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**EMS SKILL**

PATIENT ASSESSMENT / VITAL SIGNS

**BLOOD PRESSURE (BP)**

**PERFORMANCE OBJECTIVES**

Demonstrate proficiency in obtaining a blood pressure (+/- 4mmHg) using the auscultation method, palpation method, and by using a noninvasive blood pressure monitor.

**CONDITION**

Auscultate a systolic and diastolic blood pressure, palpate a systolic blood pressure, and obtain a non-invasive blood pressure on a live model. Necessary equipment will be adjacent to the patient or brought to the field setting.

**EQUIPMENT**

Live model, large/medium/pediatric sphygmomanometer, non-invasive blood pressure monitor, stethoscope/dual teaching stethoscope, goggles, mask, gown, gloves.

**PERFORMANCE CRITERIA**

• Items designated by a diamond (⧫) must be performed successfully to demonstrate skill competency.

• Items identified by double asterisks (\*\*) indicate actions that are required if indicated.

• Items identified by (§) are not skill component items, but should be practiced.

• Reading must be within +/- 6 mmHg (systolic and diastolic) of examiner’s determination.

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| **PREPARATION** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Establish body substance isolation precautions | • Mandatory personal protective equipment - gloves  • Situational - goggles, mask, gown |
| ⧫ Select and expose an appropriate site:  • Upper extremity  • Lower extremity | * Letting the patient know what he/she may feel during the measurement allows for a more accurate reading. Constriction of the arm or limb that is held in a tense position results in an inaccurate reading and leads to discomfort, blood clots, and a potential injury to the vein. |
| ⧫ Select appropriate size blood pressure cuff | • Each EMS unit should carry all sizes of BP cuffs (large, adult, and pediatric).  • The appropriate cuff size must be selected to ensure an accurate measurement.  - The cuff width should cover 2/3rd of the upper portion of the limb.  - The bladder of the cuff should encircle 2/3rd of the circumference of the limb.  - Using a cuff too large gives a false “low” reading.  - Using a cuff too small gives a false “high” reading. |
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| **UPPER EXTREMITY AUSCULTATED BLOOD PRESSURE**  **PROCEDURE** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Apply the cuff snuggly around arm:  • Approximately 1" above antecubital space  • Center the bladder over the brachial artery  • Ensure bulb and tubing are at bottom of cuff - *if possible* | • The center of the bladder cuff must be placed over brachial artery in order to register sounds clearly.  • The bulb and tubing should be at the bottom of the cuff unless a limb contracture or otherproblems prevent this. |

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| **Skill Component** | **Key Concepts** |
| ⧫ Locate the brachial artery and palpate for a pulse | • The purpose for locating the brachial artery is to find the best site for sound reproduction.  • The rescuer must use their fingertips to palpate for a pulse.   * The thumb should NEVER be used as it contains its own pulse which may be mistaken for the patient’s pulse. |
| ⧫ Insert the earpieces of the stethoscope into the rescuer’s ears | • The earpieces must be facing forward. This allows for better sound conduction. |
| ⧫ Place the diaphragm/bell of the stethoscope over the brachial artery | * Prior to placing the diaphragm of the stethoscope over the brachial artery, tap on the diaphragm/bell and listen for the sound through the earpieces. This enables you to determine which side of the head of the stethoscope to place over the artery.   • If stethoscope has a dual head, use the bell side of the head of the stethoscope for better sound conduction. |
| ⧫ Place/hold arm at the level of the heart | * The arm should be held at the level of the heart for the best sounds to be heard. |
| ⧫ Inflate the cuff while listening for pulse sounds  ***\*\* Inflate the cuff an additional 20-30mmHg above the level where the pulse sound stops,*** | • Over inflation of the cuff causes vasospasms and/or pain and results in a false high reading. |
| ⧫ Deflate the cuff 2-4 mmHg/second and note where the first sound is heard *(systolic pressure)* | • Deflating the cuff too slowly causes venous congestion and results in a false high reading.  • The first sound heard indicates the initial flow of blood through the artery (ventricular contraction ejecting blood into the arterial system).  • If the first sound is not heard, deflate the cuff completely and wait a minimum of 30 seconds before attempting re-inflation to prevent venous congestion. |
| ⧫ Continue to deflate the cuff 2-4 mmHg/second and **note** where the first change in tone changes or disappears *(diastolic pressure)* (+/- 4mmHg) | • The sounds may disappear completely at this point or they may change (muffled). This occurs because the pressure in the cuff falls below the pressure in the artery. This is considered the diastolic pressure (ventricles in diastole - resting phase). |
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| **LOWER EXTREMITY AUSCULTATED BLOOD PRESSURE**  **PROCEDURE** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Apply the cuff snuggly around the thigh:  • Approximately 1" above the crease behind the knee  • Center the bladder over the popliteal artery  • Ensure bulb and tubing are at bottom of cuff - *if possible*  ***\*\*Place the patient in the supine position*** | • The lower extremity should be used to determine the blood pressure when the upper arm cannot be used.  • The patient should be placed in a supine position and the lower extremity should be relaxed for an accurate reading to occur.  • The center of the bladder must be placed over the popliteal artery in order to register sounds clearly.  • The lower extremity systolic pressure may be 10-40 mmHg higher than in the upper extremities. The diastolic pressure may be the same or lower than the arm. |
| ⧫ Locate the popliteal artery and palpate pulse | • The purpose for locating the popliteal artery is to find the proper site to place the diaphragm of the stethoscope.  • Use the fingertips to palpate and **NOT** the thumb. |
| ⧫ Insert the earpieces of the stethoscope into ears | • The earpieces must be facing forward. This allows for better sound conduction. |

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| **Skill Component** | **Key Concepts** | |
| ⧫ Place the diaphragm/bell of the stethoscope over the popliteal artery | * Prior to placing the diaphragm of the stethoscope over the brachial artery, tap on the diaphragm/bell and listen for the sound through the earpieces. This enables you to determine which side of the head of the stethoscope to place over the artery.   • If stethoscope has a dual head, use the bell side of the head for better sound conduction. | |
| ⧫ Place/hold leg at the level of the heart | * The leg should be held at the level of the heart for the best sounds to be heard. | |
| ⧫ Inflate the cuff while listening for pulse sounds  ***\*\* After the pulse sound disappears, inflate the cuff an additional 20-30mmHg above the level where the pulse sound stopped*** | • Over inflation of the cuff causes vasospasms and/or pain and results in a false high reading. | |
| ⧫ Deflate the cuff 2-4 mmHg/second and note where the first sound is heard *(systolic pressure)* (+/- 4mmHg) | * Deflating the cuff too slowly causes venous congestion and results in a false high reading.   • The first sound heard indicates the initial flow of blood through the artery (ventricular contraction ejecting blood into the arterial system).  • If the first sound is not heard, deflate the cuff completely and wait a minimum of 30 seconds before attempting re-inflation to prevent venous congestion. | |
| ⧫ Continue to deflate the cuff 2-4 mmHg/second and note where the last distinct sound is heard *(diastolic pressure)* (+/- 4mmHg). | • The sounds may disappear completely at this point or they may change (muffled). This occurs because the pressure in the cuff falls below the pressure in the artery. This is considered the diastolic pressure (ventricles in diastole - resting phase). This is recorded as the 2nd or last sound (120/80). | |
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| **PALPATED BLOOD PRESSURE**  **PROCEDURE** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Places the cuff on snuggly around the arm:  • Approximately 1" above antecubital space  • Center the bladder over the brachial artery  • Ensure bulb and tubing are at bottom of cuff - *if possible* | • Obtaining a **p*alpated BP is NEVER preferred.*** A palpated BP only provides a systolic pressure and does not provide a diastolic pressure. Therefore, important diagnostic information is not known (i.e. the pulse pressure).   * The pulse pressure is the difference between the systolic and diastolic pressure (i.e. 120/80 has a pulse pressure of 40mmHg). Pulse pressure readings of greater than 40mmHg may be indicative of serious underlying medical emergencies. Without a diastolic reading, a widened pulse pressure (> 40 mmHg) would go undetected. * A palpated blood pressure should only be used when environmental noise precludes you from hearing the sounds. An auscultated pressure should always be attempted initially and ASAP during the ongoing assessment.   • Palpated pressure readings are lower than auscultated readings.   * The arm should be held at level of the heart in order to obtain the best measurement.   • The center of the bladder must be placed over brachial artery in order to obtain an accurate measurement. |

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| **Skill Component** | **Key Concepts** |
| ⧫ Locate and palpate the pulse at the brachial or radial artery | * The brachial artery gives the most accurate systolic reading. |
| ⧫ Place/hold arm at the level of the heart |  |
| ⧫ Inflate the cuff while palpating the radial pulse  ***\*\* After the radial pulse disappears, inflate the cuff an additional 20-30mmHg above the level where the pulse stopped*** | * Over inflation of the cuff causes vasospasms and/or pain and results in a false high reading. |
| ⧫ Deflate cuff 2-4 mmHg/second and note where the first beat is felt (+/- 4mmHg) | * Deflating the cuff too slowly causes venous congestion and results in a false high reading.   • The first beat felt indicates the initial flow of blood through the artery (ventricular contraction ejecting blood into the arterial system). |
| **NON-INVASIVE BLOOD PRESSURE MONITOR (NIBP)**  **PROCEDURE** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Obtains a baseline auscultated blood pressure reading | * A baseline auscultated blood pressure must be obtained and documented prior to the use of a noninvasive blood pressure monitor. |
| ⧫ Apply and position the noninvasive cuff on the arm or thigh | * The noninvasive blood pressure monitor is applied in the same manner as the sphygmomanometer. |
| ⧫ Place/Hold arm/leg at the level of the heart |  |
| ⧫ Activate the device by depressing the button | * Letting the patient know what he/she may feel during the measurement allows for a more accurate reading. Constriction of the arm or limb that is held in a tense position results in an inaccurate reading and leads to discomfort, blood clots, and a potential injury to the vein. |
| ⧫ Obtain and interpret the reading, +/- 4mmHg of the auscultated blood pressure . | * The systolic and diastolic pressure will be noted in the display portion of the device. * If the initial BP reading obtained does not correlate with the patient’s clinical picture, the pressure is high, bilateral pulses are unequal, or if there is a suspicion of an aortic dissection an auscultated blood pressure must be obtained. * If the reading was not obtainable, the device will indicate this in the display portion of the device. |
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| **RE-ASSESSMENT**  **(Ongoing Assessment)** | |
| **Skill Component** | **Key Concepts** |
| § Re-assess auscultated or palpated blood pressure as required:  • Unstable patients every 5 minutes  • Stable patients every 15 minutes | • If a palpated blood pressure was obtained initially, obtain an auscultated blood pressure **ASAP**.  • Obtain a BP readings in the both arms if the initial BP reading obtained does not correlate with the patient’s clinical picture, the pressure is high, bilateral pulses are unequal, or if there is a suspicion of an aortic dissection. |

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| **PATIENT REPORT AND DOCUMENTATION** | | |
| **Skill Component** | | **Key Concepts** |
| § Verbalize/Document:  • Blood pressure reading  • Site used  • Patient’s position | | • Documentation must be on either the Los Angeles County EMS Report form or Provider Patient Care Record or ePCR.  • Documenting reassessment information provides a comprehensive picture of patient’s response to treatment.  • If blood pressure is palpated or a lower extremity is used to obtain a blood pressure, document the rationale for using this method or site.  • The site used may provide different pressure values which are specific to the upper or lower extremity.  • It is important to document the patient’s position as to standing, sitting or lying down. |

Developed 3/02 Revised 10/2018



PATIENT ASSESSMENT / VITAL SIGNS

**BLOOD PRESSURE**

**Supplemental Information**

**DEFINITIONS:**

• Blood pressure - measurement of force applied against the walls of the arteries as the heart pumps blood through the body. Determined by stroke volume (amount of blood ejected into the arterial system with one ventricular contraction), heart rate, and peripheral vascular resistance (BP=combination of SV, HR, and PVR)

• Pulse pressure -is defined as the difference in pressure between the systolic and diastolic pressure. This diagnostic information is important in certain conditions:

- Widening pulse pressure may indicate increased intracranial pressure

- Narrowing pulse pressure may indicate cardiogenic, hypovolemic or other forms of shock which have a decreasing systolic pressure

**NOTES:**

• The extremity should be at the level of the heart and in a relaxed position or readings will be inaccurate:

* + above heart level leads to a false “low” reading
  + below heart level leads to a false “high” reading
* The brachial artery gives the most accurate systolic reading. It can be palpated all the way down to approximately 70mmg/Hg. The radial artery is no longer palpable below 80mmHg.
* If you will be using an NIBP, a baseline auscultated blood pressure must be obtained and documented prior to its use.
* The noninvasive blood pressure monitor is applied in the same manner as the sphygmomanometer.
* The systolic and diastolic pressure will be noted in the display portion of the device.
* If the initial BP reading obtained does not correlate with the patient’s clinical picture, the pressure is high, bilateral pulses are unequal, or if there is a suspicion of an aortic dissection an auscultated blood pressure must be obtained.
* If the reading was not obtainable, the device will indicate this in the display portion of the device.

• Hypertension in adults is when the systolic pressure is sustained > 140mmHg **OR** diastolic pressure > 90mmHg. However, patients with chronic hypertension may be in shock when pressures drop below their normal and are considered adequate for non-hypertensive patients.

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| **Normal systolic blood pressure parameters** | | | **Systolic blood pressures denoting hypotension when associated with signs and symptoms of shock** | |
| Newborn 50-70  Infant 80-100  Child 80-110  Adult 90-140 | | | Males < 90 Systolic  Females < 80 Systolic  Children < 70 Systolic | |
| **Common Pitfalls** | | |
| **Situation** | **Results** | |
| Cuff is too large  Cuff is too small  Center of the bladder is not over the brachial artery  Cuff is deflated too slowly  Cuff is over inflated | False low reading  False high reading  Inaccurate reading  Causes venous congestion = false high reading  Causes vasospasms/pain = false high reading | |

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| **Documentation** | | |
| **Readings** | **Readings** | |
| Two sound readings  Palpated reading | Systolic/diastolic (120/72)  Systolic/palpated (90/P). | |
| *In some situations the diastolic sound may not disappear completely and is recorded as systolic/zero (72/0).* | | |