Measurement of Vital Signs

Paul P. Dobesh, Pharm.D., FACC, FAHA, FCCP, BCPS, BCCP

Professor of Pharmacy Practice and Science

College of Pharmacy

University of Nebraska Medical Center

Omaha, Nebraska, USA

American Association of of Pharmacy Technicians ™, ™

“Vitals”

- **Vital Signs**
  - Pulse
  - Respirations
  - Blood Pressure
  - Temperature
- **Vital Statistics**
  - Age
  - Height
  - Weight
  - Smoking status?

Pulse

- **Palpation of arteries**
  - close to the surface of the body
  - lie over bones
  - usually radial pulse
- **Measurement of cardiac function**
  - normal: 60-90 bpm
  - tachycardia: > 100 bpm
  - bradycardia: < 60 bpm
- **Technique**

Respirations

- **Done by inspection**
- **Measurement of respiratory rate**
  - **normal: 12-18 respirations/min**
  - **tachypnea: ≥20 respirations/min**
  - **bradypnea: <12 respirations/min**
- **Technique**

Blood Pressure

- Sizing of blood pressure cuff
  - adult
    - width
    - length
  - children
    - width
    - length
  - inappropriate cuff size
    - too large
    - too small
    - too loose

Measuring Blood Pressure

- **Positioning the patient's arm**
  - **sitting**
  - **standing**
  - **lying**
- **Patient characteristics**
- **Use correct cuff size**
- **Placement of blood pressure cuff**

Measuring Blood Pressure

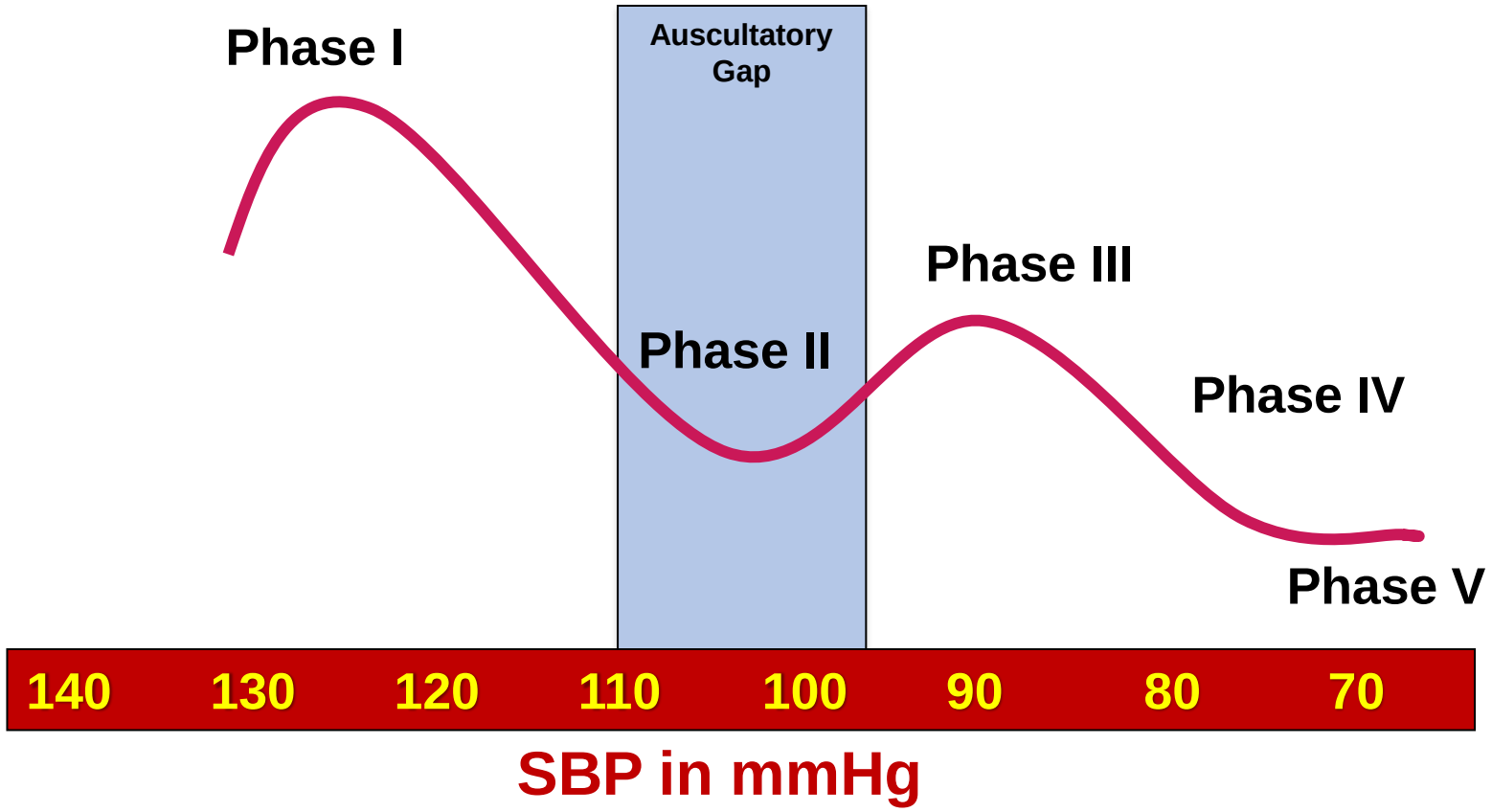
- **Palpable systolic blood pressure**
  - **avoid being mislead by auscultatory gap**
  - **technique**
    - **inflate 20-30 above point of no pulse felt**
    - **deflate slowly until you can palpate two consecutive beats**

Measuring Blood Pressure

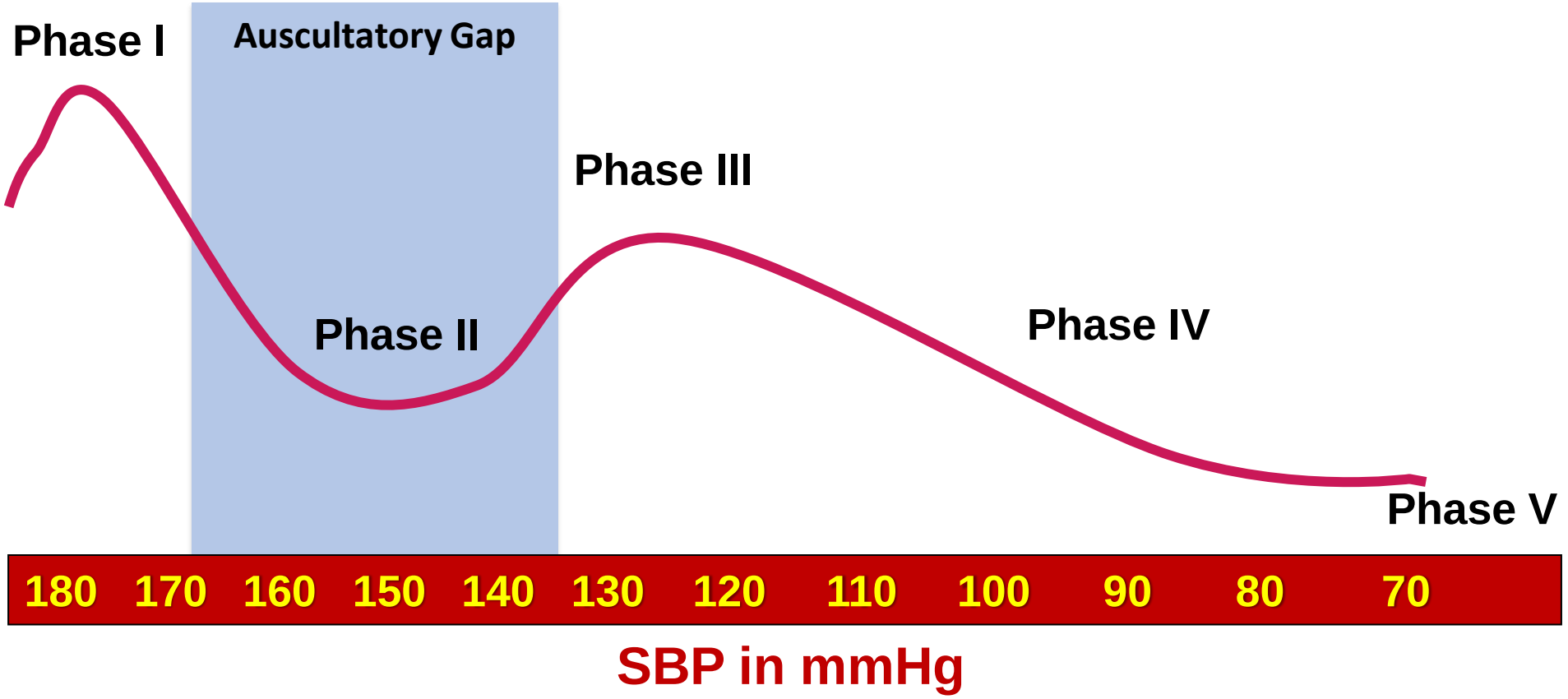
- Place diaphragm of stethoscope over brachial artery
- Inflate cuff 20-30 mm Hg above palpable SBP
- Deflate cuff slowly while listening for Korotkoff sounds

Phase I	First 2 clear repetitive sounds	Systolic BP
Phase II	Sounds are softer and longer with a murmur-like quality	
Phase III	Sounds become crisper and louder	
Phase IV	Sounds become muffled	
Phase V	Sounds completely disappear	Diastolic BP

Korotkoff Sounds and the Auscultatory Gap



Korotkoff Sounds and the Auscultatory Gap



Measuring Blood Pressure

- **Repeat measurements**
- **Record findings**
  - **2 value method: (116/68)**
  - **round upward to closest 2 mm Hg**
  - **record position and cuff size (if not standard cuff)**

Measuring Blood Pressure

Special Situations

- Infants and children
- Elderly patients
- Pregnant patients
- Obese patients
- Patients with atrial fibrillation
- Patients with mechanical heart valves
- Patients with AV fistulas or arm/shoulder surgery
- Patients in clinical shock

Blood Pressure Assessment

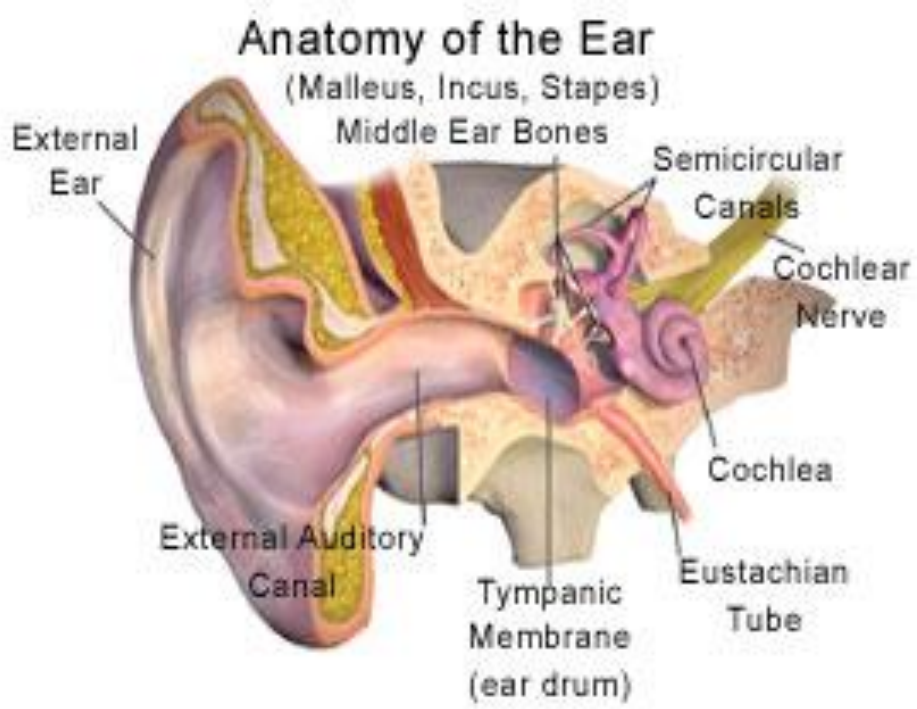
- **Normal:** **≤ 120/80 mmHg**
- **Elevated:** **> 120/80 mmHg**
- **Hypertension:** **> 130/80 mmHg**
- **Hypotension:**
  - **SBP < 90 to 100 mmHg**
  - **DBP < 50 to 60 mmHg**
  - **Patient is symptomatic**

Temperature

- Routes and interpretation
  - oral
  - rectal
  - axillary
  - tympanic membrane
- Different for infants and children
- Values may vary throughout the day

Thermometers

Tympanic Membrane Thermometers



American Association of Pharmacy Technicians ™

Temporal Artery Thermometers

Courtesy Exergen Corporation, Watertown, Massachusetts.

American Association of Pharmacy Technicians ™

Temperature Assessment

- **Normal:**
  - **98.0°F to 98.6°F**
  - **36.7°C to 37°C**
- **“Fever”**
  - **100.4 °F (38 °C) measured rectally**
  - **99.5 °F(37.5 °C) measured orally**
  - **99 °F (37.2 °C) measured axillary**
- **Think about false positives and negatives**
- **Dangerous**
  - **> 105°F**
  - **> 40.5°C**

Pulse Oximetry

- **Measures the oxygen (O_2) saturation of arterial blood**
  - **Hemoglobin can carry up to 4 O_2 molecules**
  - **Example**
    - **100 hemoglobin molecules could carry up to 400 O_2 molecules**
    - **What if they were carrying 380 O_2 molecules?**
    - **(380 ÷ 400) x 100 = 95%**
  - **Values**
    - **95% to 99% is normal**
    - **< 90% needs medical attention**

Pulse Oximetry

Technology

- The color of blood varies depending on the amount of O_2
- Uses 2 beams of light through the finger (or earlobe)
  - Red light
  - Infrared light
- These beams determine the color and then calculate the SpO_2

Considerations

- Need a strong pulse
- Cold hands
- Position
  - Large and small fingers
  - Nail polish
- Carbon monoxide
- Skin pigmentation
  - No effect typically noted
  - May overestimate it SpO_2 is < 80%

American Association of Pharmacy Technicians ™