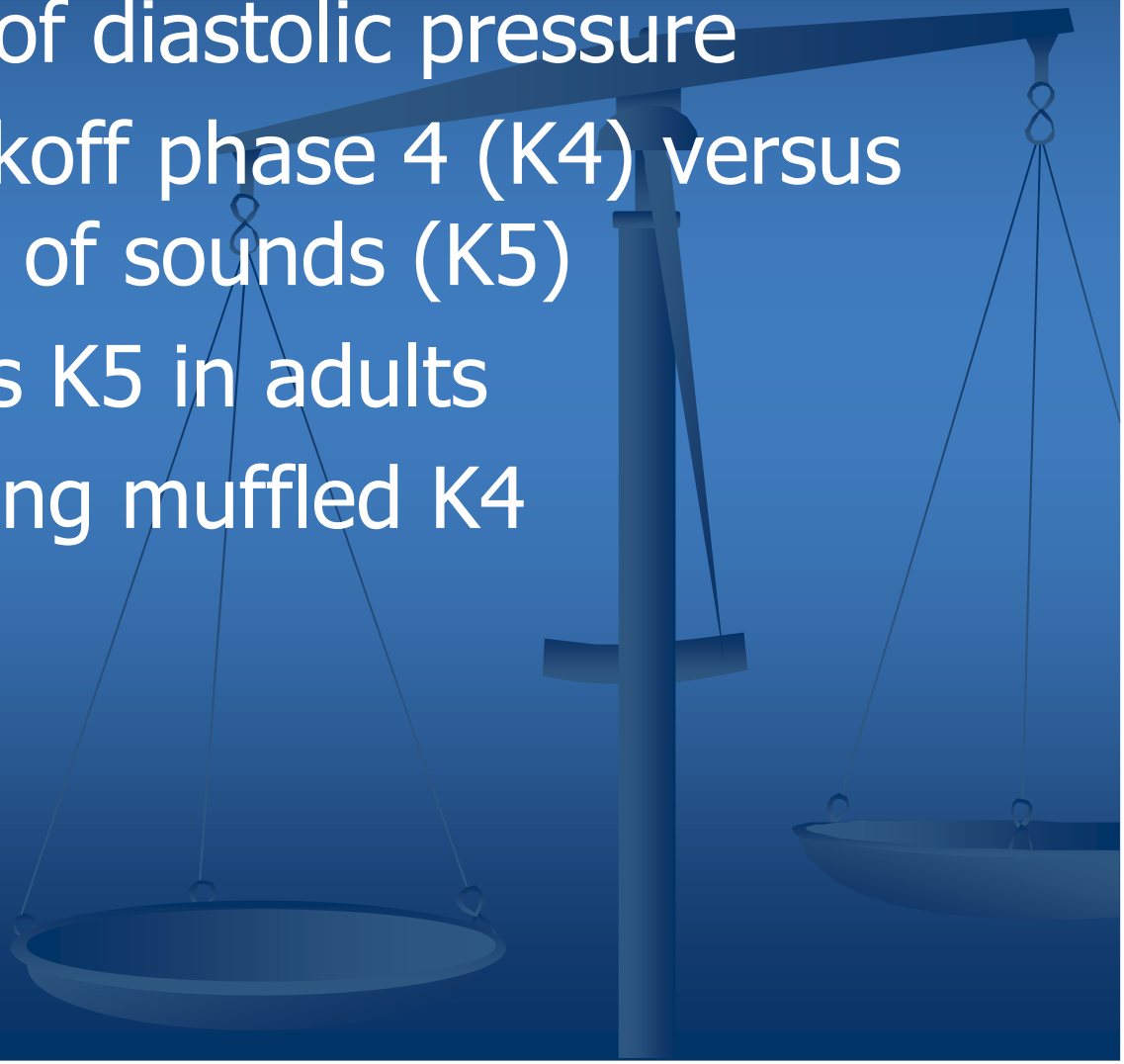




Diastolic Measurement

- Measurement of diastolic pressure

1. Muffling Korotkoff phase 4 (K4) versus disappearance of sounds (K5)
2. Best Practice is K5 in adults
3. Difficulty hearing muffled K4
4. Observer Bias



Observer Bias

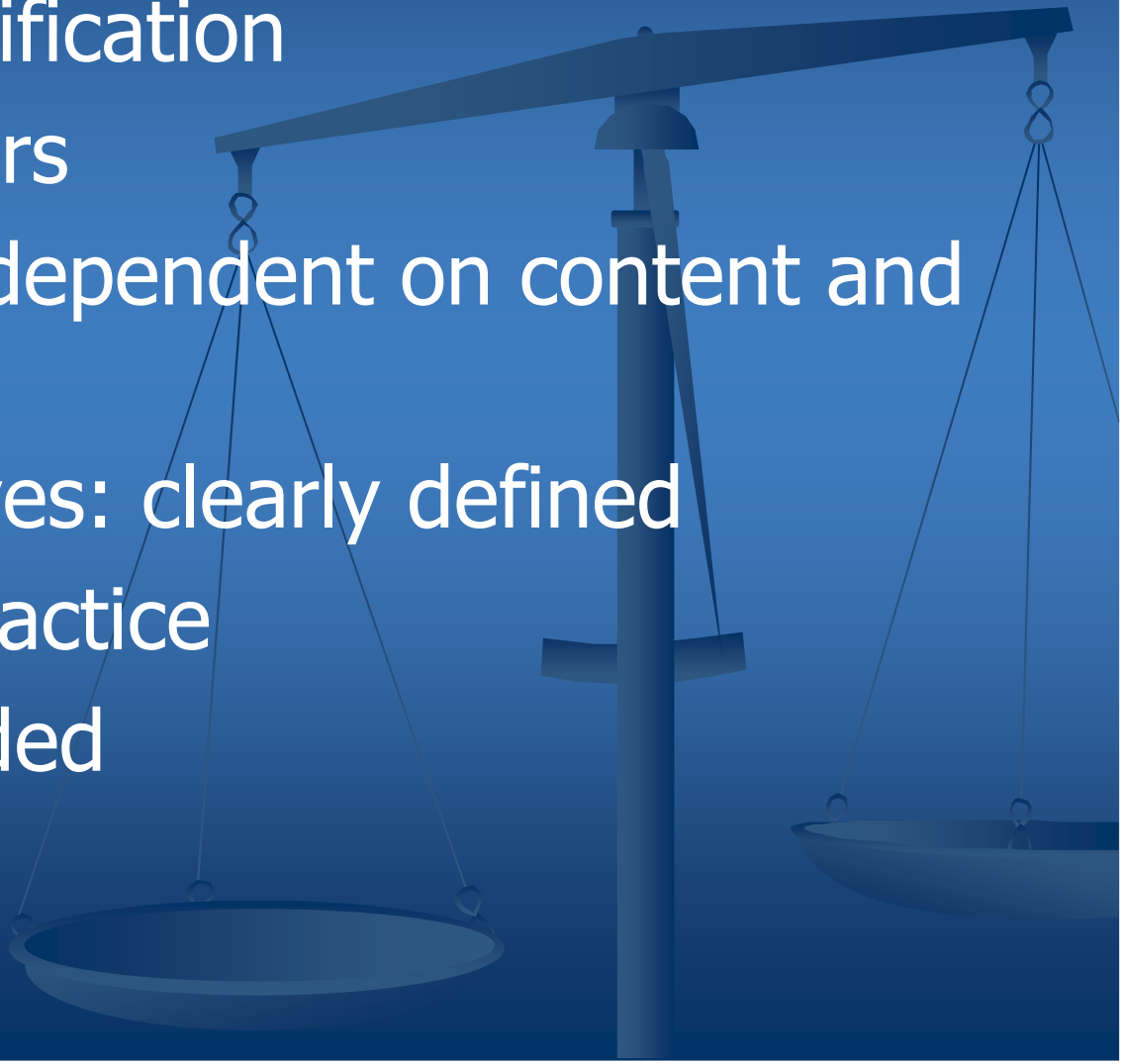
- Digit Preference: Record round numbers as the terminal digit of any reading
- Most common Terminal digit is "0
- Multiple readings over several minutes: tend to record similar readings

Maintaining Competence

- Ongoing education of clinical, clerical, and physician staff
- Training
- Expert
- Certification
- Standardization/Restandardization (6-month intervals)
- Trainers

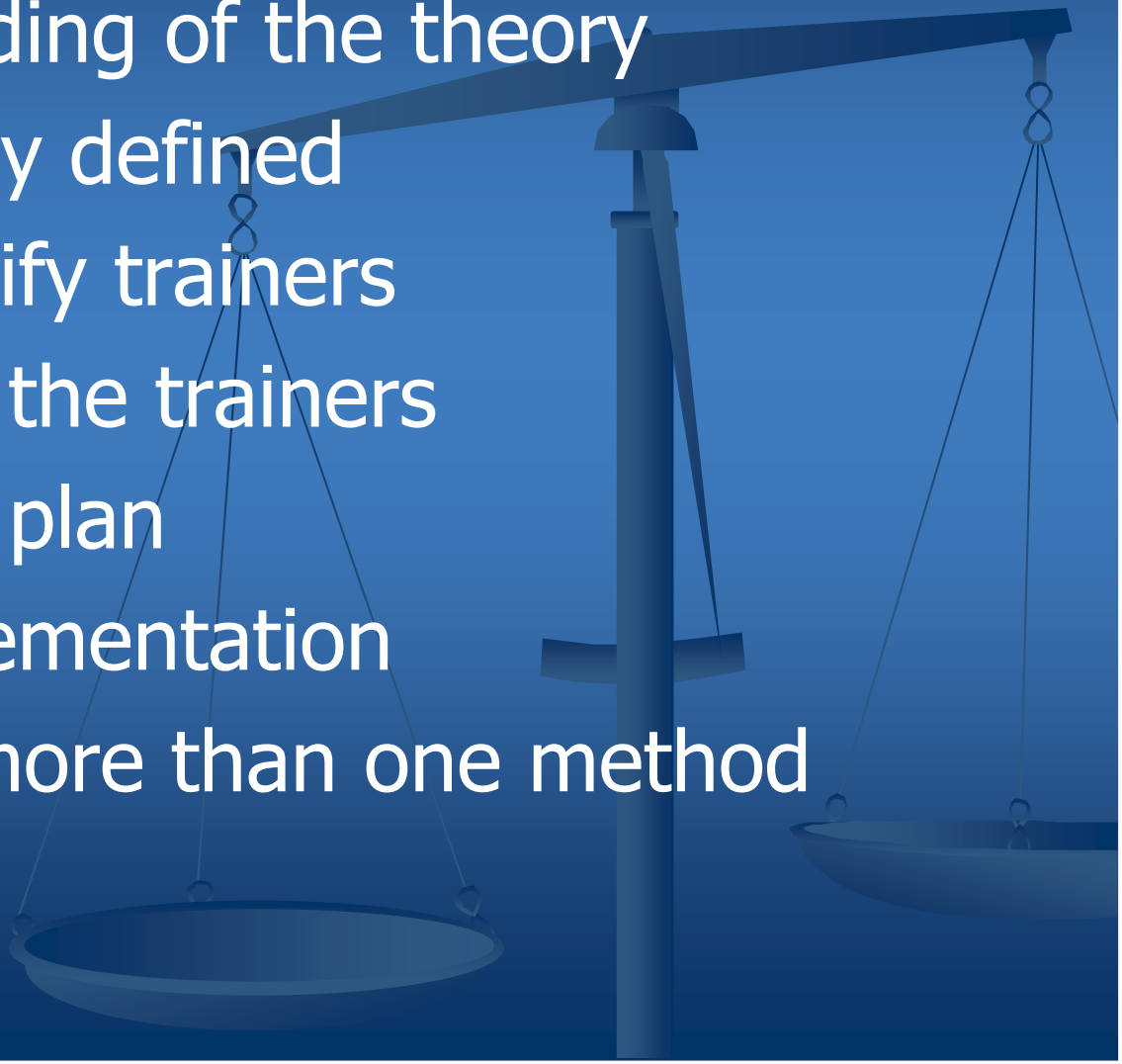
Educational Objectives

- Bi-annual recertification
- Identified trainers
- Competence is dependent on content and the individual
- Specific objectives: clearly defined
- Monitoring in practice
- Feedback provided



Educational Keys to Success

- Staff understanding of the theory
- Outcomes clearly defined
- Process to identify trainers
- Process to train the trainers
- Commitment to plan
- Successful implementation
- Educate using more than one method



Benefits of Self Monitoring

- Suspected white coat syndrome
- Apparent drug resistance
- Episodic hypertension
- Suspected autonomic dysfunction
- Hypotensive reaction to antihypertensive treatment
- Predict cardiovascular event

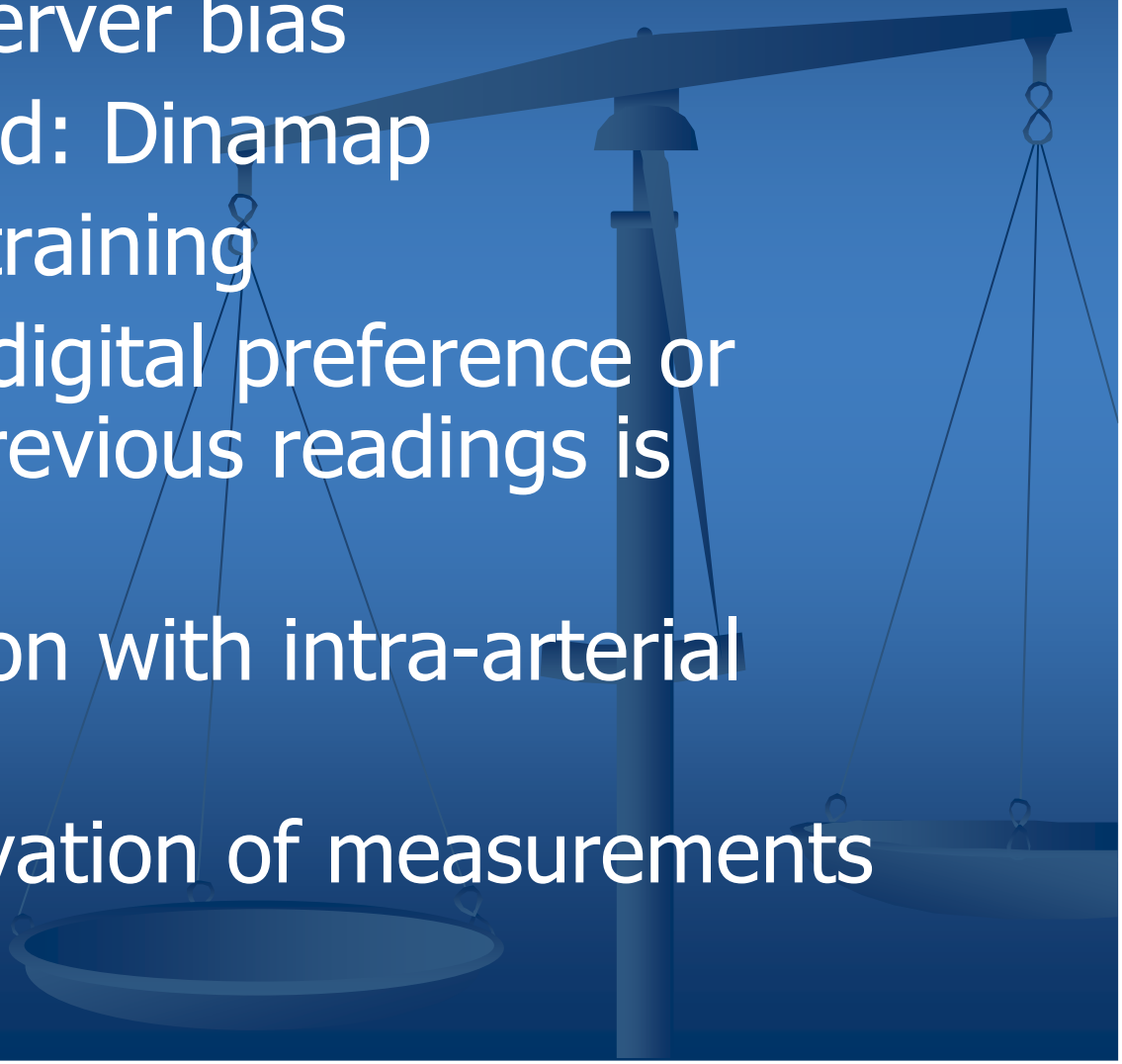
Home Monitoring Devices

Patient Education

- Uniform educational material available throughout organization
- Establish protocols for monitoring specific patient population: identify criteria
- Provide patient resources

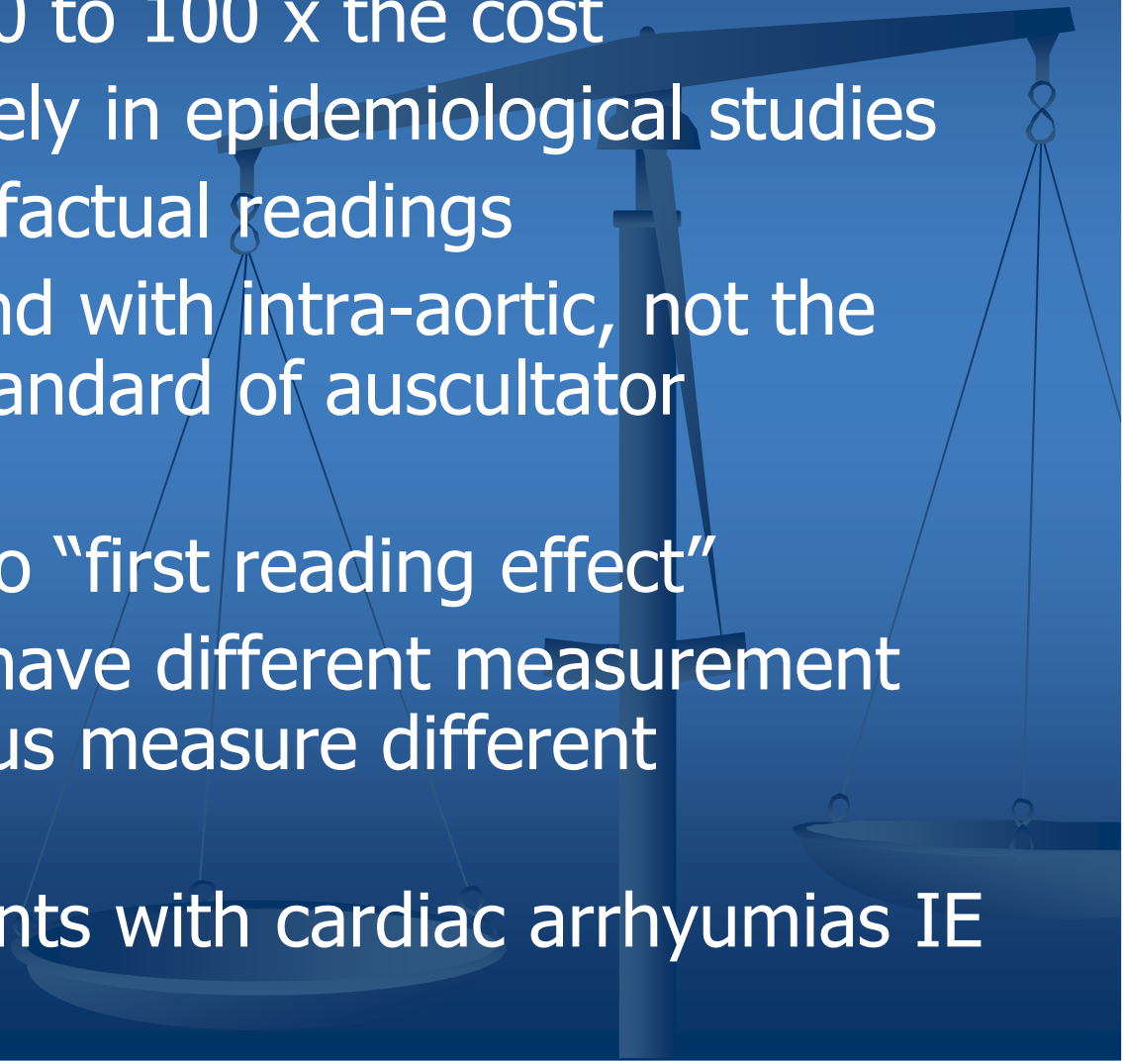
Automated Blood Pressure Devices: PROS

- Removal of observer bias
- Most widely used: Dinamap
- Relatively little training
- Bias caused by digital preference or knowledge of previous readings is eliminated
- Strong correlation with intra-arterial readings
- No direct observation of measurements



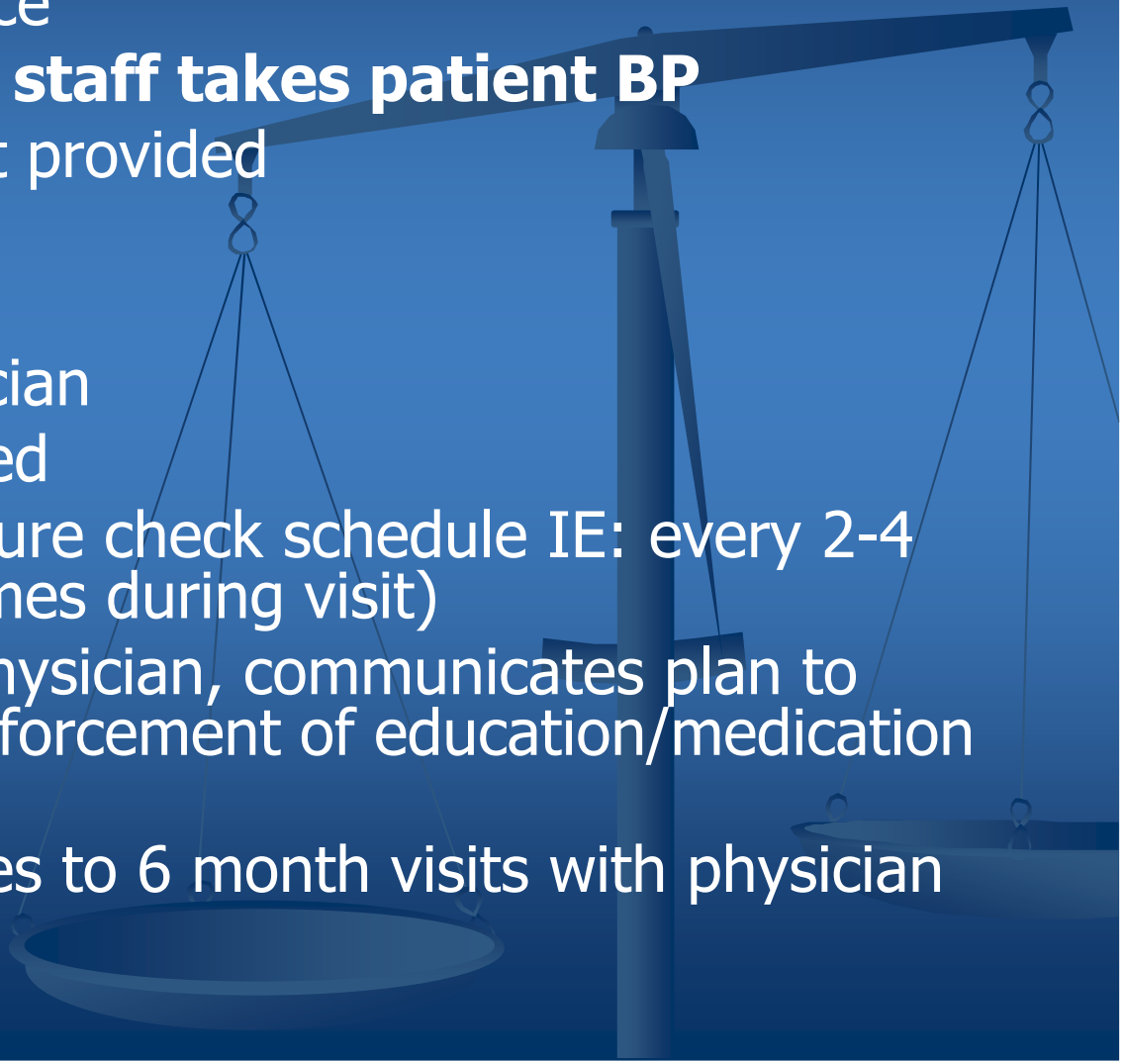
Automated Blood Pressure Devices: CONS

- Very expensive: 50 to 100 x the cost
- Not used extensively in epidemiological studies
- Motion of arm artifactual readings
- Reading correspond with intra-aortic, not the epidemiological standard of auscultator measurements
- Variation related to "first reading effect"
- Different devices have different measurement algorithms and thus measure different quantities.
- Variations in patients with cardiac arrhyumias IE A-fib



Interventional Flowchart

- Patient arrives at office
- **Clinical competent staff takes patient BP**
- Educational pamphlet provided
- Update Physician
- Physician Evaluation
- Recheck BP by Physician
- Plan of Care developed
- Establish Blood Pressure check schedule IE: every 2-4 weeks (measure 3 times during visit)
- Nurse confers with physician, communicates plan to patient, provides reinforcement of education/medication adjustments
- Once controlled moves to 6 month visits with physician

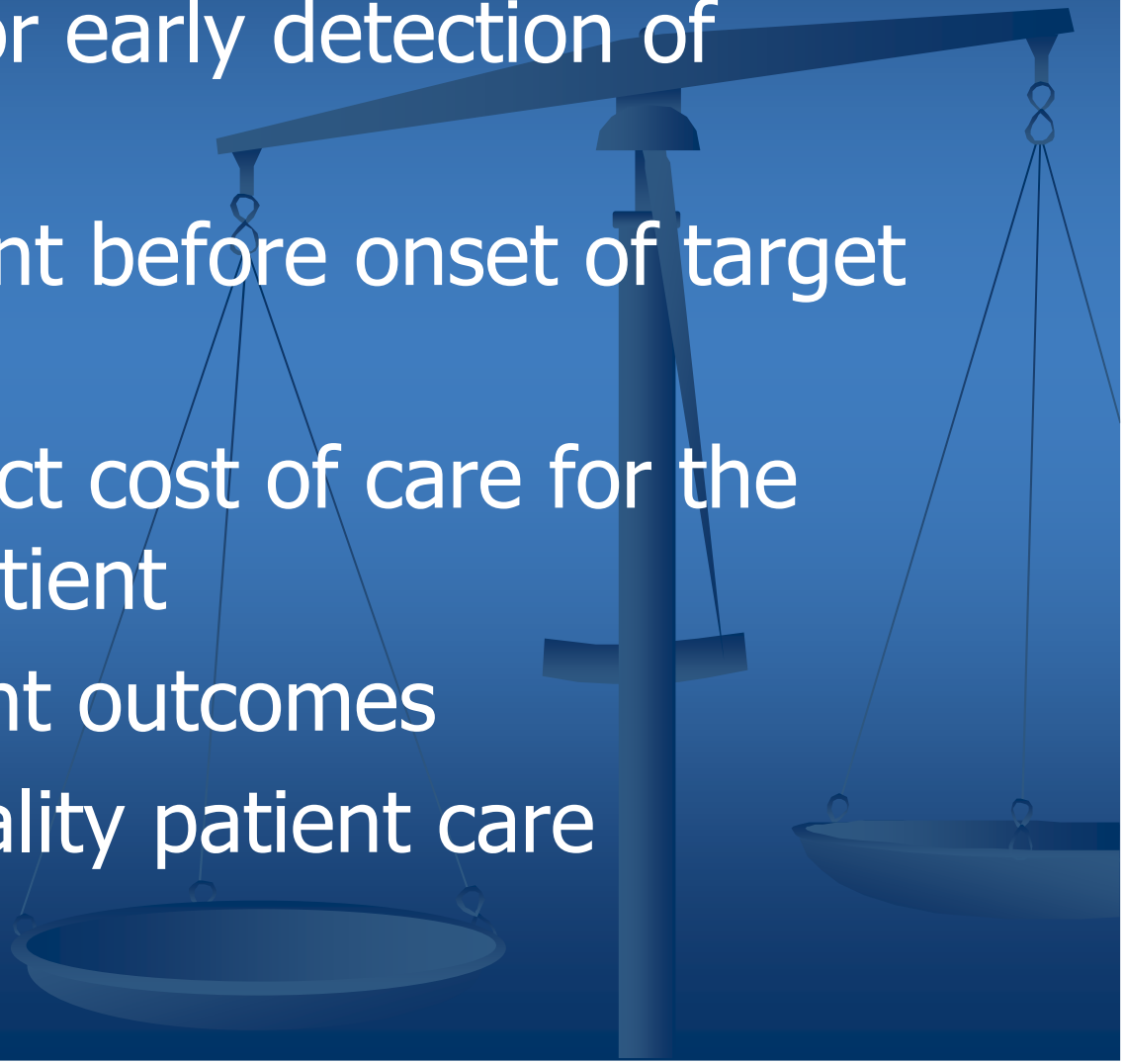


Keys to success

- Communication
- Education/Training
- Teamwork
- Assessment/Reassessment
- Compliance
- Clearly defined goals and objectives
- Shared Governance

Cost Effective Initiatives

- Screen adults for early detection of hypertension
- Initiate treatment before onset of target organ damage
- Reduce the direct cost of care for the hypertensive patient
- Improved patient outcomes
- Deliver high quality patient care



AHA Recommendations

- As the American Heart Association (AHA) states in their most recent recommendations for blood pressure measurement, "there is a role for (automated) devices in office use, both as a substitute for traditional (manual) readings and as supplements to them." * However, the AHA goes on to recommend that a properly maintained monitor for manual measurement of blood pressure be available for routine office measurement (Anderson, 2009).

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Questions