

Procedure for Measuring and Calculating the ABI

Action	Procedure
Prepare equipment and supplies	<ol style="list-style-type: none"> 1. Gather equipment and supplies for the ABI. <ul style="list-style-type: none"> • Portable continuous wave Doppler with 8 to 10 MHz probe (5 MHz if a large amount of edema is present at the ankle). • Aneroid sphygmomanometer and pressure cuff. • Ultrasound transmission gel. • Alcohol pads to clean the Doppler and gauze, tissue, or pads to remove the transmission gel from the patient's skin. • Towels, sheets, or blankets to cover the trunk and extremities. • Paper and pen for recording test results; calculator. • Inspect the equipment and check the batteries if a battery-operated Doppler is used, and replace equipment that is damaged or not calibrated. 2. Pressure cuffs for arms and ankles should be long enough to fully encircle the limb. The width of the cuff's bladder should be 40% of the limb's circumference and the length sufficient to cover 80% of the limb's circumference. <ul style="list-style-type: none"> • Typically, 12 cm wide cuffs are used for arms and 10 cm wide cuffs at the ankles. • Extra-large adult cuffs might be needed (14 cm).
Prepare patient and environment	<ol style="list-style-type: none"> 1. Inquire about recent use of tobacco, caffeine, or alcohol; recent heavy activity, and presence of pain. Note: When possible, advise the patient to avoid stimulants or heavy exercise for an hour prior to the test. 2. Perform the ABI in a quiet, warm environment to prevent vasoconstriction of the arteries (21 to 23 ± 1 °C). 3. The best ABI results are obtained when the patient is relaxed, comfortable, and has an empty bladder. 4. Explain the procedure to the patient. 5. Remove shoes, socks, and tight clothing to permit placement of the pressure cuff and access to the pulse sites by the Doppler probe. 6. Place the patient in a flat, supine position. Place one small pillow behind the patient's head for comfort. 7. Cover the trunk and extremities to prevent cooling. 8. Ensure the patient is comfortable and have the patient rest for a minimum of 10 minutes prior to the test to allow pressures to normalize. 9. After the rest period, measure the arm and ankle pressures.
Measure brachial pressures with Doppler	<ol style="list-style-type: none"> 1. The arm should be relaxed, supported, and at heart level. 2. Prior to placement of the cuff, apply a protective barrier (e.g., plastic wrap) on the extremity if any wounds or alterations in skin integrity are present. 3. Place the pressure cuff with the bottom of the cuff approximately 2 to 3 cm above the cubital fossa on the arm. 4. The cuff should be wrapped without wrinkles and placed securely to prevent slipping and movement during the test. 5. Palpate the brachial pulse to determine the location to obtain an audible pulse. 6. Apply transmission gel over the pulse site. 7. Place the tip of the Doppler probe at a 45° angle pointed towards the patient's head until an audible pulse signal is obtained.

	<ol style="list-style-type: none"> 8. Inflate the pressure cuff 20 to 30 mmHg above the point where the pulse is no longer audible. 9. Deflate the pressure cuff at a rate of 2 to 3 mmHg per second, noting the manometer reading at which the first pulse signal is heard and record that systolic value. 10. Cleanse/remove gel from the pulse site. 11. Repeat the procedure to measure the pressure on the other arm. 12. If a pressure needs to be repeated, wait 1 minute before re-inflating the cuff. 13. Use the higher of the brachial pressures from the right or left arm to calculate the ABI for both legs.
Measure ankle pressures with Doppler	<ol style="list-style-type: none"> 1. Prior to placing the cuff, apply a protective barrier (e.g., plastic wrap) on the extremity if there are any wounds or alterations in skin integrity. 2. Place the cuff on the patient's lower leg with the bottom of the cuff approximately 2 to 3 cm above the malleolus. 3. The cuff should be wrapped without wrinkles and placed securely to prevent slipping and movement during the test. 4. Measure both dorsalis pedis and posterior tibial pulses on each leg. 5. Locate the pulses by palpation or with the Doppler probe. 6. Apply transmission gel to the pulse site. 7. Place the tip of the Doppler probe at a 45° angle pointed towards the patient's knee until an audible pulse signal is obtained. 8. Inflate the pressure cuff 20 to 30 mmHg above the point where the pulse is no longer audible. 9. Deflate the cuff slowly at a rate of 2 to 3 mmHg per second noting the manometer reading at which the first pulse signal is heard and record that systolic value. 10. Cleanse/remove gel from the pulse site. 11. Repeat the procedure to measure pressures on the other ankle. 12. If a pressure needs to be repeated, wait 1 minute before re-inflating the cuff. 13. Use the higher of the ankle pressures of each leg to calculate the ABI for each leg.
Calculate the ABI	<ol style="list-style-type: none"> 1. Divide the higher of the dorsalis pedis or posterior tibial systolic pressure for each ankle by the higher of the right or left brachial pressures to obtain the ABI for each leg. <p style="text-align: center;"> $\text{ABI} = \frac{\text{Higher of either the dorsalis pedis or posterior tibial pressures}}{\text{Higher of the brachial pressures}}$ </p> 2. Interpret and compare the ABI values from each leg. 3. Refer the patient for further testing and evaluation if the ABI is less than 0.90, greater than 1.30, or unmeasurable due to noncompressible vessels; and/or if the patient's clinical symptoms and ABI are inconsistent. 4. Document findings, follow-up plans, and referrals.

Note. Table adapted with permission from: Wound, Ostomy and Continence Nurses Society. (2011). *Ankle brachial index: Quick reference guide for clinicians*. Mt. Laurel, NJ: Author.

Interpretation of Ankle Brachial Index (ABI)

ABI	Interpretation
Unable to obliterate the pulse signal at cuff pressure > 250 mmHg	Noncompressible arteries
> 1.30	Elevated
≥ 1.00	Normal
≤ 0.90	LEAD
≤ 0.60 to 0.80	Borderline perfusion
≤ 0.50	Severe ischemia
≤ 0.40	Critical limb ischemia (limb threatened)

Note. Table reprinted with permission from: Wound, Ostomy and Continence Nurses Society. (2014). *Guideline for management of wounds in patients with lower-extremity arterial disease. WOCN clinical practice guideline series1* (p. 60). Mt. Laurel, NJ: Author.