Facilitators and Barriers to Implementation of the Ankle Brachial Index in Outpatient Physical Therapy Practice: A Qualitative Study

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ABSTRACT

Introduction: The ankle brachial index (ABI) is a valid and reliable measurement of lower extremity circulation and can be used as a screening tool for peripheral arterial disease (PAD), but the usage pattern in physical therapy practice is virtually unknown. **Purpose:** This study was performed to describe the phenomenon of using the ABI in outpatient physical therapy practice. **Methods:** Nine participants from 3 different outpatient physical therapy clinics were provided with a hand held Doppler and education on how to accurately perform an ABI. Over a 3-month period, participants performed the ABI on any patient presenting with age > 50 with at least two risk factors for PAD. Immediately following the 3-month data collection period, two focus group interviews were performed to examine the therapist's experience using the ABI. Transcripts were analyzed to identify facilitators and barriers to implementation. **Results:** Facilitators identified include familiarity, ease of use, accuracy, and confidence with results. Barriers included flow and routine disruption, patient did not want/refused, and issues related to direct access. **Conclusion:** Although some barriers to use of the ABI in an outpatient clinical setting need to be considered, most participants found the experience of using the ABI positive and feasible.

Key Words: ankle brachial index, peripheral arterial disease, physical therapy

INTRODUCTION

Peripheral arterial disease (PAD) is primarily characterized by blockage or narrowing of the arteries by atherosclerosis resulting in reduced oxygenated blood flow to extremities. Peripheral arterial disease is a circulatory problem that impacts 8 to 12 million Americans, although

it is considered under-diagnosed and undertreated.^{1,2} Of those 8 to 12 million, only 10% present with the classic symptoms of the disease.¹ The remaining 90% of affected individuals include 50% with atypical leg symptoms and 40% with no lower extremity symptoms present.¹ The presence of PAD highly increases the likelihood of all cause and cardiovascular mortality within a 5-year period.³

Individuals with PAD may experience circulatory symptoms such as claudication or cramping in the calves that increases when walking and dissipates with rest, thus limiting functional mobility.⁴ As the disease progresses, patients with PAD experience increased neurological pain, muscle wasting, integumentary breakdown, and poorly-healing wounds.⁴ Other symptoms of the disease include color change, bruising, numbness, weakness, and decreased pulse to the lower extremities, each of which can have a direct influence on the patient's ability to perform functional mobility.⁴ In the later stages of PAD, patients may experience ischemic pain at rest and sleep disturbances.^{5,6} Patients with extensive PAD may need to undergo invasive surgery such as bypass of the arteries of the lower extremities or limb amputation.^{7,8}

Due to the multi-factorial integumentary, circulatory, musculoskeletal, and neurologic impairments that result from PAD, physical therapists often interact with these patients across the continuum of care and can play a role in differential diagnosis, intervention, and prevention of PAD. As physical therapists become the practitioners of choice and gain direct access, it imperative that therapists screen, diagnose, and intervene in patients with PAD. Undiagnosed and untreated symptoms of PAD can lead to amputation, decreased functional capacity, and poor quality of life.⁸

Data from surveys conducted by the World Health Organization concluded that asymptomatic PAD is two to 5 times more common than the symptomatic presentation of the disease.² For these reasons, the American Heart Association (AHA) suggests that all individuals suspected of having the disease be screened with the ankle brachial index (ABI), which is considered the "standard" for diagnosis in the office setting.² Reasons to screen include intermittent claudication, non-healing wounds, age 70 years or older, and age 50 years or older with a history of

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smoking or diabetes.² Many epidemiological studies have also looked at using the ABI to screen for the disease with great success.⁵⁻⁹

The ABI is a quick, inexpensive, valid, and reliable measure of lower extremity circulation.¹⁰ The ABI compares the average of 3 systolic blood pressures in the upper extremity to 3 systolic blood pressures in the lower extremity to observe if a difference exists between the two averages. The average of the 3 systolic lower extremity blood pressures is then divided by the average of 3 systolic upper extremity blood pressures. An abnormal finding would be indicated by a ratio of less than 1.0, with 0.9 indicative of the presence of PAD.¹⁰ The blood pressure in the lower extremity can be taken at the posterior tibial artery or the dorsalis pedis artery. The ABI can be performed with a blood pressure cuff and stethoscope or hand held Doppler.¹¹

Although there is evidence to support that the ABI can reliably predict the presence of both symptomatic and asymptomatic PAD, there is no evidence about the use of the ABI as a diagnostic screening tool in outpatient physical therapy practice. The aim of this study was to understand clinicians' perspectives of implementing the ABI and the feasibility of its use in outpatient physical therapy practice.

METHODS

Four research students and two professors acting as faculty advisors at Widener University's Institute for Physical Therapy Education conducted this study. One professor is an American Board of Physical Therapy Specialists (ABPTS) certified Cardiovascular and Pulmonary Clinical Specialist while the other is experienced with qualitative research and data analysis. This phenomenological study was approved by the Institutional Review Board at Widener University. This study records the opinions and perspectives of physical therapists that used the ABI for a designated period of time (3 months) in outpatient physical therapy practice.

PARTICIPANTS

Three Kinetic Physical Therapy and Human Performance Center clinics were recruited to be sites for data collection. All 3 clinics are located in Chester County, PA, which is located in southeastern Pennsylvania. These clinics treat a variety of patient populations providing orthopedic, sports, neurologic, and cardiovascular rehabilitation. Each clinic also treats a patient population ranging in age from children to elderly. From the 3 participating clinics, 9 physical therapists agreed to perform the ABI on each patient that met the inclusion criteria for this study and provided consent. Of the 9 physical therapists recruited, 6 were males and 3 were females whose mean age was 33 and range was 26-39 years of age. The mean years of clinical experience for this group was 3.1 years ranging from 1-15. Four of the physical therapists were in management positions and 5 were staff physical therapists.

Inclusion criteria for receiving the ABI in this study included any patient of the participating therapists presenting to any of the 3 clinics for initial evaluation that

were 50 years of age or older with two or more risk factors for PAD. Risk factors were based on information gained from a review of the literature and included smoking, decreased activity level, minority race, hypertension, diabetes, elevated cholesterol, or obesity.¹² An intake sheet (Appendix) provided to each clinic and completed by each potential participant allowed therapists to easily identify those patients that would qualify for participation in the study.

Equipment

Three Doppler ultrasound units (Huntleigh Mini-Non Directional Vascular Doppler, Dopplex D-900, Booth Medical, Alexander, AK) were purchased with internal grant money for the purposes of this study. Following the study, the Doppler ultrasound units were donated to each clinic in appreciation for their participation in the study. The Doppler ultrasound units were used while performing the ABI in combination with a blood pressure cuff.

Training

Two training sessions were performed at the clinic staff meetings to instruct the 9 participating physical therapists about how to perform the ABI and to explain the study protocol. The faculty researcher (KL) who provided this instruction is a board certified cardiovascular and pulmonary specialist. Therapists were informed how to determine appropriate patients on whom to perform the ABI. Once appropriate patients were recognized, the therapists were asked to inform patients if they would consent to receive the ABI. For patients that signed the consent form, the providing therapist was told to perform the ABI at the initial evaluation. To ensure the ABI was performed accurately, participants were evaluated in the proper technique at each training session.

Blood pressure cuffs were used to measure systolic blood pressures as the Doppler ultrasound units were used to provide audio feedback. Therapists were taught to average 3 systolic blood pressures from the left upper and lower extremities. Upper extremity systolic pressure was assessed at the brachial artery. Lower extremity pressure was assessed at either the dorsalis pedis or posterior tibialis arteries. The Doppler ultrasound units were used to assess blood pressures at both locations. The mean lower extremity systolic blood pressure was divided by the mean systolic upper extremity systolic blood pressure to yield the ABI index. The therapists were informed that an ABI below 0.9 indicates PAD. After all 9 physical therapists were trained in the use of the ABI and the experimental procedures and protocol, a 3-month ABI screening period commenced.

Data collection

Following 3 months of use of the ABI by the 9 participating therapists, a focus group interview was performed in two separate focus groups. During the focus group interview, physical therapists discussed their perceptions of using the ABI in clinical practice. One focus group consisted of administrative therapists (n = 4) while the other consisted

of staff therapists (n = 5). The purpose of organizing the focus groups in such a manner was to prevent staff physical therapists from feeling obligated to agree with a superior.

During the focus group interview, 8 predetermined discussion points were posed to each group to promote dialogue on the use of the ABI in clinical practice (Table 1). A member of the research team who did not participate in discussion posed discussion points. Each interview was audio-recorded. Two members of the research team not present at either interview transcribed audio-recordings of each interview verbatim. This was to prevent any bias while transcribing interviews. When transcripts from each interview were finalized, they were then provided to the 9 participating therapists to review for accuracy, a form of member checking.

Table 1. Interview Discussion Points

1. Describe your familiarity with the ABI prior to this experience.
2. Describe your experience using the ABI here in your work setting.
3. Were there any barriers to using the ABI in daily practice?
4. Describe factors that facilitated your use of the ABI.
5. Describe your feeling with respect to the ABI's ability to measure cardiovascular status.
6. Would a positive test change the way you treat your patient?
7. Do you feel other tools provide a better measure of cardiovascular status than the ABI? Which tools and why?
8. What would influence your decision to use the ABI in your clinical practice?

Analysis

After member checking, the 5 members of the research team read each transcript and formulated themes and sub-themes individually. The members then held a meeting to choose open and axial codes based on the themes and sub-themes derived (Table 2). Five members then recoded each transcript individually using the generated open and axial codes to insure that full saturation was reached.

Table 2. Open and Axial Codes

Axial Codes	Open Codes
Facilitators	F1 = Ease of use/ time to perform F2 = Confidence of results F3 = Familiarity F4= Direct Access/Responsibility of the first care provider
Barriers	B1 = Flow/ Routine B2 = Patient Refused B3 = No impact on daily intervention

RESULTS

The experience of using the ABI was expressed in two main themes, facilitators and barriers. From these broad axial codes, sub-themes emerged that further described attitudes and beliefs of using the ABI in an outpatient setting. These

were agreed upon by the 6 primary researchers and one outside blinded researcher. Full saturation of the data was achieved. As summarized below, participating therapists described positive and negative beliefs, attitudes, and experiences during this study and explained the integration of these to uncover a relationship to professionalism.

Facilitators

Under our major theme of facilitators, 4 sub-themes emerged. The first facilitator that emerged from our interviews was 'ease of use.' Physical therapists reported using the ABI with little difficulty. In both focus group interviews, therapists expressed their beliefs on the simplicity and effortlessness of performing the ABI. When compared to blood pressure, one therapist felt that the ABI was easier. Overall, the therapists seemed confident in their ability to perform the skill without significant effort.

"I thought it was easy to use once we practiced it and learned it... I used it a few times and I thought each time I used it, it worked well. I didn't have any problems with it at all." PT 8

"I had an opportunity to do it on a couple occasions and I felt once I had a little bit of practice and comfort with it, I felt very comfortable using it." PT 7

"I thought it was easy to use, and I thought it was nice for the patients to actually hear what I was hearing, instead of having the stethoscope on where they were not hearing what I'm hearing. They were like 'Wow, that's neat.' And, we could talk about it at least and they could ask questions from there too." PT 6

The second facilitator was 'confidence in the results.' Physical therapists shared their belief that the ABI is a reliable, valid, and accurate assessment tool for lower extremity circulation. They further stated that they were confident with the measurements they took in the clinic as an accurate reflection of a patient's vascular status.

"I thought it was a fairly easy process to do, and felt pretty confident with the results." PT 7

"Specific to this outpatient setting that was the best tool to use." PT 8

"I think in this setting that was the most reliable and most accurate that we could have done." PT 5

The third facilitator was 'academic familiarity.' Although most participants reported some level of educational exposure to the ABI during their formal education, they shared that, for the most part, they had not seen its use in outpatient clinical practice. Only one therapist shared seeing the ABI performed outside of the classroom.

"I've only really experienced it in school. I've seen people do it while working in a hospital but I have not seen it in an outpatient clinic before." PT 8

"I would say my only recollection in school was that it was something we had spoken about but it was not something that I even recall practicing or using in school or in a clinical setting." PT 7

"I've heard it through schooling and continuing education, except I have never, ever seen it used in the clinical setting." PT 4

The final facilitator that emerged from the discussions with the physical therapists surrounded the principle of professionalism. The participants felt that as a profession they are moving towards an era of universal direct access. Therefore, it is imperative as a 'responsibility as a first care provider' to consider screening patients for potential disease processes, such as PAD, especially in light of the fact that PAD could be masked as a musculoskeletal impairment. The physical therapists explained that it is important to assess all body systems, especially when seeing patients who have not been screened by a physician first.

"I think as physical therapy is going more in the direction of direct access, we are getting more and more people off the street, then these are the types of things we need to consider integrating more into our practice being a primary health care provider..." PT 7

"I think [it] is invaluable to a PT daily practice, and especially if we are looking to take on that responsibility with direct access." PT 2

"[H]aving a tool like this will help us be the health care provider of choice, and help us better serve our patients." PT 8

"[A]s we are now Doctorate level professionals, ... we are getting people right off the street. It's an easy screen, why not do it. You can pick something up before, God forbid somebody has a stroke." PT 4

Barriers

Under our second major theme of barriers, 3 sub-themes emerged. The first sub-theme was a barrier related to the 'disruption of the flow and routine' of the initial evaluation. Participants described some of the difficulties encountered with using the ABI during the study. Most cited a resistance to a change of their evaluation routine, the test being cumbersome, or their patient simply did not want to have the test done. The physical therapists explained the difficulty they had fitting the ABI into their established routine of their initial evaluation. There was a general consistency among the therapists that it was hard to find time to perform the ABI. They were unsure where it would fit during an evaluation.

"If it's running smoothly and you're starting on time, and you have your full hour, but you know, sometimes with the evaluation, throwing that 5-10 minutes in there is kind of cumbersome." PT 9

"Again, I would say, from an evaluation standpoint, using it sometimes can be a little bit of a time constraint, depending on the day and what your caseload may be." PT 7

"The perception could be that my attention is being taken away from their back problem..." PT 2

Another sub-theme that emerged from the discussion was 'resistance from the patient to have the ABI performed.' Several physical therapists shared that they did not feel comfortable asking the patient to elaborate on their refusal. The physical therapists perceived this resistance as a fear of the patient. This fear could include the possibility of having a more serious problem, taking time and focus from their current injury, or anticipated pain from the blood pressure cuff around the calf. The reasons warrant further investigation.

"I came across a lot of patients who were not willing to participate without trying to coerce them, by explaining the benefits... and I don't really understand still why they turned it down." PT 4

"She just said no – "I'm here for this, I'm not here for that." That was just sort of her reasoning." PT 9

"I think I was surprised quite honestly, that some people did not want to have it done." PT 2

The final sub-theme that emerged under barriers was the idea that although the participants were aware of the measures provided by performing the ABI, there was 'no adaptation to the planned treatment session.' Rather, they expressed that an abnormal finding on ABI indicated that a call to the medical doctor was the necessary next step. The physical therapists indicated that this would be the only change to the plan of care. The participants explain that the ABI is another assessment tool that they could use in the initial evaluation, but the results do not change how they would treat their patient.

"I don't see it as something that would be done regularly, because again, it's not that that information goes directly into our intervention, or treatment." PT 7

"I don't think the ABI changes [my treatment plan] any more than if I had seen [the patient] had a cardiac history." PT 1

DISCUSSION

Major Theme #1: Facilitators

We examined the physical therapist experience of using the ABI to screen for PAD in busy outpatient orthopedic physical therapy clinics. Our study uncovered 3 sub-themes held by clinicians that facilitated the use of the ABI in clinical practice. These factors included that the clinicians were familiar with the test, they found it quick and easy to use, they were confident with their results, and felt that it was our responsibility as direct access or first care providers to use the ABI. All clinicians in the study indicated that they were familiar with the test and had either learned about it in their physical therapy education, or had seen it performed in the hospital setting.

Although most of the participants recalled covering of the educational component of the ABI, none reported previous use in clinical practice. Clinicians in the study indicated that it took anywhere from 5 to 10 minutes to complete the test. This finding is supported by Pearson et al¹³ who found that the actual time needed to complete the ABI averaged 5 minutes and ranged from 3 to 11 minutes. The time includes the actual performance of the test as well as the ratio calculation. The AHA's 2005 Practice Guidelines also describe the ABI as "a quick and cost-effective way to establish or refute the lower extremity PAD diagnosis."¹⁴(pe492)

Clinicians also stated that they were confident with their results. They believed the ABI is the most reliable and accurate tool at their disposal, and that it was the most appropriate screening tool for the outpatient setting. Their beliefs are justified in the literature by not only the AHA, but is also supported by the American Physical Therapy Association (APTA) as a reliable and valid measure for PAD in the *Guide to Physical Therapist Practice*.^{15,16}

Barriers

Three subthemes were found as barriers to the use of the ABI in clinical practice in this study. Participants believed that the test was disjointed and interrupted the flow of their evaluation, and stated that some of patients refused to be screened for PAD. Pearson et al¹³ reports that although the time required to complete the ABI is minimal – averaging 7 minutes, in a busy clinical setting, the extra 5 minutes has potential to hinder patient flow. During this study, the process of taking the ABI in the outpatient clinics required more effort on the part of the clinician as they had to explain the purpose of the study to the patient, gain consent, and then perform the test. We also provided strict guidelines as to who should be tested. These were constraints placed on the clinicians for the purpose of this study. In the future, they will be able to use their clinical judgment to screen patients they feel are at risk in accordance with the AHA and American College of Cardiology (ACC).¹⁴ Although it seems unrealistic that the physical therapist will be using the ABI on every patient with risk factors for PAD, the ABI may become a tool that is accessed for differential diagnosis in patients with lower extremity pain.

Tod et al¹⁷ studied patient specific barriers toward use

of services for coronary heart disease. Patient barriers fell into 6 categories: structural, personal, social/cultural, past experience/expectations, diagnostic confusion, and knowledge/awareness. They concluded that through community development, structural changes within health care and education of primary care staff, these barriers can be addressed to ensure appropriate use of the services available.¹⁷ Physical therapists could consider this in response to the barrier related to refusal to receive screening. Physical therapist training on how to address these barriers might lead to an increased willingness on the part of the patient to participate in having the ABI measurement performed.

Finally, the participants indicated that a positive test would lead them to refer their patient to a physician, but it would not alter the treatment plan for that patient. One therapist stated that he would treat a positive test as he would the presence of a cardiac history on an intake form—monitor symptoms and treat accordingly. However, the literature reports that exercise has a significant cardiovascular impact on reducing the symptoms associated with PAD.^{18,19} This disconnect may reflect a need for continuing education in this area.

Physical therapists may need to consider exercise protocols in the presence of PAD prior to physician referral, depending on the extent of PAD. This was not the case with participants in this study. Using the ABI as a screening tool can decrease a patient's mortality risk if clinicians are able to make the appropriate follow up clinical decisions to address the patient's medical status. Hirsh et al² state that an ABI of 0.78 predicts an approximate 30% risk of myocardial infarction, ischemic stroke, or vascular death in 5 years. Selecting appropriate lifestyle interventions can reduce this risk.²

Limitations of the Study

The limitations of this study were time and resources. Our clinician pool was small and thus may not represent all physical therapists' attitudes. Furthermore, because we used 3 clinical sites and the physical therapists at those sites, differences in environment could have contributed to differences in opinion. As mentioned, a larger survey regarding attitudes towards the use of the ABI is warranted to more fully explore this area.

Future Research

Through the process of our research, we identified 3 main questions that remain unanswered and require further exploration with future research. The first is the issue of communicating with physicians regarding a positive ABI but not treating PAD with exercise. As the profession continues to obtain direct access across the United States, clinicians should treat the impairments patients present rather than focusing on a single diagnosis. This could be better explored by a larger survey about use of ABI and use of exercise to treat PAD among physical therapists.

The second is the issue of patient's refusal of screening for PAD. Health disparities in the United States are present,

particularly in the lack of education and awareness about diseases. Current health disparities literature supports that minority patients of lower socioeconomic status are at higher risk for cardiovascular morbidity and mortality, as seen in higher rates of peripheral arterial disease and amputation in these populations.²⁰ A look at acceptance or refusal of services among minorities in physical therapy practice could be warranted.

Finally there is the issue of barriers to physical therapists performing the ABI to screen and diagnose patients with PAD. A study exploring why these barriers exist and what could be done to eliminate them may facilitate more use of the ABI in physical therapy practice, which may stand to benefit the profession as a whole.

CONCLUSION

We aimed to describe clinicians' experience using the ABI in an outpatient physical therapy setting. Clinicians found the test to be easy to perform and they were confident with their results. In general they believed using the ABI to screen patients for PAD is their duty as primary care medical professionals. By screening patients with measures as simple as the ABI, and communicating the results with their referring physicians, physical therapists will be presenting themselves as doctors of the profession and validate themselves as practitioners of choice. Physical therapists, especially those practicing with direct access, should keep up-to-date with best practice related to PAD as defined in the literature.

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Appendix. Data Intake Form

The Impact of the Use of the Ankle Brachial Index Among Physical Therapists Working in Outpatient Settings

Risk Factors for PAD:

Smoking	Activity Level	BMI	Cholesterol	Diabetes	Blood Pressure	Race
☐ Current Smoker	☐ Not Active	☐ Obese	☐ High LDL	☐ Type 2	☐ High BP	☐ African American
☐ Past Smoker	☐ Moderately Active	☐ Overweight	☐ High HDL	☐ Type 1	☐ Low BP	☐ White/Caucasian
☐ Never Smoked	☐ Very Active	☐ Normal	☐ Normal	☐ N/A	☐ Normal	☐ Hispanic ☐ Other
Personal or Family History of:			Relation to Self:			
Peripheral Arterial Disease ☐ Yes ☐ No			_____			
Coronary Artery Disease ☐ Yes ☐ No			_____			
Stroke ☐ Yes ☐ No			_____			

Patient Demographics:

Age	Gender	Education Level	Income	Body Part Treated
_____	☐ Male	☐ High School	☐ < 25,000	☐ Arm/Shoulder
	☐ Female	☐ College	☐ 25,000 – 50,000	☐ Leg/Hip
	☐ Advanced Degree	☐ 51,000 – 75,000	☐ Neck/Back	
	☐ > 75,000	☐ Other		

Do Not Write Below This Line: For The Therapist Only

		First Reading	Second Reading	Third Reading	Average
A	Dorsalis Pedis/Posterior Tibialis Systolic				
B	Brachial Artery Systolic				

ABI	PAD Present	Presentation
A	☐ Yes	☐ Symptomatic
B	☐ No	☐ Asymptomatic

☐ Patient Did Not Consent