Lab 4 Heart Rate & Blood Pressure

I. **Attendance** – Cards

II. **Heart Rate?**

   **What?** # beats per min
   - < 60 (slow)
   - 60-100 (normal)
   - > 100 (fast)

   **bradycardia**
   **tachycardia**

   **Where?** heart or peripheral arteries
   **How?** palpation *to feel* vs. auscultation *to hear* vs. EKG...
   **Why?** vital sign "Vital signs are vital!" Pilar Bradshaw, MD

III. **Blood Pressure?**

   **What?** force exerted by blood on large systemic arteries
   **Where?** peripheral/systemic, large arteries
   **How?** direct (cannula) vs. indirect (external cuff, P meter = sphygmomanometer + stethoscope/sensor

   **Why?** vital sign + CVD risk indicator low < 120/<80 mm Hg
   Hypertension ≥140/90 mm Hg? See LM pp 4-4 to 4-6

IV. **Practice Tests**

V. **Old vs. New High Blood Pressure Guidelines**
Factors that Influence Heart Rate (HR, b/min) & Blood Pressure (BP, mm Hg)

Short list of individual, exercise & environmental variables (superimposed upon genetics) that alter HR & BP:

1. arousal state (asleep, awake, drowsy, unconscious... BI 121 lecture!)
2. bladder and/or bowel distention (if > semi-filled, higher BP!)
3. exercise (mode, frequency, intensity, duration, distribution)
4. illness (type, current, past...)
5. menstrual phase (follicular, ovulatory, luteal)
6. nutritional status (alcohol, caffeine, H2O, meal composition & time)
7. pets (on lap? may lower BP!)
8. posture (supine, seated, standing)
9. sleep (less elevates!)
10. smoking status (# & time)
11. temperature (ambient & body)
12. white-coat effect or white-coat syndrome,...
Where is BP measured?

Here! Large, systemic arteries!

RA = Right atrium
RV = Right ventricle
LA = Left atrium
LV = Left ventricle

LS 1991 fig 8-2 p 225.
Pressure-recording device

Inflatable cuff

Stethoscope

LS 2006 fig 10-7a p 282.
**Personal Measurements**

**Heart Rate (HR):** Record on p 4-7, Q 1.
- 6-sec → add 0 to end or multiply by 10
- 15-sec → multiply by 4
- 60-sec → record as is; seated resting HR

Each of you place stethoscope over your heart to detect *lub-dup, lub-dup*...

**Blood Pressure (BP):** Record on p 4-8, Q 4.
- R arm x 2 → SBP/DBP & HR
- L arm x 2 → SBP/DBP & HR

Try to detect Korotkoff sounds w/stethoscope during a few automated BP measurements.

Evaluate values & answer Q 2, 3 & 5 later.
When cuff pressure is between 120 and 80 mm Hg:

Blood flow through the vessel is **turbulent** whenever blood pressure exceeds cuff pressure.

Intermittent sounds are heard as blood pressure fluctuates throughout the cardiac cycle.
Where Does Your Pressure Fall? Previous Guidelines < Nov 2017

- Stage 2 Hypertension
- Stage 1 Hypertension
- Prehypertension
- Normal Blood Pressure

Death!
# Blood Pressure Categories

<table>
<thead>
<tr>
<th>Blood Pressure Category</th>
<th>Systolic mm Hg (Upper Number)</th>
<th>Diastolic mm Hg (Lower Number)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal</strong></td>
<td>Less than 120</td>
<td>and</td>
</tr>
<tr>
<td><strong>Elevated</strong></td>
<td>120 - 129</td>
<td>and</td>
</tr>
<tr>
<td><strong>High Blood Pressure (Hypertension) Stage 1</strong></td>
<td>130 - 139</td>
<td>or</td>
</tr>
<tr>
<td><strong>High Blood Pressure (Hypertension) Stage 2</strong></td>
<td>140 or higher</td>
<td>or</td>
</tr>
<tr>
<td><strong>Hypertensive Crisis</strong> (consult your doctor immediately)</td>
<td>Higher than 180</td>
<td>and/or</td>
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</tbody>
</table>

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http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/GettheFactsAboutHighBloodPressure/How-High-Blood-Pressure-is-Diagnosed_UCM_301873_Article.jsp#.W0P-VbgnaUk

https://www.health.harvard.edu/heart-health/reading-the-new-blood-pressure-guidelines
<table>
<thead>
<tr>
<th>Class</th>
<th>Systolic blood pressure (mmHg)</th>
<th>Diastolic blood pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt; 120</td>
<td>AND</td>
</tr>
<tr>
<td>Normal</td>
<td>120-129</td>
<td>AND/OR</td>
</tr>
<tr>
<td>High normal</td>
<td>130-139</td>
<td>AND/OR</td>
</tr>
<tr>
<td>Grade 1 hypertension</td>
<td>140-159</td>
<td>AND/OR</td>
</tr>
<tr>
<td>Grade 2 hypertension</td>
<td>160-179</td>
<td>AND/OR</td>
</tr>
<tr>
<td>Grade 3 hypertension</td>
<td>≥ 180</td>
<td>AND/OR</td>
</tr>
<tr>
<td>Isolated systolic hypertension</td>
<td>≥ 140</td>
<td>AND</td>
</tr>
</tbody>
</table>

Guidelines 2018
2018 Guidelines

Elevated BP Reading (office, home or pharmacy)

Dedicated Office Visit
Mean Office BP ≥ 180/110

No Diabetes
1. AOBP ≥ 135/85 (preferred)
2. Non-AOBP ≥ 140/90 (if AOBP unavailable)

Diabetes
AOBP or non-AOBP ≥ 130/80

No

Out-of-office Measurement
1. ABPM (preferred)
   Daytime mean ≥ 135/85
   24-hour mean ≥ 130/80
2. Home BP Series
   Mean ≥ 135/85

Yes

Hypertension

Notes:
1. If AOBP is used, use the mean calculated and displayed by the device. If non-AOBP (see note 2) is used, take at least three readings, discard the first and calculate the mean of the remaining measurements. A history and physical exam should be performed and diagnostic tests ordered.

2. AOBP = Automated Office BP. This is performed with the patient unattended in a private area.
   Non-AOBP = Non-automated measurement performed using an electronic upper arm device with the provider in the room.

3. Diagnostic thresholds for AOBP, ABPM, and home BP in patients with diabetes have yet to be established (and may be lower than 130/80 mmHg).

4. Serial office measurements over 3-5 visits can be used if ABPM or home measurement not available.

5. Home BP Series: Two readings taken each morning and evening for 7 days (28 total). Discard first day readings and average the last 6 days.

6. Annual BP measurement is recommended to detect progression to hypertension.

White Coat Hypertension
What can I do if I have prehypertension or hypertension?

1. See your doctor & have your BP checked regularly. Also, see if it's safe to start an exercise program.

2. Exercise, exercise, exercise! 20-60 min of aerobic exercise on most days.

3. Lose weight, if overweight. Exercise, exercise, exercise!

4. Add spice to your life, not salt. Garlic, cilantro, oregano, pepper & onion instead of salt!

5. Do the DASH, don't overdine! Dietary Approaches to Stop Hypertension, plant-based Mediterranean diet w/plenty of vegetables, fruits, whole grains & non-/low-fat dairy to ensure much Ca\(^2+\), K\(^+\) & Mg\(^2+\) intake.

6. Limit alcohol intake. No more than 1-2 drinks/d for ♀, 2-3 drinks/day for ♂.
Resources that may be helpful…

https://newsroom.heart.org/news/high-blood-pressure-redefined-for-first-time-in-14-years-130-is-the-new-high

https://www.khanacademy.org/science/health-and-medicine/circulatory-system/blood-pressure-ddp/v/what-is-blood-pressure-1

https://www.youtube.com/watch?v=o3UA-bTbWDc

https://www.youtube.com/watch?v=sOwBDmu1Y0c

https://www.youtube.com/watch?v=JA0Wb3gc4mE