

Recommended Practice: Ankle-Brachial Pressure Index (ABPI) using hand-held Doppler ultrasound

Wound Healing and Management Node Group



PURPOSE

Ankle-Brachial Pressure Index (ABPI), as part of a comprehensive clinical assessment, is a useful tool to assess peripheral arterial blood supply. Most commonly ABPI is used:

- to determine if peripheral arterial blood supply is adequate to allow application of graduated compression therapy;
- for assessment of peripheral arterial supply when there are non-healing wounds or potential for wounds on the lower extremities;
- to determine the appropriateness of wound debridement, e.g. the neuroischaemic foot where there is insufficient blood supply to support control of infection; and
- as a screening tool for high risk populations.

EQUIPMENT

- Hand-held ultrasound Doppler device with 5–8 MHz probe
- Sphygmomanometer with an appropriately sized cuff (n.b., some devices allow the recording of all four extremity systolic blood pressures at the one time.)
- Ultrasound transmission gel
- Plastic wrap
- Paper and pen
- Calculator
- Detergent or alcohol wipes
- Tissues or gauze
- Adequate lighting

RECOMMENDED PRACTICE

ABPI is used to assess patients for lower limb peripheral arterial disease as a fall in blood pressure in an artery at the ankle relative to the central blood pressure suggests there is stenosis in the arterial conduits somewhere between the aorta and the ankle.¹

An ABPI is performed by measuring the systolic blood pressure in both brachial arteries, and in both the dorsalis pedis and posterior tibial arteries of each leg (some centres also assess the peroneal artery) after the patient has been at rest in the supine position for 15–25 minutes.²

The ABPI is calculated on each leg by dividing the highest ankle systolic blood pressure in each leg by the highest brachial systolic blood pressure obtained from either arm.^{1,2} Calculated ABPI values should be recorded to two decimal places.³

$$\text{ABPI} = \frac{\text{Ankle systolic blood pressure}}{\text{Brachial systolic pressure}}$$

Results should never be considered in isolation but in the context of the individual's clinical presentation.

PROCEDURE

Measurement of ABPI should be performed only by appropriately trained practitioners whose competency is regularly assessed. This is important given the complex method, and the clinical reporting issues around interpretation and reproducibility of results.⁴

Additionally, the practitioner needs to be able to recognise the quality of the audible signal transmitted from the Doppler (biphasic, triphasic or monophasic signals) as monophasic blood flow (a single, dull or high-pitched sound) signifies calcified or sclerosed arteries regardless of the ABPI result.

Sihlangu et. al.² found variations in the method used to measure the ABPI. The authors recommended standardising the procedure for each health care organisation. This standardisation should include:

- resting time required prior to ABPI measurement;

- the position of the patient; and
- precise location of the cuff.

It is recommended that the brachial readings be obtained before the ankle readings to limit the impact of discomfort or pain on the individual's blood pressure readings.

ABPI PROCEDURE

The operator should be comfortably positioned.

1. To ensure accuracy of blood pressure results: ask the patient to abstain from exercise, smoking or caffeine for 60 minutes prior to the procedure if possible. Provide a warm, relaxed environment.
2. Explain the procedure to the patient.
3. Ask the patient to lie in the supine position with one small pillow behind their head for comfort (preferably 20 minutes prior to the assessment).
4. If patient is unable to sustain the supine position, e.g. has difficulty breathing, place in the semi-recumbent position. This position should be documented and all successive readings taken in the same position for comparison purposes.
5. Remove socks, shoes or clothing that may impede placement of the sphygmomanometer cuff and access to pulse sites.
6. Follow the procedures below to assess the [brachial pressure](#) and [ankle pressure](#).
7. Calculate and record the ABPI to two decimal places (see above).
8. Calibrate the sphygmomanometer and the Doppler as per manufacturer's instructions.

Brachial pressure

1. Apply the sphygmomanometer cuff on the patient's upper arm, 2.5 cm above the antecubital space.
2. Ensure the patient's arm musculature is relaxed, supported and at the level of the heart.
3. Palpate the brachial pulse and place conductive gel over the identified area.
4. Locate the brachial pulse using the Doppler ultrasound and position the probe at a 45 degree angle against the direction of the blood flow to optimise reflected sound.
5. Once the pulse is located, inflate the sphygmomanometer cuff to 20–30 mmHg above the point that the pulse is no longer audible.

6. Deflate the cuff at a rate of 2–3 mmHg per second, noting the manometer reading at which the first pulse signal is heard.
7. Document this as the brachial systolic pressure.
8. Cleanse area with tissue or gauze to remove gel from arm.
9. Repeat procedure on the other arm.
10. Clean equipment using alcohol/detergent wipes.

Ankle pressure

1. Remove any wound dressings that are positioned where the sphygmomanometer needs to be placed. Place plastic wrap around patient's legs over the wounds. (A disposable cuff may be used.)
2. Place the sphygmomanometer cuff around the first ankle, 2.5 cm above the malleolus.
3. Locate the dorsalis pedis and the posterior tibialis pulses by palpation.
4. Apply conducting gel over the dorsalis pedis and posterior tibialis arteries at the ankle.
5. Locate the dorsalis pedis artery using the Doppler ultrasound. Position the probe at a 45 degree angle against the direction of the blood flow to optimise reflected sound.
6. Once the pulse is located, inflate the sphygmomanometer cuff to 20–30 mmHg above the point that the pulse is no longer audible.
7. Deflate the sphygmomanometer cuff at a rate of 2–3 mmHg per second, noting the manometer reading at which the first pulse signal is heard.
8. Document this reading as the ankle systolic pressure.
9. Repeat the procedure over the posterior tibialis artery.
10. Cleanse area with tissues or gauze to remove gel from leg.
11. Repeat procedure on the other ankle.
12. Clean equipment using detergent wipe.
13. Re-dress any wounds, if required.

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, *Worldviews Evid Based Nurs*. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute.⁶⁻⁸ WHAM evidence summaries undergo peer-review by an international review panel.

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in:

Wound Healing and Management Node Group, Evidence summary: Recommended practice: Ankle-Brachial Pressure Index (ABPI) using hand-held Doppler ultrasound. *Wound Practice and Research*, 2014;252(2):102-3.

REFERENCES

1. Al-Qaisi M, Nott D, King D & Kaddoura S. Ankle-Brachial Pressure Index (ABPI): An update for practitioners. *Vasc Health Risk Manag*, 2009; 5:833–41.
2. Sihlangu D & Bliss J. Resting Doppler ankle brachial pressure index measurement: a literature review. *Br J Community Nurs*, 2012; 17(7):318–24.
3. Hirsch A, Haskal Z, Hertzner N et al. ACC/AHA Guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric and abdominal aorta): Summary of

- recommendations. *J Vasc Interv Radiol* 2006; 17(9):1383–97.
4. Scottish Intercollegiate Guidelines Network. Management of chronic venous leg ulcers. Edinburgh: Scottish Intercollegiate Guidelines Network; 2010.
5. Wound Ostomy and Continence Nurses Society Clinical Practice Wound Subcommittee. Ankle Brachial Index: Quick reference guide for clinicians. *J Wound Ostomy Continence Nurs* 2012; 39(2S):S21–S9.
6. Aromataris E, Munn Z, editors. Joanna Briggs Institute Reviewer's Manual. <https://reviewersmanual.joannabriggs.org/>. The Joanna Briggs Institute, 2017.
7. Joanna Briggs Institute Levels of Evidence and Grades of Recommendation Working Party. New JBI Grades of Recommendation. Adelaide: Joanna Briggs Institute, 2013.
8. The Joanna Briggs Institute Levels of Evidence and Grades of Recommendation Working Party. Supporting Document for the Joanna Briggs Institute Levels of Evidence and Grades of Recommendation. The Joanna Briggs Institute, 2014.