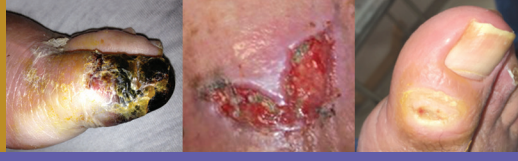

Peripheral Vascular Disease, Infection, Foot Ulcers, and the WIfI Classification System

It's a limb-saving paradigm shift that could change the way we evaluate patients with diabetes.

BY ROBERT SNYDER, DPM, MSC
AND JOEY EAD, MS

Goals and Objectives

After reading this article the podiatric physician and wound care specialist should be able to:

1) Recognize the epidemiologic significance of vascular disease in the presence of diabetes.

2) Learn how to properly utilize the WIfi classification system in any clinical setting by using the mobile application.

3) Distinguish between intermittent claudication, acute limb ischemia, and critical limb ischemia.

4) Discern when to apply the appropriate diagnostic modalities in patients with diabetes and peripheral arterial disease.

5) Recognize the importance of the angiosome concept when assessing patients with vascular disease.

6) Understand how previous intervention methods that incorporated the angiosome concept resulted in better outcomes.

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Diabetes mellitus (DM) has impacted over 170 million people worldwide.[1] By 2030, DM is projected to increase to nearly 366 million.[1] DM is largely attributed to the body's inability to produce or respond to insulin, which results in carbohydrate metabolic dysfunction. Chronic resistance to insulin can increase blood and urine glucose levels.[1] Patients with DM have an increased probability of developing other systemic pathologies that can affect the feet, eyes, skin, kidneys, and cardiovascular systems.[1] The deleterious nature of this disease process subsequently makes it a major risk factor for atherosclerotic disease.[2] DM-associated athero-

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sclerosis has the ability to compromise the integrity of important vascular networks, including carotid vessels, coronary arteries, and the lower extremity arterial system.[3] High blood glucose levels trigger a series of events that cause an accumulation of lipid deposits within the arterial framework of large and small vessels. This can lead to stroke, myocardial infarction, and inadequate perfusion to the lower extremity.

Peripheral arterial disease (PAD) is an occlusive disease process that typically occurs in the lower extremities. It is now estimated that PAD affects approximately 12 million people in the United States.[4] Patients with PAD are associated with lower extremity amputations, and it can be a key indicator for other deleterious cardiovascular pathologies.[5] The underlying pathophysiologic mechanism of poorly managed DM causes PAD to increase rapidly.[5] Furthermore, patients with PAD and DM typically present with peripheral neuropathy.[6] Sensory impairment increases the risk of progressive tissue degeneration and foot ulcerations.

Falsely elevated ABI levels (> 1.40) could most likely be an indication of medial arterial calcinosis.

Takeaways

- PAD affects approximately 12 million people in the United States.
- Diabetics are at an increased risk of developing vascular disease in the lower extremity.
- The deleterious nature of these combined pathologies can block the microvasculature of the lower limb and induce peripheral neuropathy, which puts these patients at increased risk of ulcerations and potential amputations.
- Any surgical intervention upon the diabetic foot should take into consideration the angiosomal distribution of blood flow.
- Although there has been some controversy regarding the utilization of the TBI measurements, it is still recommended to help diagnose PAD in the presence of non-compressible vessels.
- The American College of Cardiology and American Heart Association have established clinical practice guidelines with recommendations to help improve outcomes in patients with cardiovascular co-morbidities:
- For patients with a history or physical examination suggestive of PAD or non-joint related leg pain, the resting and post exercise ABI is recommended.
- TBIs should be implemented to measure and diagnose patients with PAD when ABI values are greater than 1.40.
- The Society for Vascular Surgery proposed a robust classification system based on wound (extent), ischemia, and foot infection. They devised an easy-to-use mobile application that can help clinicians assess important clinical outcomes for limb salvage and wound healing. •

The American College of Cardiology (ACC) & American Heart Association (AHA) practice guidelines compartmentalize PAD as four distinct categories: claudication, asymptomatic, acute limb ischemia (ALI), and critical limb ischemia (CLI).[7,19] Intermittent claudication is characterized as a painful cramp or ache in the thighs, calves, or gluteal regions. The pain is classically exacerbated with exercise and is abated with rest.[7,19] High-risk patients who do not experience these clinical symptoms of claudication could be asymptomatic.[7,19] Severe vascular obstruction significantly reduces blood flow to the extremities, ultimately predisposing patients to skin ulcerations, sores, or gangrene.[7,19] This clinical presentation is known as critical limb ischemia (CLI). It is often characterized by nocturnal recumbent pain, chronic ischemic rest pain, or the formation of gangrene or ulcerations.[7,19] Acute limb ischemia is an insidious decrease in limb perfusion triggering an immediate threat to limb viability.[7,19]

The development of diabetic foot ulcerations (DFUs) has generally been thought to be a ramification of several co-morbidities that include peripheral neuropathy, PAD, and/or structural deformities of the lower extremity. Additionally, diabetic patients are four more times likely to develop CLI than patients without diabetes mellitus.[8] Approximately 15% of DFUs result in lower extremity amputations.[9] It should be em-

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phasized that DFUs precede roughly 85% of amputations in patients with diabetes.[10] The five-year mortality rates from these surgical interventions can range from 50%-76%.[11]

The high mortality rates could be a consequence of an array of systemic co-morbidities that include: pulmonary disease, cardiovascular disease, and end-stage renal disease, among others. The diagnosis and treatment of the diabetic patient with concomitant vascular disease should encompass a holistic approach. However, the challenge to treat these patients is to accurately diagnose the symptoms and facilitate the proper treatment pathways. The diverse nature of this wide spectrum disease process has led to the development of numerous diagnostic methodologies, intervention strategies, and classification guidelines. Yet, many of these classifications are limited and fail to appropriately stratify the major factors that impact clinical management and risk of limb loss.

Angiosomes and PAD

In the late '80s, Taylor and Palmer introduced the angiosome concept that divides the body into three-dimensional anatomic vascular regions supplied by specific source arteries and drained by specific veins. It has been found that there are at least 40 angiosomes in the body that are interconnected by anastomotic arteries or reduced caliber choke vessels.[12] These vessels mark the boundary of any angiosome and can supply blood to an adjacent angiosome through the delay phenomenon.[12] The foot has a distribution of six angiosomes to create a vascular circumvolution (Figure 1).[12] This generates multiple pathways to augment blood supply to ulceration.[12] The six angiosomes in the foot originate from the three major arteries in the lower leg (posterior tibial, anterior tibial/dorsalis pedis, peroneal). Attinger, et al. pioneered the angiosome model in the diabetic foot.[13]

Six angiosomes have been found to be present in the foot.

They conducted a retrospective analysis that assessed angiosome targeted vs. non-targeted revascularization in 52 consecutive limbs.[13] Interestingly, there was a 9.1% failure rate in the angiosomal-targeted group in contrast to a 38.1% failure in the non-targeted group.[13] It should be noted that all of the failures subsequently led to major amputation.[13] However, the rate of amputation in the non-targeted group was four times greater than the targeted group.[13] This could potentially suggest a holistic angiosome paradigm shift in revascularization strategies of the diabetic foot. More studies are warranted to elucidate patency rates, wound healing timelines, and overall successful limb preservation.

Critical limb ischemia is characterized with severe vascular obstruction that significantly reduces blood flow to the extremities ultimately predisposing patients to skin ulcerations, sores, or gangrene.

Classification Systems

The term CLI has been widely misconstrued and not well-defined due to many discrepancies in the definition and the eminent variations that pertain to this disease process. Demographic and epidemiologic shifts have increased tremendously over the years, consequently making treatment and diagnostic methods arduous to implement. The prevalence of DM in the world presently has changed the scope of how patients with PAD are managed. It has become more incumbent on the physician to identify the severity of the disease and also stratify risk to obviate catastrophic events.

Wagner Classification System

The Wagner classification system employs six wound grades that are scored from 0 to 514. Its primary objective is to assess depth in various diabetic foot ulcerations. However, this system is unable to properly describe and identify infection and vascular disease as independent risk factors.[12] The University of Texas at San Antonio (UTSA) devised a classification guideline which utilizes a matrix that incorporates scales that are scored A to D and grades scored 0 to 512.

Irrespective of ulcer anatomic depth, the UTSA system allows the identification of infection and vascular disease as independent factors.[12] The PEDIS guideline stratifies the diabetic foot according to five categories: perfusion, extent/size, depth/tissue loss, infection, and sensation.[15] This system uses a classifying matrix grading each category 0 through 315.

It should be noted that this classification system does not measure ischemic rest pain or include the presence of gangrene.[15] Although many of these stratification guidelines have been validated, they fail to offer adequate detail to the dynamic pathophysiologic responses that diabetics elicit in the presence of PAD.

Diagnostic Tools

Ankle-Brachial Index vs. Toe-Brachial Index

The Ankle-Brachial Index (ABI)

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is a widely utilized diagnostic tool for vascular evaluation. This modality measures patency of the lower extremity arterial system within the lower extremity arterial complex.[12] The pathophysiologic response to MAC could contribute to a critical decline in tissue perfusion, consequently resulting in faulty peripheral vascularity.[12] This prognostic obscurity has served as a major challenge to clinicians. Prior studies have described the potential association between amputation rates and elevated ABIs.

SVS WIfI classification systems uses a grading matrix based on wound depth, ischemia, and foot infection.

A recent prospective study conducted by the American Diabetes Association (ADA) found that patients who had CLI with concomitant DM were at a much higher risk of a major amputation in contrast to CLI patients without DM.[15] Interestingly, increased amputation risk was associated with elevated ABI levels (ABI > 1.4), thus potentially serving as an equitable prognostic value in comparison to a low ABI index.[14]

However, the ABI test has several limitations, one of which includes its inability to measure occlusive arterial etiologies distal to the ankle.[12] Also, ABIs have been demonstrated to be sensitive to patients' height, gender, and ethnicity.[12] It has been seen that taller patients were more likely to have increased ABI values.

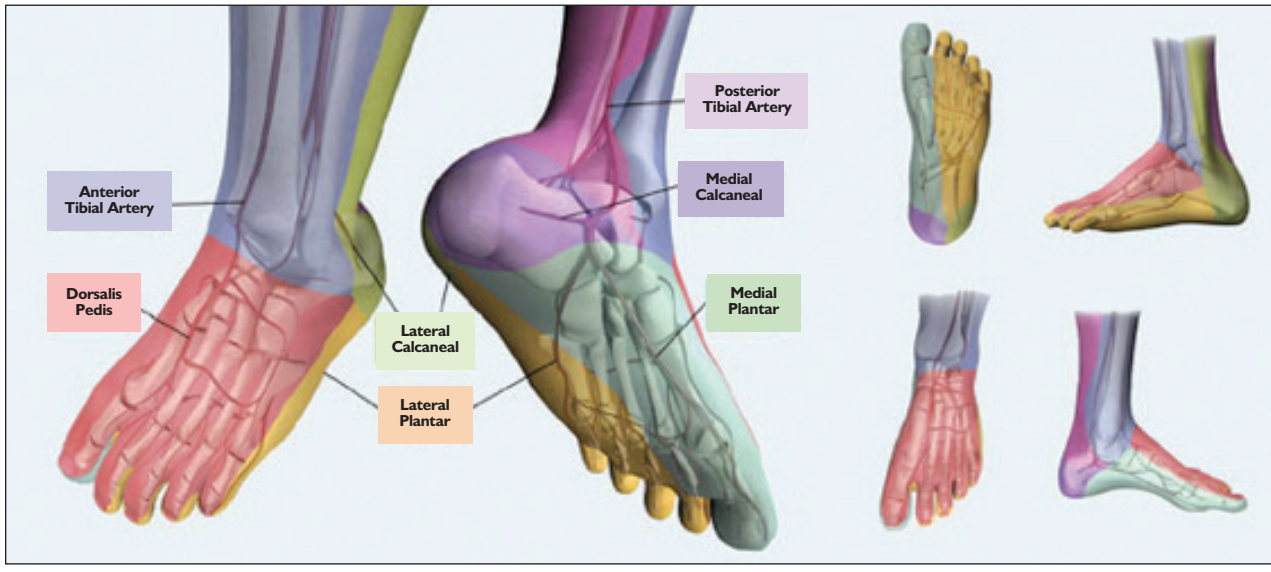

Figure 1: Angiosomes of the Foot

using a blood pressure cuff and a hand-held Doppler probe.[12] The ABI is calculated as a ratio of systolic blood pressure of the arterial network of the dorsalis pedis or posterior tibial artery divided by the systolic blood pressure in the brachial artery.[12] Normal values range from 0.9 to 1.30. Ratios < 0.9 or > 1.30 have been associated with PAD.[12] It should be noted that limitations might arise in patients with diabetes. A value greater than 1.4 could be an indication of medial arterial calcification (MAC).

This malady also known as Monckeberg's sclerosis has been found to be the consequence of the (age-related) build-up of glycosylated proteins.[7] It is intensified in systemic illnesses such as renal failure and DM.[12] The decreased elasticity of the vessel impairs pulsatile flow

Transcutaneous oxygen measurement ($TCPO_2$) measures oxygen tension in areas contiguous to wound margins and has been promoted as an effective means of assessing the probability of wound healing.

Although recent studies have revealed promising prognostic value of falsely elevated ABIs, the ACC and AHA still recommends that clinicians utilize the toe brachial index (TBI) in patients with concomitant DM and CLI. Roughly 20% of potential PAD patients undergoing ABI evaluation have non-compressible vessels.[17,12,16] TBI utiliza-

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tion has been indicated to be superior to the ABI in patients with MAC.[12] It has been established that a normal TBI that is greater than 0.7 can potentially exclude the presence of vascular disease.[12]

Interestingly, Brooks and colleagues found that TBI values actually do not have the once-thought prognostic advantage over ABIs in determining remote lower extremity arterial perfusion.[16] However, they did find that the TBI was in fact advantageous when assessing vascularity in patients with systemic co-morbidities (chronic kidney disease, DM, obesity, etc.).[15]

The European Society for Vascular Surgery conducted a study to determine whether diabetes nullifies the ABI as opposed to the TBI.[17] They investigated ABI-TBI and found no evidence that the TBI diagnostic approach promoted early detection of vascular disease in their diabetic group.[16] However, their study did not take into account the current state and duration of the diabetic sample size, which could impact study outcomes. Diabetic patients who manage their illness effectively may not be subject to MAC.

As previously mentioned, approximately 20% of patients with PAD present with MAC. In order to definitively invalidate the utilization of TBIs, extensive research is needed to compare TBI utilization

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Skin perfusion pressure (SPP) is a laser Doppler modality that measures arterial occlusion at the level of the ankle to evaluate the cutaneous capillary circulation.

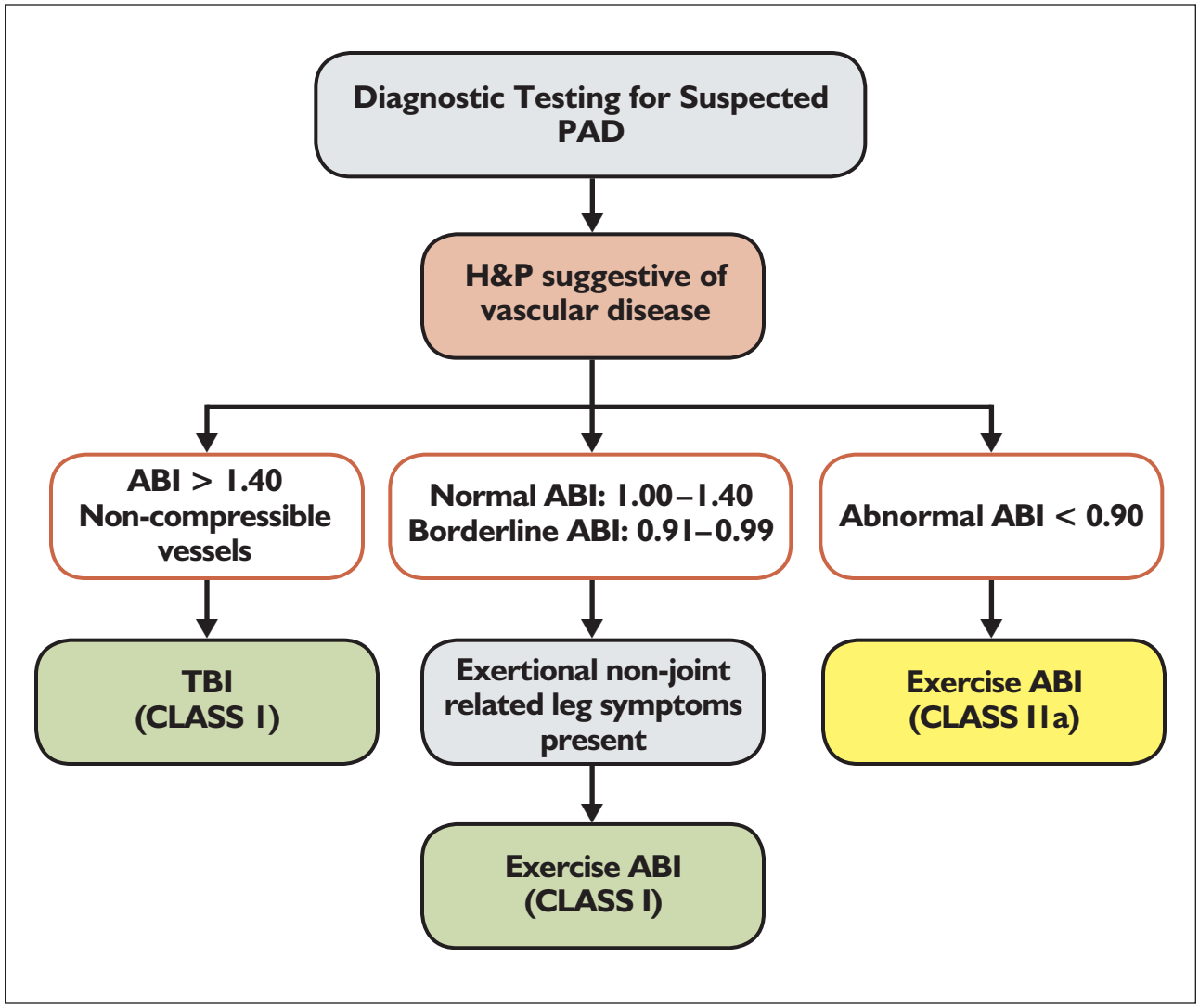

Figure 2: AHA/ACC Taskforce ABI & TBI Recommendations[20]

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against image-confirmed PAD.

In 2016, the AHA/ACC assembled a taskforce to re-establish a set of guidelines on the management of patients with lower extremity Peripheral arterial disease (PAD).[18,19] They highly recommend TBI measurements to diagnose patients suspected of having PAD when the ABI is greater than 1.40 (Figure 5).[19] Additionally, the taskforce recommended patients with borderline ABI values (0.9–0.99) but still symptomatic to have an exercise ABI conducted.[19]

Typically, patients with PAD present to the clinic with exercise (or exertional)-induced claudication. This led many to speculate on the efficacy of post-exercise ABI testing. Hammad, et al. directed a major retrospective analysis consisting of 2,391 patients who underwent both post and resting ABI testing over a five-year period.[19]

They found that by adding post-exercise ABI testing, it appeared to offer better prognostic and clinical information in contrast to normal/abnormal resting ABI values.[18] When patients were symptomatic with claudication, post-ex-

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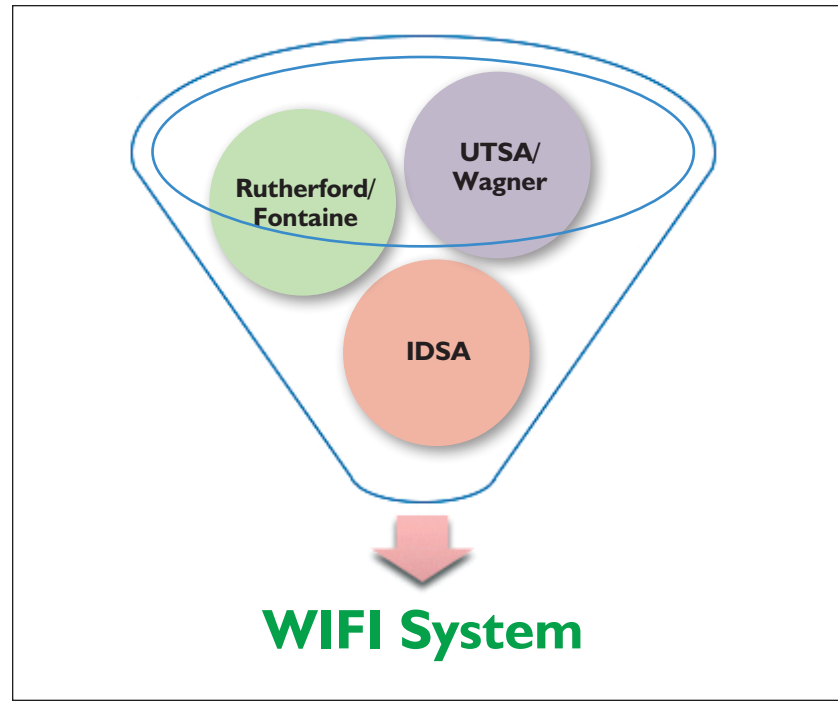

Figure 3: SVS WiFI Classification System

Post-exercise ABI has been found to provide clinicians better prognostic information than resting ABI values.

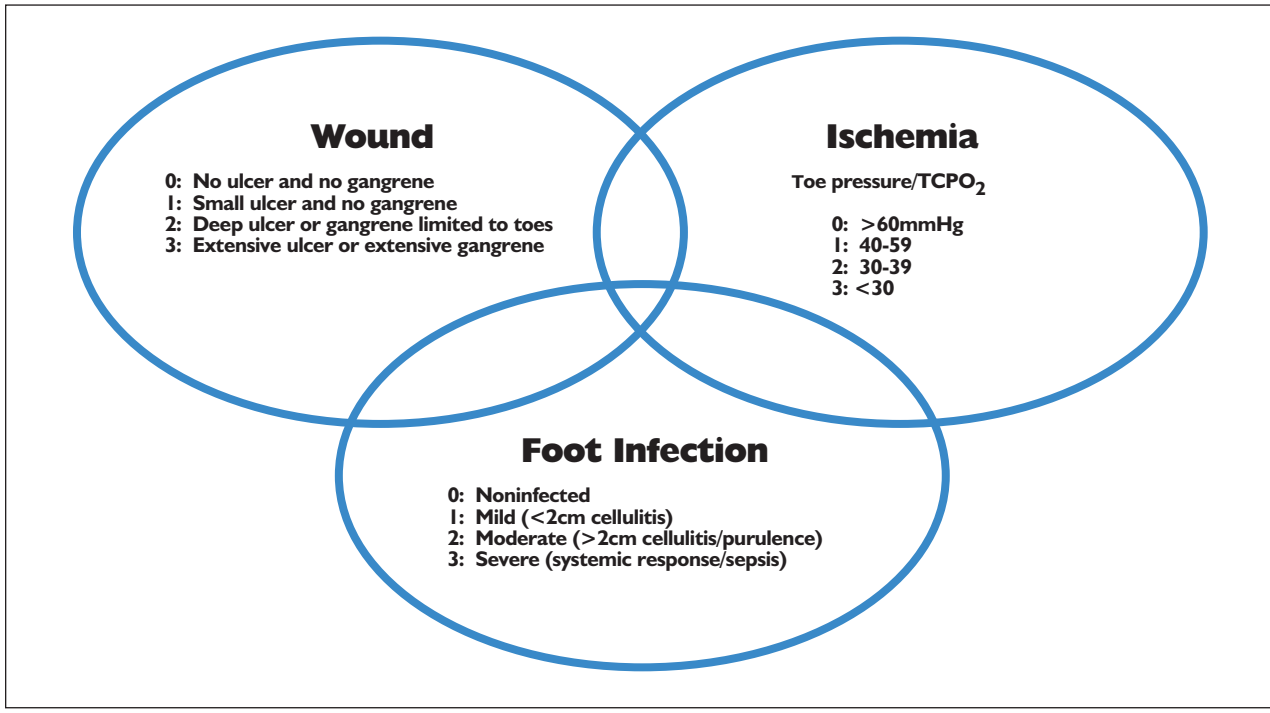

Figure 4: Dynamic Integration of WIfi System[24]

Classification *(from page 150)*

ercise ABI testing better reflected limb perfusion.[15] This diagnostic modality may help physicians accurately and more objectively identify the level of mal-perfusion, and more effectively connect the results with patients' symptoms.[18]

For instance, a patient who presents with a resting ABI of 0.84 would be considered mild/borderline. However a post-exercise ABI of 0.29 in that same patient would alarm physicians of vascular disease that may require further intervention.[18] This test should be considered in the diabetic patient presenting with symptoms of intermittent claudication.

Note: The AHA/ACC taskforce has designated a Class I as the "strongest" recommendation and a Class IIa as "moderate". Each category in the figure displayed "moderate quality evidence" from one or more "well designed, well executed, non-randomized, observational, or registry studies." Meta-analysis for the respective categories was conducted.

When using the WiFI classification to stratify the threat of amputation, wound extent takes into account the presence of gangrene to determine the grade of severity.

Alternative Vascular Examination Modalities

Second tier vascular examination options include segmental pressure volume (SPV), skin perfusion pressure (SPP), and transcutaneous oxygen measurement ($TCPO_2$), among others. These modalities are able to measure tissue oxygenation, and skin SPV is indicated in patients with normal ABI but with suspicion of peripheral arterial disease and incompressible vessels secondary to diabetes.[12] The framework of SPV is built around the physiologic response to obstruction that occurs proximal to the level of which the pressure drops.[12] In order to locate the area of concern, blood pressure cuffs (systolic) are placed at several intervals along the lower extremity (ankle, calf, thigh).[12]

The shape of the pulse-wave is used to determine the severity and general location of the arterial occlusion.[12] Skin perfusion pressure (SPP) is a laser Doppler modality that measures arterial occlusion at the level of the ankle.[12] It is utilized to address the micro-vascular network, specifically the cutaneous capillary circulation. Previous studies have shown SPP to be more sensitive than other diagnostic tools for detecting lower extremity peripheral arterial disease.[21]

$TCPO_2$

$TCPO_2$ measures oxygen tension in areas contiguous to wound margins and has been promoted as an effective means of assessing the probability of wound healing. This modality should be utilized in conjunction with hyperbaric oxygen intervention, and its results should validate referral for vascular status.[12] A prospective study has shown that $TCPO_2$ indicates a predictive diagnostic accuracy of pe-

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a, Estimate risk of amputation at 1 year for each combination

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	L	M	VL	L	M	H	L	L	M	H	L	M	M	H
W-1	VL	VL	L	M	VL	L	M	H	L	M	H	H	M	M	H	H
W-2	L	L	M	H	M	M	H	H	M	H	H	H	H	H	H	H
W-3	M	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H
	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3

b, Estimate likelihood of benefit of/requirement for revascularization (assuming infection can be controlled first)

	Ischemia – 0				Ischemia – 1				Ischemia – 2				Ischemia – 3			
W-0	VL	VL	VL	VL	VL	L	L	M	L	L	M	M	M	H	H	H
W-1	VL	VL	VL	VL	L	M	M	M	M	H	H	H	H	H	H	H
W-2	VL	VL	VL	VL	M	M	H	H	H	H	H	H	H	H	H	H
W-3	VL	VL	VL	VL	M	M	M	H	H	H	H	H	H	H	H	H
	f-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3	fI-0	fI-1	fI-2	fI-3

fI, foot Infection; I, Ischemia; W, Wound.

Premises:

1. Increase in wound class increases risk of amputation (based on PEDIS, UT, and other wound classification systems)
2. PAD and infection are synergistic (Eurodiale); infected wound + PAD increases likelihood revascularization will be needed to heal wound
3. Infection 3 category (systemic/metabolic instability): moderate to high-risk of amputation regardless of other factors (validated IDSA guidelines)

Four classes: for each box, group combination into one of these four classes

Very low = VL = clinical stage 1
Low = L = clinical stage 2
Moderate = M = clinical stage 3
High = H = clinical stage 4
Clinical stage 5 would signify an unsalvageable foot

Figure 5: SVS WIfI Grading Matrix[24]

Classification *(from page 151)*

ripheral arterial occlusive disease of greater than 90%.[22] It should be noted that the authors have found this diagnostic tool to be technician-sensitive which could result in wide variability.[14]

Stonebridge conducted a literature review on the measurement accuracy of transcutaneous partial oxygen pressure in individuals with diabetic foot ulcerations and found this method to be unreliable.[23] This study reiterates the importance of proper vascular examination and wound risk stratification guidelines in order help patients curtail limb amputations. Taking everything into consideration, both macro- and micro-vascular disease are implicated in an array of complications in this patient group. The diagnosis and treatment strategies remain controversial.

Figure 7: Neuro-ischemic diabetic foot

Figure 9: Neuro-ischemic wound with mild infection

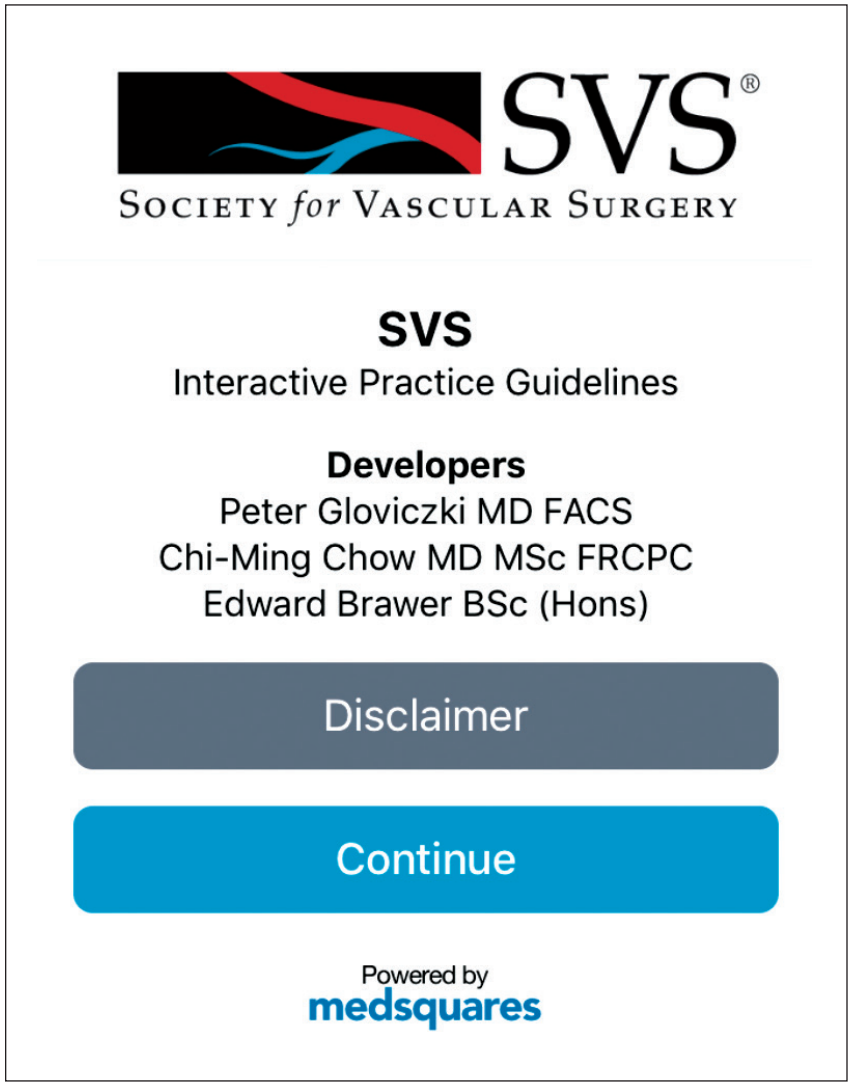

Figure 6: SVS WIfI Application[24]

Bringing It All Together

The Society of Vascular Surgery (SVS) opined that the current classification systems have two major problems: "1) the validity and natural history of the concept of CLI and 2) the failure of most existing systems to assess and grade the major factors that influence both risk of limb loss and clinical management."[24] Uncontrolled diabetes typically presents with several deleterious factors of which ischemia is just one component of a much larger conundrum.[24] Current CLI classification guidelines do not properly address the extent of tissue loss and ignore the symptomology of infection.[24]

Although Rutherford's and Fontaine's classification system does take into account rest pain, ischemic ulceration, and gangrene, it is limited to stratify the range of risk in patients with broad-spectrum disease etiologies as seen in DM.[24] Ischemia in the foot has been associated with an increased risk for infection. This may be attributed to the fact that DMs pathophysiologic mechanism causes a decreased inflammatory response to infection or injury.[24]

The lack of perfusion to the area of concern could result in the absence of erythema, which is a vital clinical symptom of infection.[24] Additionally, peripheral neuropathy inhibits DM patients to sense skin warmth and pain.[24] These detrimental factors could delay the awareness of a present infection.[24] Vascular disease is critically important, but it is one of

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several factors that can lead to amputations. The detection and immediate intervention of severe infection is absolutely paramount for favorable outcomes.

Common signs of an infection include: exudate or pus, redness/change in skin color, fever, inflammation or swelling, tenderness or warmth in the wound area, and a slow-healing wound. This pathogenic feature can obscure the clinician's decision-making process, which could impact the implementation of effective treatment pathways.[24]

The angiosome to the medial heel is directly supplied by the posterior tibial artery.

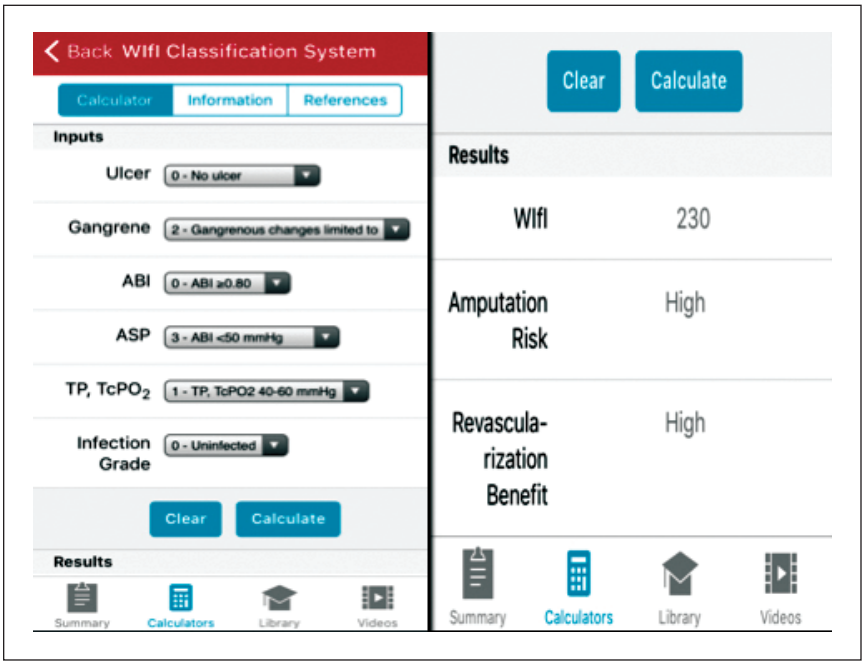

Figure 8: SVS WIfI Application Pertaining to Case 1

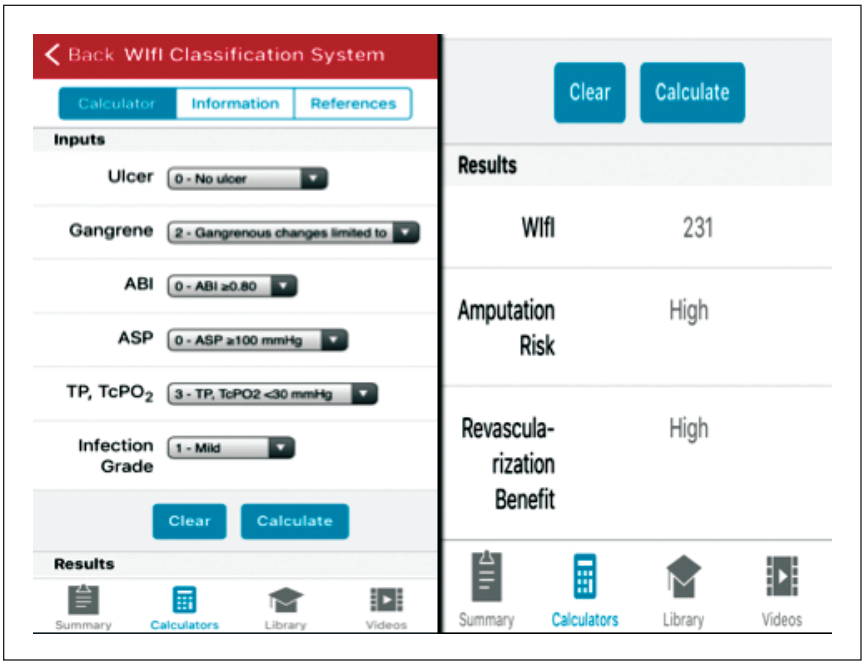

Figure 10: SVS WIfI Application Pertaining to Case 2

Consequently, the SVS devised a dynamic classification system that integrates a global methodology in the stratification of these disease pathologies: wound extent, ischemia, and foot infection (Figure 3).[24] This resulted in a paradigm shift in evaluating the risks of amputation and the potential benefits of vascular intervention. The target population of the WifI system incorporates patients across a broad spectrum of lower extremity vascular disease etiologies.[24]

The main idea behind this new classification system was to help patients categorize their condition in a similar fashion to the TNM (tumor, nodes, metastasis) system commonly utilized in malignancies (Figure 4). Grades are calculated separately by measuring the wound depth, ischemia based on TBI, ABI, and $TcPO_2$, and the presence of systemic or local infections from the IDSA guidelines.[24] Once the grades are combined and calculated, a risk of amputation is generated (Figure 5). Using the original WIfI grading matrix could be deemed complex and time-consuming. However, the SVS has developed a robust mobile application that would enable the attending physician to input patients' WIfI scores and rapidly generate this risk assessment (Figure 6).

It should be noted that there are in fact some nuances associated with the WIfI system especially when evaluating the infection component. Infection assessment should be based on clinical features that need to be physically appreciated before applying a specific grade. It is advised to reference the original SVS WIfi classification-grading matrix when in doubt. Clinicians are now able to generate

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Classification (from page 153)

an evidence-based risk assessment score that can be converted to meaningful insights to help diagnose, counsel and treat patients. also benefit with vascular intervention (Figure 7). **PM**

The consensus clinical stage for this patient would be scored 2,3,0 (high amputation risk) noting a potential benefit to vascular intervention.

Clinicians should be able to utilize this methodology in any medical setting.

Case Example 1: Severe Neuro-ischemic Diabetic Foot with PAD

A 60 year-old male with a medical history of PAD, diabetes, and peripheral neuropathy presents with a non-healing neuro-ischemic lesion to his left foot (Figure 5). The vascular assessment included; ABI >0.8 mmHg, toe pressure of 40-60 mmHg, gangrenous changes limited to the patient's fourth right digit, and no infection present. The WIfI classification for this patient was graded 2,3,3, respectively. The consensus clinical stage for this patient would be scored 2,3,0 (high amputation risk) noting a potential benefit to vascular intervention.

Case Example 2: Gangrenous Foot, Patient with Vascular Disease

A 52 year-old male with a past medical history of diabetes and PAD presented with rest pain and a gangrenous left hallux. Vitals revealed mild/low fever, tachycardia, and increased respiratory rate. Laboratory analysis was notable for elevated liver enzymes, c-reactive protein, and erythrocyte sedimentation rate. Non-invasive vascular studies were performed and revealed non-compressible vessels with borderline monophasic/biphasic waveforms. An ABI of 1.30 was noted. The TBI was less than 30 mmHg. The patient is given a WIfI score of 231 and is at high risk for amputation. This patient would

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Dr. Snyder is Professor and Director of Clinical Research and Fellowship Director at Barry University SPM. Dr. Snyder is certified in foot and ankle surgery by the American Board of Podiatric Surgery and is also a board certified wound specialist.

Joey Ead is currently a third year medical student at Barry University School of Podiatric Medicine. Mr. Ead received his Masters Degree in biomedical science with a concentration in wound healing and tissue regeneration.

CME EXAMINATION

SEE ANSWER SHEET ON PAGE 157.

1) Falsely elevated ABI levels (> 1.40) could most likely be an indication of:

- **A) Anemia**
- **B) Medial arterial calcinosis**
- **C) Ulceration**
- **D) Coagulate necrosis**

2) What disease process is characterized with severe vascular obstruction that significantly reduces blood flow to the extremities, ultimately predisposing patients to skin ulcerations, sores or gangrene?

- **A) Intermittent claudication**
- **B) Chronic venous insufficiency**
- **C) Anemia**
- **D) Critical limb ischemia**

3) How many angiosomes have been found to be present in the foot?

- **A) 6**
- **B) 2**
- **C) 3**
- **D) 5**

4) SVS WIfI classification systems uses a grading matrix based on:

- **A) Wound density, infection, foul odor**
- **B) Wound depth, ischemia, and foot infection**
- **C) Wound diameter, hypoxia, foot infection**
- **D) Wound density, hypoxia, infection**

5) Which micro-vascular non-invasive study measures oxygen tension in areas contiguous to wound margins and has been promoted as an effective means of assessing the probability of wound healing?

- **A) Transcutaneous oxygen measurement ($TCPO_2$)**
- **B) Segmental pressure volume (SPV)**
- **C) Pulse volume recording (PVR)**
- **D) Ankle-brachial index (ABI)**

6) Which of the following is a laser Doppler modality that measures arterial occlusion at the level of the ankle to evaluate the cutaneous capillary circulation?

- **A) Transcutaneous oxygen measurement ($TCPO_2$)**

Continued on page 155

B) Segmental pressure volume (SPV)
C) Skin perfusion pressure (SPP)
D) Pulse Volume Recording (PVR)

7) Which of the following diagnostic modalities have been found to provide clinicians better prognostic information than resting ABI values?
A) $TCPO_2$
B) Segmental pressure volume
C) Post-exercise ABI
D) Palpation

8) When using the WiFI classification to stratify the threat of amputation, which category takes into account the presence of gangrene to determine the grade of severity?
A) Wound extent
B) Ischemia
C) Foot infection
D) Temperature

9) A 59-year-old diabetic male patient has an ischemic dorsal foot ulcer. The angiogram revealed a short segment occlusion of the anterior tibial and posterior tibial artery along with complete occlusion of the peroneal. What would be the target artery based on the angiosome concept to optimize perfusion to the aforementioned ulcer?
A) Peroneal artery
B) Posterior tibial artery
C) Anterior tibial artery
D) Popliteal artery

10) The angiosome to the medial heel is directly supplied by what source artery?
A) Anterior tibial artery
B) Lateral plantar artery
C) Medial plantar artery
D) Posterior tibial artery

SEE ANSWER SHEET ON PAGE 157.

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EXAM #6/17
Peripheral Vascular Disease, Infection, Foot Ulcers, and the WIfI Classification System (Snyder and Ead)

Circle:

1.	A	B	C	D	6.	A	B	C	D
2.	A	B	C	D	7.	A	B	C	D
3.	A	B	C	D	8.	A	B	C	D
4.	A	B	C	D	9.	A	B	C	D
5.	A	B	C	D	10.	A	B	C	D

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Strongly agree [5]	Agree [4]	Neutral [3]	Disagree [2]	Strongly disagree [1]

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