3.2: Blood Pressure Basics

What is Blood Pressure?

A blood pressure reading is the measurement of the force of blood against the walls of the arteries as the heart pumps blood through the body. It is reported in millimeters of mercury (mmHg). This pressure changes in the arteries when the heart is contracting compared to when it is resting and filling with blood. Blood pressure is typically expressed as the reflection of two numbers, systolic pressure and diastolic pressure. The **systolic blood pressure** is the maximum pressure on the arteries during systole, the phase of the heartbeat when the ventricles contract. **Systole** causes the ejection of blood out of the ventricles and into the aorta and pulmonary arteries. The **diastolic blood pressure** is the resting pressure on the arteries during **diastole**, the phase between each contraction of the heart when the ventricles are filling with blood.\(^1\)

Blood pressure measurements are obtained using a stethoscope and a **sphygmomanometer**, also called a blood pressure cuff. To obtain a manual blood pressure reading, the blood pressure cuff is placed around a patient’s extremity, and a stethoscope is placed over an artery. For most blood pressure readings, the cuff is usually placed around the upper arm, and the stethoscope is placed over the brachial artery. The cuff is inflated to constrict the artery until the pulse is no longer palpable, and then it is deflated slowly. The American Heart Association (AHA) recommends that the blood pressure cuff be inflated at least 30 mmHg above the point at which the radial pulse is no longer palpable. The first appearance of sounds, called **Korotkoff sounds**, are noted as the systolic blood pressure reading. Korotkoff sounds are named after Dr. Korotkoff, who first discovered the audible sounds of blood pressure when the arm is constricted.\(^2\) The blood pressure cuff continues to be deflated until Korotkoff sounds disappear. The last Korotkoff sounds reflect the diastolic blood pressure reading.\(^3\) It is important to deflate the cuff slowly at no more than 2-3 mmHg per second to ensure that the absence of pulse is noted promptly and that the reading is accurate. Blood pressure...
readings are documented as systolic blood pressure/diastolic pressure, for example, 120/80 mmHg.

Abnormal blood pressure readings can signify an area of concern and a need for intervention. Normal adult blood pressure is less than 120/80 mmHg. **Hypertension** is the medical term for elevated blood pressure readings of 130/80 mmHg or higher. See Table \(\PageIndex{1}\) for blood pressure categories according to the 2017 American College of Cardiology and American Heart Association Blood Pressure Guidelines. \[^4\] Prior to diagnosing a person with hypertension, the health care provider will calculate an average blood pressure based on two or more blood pressure readings obtained on two or more occasions.

**Note**

For more information about hypertension and blood pressure medications, visit the “Cardiovascular and Renal System” chapter in Open RN Nursing Pharmacology.

**Hypotension** is the medical term for low blood pressure readings less than 90/60 mmHg. \[^5\] Hypotension can be caused by dehydration, bleeding, cardiac conditions, and the side effects of many medications. Hypotension can be of significant concern because of the potential lack of perfusion to critical organs when blood pressures are low.

**Orthostatic hypotension** is a drop in blood pressure that occurs when moving from a lying down (supine) or seated position to a standing (upright) position. When measuring blood pressure, orthostatic hypotension is defined as a decrease in blood pressure by at least 20 mmHg systolic or 10 mmHg diastolic within three minutes of standing. When a person stands, gravity moves blood from the upper body to the lower limbs. As a result, there is a temporary reduction in the amount of blood in the upper body for the heart to pump, which decreases blood pressure. Normally, the body quickly counteracts the force of gravity and maintains stable blood pressure and blood flow. In most people, this transient drop in blood pressure goes unnoticed. However, some patients with orthostatic hypotension can experience light-headedness, dizziness, or fainting. This is a significant safety concern because of the increased risk of falls and injury, particularly in older adults. \[^6\]

<table>
<thead>
<tr>
<th>Blood Pressure Category</th>
<th>Systolic mm Hg (upper #)</th>
<th>Diastolic mm Hg (lower #)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 120</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>Stage 1</td>
<td>130-139</td>
<td>80-89</td>
</tr>
<tr>
<td>Stage 2</td>
<td>At least 140</td>
<td>At least 90</td>
</tr>
<tr>
<td>Hypertensive Crisis</td>
<td>&gt; 180</td>
<td>&gt; 120</td>
</tr>
</tbody>
</table>

**Note**

View Ahmend Alzawi’s Korotkoff Sounds Video on YouTube \[^8\]
Equipment to Measure Blood Pressure

Manual Blood Pressure

A sphygmomanometer, commonly called a blood pressure cuff, is used to measure blood pressure while Korotkoff sounds are auscultated using a stethoscope. See Figure \(\PageIndex{1}\)\(^9\) for an image of a sphygmomanometer.

![Sphygmomanometer](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Skills_(OpenRN)/03%3A_Blood_Pressure/3.02%3A_Blood_Pressure…)

Figure \(\PageIndex{1}\): A Sphygmomanometer

There are various sizes of blood pressure cuffs. It is crucial to select the appropriate size for the patient to obtain an accurate reading. An undersized cuff will cause an artificially high blood pressure reading, and an oversized cuff will produce an artificially low reading. See Figure \(\PageIndex{2}\)\(^{10}\) for an image of various sizes of blood pressure cuffs ranging in size for a large adult to an infant.

![Blood Pressure Cuffs](https://med.libretexts.org/Bookshelves/Nursing/Nursing_Skills_(OpenRN)/03%3A_Blood_Pressure/3.02%3A_Blood_Pressure…)

Figure \(\PageIndex{2}\): Sizes of Blood Pressure Cuffs

The width of the cuff should be 40\% of the person’s arm circumference, and the length of the cuff’s bladder should be 80–100\% of the person’s arm circumference. Keep in mind that only about half of the blood pressure cuff is the bladder and the other half is cloth with a hook and loop fastener to secure it around the arm.
Automatic Blood Pressure Equipment

Automatic blood pressure monitors are often used in health care settings to efficiently measure blood pressure for multiple patients or to repeatedly measure a single patient's blood pressure at a specific frequency such as every 15 minutes. See Figure \( \PageIndex{3} \) \[12\] for an image of an automatic blood pressure monitor. To use an automatic blood pressure monitor, appropriately position the patient and place the correctly sized blood pressure cuff on their bare arm or other extremity. Press the start button on the monitor. The cuff will automatically inflate and then deflate at a rate of 2 mmHg per second. The monitor digitally displays the blood pressure reading when done. If the blood pressure reading is unexpected, it is important to follow up by obtaining a reading using a manual blood pressure cuff. Additionally, automatic blood pressure monitors should not be used if the patient has a rapid or irregular heart rhythm, such as atrial fibrillation, or has tremors as it may lead to an inaccurate reading.

Figure \( \PageIndex{3} \): Automatic Blood Pressure Monitor