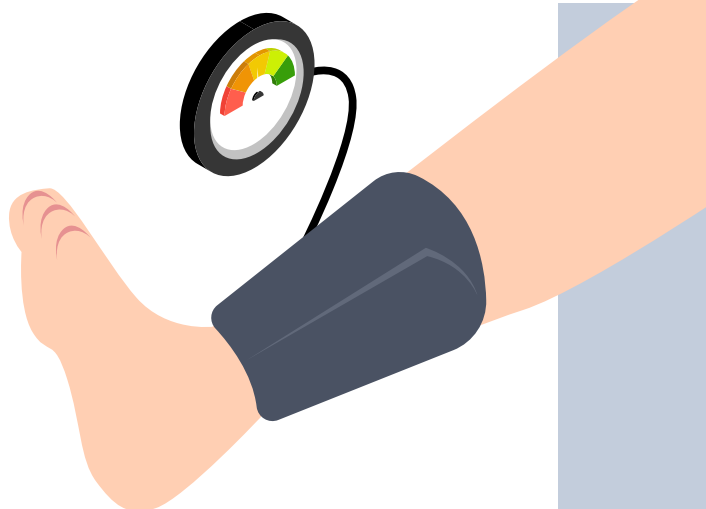


Best Practice Statement

Effectively assessing ABPI in
leg ulcer patients

2024



The importance of ABPI

Current practice

The role of automated ABPI
as part of a care pathway

The future

BEST PRACTICE STATEMENT: EFFECTIVELY ASSESSING ABPI IN LEG ULCER PATIENTS

PUBLISHED BY:

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WOUNDS | UK

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This document has been developed by Wounds UK and is supported by an unrestricted educational grant from MESI.



Simplifying Diagnostics

This publication was coordinated by Wounds UK with the Expert Working Group and Review Panel. The views presented in this document are the work of the authors and do not necessarily reflect the views of MESI.

How to cite this document:

Wounds UK (2024) *Best Practice Statement: Effectively assessing ABPI in leg ulcer patients*. Wounds UK, London. Available to download from: www.wounds-uk.com

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Foreword

Arterial assessment is a fundamental aspect of lower limb ulceration assessment; the most common form of objective arterial assessment is the measurement of ankle brachial pressure index (ABPI). However, research by Gray et al (2018) showed that 40% of people with leg ulcers either had not received an ABPI assessment, or it was unclear whether a recording had been taken. The reasons for lack of ABPI measurement include many factors, such as staff capability, equipment availability, lack of time/service capacity, and complexity of interpretation of results.

The availability of automated ABPI devices has the potential to make ABPI testing more efficient and readily available, improving assessment pathways and patient outcomes. Several clinical studies show strong agreement between automated and Doppler ABPI values in the general population and in people with cardiovascular disease and diabetes (Verberk et al, 2012; Span et al, 2016; Varetto et al, 2019; Hageman et al, 2021; Fendrik et al, 2023). While there is no clinical reason why leg ulcer patients would be different from the general population, there is a lack of documented research around the use of automated ABPI devices in patients with venous leg ulcers (VLUs) and, last year, the National Institute for Health and Care Excellence (NICE) released guidance recommending limitations to the use of automated devices for measuring ABPI in patients with or at risk of VLUs, which have made it more difficult for clinicians to access and use automated ABPI devices in practice (NICE, 2023).

Since the release of the guidance from NICE, there has been a lack of clarity for many hospitals and medical teams on how – and, indeed, if – automated ABPI devices should be used. This has led to variations and inconsistencies in clinical practice: while some clinicians recognise the benefits of automated devices, others have been forced to limit use in practice.

In many cases, significant time has been spent training clinicians on how to use automated ABPI devices, as well as money, as automated devices incur higher initial spending than traditional handheld Doppler machines. In addition, many experienced clinicians feel that the practice of now ‘storing away’ automated ABPI devices may be causing patients more harm because they are not receiving timely and appropriate assessments and treatments, which in turn may lead to patient deterioration.

In January 2024, a group of experts convened for an online meeting to develop this Best Practice Statement to help guide clinicians using automated ABPI devices for patients with VLUs. The aim of this document is to address some of the queries that clinicians have and the challenges they are facing, to help standardise practice and support clinicians to use automated ABPI devices within a safe framework.

Jacqui Fletcher, Chair

The importance of ABPI

The ABPI reading, regardless of how it was obtained, should serve as the final step to confirm clinical suspicion rather than being considered an actual diagnosis.

Best Practice Statement

ABPI is a well-established, simple and non-invasive bedside test to identify the presence/absence of peripheral arterial disease (PAD) in the leg by comparing systolic blood pressure at the ankle with the arm (Wounds UK, 2019). ABPI assessment is not intended for the diagnosis of venous disease, but rather to exclude significant arterial disease and confirm whether it is safe to use compression therapy (Wounds UK, 2022).

In very simple terms, PAD in the legs or lower extremities is the narrowing or blockage of the vessels that carry blood from the heart to the legs. It is primarily caused by the build-up of fatty plaque in the arteries, which is called atherosclerosis (CDC, 2022).

PAD can be dangerous because this build-up causes blockages that can restrict circulation to the limbs and organs, putting the patient at risk of damage. Left untreated, PAD increases the patient's risk of coronary artery disease, heart attack and stroke; limb amputation is also a serious complication of PAD (American Heart Association, 2024).

It has been shown that early identification and management of PAD helps reduce morbidity and mortality (Wounds UK, 2019). PAD has degrees of severity, which – alongside clinical signs and symptoms – should guide whether compression is applied.

Objective arterial assessment (with ABPI or toe pressure measurement generally being the most common in practice) should form a part of holistic clinical assessment in all patients with lower limb wounds, particularly a leg ulcer, as should patients who are considered to be at high risk of a leg ulcer (e.g. due to venous disease or immobility), or presenting with lower limb-related changes (Wounds UK, 2015; 2019). NICE stipulates that the ABPI should be undertaken within 2 weeks of presentation to avoid treatment delay (Srinivasaiah et al, 2007; Guest et al, 2018).

This assessment is a prerequisite for the application of strong compression therapy, which is considered the 'gold-standard' treatment for patients with (or at risk of) VLUs. If arterial assessment indicates PAD, strong compression therapy may be contraindicated, and require an individual risk assessment conducted by a specialist who is able to determine if, and what level of compression should be used.

It is important to note that 'first aid' compression up to 20mmHg pressure can be used in the absence of red flags, but this should be seen as a holding position, for a maximum of 2 weeks until the patient undergoes full holistic assessment to determine aetiology of the ulceration and start evidence-based treatment (e.g. strong compression for venous ulceration).

In a healthy individual, a normal ABPI value generally lies between 0.9 and 1.4 (Aboyans et al, 2018); see [Table 1](#) for more information on interpreting ABPI readings. It is important to remember that ABPI is only one part of a full holistic assessment, and diagnosis should be based on patient history, presenting complaint, physical examination, using diagnostic reasoning and clinical judgement to inform the clinician's treatment decisions. ABPI measurement should be used as part of this process, to confirm clinical suspicion, rather than being considered an actual diagnosis.

Automated ABPI testing

Traditionally, ABPI has been measured and calculated using handheld, manual Doppler devices, which use high-frequency ultrasound waves to measure the amount of blood flow through the patient's arteries and veins. The purpose of all ABPI testing is to assess the strength of the arterial blood flow at the ankle (Wounds UK, 2019).

While ABPI measurement is considered a vital part of assessment, evidence has shown that it is not being conducted widely enough in practice, which has a significant effect

MYTH

ABPI assessment confirms the preference of a VLU.

TRUTH

While a fundamental component of assessment, ABPI assessment will not diagnose venous disease – it will only identify the presence of significant peripheral arterial disease – and is solely a component of a full lower limb holistic assessment.

MYTH

ABPI can be used in isolation to confirm diagnosis.

TRUTH

ABPI must be recorded as part of a holistic assessment of all patients deemed to require compression therapy.

Table 1. Interpretation of ABPI measurement

ABPI reading	Interpretation of reading
>1.4	Abnormal (high)
1.0–1.4	Normal
0.9–1.0	Borderline
<0.9	Abnormal (low)

on healthcare systems, patient outcomes and costs (Wounds UK, 2019). Reasons for this often include lack of clinician skills, resources, time and confidence. Additionally, Doppler assessment can take up to 1 hour and can be uncomfortable for patients with leg ulcers.

Lack of testing can mean delayed diagnoses and negative outcomes in practice; lack of appropriate early intervention can also increase costs. The longer the patient goes without an accurate diagnosis and appropriate treatment, the smaller the chance of healing becomes (Lecouturier et al, 2019).

Recent evidence (Span et al, 2016; Carwithen et al, 2020; Watson et al, 2022) and clinician experience has shown that automated ABPI devices are generally easier and faster to use than manual Doppler testing, meaning that testing is more likely to be conducted in routine practice. The lack of Doppler assessment has historically created something of a vicious circle: clinicians do not have the time or skills to carry out Doppler assessment, but not conducting the assessment regularly means they may lose confidence and so do it even less in practice; this can be addressed with the quicker and easier automated testing, meaning that more patients receive an ABPI assessment who are in need of one. This cycle has also impacted on the use of gold-standard treatment (application of compression), with many clinicians being reluctant to apply compression in the absence of an ABPI despite the NWCSP recommendations suggesting it is safe to do so in the absence of a small number of red flag symptoms. The combination of not undertaking a Doppler,

and therefore not applying compression, results in significant delays in wound healing for many patients, substantially increasing the risk of infections and reduction of quality of life.

Some patients can find ABPI testing uncomfortable for a variety of reasons – including length of time lying down, the length of assessment and multiple inflations – therefore, automated testing may be more comfortable for many individuals with VLU (see **Box 1** for factors that may mean a patient is less able to undergo Doppler testing).

Assessing ABPI involves calculating the ratio derived from comparing the blood pressure in the upper and lower body; the brachial systolic blood pressure and pedal systolic blood pressure is measured with the patient resting. The ABPI for each leg is calculated by dividing the higher of the ankle pressures by the higher of the two brachial pressures. The readings should be approximately the same, but if the result indicates pressure variation, then further investigations may be necessary.

The following equipment is needed to conduct Doppler testing:

- Bed, couch, sofa or recliner chair
- Handheld Doppler machine
- Probe (5 or 8MHz)
- Transducer gel
- Sphygmomanometer and appropriately sized cuff
- Cling film/vapour-permeable dressing or equivalent
- Calculator or app if needed.

Before testing, the patient will generally need

Box 1. Medical factors that may affect a patient's ability to undergo Doppler ABPI testing (adapted from Wounds UK, 2019)

- Patient positioning – inability to lay flat
- Patient tolerance – unable to keep still for length of procedure or find the procedure too painful
- Other medical conditions: contractions of limb, dementia, anxiety
- Condition of skin – if fragile, infected or inflamed
- Positioning of ulcer – can increase patient pain if the ulcer is on the edge of the cuff location, or is over the area where the Doppler is normally positioned
- Size of limb – appropriate size cuff and type of Doppler probe (5mgHz)

Overview of Doppler testing (adapted from Benbow, 2011)

The term 'Doppler effect' originates from the Austrian physicist Christian Doppler (1803–1853), who found that the distance between waves (such as sound or light) changes as an observer of the waves and the source of the waves move relative to each other. Dopplers detect reflections of small, high-frequency sound waves (ultrasound) generated by microscopic vibrations of a ceramic crystal. When ultrasound waves reflect off moving objects such as blood flow, the wave frequency is slightly altered, which the Doppler picks up as signals, processes and amplifies so they are audible.

to lie flat for at least 15–20 minutes to obtain a resting pressure. By flattening the body, the hydrostatic pressure equalises, meaning pressure should be similar in the arms and legs.

The Doppler will need to be used to measure brachial systolic blood pressure and ankle systolic pressure; then ABPI is calculated using the following equation:

- Record the brachial pressure in both arms
- Record the ankle pressure in each leg using at least two pulses
- For each leg: use the highest ankle pressure in that leg and divide by the highest brachial pressure (irrespective of which arm it was recorded in). Repeat for the other leg.

ABPI assessment as part of care pathways

ABPI should form part of a care pathway that includes holistic assessment, and then appropriate care and/or referral triggered by the results of the assessment.

In reality, it is important that assessment helps to make practice more efficient and reduces overall workload by improving outcomes – as opposed to creating extra work for clinicians, which may mean that elements of assessment do not happen in practice. There have been reports that time constraints, staff capacity and lack of confidence may mean that no testing happens in practice. Incorporating automated ABPI (as depicted in **Figures 1 and 2**) into care pathways, where appropriate, may increase concordance with testing, thereby improving outcomes for patients.

Automated ABPI and current NICE guidance

NICE states that ‘there is not enough evidence to recommend routine adoption of automated ankle brachial pressure index (ABPI) measurement devices to detect peripheral arterial disease in people with leg ulcers. They should only be used in the

context of research for these people’ (NICE, 2023).

Centres already using automated ABPI measurement devices to detect PAD in people with leg ulcers can continue to use them, only if:

- they collect data or do research to assess their value and how well they identify people with PAD
- people using the devices have experience assessing PAD
- people using the devices are aware of their limitations, particularly diagnostic accuracy and the risk of missing PAD, and that there are differences between devices
- further assessment using other methods, including manual Doppler, is available.

It is acknowledged that more research is needed to understand why patients with a leg ulcer would be different in terms of ABPI accuracy compared to the general population. Further research is also needed surrounding automated ABPI devices, assessing their ability to detect PAD in people with leg ulcers, how they affect time to treatment for patients with VLU, the clinical outcomes for treatments started after ABPI assessment, and exploring the most appropriate user (specialist and non-specialist in assessing PAD) and the most appropriate healthcare setting for their use; plus potentially exploring different ABPI thresholds and how they can improve sensitivity for detecting PAD.

NICE’s economic modelling found that automated ABPI devices are unlikely to be cost-effective compared with manual Doppler measurement unless they reduce length of time before treatment starts, which was, at the time of their review, uncertain, although, more recent evidence from frontline clinicians has shown that there has been positive feedback on how automated ABPI has aided practice and increased levels of ABPI testing (Watson et al, 2022; Hazel, 2024), and therefore early instigation of compression, which benefits patients in real terms.

MYTH

Measurement of ABPI with a hand-held Doppler is the best form of ABPI testing.

TRUTH

More evidence is needed regarding the best method of ABPI testing.

Whichever way it is carried out, ABPI testing should be incorporated into existing holistic assessment frameworks and ongoing care pathways.

Best Practice Statement

Mild graduated compression therapy should be commenced in all patients with leg ulcers in the absence of red flags.

Best Practice Statement

National Wound Care Strategy Programme

The NWCSP (2022) advises using ABPI to screen for PAD in people with leg ulcers alongside a full clinical assessment. Immediate care for ulcers needs to include cleaning, application of emollient, a simple low-adherent dressing and use of compression.

It is recommended that mild graduated compression therapy is initiated in the absence of red flag symptoms/conditions

(such as infection, symptoms of sepsis, ischaemia, suspected deep vein thrombosis, skin cancer) even before obtaining an ABPI reading. Evidence has shown that the benefits of compression therapy outweigh any risks for patients.

In particular, people with non-healing leg ulcers should receive a full holistic assessment within 14 days of initial presentation to a healthcare professional (NWCSP, 2022).



Figure 1. Depiction of automated TBPI assessment in practice (shown using the MESI automated TBPI device as an example).



Statement: Any use of automated ABPI devices should be recorded, to increase evidence of use and how this might aid clinicians and patients.

Best Practice Statement

MYTH

NICE has said ABPI devices should not be used to detect PAD in any patients.

TRUTH

NICE did not question the use of automated ABPI devices in non-ulcerated patients with suspected PAD; NICE only requested more research on ulcer patients.

ABPI should be carried out in conjunction with immediate care for patients with leg ulcers.

Best Practice Statement

Current practice: needs and challenges

It can be challenging to obtain ABPI in patients with oedema, regardless of whether using a manual or automated device. Make sure that the right cuff size and Doppler probe are used, to ensure accuracy in readings.

Best Practice Statement

Where patients may be unable to undergo ABPI testing, consider other means such as toe pressure as part of their holistic assessment.

Best Practice Statement

It is important to use clinical judgement and full holistic assessment, rather than relying solely on a numerical reading.

Best Practice Statement

While appropriate referrals (e.g. to vascular or other specialists) are important, clinicians should have the confidence to make diagnoses and use their own clinical judgement when needed.

Best Practice Statement

Time is often one of the major constraints in clinical practice and can be a major factor in the type of care interventions delivered to patients. Other practical issues, such as product availability and cost, staffing levels and patient engagement, can all have a significant effect on practice.

With a focus often on 'doing more with less', it is important to integrate proper assessment and ongoing care into existing pathways that improve outcomes without complicating practice for clinicians or being seen as 'more to do', which may be counterproductive. Emerging evidence suggests that some services have stopped putting patients into compression, or there are delays in starting compression, because they have stopped using automated ABPI devices – which may be causing more harm for patients (Watson et al, 2022; Hazel, 2024).

Evidence suggest that, in the community setting, automated ABPI devices are quick to use and simultaneously compare pressure; in contrast, handheld Doppler devices can be more time-consuming and result in greater variations in blood pressure (Watson et al, 2022; Hazel, 2024) .

An over-reliance on ABPI readings – for example, clinicians waiting for a Doppler device to become available, or for a clinician with the skills to carry out a Doppler reading – delaying compression therapy, may lead to adverse consequences for the patient, including delayed healing, cellulitis and inappropriate use of antibiotics, all of which can significantly impact on the patient's quality of life. These further complications may also result in increased overall spend due to higher healthcare costs (e.g. due to delayed wound healing) and use of clinician time. There can also be an overreliance on subjective assessments (e.g. pulse palpation and Doppler waveform analysis) and a lack of use of brachial, ankle and toe pressures (North West NHS Podiatry Services Clinical Effectiveness Group, 2022).

It is important not to rely solely on ABPI measurements; for example, using toe pressure as a diagnostic tool can also provide information about a patient's vascular health and circulation. This can be beneficial for some patient groups, especially if a cuff cannot go around the ankle (for example, due to painful ulceration, lymphoedema or obesity, or if there is a suspicion of arterial calcification, or ABPI is elevated or incompressible).

Some clinicians may be hesitant to make diagnoses themselves, which may in turn lead to inappropriate referrals to vascular specialists solely based on numerical ABPI values. It is important to note that, rather than relying solely on numerical data, clinicians need to use clinical judgement, consider the patient's presenting complaints, and base treatment recommendations on a full holistic assessment. This means holistic patient assessment, leg assessment, social assessment and assessment of psychosocial factors. For example, if a patient is detected as having potential PAD based on clinical finding and ABPI results, and does not have any ulceration or signs of critical limb ischaemia, the patient does not need to be referred to vascular services. Instead, the patient should be managed within primary care with focus on risk factor modification.

Gray et al (2018) reported underutilisation of ABPI testing in individuals with leg ulcers, which is likely linked to an underuse of compression therapy in practice. Regardless of what diagnostic tools, measurements or devices are used, staff need to be trained appropriately with the right skills, and test results need to be interpreted by someone with sufficient training and knowledge.

There has been some concern that automated ABPI systems may over-predict PAD (by potentially giving a false positive result), which could potentially result in over-referral of patients into vascular services for further assessment (NICE, 2023). This requires further research, and

emphasises the importance of not using any form of ABPI testing as a diagnostic tool, but as part of a full holistic assessment.

Training is needed to help clinicians interpret device readings and differentiate between genuine cases of PAD and false positives. Based on a study undertaken by Fendrik et al (2023), it may be suggested that clinicians could utilise a two-step verification process: if an automated ABPI device confirms a PAD diagnosis, then vascular imaging can be used for further confirmation. This dual-confirmation method would help reduce the risk of false positives. Automated devices should not be used to make a definitive diagnosis but instead to address initial suspicions or concerns.

Incorporating a second step into the assessment process may consume additional time but it is necessary to reduce the number of inappropriate referrals. If the initial testing does not suggest PAD, and this is backed up with clinical judgement and overall holistic assessment, then these patients may be able to access treatment sooner using this process, rather than not using the automated testing device in the first instance.

When using all types of devices, clinicians need to be aware of the technical limitations of using ABPI and how variations in its application can affect readings (Al-Qaisi et al, 2009).

Patient factors

Factors such as pain and other health issues may mean that patients experience challenges when undergoing ABPI testing. It is important that clinicians do all they can to address these issues and obtain an accurate ABPI reading, irrespective of device used, to inform treatment and improve the patient's overall outcome.

Addressing potential pain issues is important; pain may be linked to patients' experiencing anxiety around testing and treatment, and potentially not engaging with treatment. A patient may have had

a previous bad experience around ABPI testing, and will need to be reassured about the process.

Having an open and transparent conversation in this way may represent a good opportunity to open a discussion with the patient about their overall health and any lifestyle or psychosocial factors that may be relevant; for example, this could mean talking with the patient about smoking or nutrition.

Generalists carrying out Doppler assessments may not get it right the first time, so repeated pumping up of the cuff can cause more pain to the patient; whereas automated ABPI devices can help to reduce pain experienced by the patient, so may be particularly helpful in patients where pain is an issue (e.g. due to oedema, active ulceration or fragile skin).

Both Doppler and automated ABPI require patients to lie down flat; however, automated ABPI testing requires the patient to lie down for a much shorter period than Doppler testing (Carwithen et al, 2020). Additionally, for the longer periods that the Doppler ABPI requires, lying down ('flat', ideally at a maximum of 30 degrees) may not be possible for all patients due to issues such as pain, mobility, breathing or weight problems.

Importantly, there can often be a misconception that conducting ABPI testing in an incorrect position is 'better than not doing it' but this can cause problems, and results should be interpreted with caution and any potential discrepancies considered (Wounds UK, 2019).

From a practical clinician point of view, having to incorporate extra time for the patient to rest flat before testing can begin (for at least 10 minutes) means that the overall testing process takes longer and this can cause challenges in practice that may limit testing being carried out at all.

MYTH

No patient should be put into compression without ABPI testing.

TRUTH

If no red flags, all patients can be started on mild graduated compression before ABPI testing.

Regardless of how readings are obtained, ABPI test readings need to be interpreted by an appropriate clinician with the relevant skills and training.

Best Practice Statement

Staff should be trained in interpreting ABPI readings.

Best Practice Statement

Communication with the patient about the testing process, and what they can expect, is vital.

Best Practice Statement

It is important to be transparent with patients and warn them that some initial discomfort may be felt.

Best Practice Statement

Addressing any potential pain issues with the patient to help the process should be done before testing.

Best Practice Statement

If a patient cannot lie down for >5 minutes, Doppler alternatives should be considered.

Best Practice Statement

MYTH

Any Doppler testing is better than none, even if it has to be conducted in an incorrect position.

TRUTH

Doppler testing in an incorrect position provides inaccurate readings and therefore puts the patient at risk of false negative results, so alternatives to Doppler testing should be considered.

Experiences of using traditional Doppler devices

Clinicians reported that carrying out Doppler ABPI testing can be time-consuming; this includes multiple steps, such as ensuring the patient is resting before taking the reading, applying the cuff at multiple body sites, using an ultrasound probe to measure blood flow and manually calculating the ABPI number.

Doppler testing requires a relatively high level of skill and can create challenges with technique. This means that sometimes two staff members are needed to carry out the holistic leg ulcer assessment process and take a single Doppler reading (Welsh et al, 2016). The need for an additional staff member can arise from a lack of confidence and competence in using the equipment, as some nurses find it challenging to simultaneously keep the probe still and pump up the cuff.

There is often a lack of local guidance and support (despite availability of the NWCSP pathway) to guide clinicians considering when to initiate compression therapy, with clinicians believing that Doppler testing is the gateway and is required before any compression can be commenced. This can result in long waiting times, with patients failing to receive timely Doppler readings, leading to delayed treatment and longer periods without compression. NICE (2023) report that access to ABPI assessment varies across healthcare settings in the UK, with people waiting between 2 and 12 weeks for an appointment.

Experiences of using automated ABPI devices

Potential benefits of automated devices (examples shown in **Figures 1 and 2**) over traditional hand-held Doppler machines include: ease of use, reduced procedure time and reduced time lying flat for the patient (Welsh et al, 2016). Automated devices provide a quicker reading and are more comfortable and tolerable for patients, compared to the lengthier and potentially less comfortable handheld Doppler examinations.

Several studies have found good agreement between Doppler and automated ABPI results (Ververk et al, 2012; Span et al, 2016; Watson et al, 2022; Fendrik et al, 2023); Watson et al (2022) found that, with the optimal diagnostic threshold of 1.0, automated ABPI had a sensitivity and specificity of 90% and 94%, respectively.

With automated devices, no resting period is required, allowing for ABPI reading within a minute. In contrast, patients are often required to rest for at least 10 minutes before a reading can be obtained with Doppler testing.

Using automated ABPI devices can help reduce waiting times for assessment in clinical practice (perceived as a more time-efficient option), especially in healthcare settings where resources or staffing levels are low. As they are generally easier and quicker to operate, this can help to free up clinician time. The simplified procedure means that clinicians only need to apply the cuffs, and the automated ABPI device calculates the reading, eliminating the need for manual calculations, which can be prone to human error (both in the ordering of numbers and the calculation itself). Automated devices are designed to be user-friendly, allowing almost anyone to perform the test with minimal training and thus reducing the reliance on highly skilled personnel for the procedure. A study showed that clinicians agreed there was a role for ABPI use in the community, but only if practical barriers were overcome (e.g. cost of equipment and length of time needed) to justify the cost (Ding and Lloyd, 2021).

A further benefit of using automated devices is that readings are taken from both legs; often nurses only take readings from the affected leg when using a handheld Doppler device. This means that automated devices may give a fuller picture of the patient's health, facilitating screening for undiagnosed PAD.

Challenges of Doppler ABPI testing

Any method of testing and interpretation of results may be subject to human error,

affecting the accuracy of the reading or how the results are used. Research from Nietert et al (2006) concluded that clinicians overuse specific digits, particularly the digit 0, when recording systolic and diastolic blood pressure test results (e.g. rounding numbers up or down so they end in a 0 or 5 is common, especially when using the pre-printed ABPI calculators). It may be helpful to identify and look out for some common issues that may affect testing and cause human error. These factors can then potentially be avoided or mitigated in practice. These may include factors such as:

- Using a cuff that is the wrong size, either too small or too large
- Repeated inflation affecting the reading
- Speed of inflation/deflation affecting blood pressure recordings
- Last digit preference (Al-Qaisi et al, 2009)

Clinical evidence strongly suggests that automated, digitalised readings may be more accurate, as there is no requirement for staff to calculate results because this is completed automatically by the automated ABPI device (Verberk et al, 2012; Span et al, 2016; Carwithen et al, 2020; Hageman et al, 2021; Watson et al, 2022; Fendrik et al, 2023). This means that the potential for human error, which can be common in calculating and interpreting ABPI readings, is greatly reduced.

Interpreting the results and what they mean for ongoing care is as vital as correct testing. Results of ABPI measurement should be used to trigger the appropriate treatment plan. Interpretation of the results is vital and depends on clinician's knowledge and judgement. A clear benefit of automated devices is that the results are clearly displayed; not having to rely on human calculations means there is less room for error. Additionally, the automatically displayed results make it easier to ensure the process is appropriately documented and recorded.

No definitive recommendations have yet been made around diagnosis of PAD; anecdotal evidence suggests there may have been an increase in PAD referral rates since using automated ABPI devices in practice. This could be seen as positive, as long as the referrals are deemed appropriate and the patient does indeed have PAD, requiring further intervention. It is important to monitor this within local services to ensure that the number of false and inappropriate PAD referrals does not increase, as this is not good use of vascular services time. However, more evidence is needed.

While automated ABPI devices are easier to use, it is imperative that it is still testing correctly; make sure that the patient is in the right position and the correct cuff size is used.

Best Practice Statement

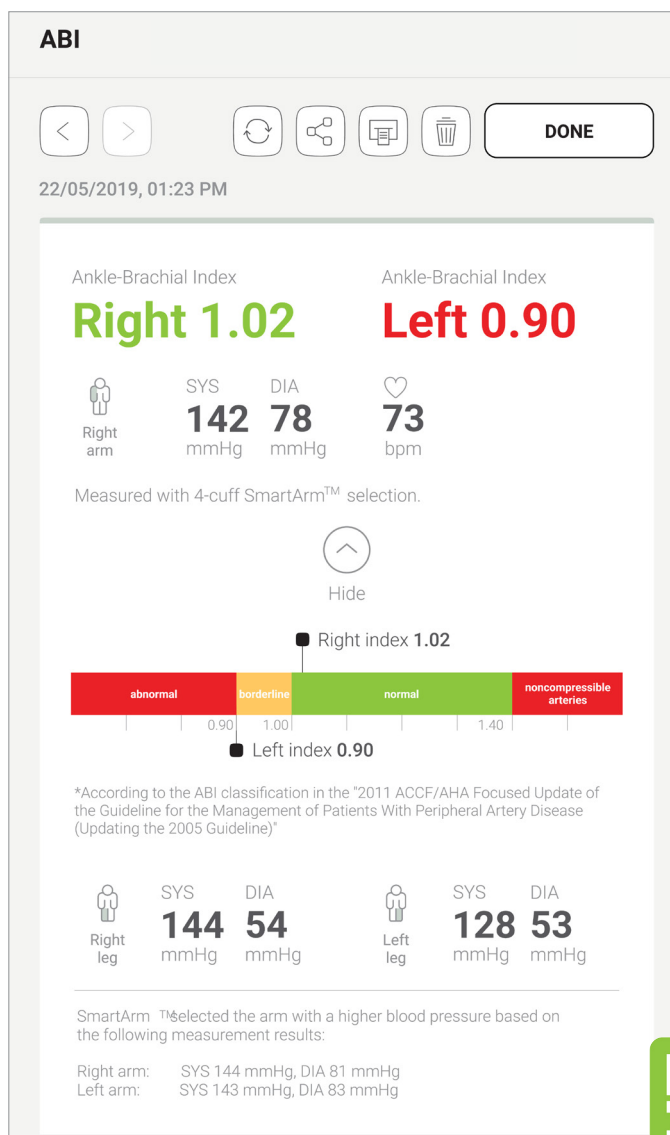


Figure 2. Output from an automated ABPI assessment (example shown from the MESI automated ABPI device).

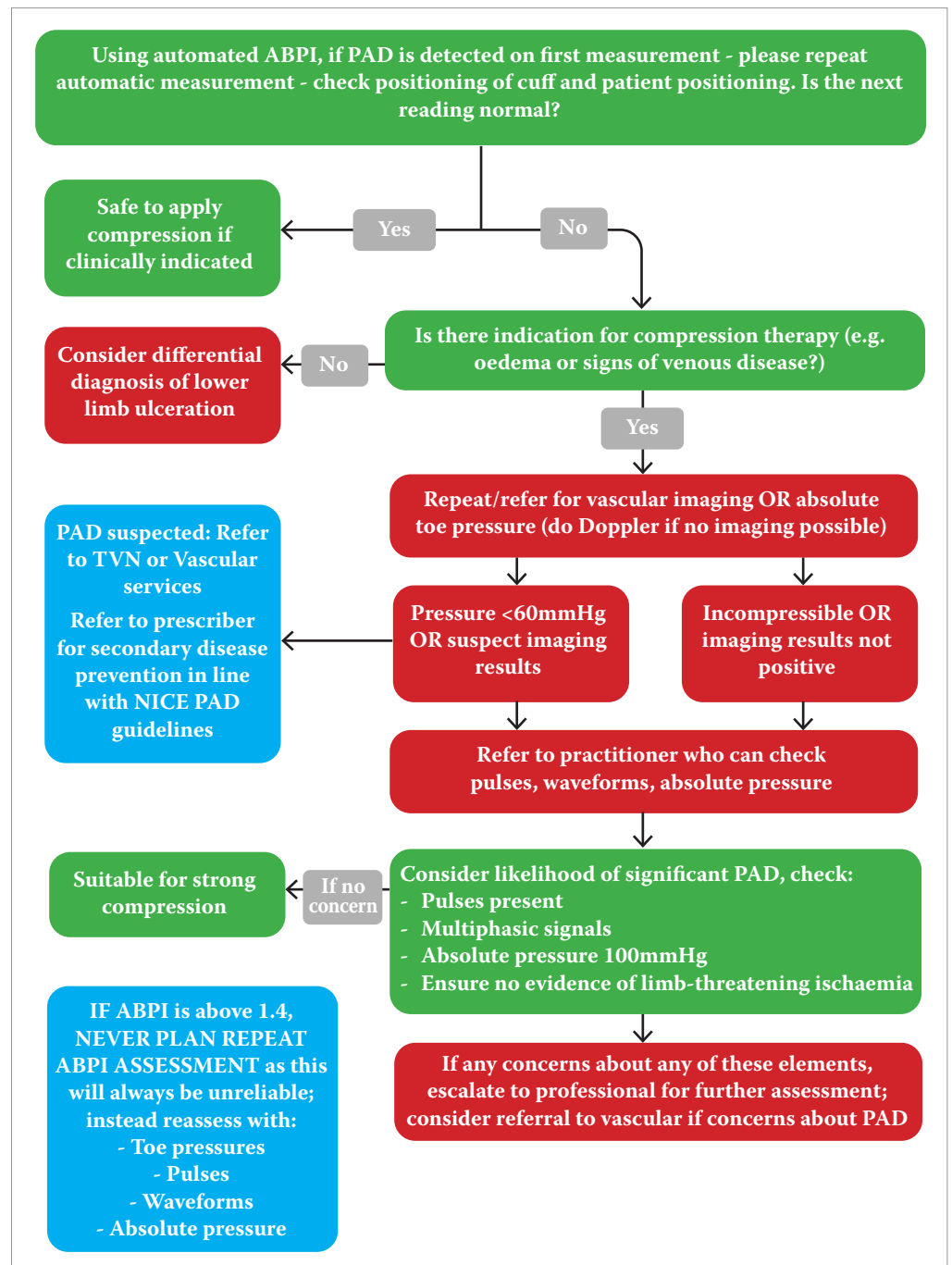


The role of automated ABPI as part of a care pathway

It is important to note that NICE guidance does not state that clinicians should stop using automated ABPI devices; clinicians can keep using them as long as certain conditions are put in place.

The simple care pathway in **Figure 3** may be useful to incorporate efficient ABPI testing into practice. The ultimate purpose of the pathway is to ensure that as many suitable patients as possible are started on therapeutic compression in a timely fashion.

Figure 3. Pathway for efficient ABPI testing in practice.



Tips for use in practice

- Doppler and automated ABPI devices should not be used on patients with extremely fragile skin (e.g. moveable/separated skin, oedematous skin where fluid can be felt underneath and skin that feels tight as if it might split if it were compressed)
- Some patients may not be suitable for Doppler or automated ABPI assessment; for example, patients who have experienced a significant loss of mobility who may find it challenging to properly position themselves for an accurate reading to be taken (e.g. fibrosis, breathing or weight issues)
- Some settings are unsuitable for Doppler or automated ABPI assessment, especially where there is no room for the patient to lie down properly or if temperature is an issue because there is no heating (note that temperature does not affect the ABPI reading); the environment in which ABPI is measured can have an effect on the outcome
- The number doesn't matter, it's what you do with the number that does; clinicians need to avoid over-relying on the numeric output provided by ABPI devices without considering the broader clinical context
- Clinicians should use their clinical judgement to avoid false positives – the recorded ABPI reading, regardless of how it was recorded, needs to be used to either confirm or challenge a clinical diagnosis made based on the patient's presenting signs and symptoms
- Steps taken and general factors considered when using a handheld device also apply when using an automated device (e.g. making sure the patient is comfortable and correctly positioned)
- If referring a patient with suspected PAD, documentation of the patient's clinical signs and symptoms is of utmost importance in order to help with triage

Reviewing ABPI status

The patient's condition can deteriorate or improve, and treatment may need to be stepped up or down. Some patients may necessitate additional holistic assessments and adjustments in their treatment plans.

Patients who are being managed with compression therapy should have regular testing with subsequent assessments incorporating ABPI measurements at 3, 6 or 12-month intervals (Wounds UK, 2019).

The importance of documentation

It is important that all testing is accurately recorded and documented. This is particularly relevant in automated ABPI testing, as the NICE guidance identified that there is a need for more documentation and building of the evidence base to support continued use in practice.

If patients are being cross-referred, it is vital to collect all the data and have this analysed and interpreted.

ABPI testing should be repeated at 3, 6 or 12-month intervals for all patients being managed with compression, depending on their overall health and wellbeing.

Best Practice Statement

All testing and results should be accurately recorded and documented.

Best Practice Statement

It is good practice to document whether the ABPI reading has been taken manually or with an automated device, to increase evidence of different methods of testing and how they may vary.

Best Practice Statement

The future

While there has undoubtedly been some controversy and confusion around best practice, it is being increasingly acknowledged that there are options for different methods of ABPI testing. The issue of lack of testing in practice – and how this may have an adverse effect on patients and access to suitable treatment – has been established, and it is important for this to be addressed in a way that is efficient, time-saving and as easy as possible for clinicians, while maintaining optimal care for patients.

Automated ABPI testing represents an accurate and efficient option, which can be used under the correct conditions. It has been recognised as a viable option in practice, and there is a current focus on building solid evidence for this that can translate into action that will help patients and improve outcomes.

The NICE guidance identified the importance of data capture, focusing on aspects such as accuracy, cost-effectiveness and patient adherence. This will help to provide insights into the performance and practicality of automated devices in clinical settings, and help highlight potential discrepancies between

NICE guidance and real-world practice. There is currently no definitive overall cost-effectiveness evidence around using automated ABPI devices, so more evidence is needed with this focus. As cost evidence builds, clinicians and healthcare systems will be able to compare the initial purchase cost of automated devices with the overall time and cost savings.

Evidence-gathering does not have to be qualitative: a good time and motion study, which is quantitative, would be equally useful. Evidence is also needed from an observational point of view; for example, exploring generalist nurses' opinion on ease of use of different devices and how confident they are using them, and how this may inform ongoing care for patients.

As clinicians, it is vital that we all contribute to best practice in this area, by ensuring that testing is carried out on patients who need it, that staff are confident and well informed, and that this informs patient care. Performing and documenting ABPI testing in all its different forms – manual Doppler or automated – will help improve care for patients.

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