

Why you should read this article:

- To enhance your knowledge of the potential benefits of using an automated device rather than a Doppler assessment to measure and calculate ankle-brachial pressure index (ABPI) ratios
- To be aware of how a specific leg ulcer pathway could improve wound care and management in general practice
- To understand how optimising the care of patients with lower leg wounds could result in time and cost savings

Optimising the assessment and management of lower limb wounds in general practice

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Erratum

Figure 1 was updated on 17 November 2020. The previous version was incorrect and should not be followed

Abstract

Patients who present to general practice with a complex lower limb wound or vascular concerns are often referred to other services for review, which may cause delays to their assessment and treatment. To provide prompt assessment and management for patients with lower leg wounds or vascular concerns, a service improvement project was developed to provide a pathway for these patients. Automated ankle-brachial pressure index (ABPI) devices were supplied to 19 GP surgeries and one community vascular clinic in the project region, with training, protocols and project leadership also provided. General practice nurses undertook automated ABPI readings for patients with a wound or vascular concern and provided appropriate care. Patients with complex wounds and those with vascular concerns were referred to other services where appropriate. This article describes the results of the service improvement project and its effect on patient care.

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Keywords

cardiorespiratory, cardiovascular diseases, leg ulcers, peripheral arterial disease, skin, vascular diseases, wound care

Background

Patients frequently present to general practice with a range of complex lower limb wounds, vascular concerns, or a combination of these two concerns. Lower limb wounds include cuts, grazes, diabetic foot ulcers, pre-tibial lacerations and leg ulcers.

A leg ulcer is defined as a break in the skin below the knee that has failed to heal within two weeks (National Institute for Health and Care Excellence (NICE) 2020). The prevalence of leg ulcers internationally is high, and 60-80% of cases arise due to venous disease (Vasudevan 2014); it is difficult for such ulcers to heal and they are likely to recur

(Guest et al 2018). Leg ulcers are classified as venous, mixed or of arterial aetiology following a thorough clinical assessment, with the diagnosis supported by the recording of an ankle-brachial pressure index (ABPI) ratio where possible (Scottish Intercollegiate Guidelines Network 2010, NICE 2020). The ABPI is a calculation of the ratio of the systolic blood pressure measured at the ankle compared with the blood pressure measured in the arm, and is used to support the diagnosis of wound aetiology, thereby excluding an arterial cause for leg ulcers (Wounds UK 2016).

Traditionally, ABPI is measured and calculated manually using a Doppler

assessment, which involves taking bilateral blood pressure readings at the patient's arms and ankles and using the highest systolic blood pressure readings in each to calculate the ABPI ratio. However, additional advanced training is required to undertake a Doppler assessment, and it is quicker to use an automated device to measure and calculate ABPI. Once trained, general practice nurses (GPNs) can use an automated ABPI device to complete an ABPI reading in approximately ten minutes, compared with around 60 minutes for a handheld Doppler assessment, which includes 20 minutes allowed for a rest period required in this procedure (Boast et al 2019). The automated ABPI procedure can also be performed by a healthcare assistant (HCA), with the results interpreted by a GPN.

Patients who present to their GP or GPN with a wound to their lower limb are often referred to an ambulatory clinic or leg ulcer service for assessment and treatment. Such referrals can delay a full assessment of the patient, potentially resulting in suboptimal treatment. Data from national GP records suggest that up to 50% of patients with a venous leg ulcer do not receive the care that they require (Vascular Society 2018).

In response to this issue, a project proposal was developed by one of the authors (GB), a GPN clinical lead, with the intention of empowering GPNs to optimise the assessment and management of patients presenting with leg ulcers, using the MESI automated ABPI device (MESI UK 2020) as an adjunct to their assessment.

Project plan

The project proposal requested funding for automated ABPI devices to be supplied for use by GPNs within GP surgeries and a community vascular clinic in Staffordshire, England. Funding was provided by Staffordshire Sustainability and Transformation Partnership, and a timeline for the project was agreed in conjunction with them.

A project steering group was formed and met monthly to ensure effective project management and that the necessary milestones were achieved. Funding enabled the steering group to procure 20 automated ABPI devices and tablet computers. Tablet computers were used for wound photography, with images shared with tissue viability experts or attached to referral letters to specialists, to promote health and well-being applications to enhance self-care, and to facilitate technology-enabled care services that enable patients to communicate online with healthcare professionals.

The project protocol detailed a pathway for adult patients presenting to their GP surgery with a lower limb wound, shown in Figure 1. These patients would be offered a full holistic wound assessment to check for signs of venous disease. If signs were present, an automated ABPI reading would be taken, unless contraindicated, with the results categorised in one of four ranges:

- » Less than 0.6 – indicates significant impairment to lower limb blood flow that requires referral to vascular services for review.
- » 0.6-0.8 – indicates some compromise of blood flow to the limb that may require referral to vascular services for review.
- » 0.8-1.3 – indicates that the use of compression therapy would be appropriate.
- » More than 1.3 – indicates that the lower leg vessels may be compromised and are demonstrating a lack of compressibility, which suggests atherosclerotic hardening. A referral to vascular services for further review may be required.

The ABPI readings for patients with diabetes mellitus, renal disease, lymphoedema or rheumatological conditions were interpreted with caution. This is because diabetes can cause atherosclerosis and medial arterial calcification (Ho and Shanahan 2016), while in lymphoedema there may be hyperkeratosis, tissue thickening and oedema present (British Lymphology Society 2018), so ABPI readings may be inaccurate. In addition, some patients may be unable to tolerate the procedure because of the discomfort it causes them or because they are unable to maintain a supine position while the ABPI reading is taken.

Patients with a venous leg ulcer – confirmed by an ABPI reading of between 0.8 and 1.3 – and who were suitable for management with a simple dressing would be managed by the GPN using the newer compression hosiery kits. For those patients with a venous leg ulcer who were already managed with compression therapy by GPNs, access to an automated ABPI device would enable regular vascular reassessment, ideally every 12 weeks, to ensure that compression therapy remained the most appropriate treatment (Wounds UK 2016). Patients with an ABPI reading of less than 0.8 or more than 1.3 would be referred back to the GP for review and potential treatment or onward referral for a vascular review, if required.

Any patients presenting with a non-complex wound, whose full holistic assessment and ABPI indicated no underlying vascular concerns, and where the wound could be

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Key points

- Leg ulcers are classified as venous, mixed or of arterial aetiology following a thorough clinical assessment, with the diagnosis supported by the recording of an ankle-brachial pressure index (ABPI) ratio where possible
- Traditionally, ABPI is measured and calculated manually using a Doppler assessment, but it is quicker to use an automated ABPI device
- Patients who present to their GP or general practice nurse with a lower limb wound are often referred to an ambulatory clinic or leg ulcer service, which can delay their assessment and treatment
- Implementing a specific leg ulcer pathway in general practice improved access to treatment, reduced delays for patients and appears to have led to cost savings for the majority of the GP surgeries that participated

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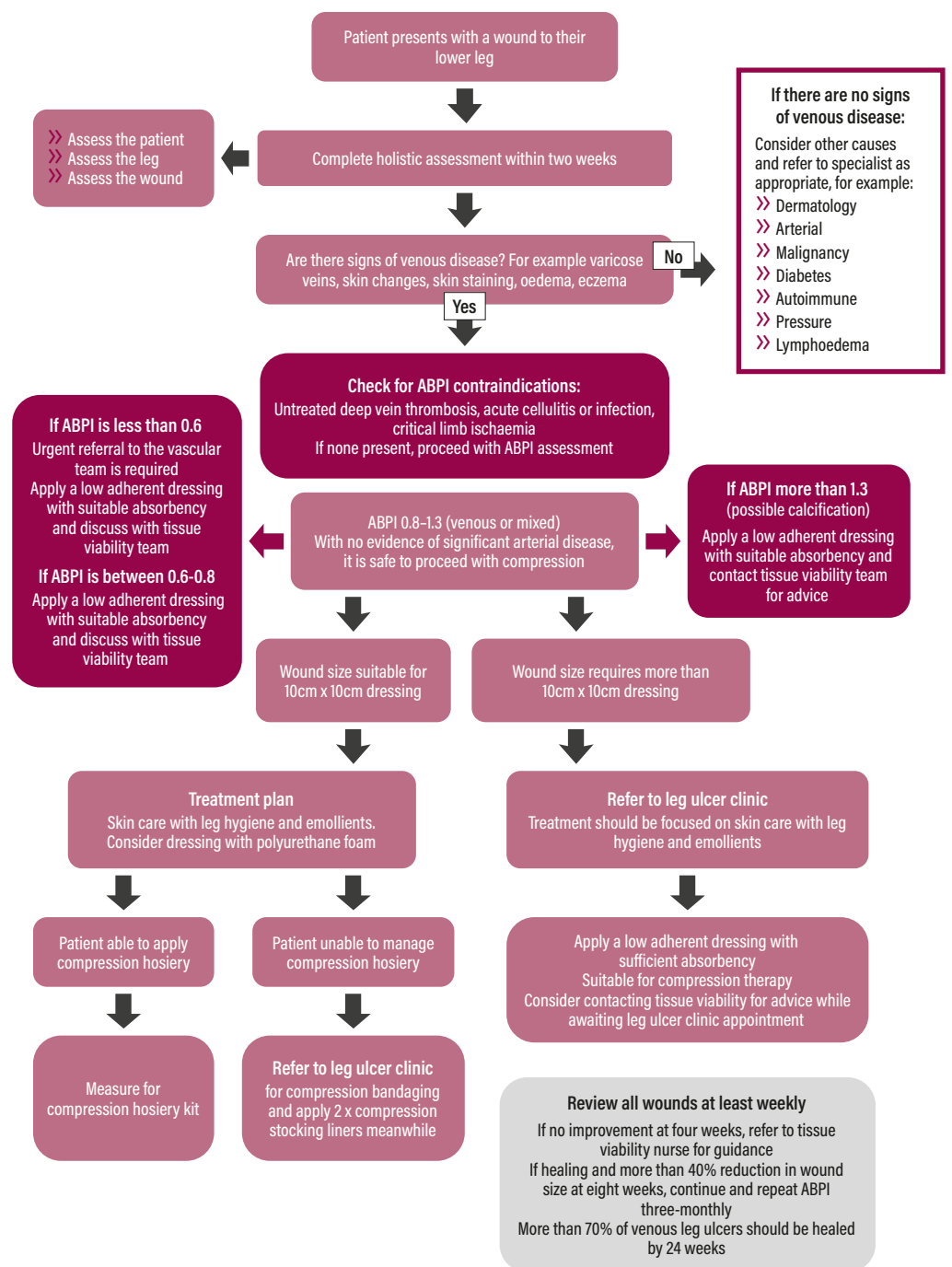
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managed by applying a simple dressing and using one of the new compression hosiery kits, would be cared for in general practice. In some GP surgeries, for example where the GPNs had experience of compression therapy or had received specific education and training, the pathway included the application of compression bandaging. Where wounds were not managed by the GPN, the patient

would be referred, if required, to district nurse services, an ambulatory clinic, or the tissue viability service.

In addition to optimising the care of patients presenting with a wound, the project also aimed to make automated ABPI assessments available to patients presenting with vascular concerns, such as intermittent claudication or night-time cramping. For these patients, an

Figure 1. Leg ulcer pathway and use of automated ankle-brachial pressure index (ABPI) device



abnormal ABPI reading of 0.8 or less would provide an opportunity to promote lifestyle advice and appropriate pharmacological therapy, alongside an expedited, informed referral to vascular services for review. All referrals, whether for lower limb wounds or vascular concerns, would be accompanied by the automated ABPI results sheet and wound photographs where indicated, with patient consent.

Aim

The aims of the project were to:

- » Deliver a prompt patient assessment for vascular concerns, enabling appropriate treatment to be commenced in a timely manner.
- » Increase the speed of assessment, since the use of an automated ABPI device is quicker than a traditional manual ABPI Doppler assessment.
- » Ensure regular and timely reassessment of patients with lower limb wounds. Once a venous leg ulcer is managed with compression therapy, patients require regular vascular assessment, ideally every 12 weeks. Automated ABPI use would support this monitoring in general practice, to ensure that management with compression therapy remained appropriate.
- » Identify and manage peripheral arterial disease. Offering an assessment to patients presenting with vascular concerns can enable earlier recognition of peripheral arterial disease in the community, thus reducing pressure on secondary care services.
- » Improve record-keeping – the results of the automated ABPI readings are available for digital upload directly to patient records.

Method

Recruitment of GP surgeries

Nineteen GP surgeries and one community vascular clinic agreed to participate in the project, which ran from November 2018 to the end of September 2019. Before the launch of the project a wound care event was held by one of the authors (GB), supported by district nurse and tissue viability nurse colleagues, to provide an update on wound assessment and management for GPNs and HCAs.

A total of 37 GPNs, ten HCAs and three nursing students committed to the project, agreeing to complete and share anonymised ABPI readings with the project steering group. A GPN from each of the 19 GP surgeries involved in the project volunteered as a wound champion, whose role was to lead lower limb care in each GP surgery,

including completing any required referrals to community vascular clinics or secondary care services. This role also involved offering lifestyle, skin care and wound management advice to support self-care where appropriate. Education and training for the GP surgeries was provided by a range of experts, such as a consultant vascular surgeon, clinical nurse specialists, the project lead and wound care company nurse advisers. It included information on:

- » Undertaking a full vascular and wound assessment.
- » Using the automated ABPI equipment.
- » The national minimum data set, which provides details of the minimum assessment criteria for a patient presenting with a wound.
- » Theories underpinning compression therapy and its application, including compression hosiery kits, wraps and bandaging.

A 'memorandum of understanding' between the clinical commissioning group (CCG) and each GP surgery was signed on receipt of the automated ABPI device. This confirmed that each GP surgery was required to submit a minimum of ten anonymous automated ABPI readings to the project steering group and that the ABPI and tablet computers would be retained by the GP surgery once the project was completed.

Project design and evaluation

The evaluation of the project included tracking the submitted ABPI readings according to the four categories listed previously. The reason why each reading was performed – whether this was for a lower limb wound or vascular concern – was also recorded, alongside the treatment the patient received after their assessment. At the start of the project each GP surgery was supplied with a folder that included the data collection template, protocol, wound assessment checklist, British Lymphology Society (2018) vascular assessment guidance and MESI software guidance for using the automated ABPI devices.

In addition to evaluating patient outcomes, the regional medicines optimisation team conducted an audit of wound expenditure, to demonstrate the effect of the project on wound management costs. A survey was also developed via Google Forms and emailed to each of the 19 GPN wound champions. The survey featured questions that ascertained their experiences of the project, the effect of the wound champion role, the training provided, the engagement of the GP surgery in the

project, the assessment process and return of the data collection templates. Since this was a service improvement project, ethical approval was not deemed necessary.

Results

During the project period, 16 of the 19 GP surgeries submitted a total of 145 automated ABPI readings (Table 1). Three submitted their readings after the project and analysis were completed, so these were not included in the data analysis. No results were submitted by the community vascular clinic during the project data collection period. Only six of the 16 GP surgeries provided the minimum of ten results, but this may have been due to the practice population – those who submitted low numbers of ABPI readings during the project period were primarily those with a smaller practice population. In such cases, there were fewer patients presenting to the GP surgery who met the project criteria when compared with larger GP surgeries.

Table 1. Automated ankle-brachial pressure index (ABPI) readings submitted by each GP surgery

GP surgery	Number of automated ABPI readings returned
Practice 1	14
Practice 2	6
Practice 3	4
Practice 4	18
Practice 5	14
Practice 6	2
Practice 7	3
Practice 8	6
Practice 9	20
Practice 10	21
Practice 11	2
Practice 12	11
Practice 13	4
Practice 14	8
Practice 15	9
Practice 16	3

During the project period no patients refused an automated ABPI reading when offered, but it was not possible to establish if any patients presenting with appropriate symptoms were overlooked, informed that they would require a further review at a later date, or not referred for a reading.

Despite the portability of the automated ABPI device, all procedures were undertaken within GP surgery premises. Lower limb wounds were the reason for 58% ($n=84$) of the referrals to GPNs for an ABPI reading, while 47% ($n=68$) were for vascular concerns with or without an accompanying lower limb wound. Some of the vascular concerns also presented with a wound of unknown aetiology and were recorded as both a wound and a vascular referral ($n=7$). Of the 145 ABPI readings, 96% ($n=139$) were taken by the GPN, with the remaining six readings taken by HCAs.

Table 2 shows the 145 ABPI readings recorded during the project period. On 24 (17%) occasions, the automated ABPI reading was confirmed as accurate with a traditional manual ABPI Doppler assessment.

Management of patients

Care provided at the GP surgery

Of the 145 patients who had an ABPI reading, 66% ($n=96$) were managed within general practice. Patient management varied: 9% ($n=13$) of patients were started on statins or antiplatelet therapy, or offered smoking cessation or exercise advice; 51% ($n=74$) of patients were offered lifestyle advice, including on weight management, diet, alcohol intake and smoking; and 53% ($n=77$) were advised about skin care. Compression therapy was either started or continued in 51% ($n=74$) of patients, and 23% ($n=34$) were self-managing.

Onward referral

A total of 26 (18%) patients were referred for a vascular review, which included all the

Table 2. Ankle-brachial pressure index (ABPI) readings recorded in the project period ($n=145$)

ABPI reading	Number of patients
Less than 0.6	12
0.6-0.8	7
0.8-1.3	113
More than 1.3	13

patients whose ABPI reading was less than 0.8 and some of those whose reading was above 1.3. All of them were from the group of patients who were referred to the GPNs for a reading because of vascular concerns.

Four patients (3%) were referred to the district nurse service; five patients (3%) were referred to tissue viability nurses; two patients (1%) were referred to the lymphoedema service; five patients (3%) were sent to leg ulcer clinics; and six patients (4%) were sent back to their GP for further review. One patient was referred for a duplex assessment, one patient to dermatology and one patient to an orthopaedic surgeon.

Data from the audit of wound expenditure

Due to variations with GP surgery data recording and some GP surgeries falling out of area, specific wound expenditure information was only available for 14 of the GP surgeries involved in the project. Table 3 shows the wound management costs for these GP surgeries in 2018 and 2019, which included wound care and related products

Table 3. Wound management costs for GP surgeries in 2018 and 2019

GP surgery code	Number of automated ankle-brachial pressure index (ABPI) readings	Wound management cost	
		2018	2019
Practice 1	14	£6,491	£9,153
Practice 2	6	£3,302	£9,443
Practice 3	4	£8,100	£7,601
Practice 4	18	£8,900	£6,712
Practice 5	14	£15,555	£15,088
Practice 6	2	£4,123	£4,560
Practice 7	3	£10,701	£9,423
Practice 8	6	£7,086	£6,693
Practice 9	20	£7,905	£3,569
Practice 10	21	£2,392	£1,211
Practice 11	2	£22,151	£14,243
Practice 12	11	£6,813	£5,555
Practice 13	4	£5,496	£4,892
Practice 14	8	£16,110	£11,793

such as bandages, gauze, skin closures, stockinettes, tape and swabs.

Table 4 provides a comparison of the total wound expenditure for each of the 14 GP surgeries in 2018 and 2019, which included other areas such as stoma and tracheostomy care, in addition to the wound management costs.

The GP surgeries with the most ABPI readings undertaken during the project period were Practice 1 (14 results), Practice 4 (18 results), Practice 5 (14 results), Practice 9 (20 results) and Practice 10 (21 results). Four of these five GP surgeries demonstrated a reduction in total wound expenditure, with the largest saving made by Practice 10. While other factors may have affected this during the project period, no other variables were changed.

Survey of general practice nurse wound champions

The survey of GPN wound champions received ten responses, yielding a response rate of 53%. Of the survey responses, nine (90%) were completed by wound champions while one was completed by a member of staff

Table 4. Comparison of total wound expenditure for GP surgeries in 2018 and 2019

GP surgery code	Total wound expenditure		2018 versus 2019
	2018	2019	
Practice 1	£8,669	£11,105	+ £2,436
Practice 2	£7,301	£16,087	+ £8,786
Practice 3	£11,718	£11,055	- £663
Practice 4	£15,076	£13,179	- £1,897
Practice 5	£21,286	£20,209	- £1,077
Practice 6	£5,009	£5,356	+ £347
Practice 7	£15,503	£11,421	- £4,082
Practice 8	£10,046	£9,148	- £898
Practice 9	£14,534	£8,473	- £6,061
Practice 10	£15,520	£1,543	- £13,977
Practice 11	£25,918	£19,661	- £6,257
Practice 12	£9,780	£6,831	- £2,949
Practice 13	£7,260	£6,923	- £337
Practice 14	£20,254	£14,624	- £5,630

who was not a designated wound champion. The respondents reported that it was easy to take part in the project but that it presented several challenges, including: the length of time it took to set up the ABPI device software and to undertake the procedure; the effects of inadequate staffing levels; and GPs not referring patients for an ABPI reading. Most of the respondents reported that the device was simple to understand and the training provided was satisfactory, but that the computer software was challenging and time-consuming, which had delayed the start of the project because they were unable to begin taking ABPI readings.

Respondents reported that a bilateral automated ABPI reading took 10-40 minutes. Although it has been estimated that an automated ABPI reading can be recorded in ten minutes, the longer periods cited in the survey also included the completion of a full holistic assessment of the patient and their lower limbs, including information about the effect on the patient's quality of life. Only four respondents stated that they would have undertaken a traditional manual ABPI Doppler assessment before the project and six respondents would not have completed a full assessment before the project.

Respondents cited several benefits of using the automated ABPI device including its speed, simplicity, the provision of a printout of the results, accurate identification of peripheral arterial disease, facilitation of early diagnosis and treatment, improved patient outcomes and timely onward referral.

Nine respondents indicated that they would continue to use the automated device once the project was completed. However, they stated additional staff and time would be advantageous, not only to undertake the ABPI readings, but also to facilitate the ongoing management of patients within general practice. Most respondents reported that their GP surgeries had not yet used the automated ABPI device opportunistically during reviews of patients with long-term conditions or risk factors for vascular concerns, for example with smokers and those with general circulatory concerns, but some felt this could be worthwhile.

All of the respondents reported that time pressures and the limited availability of appointments had restricted their GP surgery's engagement with the use of the automated ABPI device. They also all stated that appropriate funding would be required for the increased workload in general practice to be sustainable.

Discussion

This project found that the implementation of a specific leg ulcer pathway in general practice improved access to treatment, reduced delays for patients, and appears to have led to cost savings for the majority of GP surgeries that participated. However, several GP surgeries felt that wound care was not within the remit of their practice, but should instead be managed by local ambulatory clinics or leg ulcer services. Therefore, in some GP surgeries this factor may have reduced the number of patients sent to GPNs for ABPI readings. Increasing awareness and understanding of the usefulness and accuracy of automated ABPI devices could enhance GP referral rates for the procedure in the future.

Data were returned on 145 automated ABPI readings. An automated ABPI reading takes around ten minutes to complete, compared with up to 60 minutes for a traditional manual ABPI Doppler assessment. In view of these timings, the 145 automated ABPI readings undertaken during the project required an estimated 24 hours and 10 minutes in total, whereas the equivalent ABPI Doppler assessments would have required about 145 hours. This means that time saved undertaking automated ABPIs during the project period represents a saving of 120 hours and 50 minutes of nurses' time, which equates to a monetary saving for nurses' time of more than £3,200, based on a GPN pay rate of £26.70 per hour in 2019, according to data provided by the CCG.

As confidence in completing automated ABPI readings increases and these devices become more widely available, this could lead to substantial efficiency and cost savings. However, since this activity would previously have been undertaken by other services, GPNs reported that additional funding would be required to sustain the use of ABPI devices and the additional workload that this presented in general practice.

The speed, simplicity and accuracy of the automated ABPI devices suggests that there is scope for increasingly widespread application of ABPI testing within general practice, for example during NHS health checks. Replacing an automated blood pressure recording with an automated ABPI reading would provide an opportunity to undertake widespread screening of a practice population for any underlying vascular concerns. This would require minimal additional consultation time but could provide substantial cost savings for the management of peripheral arterial disease

and other vascular conditions before patients become symptomatic.

It has been reported that awareness of peripheral arterial disease is low among patients and healthcare professionals, resulting in patients experiencing delays in diagnosis and referral for treatment (All-Party Parliamentary Group on Vascular Disease 2016). The All-Party Parliamentary Group on Vascular Disease (2016) stated that ABPI testing should be available in community and primary healthcare settings to encourage early diagnosis and treatment. Providing automated ABPIs in general practice would ensure that this objective is realised.

At the start of the project, it had been thought that GP surgeries' engagement in the project would potentially result in additional expenditure, with increasing numbers of patients retained in general practice for ongoing care. Before the project, these patients would often have been referred to ambulatory clinics or district nurse services for their ongoing care. However, wound expenditure data during the project period indicated that engagement with the project resulted in wound management cost savings.

Further analysis attributes these cost savings to a reduction in the frequency of changing dressings, with patients being optimally managed with compression hosiery as part of the project. Such management would often result in once weekly dressing changes, compared with more frequent dressing changes when patients did not receive optimal management. In addition, enhanced healing rates due to prompt and appropriate management of venous leg ulcers are likely to have contributed to these cost savings.

Recommendations for practice

The authors suggest several recommendations for practice from this project:

- » Funding for automated ABPI devices with comprehensive training for GPNs and HCAs in general practice, along with appropriate provision of information technology support to assist with set-up.
- » Establishment of wound champion roles to lead lower limb wound care in each GP surgery.
- » Development of lower limb management pathways that include joint working across primary, community and secondary care services; that are appropriately incentivised and funded; and ensure integrated care.
- » Incentivisation for venous leg ulcer management for ambulatory patients in general practice.
- » Upskilling of HCAs to perform ABPI readings, with a full holistic assessment being undertaken by nurses.
- » Enhanced wound care education and training for all healthcare professionals.

Conclusion

In this service improvement project, access to automated ABPI devices in general practice enabled the timely assessment of 145 patients with a lower limb wound or vascular concern. These patients also received enhanced management as a result of their care remaining within general practice, and the project demonstrated improvements in the management of patients presenting with lower limb wounds or vascular concerns. Retaining patient care in general practice also reduced referrals to other services. It is essential that findings from this project are disseminated to other areas of the UK to inspire similar service improvement projects.

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