HANDBOOK

Diabetes footcare in dark skin tones

with visual guide

DIABETES AFRICA

This handbook was developed with insights and guidance from the Royal College of Podiatry. It also received support from Mölnlycke.

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1st Floor, North Westgate House,
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info@diabetesafrica.org
www.diabetesafrica.org

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For further information or to provide feedback: info@diabetesafrica.org. This handbook is available for download: www.diabetesafrica.org/footcare-handbook.

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Important information

This handbook is intended for educational and informational purposes only. It is not a substitute for professional medical advice, diagnosis, or treatment. The information provided in this handbook should not be relied upon for making decisions regarding medical care. Individuals with diabetes or any other health condition should always consult with their healthcare providers for personalised advice and treatment plans.

This handbook is primarily designed as a resource for healthcare professionals involved in the care of individuals with diabetes, particularly those with dark skin tones. However, individuals with diabetes and their caregivers may also find the information useful as a supplementary educational resource. Do not delay seeking medical advice because of something you have read in this handbook.

The recommendations and guidelines presented in this handbook are based on the best available evidence and expert consensus at the time of publication. However, the field of medicine is constantly evolving, and healthcare professionals should always refer to the most up-to-date guidelines, research, and clinical practice recommendations.

The authors and publishers of this handbook do not assume any liability for any injury, damage, or loss arising from the use or misuse of the information contained herein.

Please note

All photographs included in this handbook have been used with the consent of the patients depicted. These images are intended solely for educational purposes to enhance understanding and management of diabetes foot care, particularly in individuals with dark skin tones. The privacy and dignity of all patients are of utmost importance, and any identifying information has been anonymized to ensure confidentiality. Unauthorized use or reproduction of these images without proper consent is strictly prohibited.

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About

This handbook

is the product of a unique collaboration across multiple healthcare specialities, with valuable input from people living with diabetes.

It is designed to provide essential information as well as quick tips to improve foot care for people with dark skin tone living with diabetes.

Co-authors and reviewers represent diverse professional backgrounds, including primary and community care, secondary, and tertiary care. They are subject-matter experts in diabetes, tissue viability, and podiatry, among others.

Mölnlycke provided the financial support to enable this collaboration. Images were sourced from contributors and specialists from around the world. Their support is acknowledged with thanks.

Diabetes Africa conceptualised the handbook and coordinated the project until its completion.

In addition to their contribution as authors, Chris Manu, Luxmi Dhoonmoon, Joan St John and Zulfiqarali Abbas provided advice and guidance throughout the development phases of the project This report also benefited from the in-depth reviews and comments of other passionate experts.

The editors are grateful to all for their time, and invaluable contribution in the development of this handbook.

Choosing the right words

We acknowledge that talking about skin tone is not always easy.

A good rule of thumb is to approach the topic with humility and, in a clinical context, describe skin tone objectively, using the tools available.

To qualify our focus, we used "dark skin tone(s)" to refer to the broad spectrum often described as "black and brown". Our intention is to be respectful and inclusive, acknowledging diversity within and across communities.

We recognize that language is ever-evolving, and that terms like “black” and “brown” have been widely used and accepted by many. These terms carry historical and cultural significance, and their use is a matter of personal preference and identity.

At the same time, we acknowledge that the terms “black” and “brown” can be perceived as overly broad or reductive, failing to capture the rich diversity of skin tones and ethnicities that exist within these categories.

Additionally, we avoided terminology like 'darker skin tone' as it can subtly reinforce the notion that lighter complexions represent the primary or typical point of comparison.

Our goal is to provide information and guidance that is relevant and applicable to a wide range of skin tones, without inadvertently excluding or marginalizing any individuals or groups.

We understand that language choices can be complex and nuanced, and we welcome feedback and dialogue on this issue. Our commitment is to approach this topic with care, respect, and a willingness to evolve our language as our understanding deepens, particularly regarding societal biases towards lighter skin.

Authors and reviewers

*Authors**

Zulfiqarali Abbas
MD, Endocrinologist
President,
D-Foot International

Bernadette Adeyileka-Tracz
MPharm, PhD, Exec MBA
Executive Director,
Diabetes Africa

Luxmi Dhoonmoon
Nurse Consultant, Tissue Viability, London North West University Healthcare NHS Trust

Chris Manu
Consultant Diabetologist, Co-lead for Diabetes Foot Service, King's College Hospital NHS Foundation Trust

Joan St John
GPwER Diabetes, Diabetes UK Clinical Champion

*Reviewers**

Laura Lovell
MD, GPwSI Diabetes, Barbados Diabetes Foundation

Jayne Robbie
Senior Lecturer in Diabetes and Vascular Disease, Birmingham City University

Debbie Sharman
Consultant Podiatrist, Diabetes, Dorset HealthCare University NHS Foundation Trust

Lived experience insights from

Geoff Schumann
Writer, Entertainer, Advocate
Living with diabetes

**(in alphabetical order)*

Our skin

is the most exposed part of our bodies, a first line of defence and an early indicator of many health issues.

Chris Manu
Consultant Diabetologist, Co-lead for Diabetes Foot Service, King's College Hospital NHS Foundation Trust

Yet, for dark skin tones, the signals are often misread. This is the critical issue we confront in this ground-breaking book on clinical foot care for individuals of colour, specifically those living with diabetes.

If you're a a person of colour living with diabetes, a carer or a healthcare professional who wants to enhance the level of care for your increasingly diverse patient base, then this book is for you.

The reality is that outcomes for people of dark skin tones are different to those of counterparts with lighter skin colour. This disparity often stems from a poor understanding of how conditions manifest on dark skin.

Drawing upon a broad range of clinical expertise, this guide, highlights the often-understated importance of understanding skin tone variations in diabetes foot care.

Throughout the book, we'll explore these differences in detail. Using real-life examples, we will show how by correctly interpreting signs at different stages of the condition, we can significantly improve diagnosis, treatment, and, ultimately, outcomes for people living with diabetes.

This book isn't just about improving individual practice; it's about transforming our collective understanding of healthcare to achieve a more inclusive and effective system.

All over the world

diabetes is wreaking havoc among communities, and Black, African and African-Caribbean groups are among the worst affected.

Bernadette Adeyileka-Tracz
Executive Director,
Diabetes Africa

Poor knowledge is one of the reasons why diabetes is able to cause so much harm. In response, Diabetes Africa has embarked on a mission to turn the tide against this life-threatening condition throughout the world.

At Diabetes Africa, we're doing more than raising awareness. We also want to expand knowledge about diabetes, especially how it uniquely affects individuals of African and African-Caribbean heritage.

Our initiatives are multifaceted, targeting the roots of the problem and branching out to offer solutions that are both practical and sustainable.

We recognize the critical need for specialized knowledge and skills in managing diabetes, particularly in foot care, which presents unique challenges in dark skin tones. Complications such as diabetes-related foot ulcers can have devastating consequences if not properly managed.

This guide demonstrates our dedication to improving disease knowledge, enriching training, and elevating leaders within the health and care workforce.

We believe that knowledge is power. By sharing this knowledge today, we aim to help create a future where diabetes no longer dictates the terms of our health and well-being.

Understanding skin tones

in all areas of healthcare is vital none more so than diabetes foot care.

Michelle Scott
Chair
Royal College of Podiatry

This handbook is an invaluable resource, helping clinicians build confidence and expertise in identifying and accurately assessing individuals across the full spectrum of skin tones.

This handbook supports clinicians to use respectful language and appropriate tools when establishing baseline skin colour for patients.

As healthcare professionals, it is vital that we recognise early any changes in colour and pigmentation in those with dark complexions. Missing signs of infection could prove lethal.

More research is clearly needed to ensure that all patients receive equitable and high-quality care, regardless of their skin tone. We need to ensure that our textbooks, case studies, and curriculum feature people with black and brown skin, on more than just a tokenistic or superficial level.

It is my hope that this handbook raises awareness, helps clinicians build confidence, encourages conversations, and ensures that people receive the preventative care they deserve, embracing the rich diversity of human skin tones.

Overview

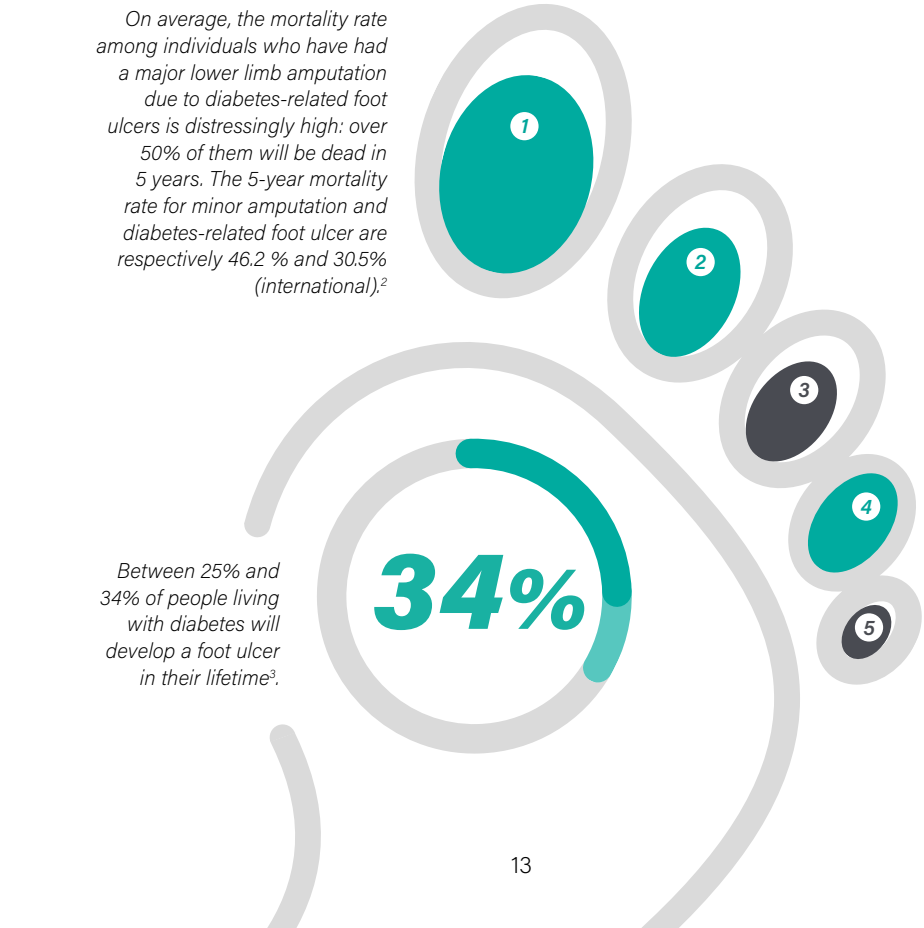
18.6 million every year

Over 550 million people worldwide have diabetes. Over the course of a year, 18.6 million of them (circ. 3%) will develop a foot ulcer[1].

5-year mortality

On average, the mortality rate among individuals who have had a major lower limb amputation due to diabetes-related foot ulcers is distressingly high: over 50% of them will be dead in 5 years. The 5-year mortality rate for minor amputation and diabetes-related foot ulcer are respectively 46.2 % and 30.5% (international).[2]

1. **Major amputation 56.6%**
2. **Minor amputation 46.2%**
3. **All cancers 31%**
4. **Diabetes-related foot ulcer 30.5%**
5. **Breast cancer 9%**



Between 25% and 34% of people living with diabetes will develop a foot ulcer in their lifetime[3].

184 amputations

This is the estimated number of amputations caused by diabetes every week in the UK[5].

Only half...

In 2020/21, only half of people living with diabetes in England had their annual foot check (51% T1D, 59% T2D)[4].

1in2

Five years after presenting with diabetes-related foot ulceration, one in two people will be dead. That's worse than many forms of cancer. The 5-year mortality rate of people presenting with diabetes-related foot ulceration in England is around 50%[6].

There were over 171,000 foot disease-related hospital admissions for people with diabetes in the UK over the three-year period 2017-2020[7].

Inequity

Black/African Americans with diabetes have double the odds of having a lower limb amputation within 1 year of diabetes-related foot ulcer diagnosis compared with non-Hispanic/White Americans[8].

1. Amstrong D.G. (2023) 2. Amstrong et al (2020) 3. Abbas (2019), Aubert (1995) 4. NCVIN (2021) 5. NHS Digital (2019) 6. NHS Digital (2022) 7. OHID (2022) 8. Miller (2022)

Make an impact

by learning what to check during consultations and improve foot care for people living with diabetes

Joan St John
GPwER Diabetes
Diabetes UK
Clinical Champion

In the UK, diabetes leads to more than 184 amputations a week. That's almost 10,000 amputations a year. Many complications for those living with diabetes could be reduced through education, training and preventative measures.

Embracing diversity is part of the journey towards better healthcare for all. This handbook illuminates that path with insights and tools that we hope you will adopt in your daily practice.

We encourage you to share the link to download this handbook. Show and explain the pictures to your patients, friends, and family.

Scan to download this handbook
Share a picture of the QR code and invite friends and colleagues to download the handbook. You can also visit www.diabetesafrica.org/footcare-handbook

As the African proverb says: 'each one teach one.' In other words, each learner becomes a teacher to others and spreads knowledge far and wide.

Education in diabetes care is an essential pillar in preventing severe complications and ensuring timely interventions. As my colleague Dr Z. Abbas emphasizes: free educational resources are available and can make a real difference.

For healthcare providers, continuing professional development means developing an understanding of the various ways in which a condition can present on an increasingly diverse population.

For example, recognising less obvious signs of foot issues in dark skin tones, like subtle colour changes or texture differences, to enable faster and more appropriate responses.

It also means practising cultural humility, recognizing that cultural understanding plays a significant role in delivering effective healthcare.

By creating an environment where people feel understood and respected, healthcare providers can improve outcomes and adherence to treatment protocols.

Time is of the essence when addressing wound care, so ensuring that people living with diabetes are empowered with this knowledge is essential.

THE EXPERT SAYS

Education is our most powerful tool. It's free for everyone and truly makes a difference when implemented with care."

Zulfiqarali Abbas
MD, Endocrinologist
President, D-Foot International

As healthcare professionals, the time we spend upskilling people living with diabetes on how to conduct daily foot self-examinations is never wasted.

This simple practice can prevent infections and reduce the rate of amputations significantly. Catching small injuries or changes early is best done together with the person living with diabetes themselves.

Find the best way

to make the handbook work for you, no matter your background or knowledge of the topic.

This handbook is a quick resource, with real-life examples and visual prompts. It is designed to guide professionals who are treating foot complications in individuals with dark skin tones living with diabetes.

We invite you to treat it as *a* reference, but not *the* reference. It is a complement to other existing resources.

Keep in mind that this handbook does not address every aspect relevant to the diagnosis and of diabetes-related foot complications. Nor does it cover all skin conditions.

Other resources exist on these topics. We direct readers to further reading in the References section.

In a nutshell

Physiology Fundamental notions about skin, skin tone and how they relate to diabetes.

Clinical assessment A look at how history, investigation and examination may vary.

Visual guide Compare conditions across skin tones and test your acuity.

Tools and testing Review when additional investigations may be helpful, or not.

Physiology

We know that

the skin is the largest organ in the body. It contains nerve endings, blood vessels and fat.

The skin plays a crucial role as a sensory organ, providing information that helps regulate our body temperature, for example.

But the skin is also an active participant in our immune system, employing a multi-faceted strategy to protect us:

Physical Barrier: The skin acts as a physical barrier, preventing harmful microorganisms from entering the body. The outermost layer of the skin, (the epidermis), is made up of tightly packed cells and is covered by a layer of lipids that help to seal the gaps between cells, making it difficult for pathogens to penetrate.

Chemical Barrier: The skin produces and secretes various substances that protect against pathogens. For example, sebum (produced by sebaceous glands) contains antimicrobial properties, and sweat contains lysozyme, an enzyme that can break down the cell walls of bacteria.

Microbial Flora: The skin hosts a diverse community of microorganisms, known as the skin microbiota. These microorganisms compete with potentially harmful pathogens for nutrients and space, reducing the chances of pathogenic infections.

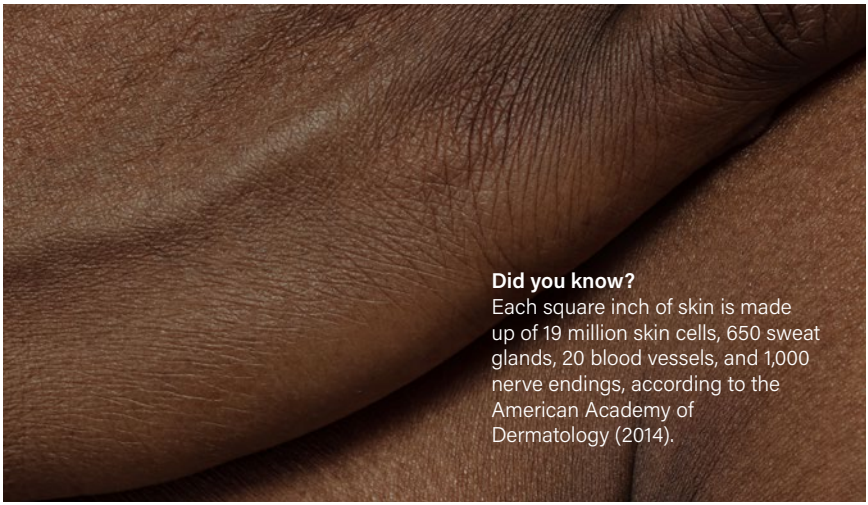
Immune cells: The skin contains specialized immune cells. These cells detect and respond to pathogens that manage to penetrate the skin's physical barrier. They can initiate an immune response by capturing antigens from pathogens and presenting them to other immune cells in the lymph nodes.

Inflammatory response: When the skin is injured or detects the presence of pathogens, it can initiate an inflammatory response to contain and eliminate the threat. This involves the release of various signaling molecules that attract immune cells to the site of infection or injury.

Wound healing: The skin is also involved in the repair and regeneration process after injury, which is essential to restore the integrity of the skin barrier. This process involves various immune cells and signaling pathways that work together to close wounds and prevent the invasion of pathogens.

The bottom line

A damaged or infected skin will struggle to fulfil its role as part of the body's nervous and immune system. Detecting issues early can avoid dramatic cascading effects.



Did you know?
Each square inch of skin is made up of 19 million skin cells, 650 sweat glands, 20 blood vessels, and 1,000 nerve endings, according to the American Academy of Dermatology (2014).

Anatomy of the skin

The skin is a dynamic and active multi-layered organ, each layer helps it to fulfil its differing functions of protection and absorption, evaporation and fluid retention.

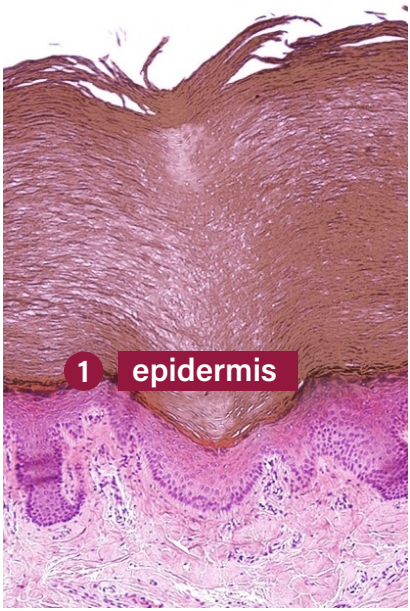
Beneath the tangible surface of the skin is the first layer which is the epidermis (1). The stratum corneum is the first layer within this, which is the toughened outer keratin shell that can primarily act as a barrier and protect against forceful as well as chemical and infectious challenges.

This layer is thicker on the sole of our feet, or plantar area.

The epidermis also consists of a layer of fat rich and active constituents and other layers that allow skin permeability.

Protection from sunlight
Melanocytes (the melanin containing cells) are found in this layer, primarily shielding the skin from the damaging impact of sunlight (ultraviolet radiations).

Picture 1. Microscope micrograph of human glabrous skin. From top, the epidermis (1), showing a prominent horny layer, the dermis (2) and hypodermis (3). Credit: Jose Luis Calvo.



The dermis (2) is the next layer down. It contains blood vessels, connective tissue, hair follicles, parts of the immune system, nerve endings and glands.

The connective tissue enables both flexibility whilst also containing supporting structures. The nerve endings allow the sensations of heat and touch to be appreciated.

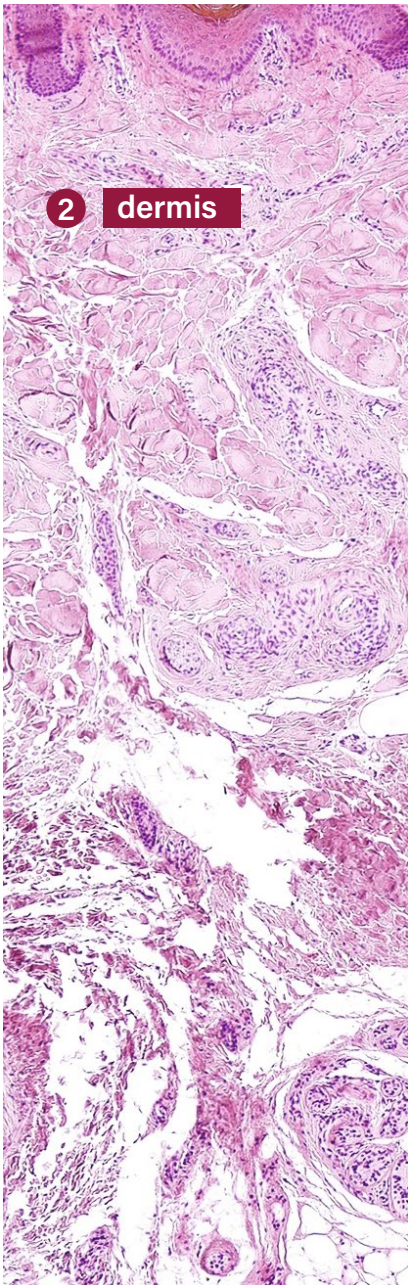
Three types of glands

There are thought to be millions of glands in the skin distributed throughout the body, with different concentrations of them found in the palms, forehead, and soles of the feet, among other areas.

The glands found in the dermis are of three main types which vary in their function. The contribution to the vitally important task of thermo-regulation is provided by the (eccrine) sweat glands. They account for the degree of 'saltiness' of the sweat that is produced.

The glands associated with the hair follicles (pilosebaceous) are apocrine glands which produce sweat that takes its odour from interaction with bacteria on the skin surface.

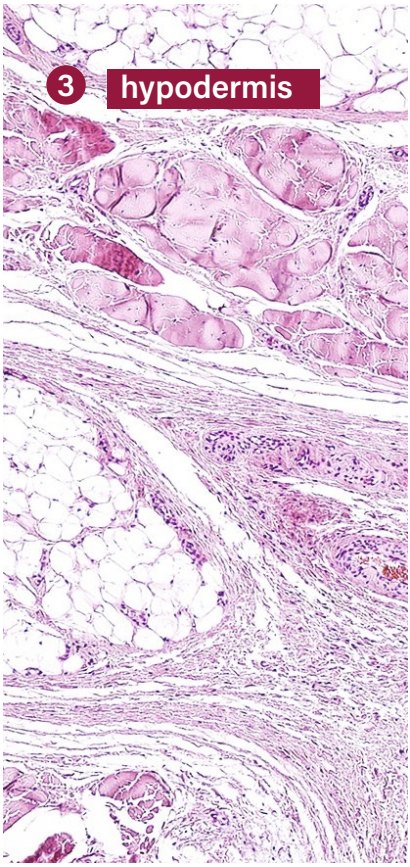
The third type of gland produce the skin's own made moisturiser, is the sebaceous gland. Sebum is the fat rich compound produced by this gland which provides moisture to the skin's surface.



Beneath the dermis is the layer known as the subcutaneous tissue, subcutis or hypodermis (3). This contains the subcutaneous fat as well as blood vessels and nerves

Skin tone and skin components
Strong evidence regarding absolute differences in the components of the skin based on external skin tone which are not related to climate adaptations is lacking.

There may be three areas with limited evidence. These are: a lower sodium content of sweat from People of Black African heritage suggesting that the electrolyte conservation within the body is more efficient, a difference in the manifestation of ageing in the skin, and the tendency for cells called fibroblasts to become hyper-reactive and lead to the propensity for keloid scarring (see key concepts, p.28)



Our skin tone

Throughout history, various religious, pseudo-scientific and anthropologic theories have tried to explain the underlying mechanisms for variation in skin tone.

Current evidence indicates skin tone variations stem from the density, ratio, and localization of the different forms of melanin.

Melanin is not a singular compound but a complex family of related molecules. This intricate diversity is what gives rise to the multitude of hues and shades of skin, hair, and eyes. Apart from the genetic condition of albinism, we all have melanin in our skin.

Septimius Severus and family, photography by Gary Todd

Individual variations

Human skin tones differ not just between people, but also within each individual. The soles of our feet, for instance, appear lighter due to the dense keratin layer which obscures the melanin beneath.

Credit: Genusfotografen & Wikimedia Sverige (wikimedia.se)

In some people with dark skin, there may be noticeable differences when examining the soles of the feet, especially in those over 50 years old. For example, there may be dark spots or patches on the soles of the feet in some individuals. Although these can be normal, clinicians should always be alert to potential differential diagnoses eg infection, or melanoma (see key concepts, p.29)

Nails of those with dark skin can also more commonly show some linear hyperpigmentation, known as longitudinal melanonychia, although this can occur after trauma, it tends to become more commonly associated with age and is often found in those over 50 years old.

Knowing when to refer

It is important to distinguish melanonychia from melanoma, a serious form of skin cancer. With melanoma, the linear pigmentation may be wider in width and/or irregular in color. If there is any diagnostic doubt, the person should be referred for dermatoscopy and an urgent expert dermatological opinion.

There are various tools and resources that can assist with objective assessments of skin tone. The most important available resource is the person with diabetes who can communicate changes in colour in their skin, nails, or skin tone to the clinician or assessor and point out areas of unaffected skin, to act as a baseline and comparator.

Knuckle pad hyperpigmentation in 29 yo female with B12 deficiency. (Illustration from picture by Ankita Srivastava and Sanjiv Choudhary)

Melanonychia is a common dermatologic condition involving black or brown pigmentation of the nail (Illustration from picture by Christopher Rizk)

Identifying skin tones

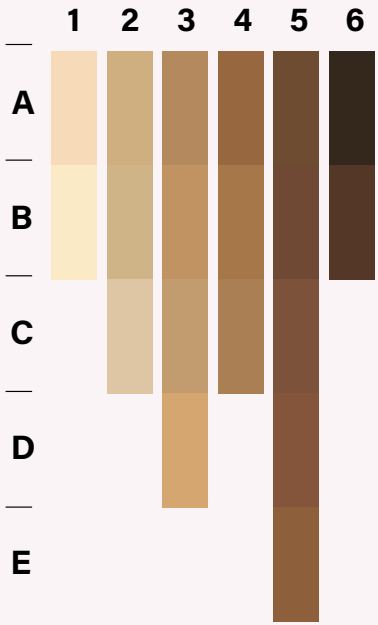
The Skin Tone Tool (2015)

This is the recommended, technology-free method to assess skin tone objectively. It relies on visual examination and offers a range from 1A to 6B. This is the system we will adopt in this handbook.

The person with diabetes is the most valuable source of information and can report changes in skin colour to clinicians, who can compare these changes to areas of the skin that are unaffected, serving as a baseline.

The Fitzpatrick Skin Type (1975): an approach with limitations

The Fitzpatrick Skin Type (FST) classifies human skin response to UV light. It tends to group individuals with dark skin tones into one category, making it less accurate for clinicians.



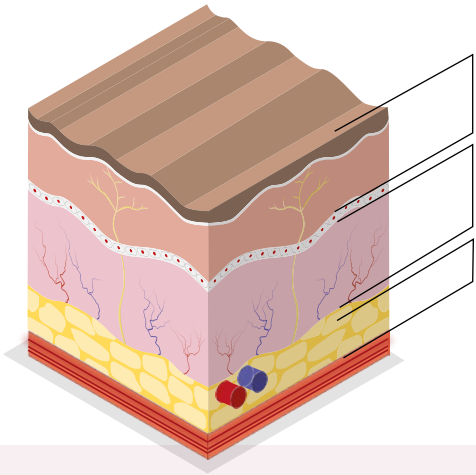
Medical literature

Ho, Byron & Robinson, June. (2015). Color Bar Tool for Skin Type Self-Identification: a cross sectional study. Journal of the American Academy of Dermatology. 73. 312-313.

Dhoonmoon L. (2023) The relevance of skin tones in the diabetic foot. The Diabetic Foot Journal 26(1): 16–9

In summary

Illustration:
Layers of the skin



1. Epidermis
Acts as a protective barrier • Provides skin colour

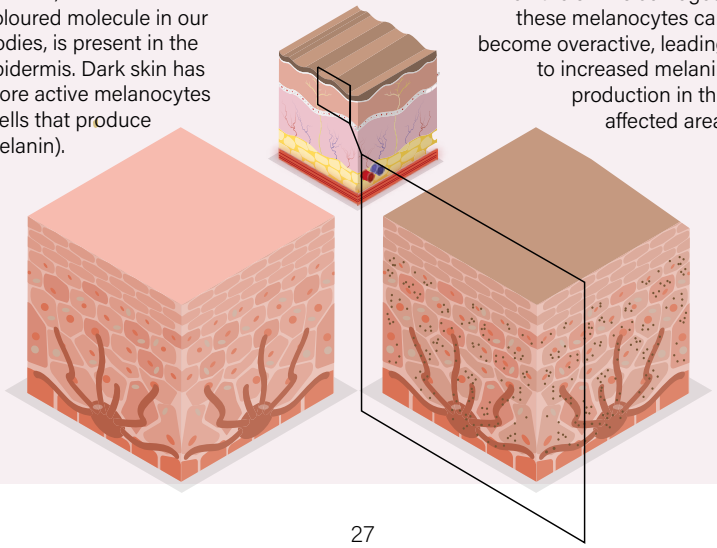
2. Dermis
Supplies blood • Connects with the nervous system • Grows hair • Makes skin elastic

3. Hypodermis
Contributes to the regulation of body temperature • Cushions and connects with other tissues

Illustration:
Our skin's pigmentation

Melanin, the most common coloured molecule in our bodies, is present in the epidermis. Dark skin has more active melanocytes (cells that produce melanin).

When the skin is damaged, these melanocytes can become overactive, leading to increased melanin production in the affected area.



Key concepts

Keloid scarring can occur in all races but occurs more commonly (up to 15 times more[1]) in those of dark skin tone. This condition, characterized by an exaggerated response to trauma, arises from a disrupted healing process in which the normal regulation of key components such as fibroblasts, collagen, and cytokines is impaired. The precise mechanism behind this disruption remains unknown. Although there appears to be a familial pattern of inheritance, the specific genetic factors involved are still unclear.

Vitamin D is a fat-soluble vitamin involved in musculo-skeletal health, bone health, immune protection and is postulated to be involved to a greater or lesser extent in many other conditions and disorders from dementia to diabetes. The skin's role here, is its involvment in the synthesis, production and storage of vitamin D. Although we can obtain vitamin D from food e.g. oily fish, dairy products and fortified foods, the major source of Vitamin D is that manufactured in our skin from the ultraviolet (UV) light rays found in sunlight. In different climates, exposure to the necessary wavelengths of UV light rays may not be possible at certain times of the year (for example September to April in the UK.)

Melanin present in the skin of people with dark skin tone, may result in inadequate amounts of vitamin D being produced in the skin leading to deficiencies, this can be mitigated by supplements either taken in response to the climacteric conditions or as a result of specific blood tests.

1. Brissett, 2001

Key concepts

Melanoma is a type of skin cancer occurring in the cells called the melanocytes. In a malignant melanoma, the lesion of the skin is usually pigmented but is not always brown or black in colour, it may be hypopigmented or red.

Changes in an area of the skin in terms of colour, itching, bleeding, increase in size are concerning symptoms and signs that need urgent expert assessment.

The aim is to recognise, assess and plan treatment as early as possible to avoid late diagnosis with the risk of metastases and poorer outcomes.

Malignant melanoma can occur in people with dark skins, it is therefore a myth that people with dark skin cannot get skin cancer.

Clinicians should consider the possibility of malignant melanoma when examining people with dark skin tones.

"It is a myth that people with dark skin cannot get skin cancer"

▲ (Above) Benign skin growth or single large mole on a foot.

▲ (Above) Acral lentiginous melanoma, a rare subtype of melanoma, on the sole of a foot.

▼ (Below) Initially misdiagnosed as a plantar wart, this malignant melanoma was not suspected due to darker skin. This lead to delayed biopsy and treatment, resulting in metastasis and poor outcomes. (Based on photo courtesy of L. Lovell)

Clinical assessment

Learning to look beyond

the standard signs of complications, such as redness and pain is essential.

In addition, conducting a thorough assessment is also learning to look beyond the visible and conventional signs of infection or ischemia.

It begins by taking a person's history with attention and open-mindedness. .

When diagnosing diabetes-related foot complications, the story begins with what the person in front of us has noticed and shares about their own bodies.

This is especially important for individuals with dark skin, where the subtleties of signs and symptoms can easily go unnoticed. As such the clinician undertaking the history needs to be aware of the subtleties and how to prompt the person in front of them appropriately.

Direct inquiries about skin colour changes can provide valuable insights. When combined with traditional questions about pain, these queries enable richer exchanges with people living with diabetes. Personal observations are not only significant to the individual but also offer crucial information for the clinician's assessment.

The same standard of scrutiny applies to examination. In individuals

with dark skin tones who have diabetes-related foot complications, the telltale redness signaling infection may not be visibly apparent. Moreover, the pain associated with impaired blood flow could be masked by the nerve damage resulting from diabetes.

Some of the concepts covered in this chapter will apply to all, regardless of skin tone, whilst others will be particularly relevant to people of dark skin tone.

THE EXPERT SAYS

We are not cultural experts, but we must become experts at finding out culturally-relevant information."

Joan St John
GPwER Diabetes,
Diabetes UK Clinical Champion

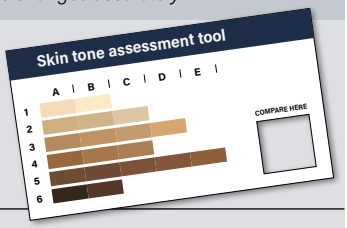
At a glance

To treat diabetes-related foot complications, follow guidelines closely, look for subtle changes in dark skin, and avoid cultural assumptions to provide respectful, comprehensive care.

	GENERAL	DARK SKIN TONES
HISTORY	• *Symptoms may develop slowly and subtly, making them easy to overlook.* • *A history of foot issues, like ulcers and amputations, signals a high risk of further complications.* • *Ask for current diabetes-related health status* • *Investigate medications that could be masking foot pain.* • *Remember lifestyle factors, including footwear, line of work, cosmetic practices (eg. pedicures), smoking and and daily activities.*	• *Same as general considerations.* *Remember that skin tone does not always equate to ethnicity (culture).* • *Where relevant, discuss culturally specific practices that might affect foot health, such as traditional and religious activities necessitating regular feet washing or walking barefooted, use of traditional remedies, footwear habits/ preferences etc.*

CONTINUED

At a glance

	GENERAL	DARK SKIN TONES
EXAMINATION	• *Use adequate lighting,* • *Fully expose and inspect both feet (if available) for comparison, revealing as much of the leg as possible to detect colour changes better.* • *Assess for changes in shape, temperature, texture, colour etc.* • *Check and compare foot pulses on both feet.* • *Assess for changes in sensation in both feet and legs, noting that people with diabetes may have neuropathy that will mask pain.*	• *Increase vigilance for subtle variations in skin colour that may indicate infection or ischemia (e.g. hyper-pigmentation can be a sign of underlying infection or poor blood supply).* • *Carefully inspect for signs of inflammation that might be less apparent: erythema or 'redness' may not be apparent.* • *Use of adequate lighting to enhance visibility of skin changes.* • *Use a skin assessment tool to record skin tone changes accurately.* 
INVESTIGATION	• *Inflammation: some inflammatory markers in blood tests and physiological indicators of infection and sepsis may not be raised in people with diabetes-related neuropathy or diabetes related autonomic neuropathy* • *Peripheral arterial disease (PAD): vascular studies (e.g., toe pressures (TBI), ankle pressures (ABPI), tissue oxygenation (TcpO2), and Doppler ultrasound).** • *Infected ulcers: microbiological swabs and tissue samples to target antibiotic therapy.* **ABPI can be falsely elevated in people with diabetes due to arterial calcification (NICE, 2018)*	• *Blood test for diabetes control (HbA1c) may be inaccurate in people with anaemia, sickle cell disorder or thalassaemia* • *Ankle pressure can be falsely high or falsely normal in people with concurrent hypertension during measurement, a condition more prevalent among people of Black, African and Ethnic minority background.*

Individual history

History-taking is a critical first step in the diagnostic process, and should never be overlooked. Proceed systematically, without making assumptions and listen to what is said - and not said.

History is usually reliant on the symptoms and signs that a person may interpret or report as a problem. Unfortunately, the symptoms and signs of diabetes related foot complications can be subtle and masked, and more so in people with dark skin. As such the clinician undertaking the history needs to be aware of the subtleties and how to prompt someone appropriately.

Exploring a person's story can help uncover critical details about their diabetes, past medical history, self-care habits, and enhance the clinical interaction.

This is not just about asking the right questions; it's about listening for the answers that matter. With practical advice, empathy, and a touch of detective work, informed healthcare professionals can build a clearer picture of a person's health, paving the way for effective clinical care and prevention of diabetes-related foot issues.

THE EXPERT SAYS

A thorough, person-specific history is essential for the diagnostic process, which should be followed by detailed examinations and targeted investi-gations to confirm the condition accurately."

Joan St John
GPwER Diabetes,
Diabetes UK Clinical Champion

The following elements are of particular importance for people with dark skin tones in the context of diabetes foot care:

Cultural humility. Understand the diverse cultural backgrounds and experiences that people with dark skin tones may have. This includes being aware of historical and ongoing experiences of racism, discrimination, and mistrust of healthcare systems, which may affect how someone perceives and interacts with healthcare providers.

Family history. Given the higher prevalence of certain genetic conditions, such as sickle cell disorder in individuals of African and Caribbean descent, a thorough family medical history is vital. It's also important for assessing risk factors for common long-term conditions.

Mental health: Be attentive to mental health, considering the potential impact of racial trauma, discrimination, and acculturative stress on mental wellbeing.

Social determinants of health: Inquire about social determinants of health that may affect a person's wellbeing, including socioeconomic status, education, neighbourhood and physical environment, employment, and social support networks. Understanding these factors can provide crucial context for improving health.

Communication styles: Be aware that communication styles may vary widely, including preferences for direct versus indirect communication, norms around discussing personal or family matters, and expectations of formality or informality. Active listening and asking open-ended questions can help bridge communication gaps.

A careful history will lead to the correct diagnosis 80% of the time*

* A famously referenced study showed that in 66 patients out of a sample of 80, the medical history provided enough information to make an initial diagnosis of a specific disease entity which agreed with the one finally accepted (Hampton, 1975). These results were corroborated by subsequent studies (Peterson, 1992)

10 things to do when taking history

Luxmi Dhoonmoon
Nurse Consultant, Tissue Viability, London North West University Healthcare NHS Trust

1. **Encourage sharing of concerns and beliefs.** Create a safe space for people to express their beliefs, fears, and concerns about diabetes and foot care.
2. **Start with open-ended questions.** Begin the consultation with open-ended questions to encourage the person to share their concerns and symptoms freely. It is important to listen to the person's perspective and their views and feelings on their own wound and experiences.
3. **Use direct questions to get specific information.** For example, 'are any parts of your skin sore?' or 'have you noticed any changes to your skin?' can help to obtain information that might otherwise be missed.
4. **Avoid assumptions.** Make sure to double check and clarify information with the person.
5. **Don't forget their diabetes health status.** Take into account any recent test results, medication adherence, blood glucose monitoring, and any previous complications or diabetes-related interventions.
6. **Explore foot care practices.** Ask about the person's routine foot care practices, including daily foot inspections, moisturizing, and nail care, to gauge their awareness and habits related to foot health.

THE EXPERT SAYS

Inquire about the specific products used. Certain moisturising creams may contain skin-lightening agents that could alter the skin's appearance."

7. **Inquire about previous foot health.** Delve into any history of foot issues such as ulcers, infections, or surgeries, which can provide insight into potential risk factors for future complications. Discuss any pain, numbness, tingling, or changes in sensation in the feet, which are crucial for diagnosing neuropathy and other diabetes-related foot issues.

8. **Assess lifestyle and occupational factors.** Understand the person's lifestyle, occupation, and daily activities that may impact foot health, such as prolonged standing or wearing inappropriate footwear.

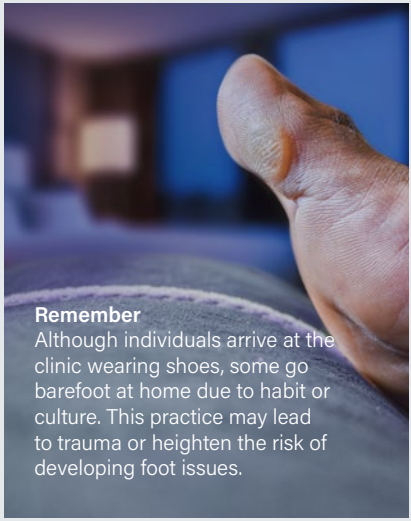
9. **Understand family and social support.** Gauge the level of family and social support available to the person for managing diabetes and foot care, as this can significantly influence their ability to follow through with treatment plans.

10. **Acknowledge cultural practices.** Recognize and respect cultural practices and beliefs related to health and diabetes, showing openness and sensitivity towards traditional remedies or dietary preferences.

The bottom line

Skin tone and ethnicity are distinct. Practically, this means that two people of similar dark skin complexion do not necessarily share the same nation of origin, traditions, language, or culture.

Similarly, two people living with diabetes will not share the same experience with the condition. The only way to take a complete history is to ask questions.



Remember
Although individuals arrive at the clinic wearing shoes, some go barefoot at home due to habit or culture. This practice may lead to trauma or heighten the risk of developing foot issues.

Key concept

Relying on pain as a symptom during history taking for people with diabetes related foot complications can be hazardous, as one of the hallmark complications of diabetes is peripheral neuropathy, thus an altered perception of pain.

Learn to compensate for the un-reliability of pain as an indicator by:

- **Enquiring about other sensations that may indicate complications**, such as tingling, numbness, or a feeling of 'walking on foam,' which can signify peripheral neuropathy or nerve damage. Changes in walking patterns, balance, or the inability to perform daily activities can indirectly indicate foot complications.
- **Ensuring that there is a thorough visual inspection of the legs and feet** for any unnoticed injuries or changes

Neuropathy can also cause pain, often an altered hyper-sensation. This neuropathic pain can be mistaken for ischaemic pain and vice versa. An individual may not perceive ischaemic pain due to neuropathy and might misinterpret ischaemic as neuropathic pain.

When sensations are present, enquiring whether there is anything that relieves the pain can be useful.

- If the person describes hanging the feet over the side of the bed to relieve pain, this might be more suggestive of ischaemic pain.
- If pain is relieved by getting out of bed and walking around, this might be more suggestive of neuropathic pain.

Listen to...

Scan the QR code below or click on the link to listen to Dr. Chris Manu from King's College Hospital in London explain how the absence of pain as a warning signal can allow foot ulcers to worsen undetected.

Click here

"They will walk a mile because the foot does not hurt."

Examination

There is no substitute for experience when identifying complications across different skin tones. But there are tools that can help. Clinicians should adopt a cautious approach as warning signs may not present in the same way on all skin tones.

Checking a person's feet during a consultation is crucial and should be done rigorously. Examination goes hand-in-hand with thorough history taking. For people with diabetes, timely foot examimation detecting nerve damage, poor circulation or signs of infection may help to prevent complications that could result in amputation.

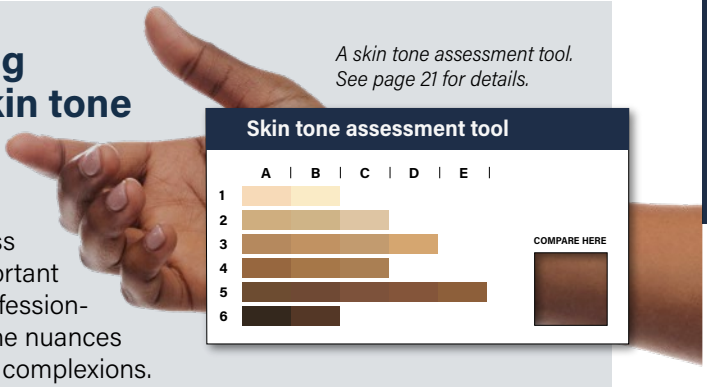
Establishing baseline skin tone

In environments where diversity in skin tones is less common, it's important for healthcare professionals to recognize the nuances between different complexions.

Increasingly, clinicians are using simple colour bar tools, like the one depicted here, to monitor shifts in skin colour.

Experience shows that this method surpasses the less reliable approach of having a person describe their skin tone, which can be influenced by subjective perceptions and societal biases towards lighter skin. This approach not only enhances accuracy but also navigates the delicate terrain of colourism with sensitivity (Everett et al, 2012).

How to use the tool? For an accurate baseline, select a shade that mirrors the person's inner upper arm.



A skin tone assessment tool. *See page 21 for details.*

What do the guidelines say?

Although the NICE guidelines on Lyme disease acknowledge the challenges of identifying erythema migrans in people with dark skin tones, few guidelines are updated to take into account assessment of dark skin tones.

In fact, current guidelines may overlook the nuances of assessing dark complexions.

Guidelines often point to 'redness' around a wound as a critical marker for assessing the severity of an infection. This approach mirrors the criteria set by the IWGDF/IDSA*, which determine the level of infection by measuring the spread of erythema from the wound's edge.

Yet, this redness—a sign often clear in lighter skin—may present as dark pigmentation or not be visible at all in those with dark skin tones. Similarly, signals like skin pallor or a 'sunset' discolouration indicating ischemia can elude detection in dark-skinned individuals.

Listen to...

Dr. Chris Manu from King's College Hospital talk about redness.

Click here

This underscores the need for revised and inclusive assessment methods.

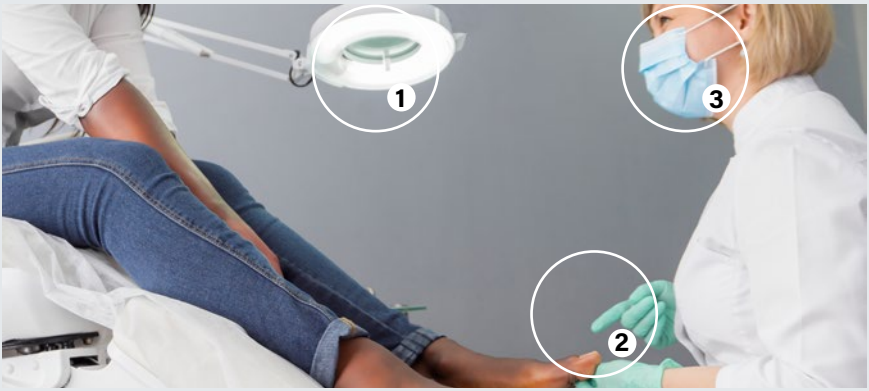
Readers who wish to explore this topic further may find it useful to consult the best practice statement issued by Wounds UK (Dhoonmoon et al 2021), on skin tone bias in wound care.

REMEMBER

Current guidelines may overlook the nuances of assessing dark skin tones."

*International Working Group on the Diabetic Foot (IWGDF) and Infectious Diseases Society of America (IDSA)

Getting started



1. Use good lighting to see the skin. In the examination area, place the person in a position where natural light will fall directly onto their skin. If this isn't possible, use a bright, focused light source (e.g. a pen light or a mobile phone's torch) to see the skin. Avoid using fluorescent light as they can cast a blue tone on dark skin tones (Black and Simende, 2020).

2. Examine the skin. Ask the person to remove shoes and socks from the lower limbs. Observe the foot for general signs and symptoms– e.g. swelling, change in colour, warmth and changes in skin texture.

3. Document findings. With consent, take photographs for recording and monitoring, rather than for diagnostic purposes. It may be helpful to spot any evolution of the skin tone (Dhoonmoon et al, 2021).

THE EXPERT SAYS

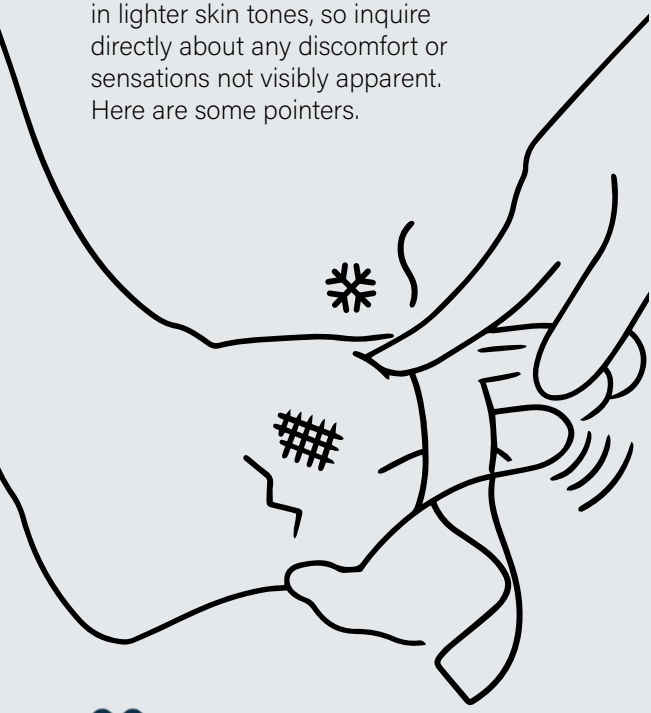
Make full use of the senses: use your sight, touch, hearing, and even smell to check for warning signs."

Chris Manu
Consultant Diabetologist
Co-lead for Diabetes Foot Service, King's College Hospital NHS Foundation Trust

Adapted from Dhoonmoon, 2023

Asking questions

What should you be asking yourself and the person in front of you during an examination? For dark skin tones, early infection indicators can be less pronounced than in lighter skin tones, so inquire directly about any discomfort or sensations not visibly apparent. Here are some pointers.



Are there any differences in colour?

How is the overall condition/integrity of the skin?

Have you moved the dressing? If so, why?

Does the skin feel warm or cold? Are there any changes in temperature?

How does the wound and periwound skin compare to the adjacent skin?

Do you have any pain, itchiness or change in sensation?

Does the skin feel spongy or firm?

Does the skin look or feel shiny or tight?

Are there any changes in the texture of the skin and the tissue beneath it?

Is there any swelling or inflammation?

"No redness, but the foot was warm to the touch"

Zulfiqarali Abbas
MD, Endocrinologist
President,
D-Foot International

CASE STUDY*

For this 47-year-old male, the primary indication of a diabetes-related foot infection was swelling and warmth, rather than redness.

The infection was identified early in this person previously unaware of his diabetes.

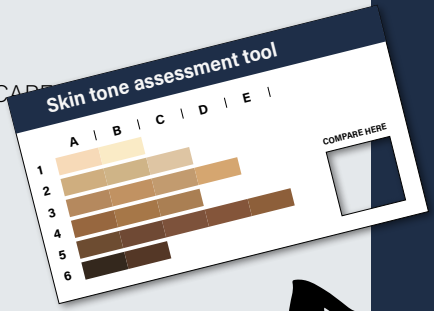
The person sought medical advice as he was concerned about the discolouration on his toe.

A physical examination showed toe swelling, with the left foot notably warm, signaling an infection.

**Case studies are based on real life. In an effort to maintain the confidentiality of individuals, names and specific aspects of the account have been changed. Photographs are shared with the person's consent.*

▲ (Above) Mirroring once again proved useful during the examination. On the left foot, there is no visible redness (erythema), but it is swollen and warm to the touch. The right foot, in contrast, shows some muscle wasting (diabetes-related muscle atrophy) and does not display swelling, redness, or warmth (Photograph courtesy of Z.G. Abbas)

Don't miss



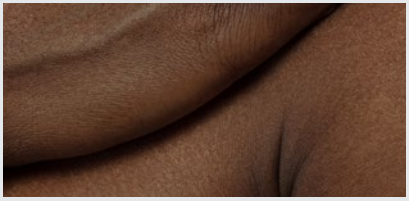
Warmth and swelling
Changes in colour and pigmentation in people with dark skin tones may be difficult to spot; therefore, diagnosing infection or ischemia in these individuals can be challenging (Dhoonmoon et al, 2021).

The 'redness' seen on light skin may not be visible in dark skin and thus may be missed in the initial assessment. It is very easy to miss erythema in dark skin since it can be difficult to predict exactly what colour erythema will look like in varying skin tones.

Therefore, clinicians should use other cardinal signs — e.g. warmth and swelling (Wang et al, 2020) — and ask people about symptoms that may not be visible (e.g. pain, changes in sensation, and/or feeling unwell).

Baseline skin tone
Determine the baseline skin tone of the person as part of the initial skin examination, so that any changes to the person's skin can be monitored regularly and identified early (Dhoonmoon et al, 2021).

Use a validated classification tool, (such as the skin tone tool) to determine and describe an individual's skin tone. Skin tone usually differs across different areas of the body; therefore, a person's tone needs to be selected that most closely matches their upper inside arm (Dhoonmoon 2023). Clinicians also need to bear in mind that age-related pigmentation may be misdiagnosed in dark skin tones — it is not uncommon for dark skin to present with age-related dark patches on the soles of the feet (see physiology, p.24)



Key concept

Mirroring

The concept of mirroring in footcare consultations involves examining both of a person's feet (if possible) during the assessment, and comparing the healthy foot with the one experiencing complications.

This approach can make it easier to see subtle differences (such as foot structure, skin condition, and vascular and neurological health) that might not be as apparent when focusing on the symptomatic foot alone.

This comparison may help to distinguishing between normal variations and pathological changes, and can serve as a real-time reference point, enabling clinicians to provide more accurate, personalized care by understanding the full scope of a person's foot health.

Remember:

- **Ensure that shoes and socks are removed from both limbs.**
- **Make sure that you have good lighting so that you can see both lower limbs.**
- **Ask the person if any deformities or differences between the two lower limbs are new or longstanding.**

"Observing your feet from above is never enough."

Chris Manu
Consultant DIabetologist
Co-lead for Diabetes Foot Services
King's College Hospital
NHS Foundation Trust

CASE STUDY*

No pain, no redness. For 45-year-old Josephine, a female with multiple minor amputations, signals of a hidden heel injury could have been missed.

The person's history of amputations suggested she may have peripheral sensory neuropathy. This condition can result in a loss of protective sensation, altering how she perceives pain.

This is why a thorough examination, to check all areas of the feet, around the sides, underneath, between the toes and at the back of the heels, was essential.

A simple glance at the top of the foot would have easily missed an ulcer forming on the heel.

An examination with both feet fully visible and well-lit, revealed a significant ulcer on the heel, requiring immediate attention and appropriate referral.

▲ (Above) A view of the dorsum (top) of the feet. When the trousers are lifted, the subtle discolouration around the ankle area becomes visible, especially when comparing it to the left foot (mirroring). This is the sign of an underlying infection under the foot, which was revealed by the full examination (left).

**Case studies are based on real life. In an effort to maintain the confidentiality of individuals, names and specific aspects of the account have been changed. Photographs are shared with the person's consent.*

Investigation

Investigations offer a deeper insight into a person's condition beyond the physical examination and history-taking. It is important to keep in mind the limitations of some investigative methods when working with people with dark skin tones.

Diagnostic tests, which may include blood tests, imaging, and vascular studies, are crucial for confirming the presence and extent of complications such as infections, peripheral neuropathy, and ischemia.

However, investigations for both infection and ischaemia in the feet of people with diabetes need to be interpreted with caution.

People with diabetes may have a different "normal" range compared to the general population. The typical signals of infection, such as white blood cell counts and C-reactive protein levels, may be affected by the presence of neuropathy.

Similarly, expected physical responses to infection—increases in body temperature, heart rate, or shifts in blood pressure—may be slower to manifest or reduced in their intensity.

THE EXPERT SAYS

The results of any investigation needs to be interpreted carefully in conjunction with the findings from the history and examination"

Zulfiqarali Abbas
President
D-Foot International

How helpful are these investigative methods?

Chris Manu
Consultant Diabetologist,
Co-lead for Diabetes Foot
Service, King's College
Hospital, NHS Foundation Trust

	NAME	USE TO DETECT	BE AWARE THAT
BLOOD TESTS	*Glycated Hemoglobin (HbA1c)*	*Diabetes*	*People with haemoglobinopathies may have inaccurate readings*
	C-reactive protein (CRP)	*Inflamation and infections*	*n/a*
	Erythrocyte sedimentation rate (ESR)	*Inflamation and infections*	*n/a*
	Complete blood count	*Infections and anemia*	*n/a*
IMAGING STUDIES	*X-ray*	*Changes in the bones, osteomyelitis (bone infection), foreign objects*	*Interpret with caution. Results may not reflect early changes.*
	Magnetic resonance imaging (MRI)	*Osteomyelitis and soft tissue infections*	*Imaging is subject to a range of cognitive biases (mistaken mental shortcuts).*
	Ultrasound	*Soft tissue lesions*	
	Doppler ultrasound	*Blockages or narrowing of arteries*	
OTHER SPECIALISED TESTS	*Neurological examination tools (for ex. monofilament testing)*	*Sensory loss in the feet*	*Interpretation bias*
	Vascular assessment (for ex. ankle-brachial index ABI)	*Pressure differences between the arms and legs*	*Arterial stiffness may vary among certain groups and affect ABI values*
	Skin and wound cultures	*Infecting organisms and guide antibiotic therapy*	*Some conditions or infections are more prevalent among certain groups*
	Tissue biopsy	*Type of infection*	*n/a*

Visual guide

When should I escalate?

Understanding when to seek a second opinion or pursue further tests is a crucial aspect of care. Much of this knowledge comes with experience.

As the saying goes: practice makes perfect. This visual guide offers a way for the reader to familiarise themselves with some of the most common diabetes-related foot complications and how they are expressed in people with dark skin.

These complications are generally caused by two conditions: neuropathy and peripheral arterial disease (sometimes referred to as PAD).

Neuropathy involves nerve damage, and peripheral arterial disease impairs blood circulation.

In the UK, neuropathy affects between 23% and 42% of people living with diabetes. The rates of prevalence of peripheral arterial disease among this group are also

THE EXPERT SAYS

Consider the full clinical picture and subsequent investigations for peripheral arterial disease, not just skin tone, to avoid delayed diagnosis."

Laura Lovell
MD, GPwSI Diabetes
Barbados Diabetes Foundation

high, as they range between 9% to 23%.

Both conditions can result in severe outcomes, such as foot ulcers, infections, sepsis, and even amputation or death. The stakes are high: in England, the five-year survival rate after a diabetes-related foot ulcer is alarmingly low at just 50%.

For those undergoing an amputation, the outlook is even grimmer, with a mortality rate of about 70%.

Crucially, these complications are not physiologically influenced by skin tone, as the underlying nerve and blood vessel structures remain consistent across individuals.

However, the way these problems manifest can vary, necessitating increased vigilance for certain signs, which we've noted with an asterisk. Early recognition of these symptoms is vital to prevent life-altering and potentially fatal consequences.

In this section

To assist the reader and add structure to this chapter, we've incorporated various visual aids. Here is a description of what they mean and what to expect.

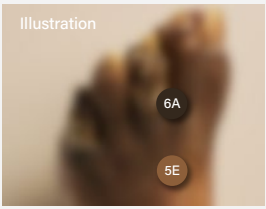
Image. *To bring the cases discussed in this chapter to life, we've included an anonymized picture or a digital illustration based on real-life examples. Whenever possible, we use the Skin Tone Tool to identify skin tone variations or discolourations, just as a clinician would during an examination.*

Description. *A short description will always accompany the image. To help place the image in context, and when relevant, we will show how a similar wound or condition presents on lighter skin tone.*

Clinician dashboard. *Clinicians invariably engage in deliberate or instinctive prioritization of their patients. This visual dashboard offers an expert's guidance on the risk level for people with similar injuries or conditions, along with recommended next steps.*

Risk level *ranks from 1 (moderate) to 3 (urgent). We intentionally do not use a "low" ranking because all ulcers, even those healing, can worsen. This approach helps prevent complacency among professionals.*

Skin Tone Tool. *Each side tab on the page features the 16 colour tones of the Skin Tone Tool (Ho & Robinson, 2015). See p. 26 for explanation.*



Title
A description of the wound or condition, which may draw attention to specific details of the case or relevant identifiable traits.

Risk level	High
Next visit	1 day
Refer to	Podiatrist

Reminder: 5 tips to get an assessment right

1. Establish a baseline tone

Make skin tone comparison more accurate by using the Skin Tone Tool (p.26). Determine a baseline skin tone by using the inner arm or an area higher up on the leg.

Do not rely on photography to establish an accurate baseline skin tone.

2. Look for colour changes rather than redness

Inspect the skin for variations in tone, noting that discolouration may manifest as either a localized, darker shape or a diffuse area, potentially spanning the dorsum. This may complicate detection. Read about discolouration p. 55.

3. Use your senses to build a more complete picture

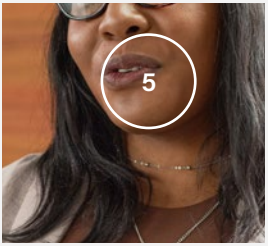
Touch, sight and smell can help detect infections. See p. 42 for types of changes to watch for.

4. Assess for warmth

Localized warmth can be a sign of infection or inflammation. If necessary, use an infrared thermometer.

5. Ask questions to the person

Enquire about the person's skin and hear their point of view. Use some of the questions listed p. 42



Neuropathy

Diabetes-related neuropathy manifests in many ways, from painful sensations to sensory loss. Impaired sensation can allow foot injuries to go unnoticed and become infected.

Neuropathy, a complication of diabetes affecting the nerves, can manifest in diverse ways. For some, it brings excruciating pain where even gentle touches feel like burning sensations or piercing needles. For others, it robs them of the ability to sense heat, cold, or touch, leaving them vulnerable to unnoticed injuries.

This condition can affect different types of nerves. Sensory nerves transmit information about touch, temperature, and pain, while motor nerves control muscle movement.

When motor nerves are impaired, it can affect the small muscles in the feet, altering the shape and pressure points, which can result in the formation of calluses and an increased risk of foot wounds.

Autonomic nerves, which control sweating and moisture balance, are crucial for maintaining healthy skin. When these nerves are compromised, the feet can experience either excessive dryness leading to cracked skin, or increased moisture accumulation, both of which can put the feet at risk, especially when combined with friction and pressure from shoes. This sets the stage for potential infections, making attentive foot care essential.

The impact of diabetes-related neuropathy on physical and emotional well-being is far-reaching, demanding vigilant foot care and a holistic approach to health.

Illustration: anatomy of the foot (showing nerves in yellow, arteries in red and veins in blue).

Neuropathy

In other words

TYPE OF NERVE	SYMPTOMS	VISIBLE SIGNS
Sensory	*None (numbness, anesthesia)* *Pain* *Burning* *Pins and needles (paraesthesia)* *Lack of temperature recognition (hot or cold)*	*None* *Rely on the person's experience (examination)*
Motor	*Callus* *Issues with ill-fitting shoes*	*Muscle wasting,* *Retraction of toes,* *Highly arched foot (contracture),* *Prominent or tight ligaments especially on top of foot*
Autonomic	*Alteration in sweating of the feet* *Cracked skin (fissures) especially around the edges of the foot and/or heel*	*Dry skin on the feet* *Cracked heels*

THE EXPERT SAYS

Delaying help leads to poor outcomes, including amputation. It's important to identify neuropathy as a risk factor since it can cause problems without pain."

Debbie Sharman
Consultant Podiatrist
Diabetes, Dorset HealthCare
University NHS Foundation

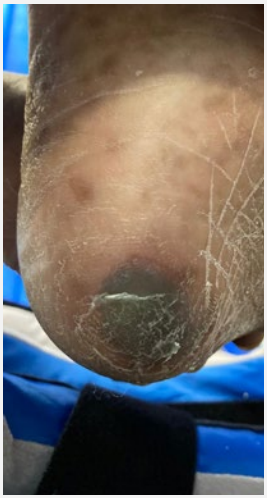
Discolouration: what could it be?

A change in colour can be an indicator that something is amiss. Whether noticed by the clinician or the person living with diabetes, discoloration may present as recent hyperpigmentation, hypopigmentation, or other colour changes, sometimes with no accompanying symptoms. Recognising these changes and understanding their potential causes is key to a good diagnosis. We have chosen to present some examples, with insights from specialists who have come across similar cases.

THE EXPERT SAYS

In darker skin tones, look out for hyperpigmentation as it can be a sign of underlying infection or poor blood supply

Chris Manu
Consultant Diabetologist
Co-lead for Diabetes Foot Service
King's College Hospital NHS Foundation Trust



Deep tissue injury on a person with a dark skin tone.

Deep tissue injury

Why it is important

Deep tissue injuries form in the underlying tissues and often remain undetected until they have progressed to a stage where treating them becomes significantly more challenging. Despite receiving the best possible care, deep tissue injuries are known to deteriorate rapidly.

Risk level	● ● ○ High
Next visit	<1 week
Refer to	Podiatrist

*or diabetes foot clinic

The expert says

"The image on the left is a late-stage deep tissue injury that should have been picked up earlier. It is comparable in severity to the one below, reflecting a so-called textbook deep tissue injury presentation, which often applies to lighter skin tones."

Based on photograph courtesy of L. Dhoonmoon

Haemosiderin

Why it is important

Hemosiderin staining occurs when the smallest blood vessels, known as capillaries, begin to leak. It can be associated with wounds, or certain illnesses that affect circulation. The most common of these is chronic venous insufficiency.

Risk	● ● ○ High
Next visit	< 1 week
Refer to	Podiatrist

*or diabetes foot clinic

The expert says

"Haemosiderin will be much more subtle on darker skin tone, and could be confused with natural ageing stains. Compare with the image below and notice how redness and ecchymosis-type colouring is absent on darker skin tones."

Based on photograph courtesy of L. Lovell

Burn injury

Why it is important

Burn wounds can become infected if bacteria get into them. With a burn injury, the pigment from the skin is lost. While pigment may return during the healing process, this outcome is unpredictable.

Risk	● ● ○ High
Next visit	< 1 week
Refer to	Burn unit

The expert says

"The person on the left scalded their foot with hot water. Due to their neuropathy, the injury was only noted a few days later when discoloration became apparent. Below is an example of burn scarring on both feet."

Sunburn or haemosiderin?

Risk level	● ● ○ High
Next visit	< 1 week
Refer to	Podiatrist

The expert says

"Haemosiderin deposition in venous disease may resemble normal sun-exposed pigmentation but should be assessed within the full clinical context."

Necrosis on an individual with a dark skin tone.

Necrosis

Why it is important

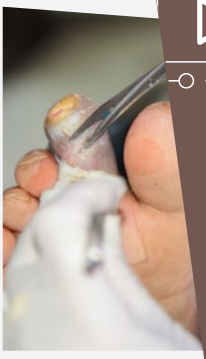
Necrosis, a sign of tissue death, requires urgent attention. If untreated, it can lead to an accumulation of decaying dead tissue and cellular waste in or around the affected area. When necrosis occurs due to a lack of blood supply and affect extremities (fingers, toes), it is often referred to as gangrene. Consequently, surgical removal of necrotic tissue, termed debridement, is frequently required to address this issue effectively.

The expert says

"Do not expect a textbook shade of black to indicate necrosis. The hallux (big toe) on the left image is at an advanced stage of necrosis in a person with a dark skin tone. Compare this with the more obvious discolouration in the image below, made more prominent by the fact that the person has a lighter skin tone.

The history of the injury will help come to the right diagnosis."

Risk	● ● ● Urgent
Next visit	<1 day
Refer to	ER



Wound debridement following diabetes-related foot complications.

Watch...

Scan the QR code below or click on the link to watch Dr. Chris Manu explain how a necrotic toe, initially white, was left untreated in a person with a dark skin tone and ultimately amputated.

"The toe of the patient was devitalised and looking white"

Click here

"Discolouration was widespread but necrosis was localised"

Zulfiqarali Abbas
MD, Endocrinologist
President, D-Foot International

CASE STUDY*

"When I asked this 47-year-old person to show his left foot for a mirroring exercise, the discoloration on the right foot became even more apparent.

Upon further examination, it became apparent this was a case of ischemic necrosis affecting his right fourth toe, where gangrene had already set in.

There was no obvious sign of redness (erythema) that one might typically expect.

Instead, the right foot displayed hyperpigmentation compared to the left, which could have easily allowed this serious condition to go unnoticed."

▲ (Above) Hyperpigmentation and gangrene on the right fourth toe were seen in this person despite no visible signs of redness (photograph courtesy of Z. G. Abbas).

**Case studies are based on real life. In an effort to maintain the confidentiality of individuals, names and specific aspects of the account have been changed. Photographs are shared with the person's consent.*

"Astonishingly, necrosis had been missed"

Luxmi Dhoonmoon
Nurse Consultant, Tissue Viability,
London North West University
Healthcare NHS Trust

CASE STUDY*

"When Adesola, a 51-year-old female from North West London, showed me her foot, it was clear that necrosis had started to spread across the dorsum. I was puzzled as to how this condition could have been overlooked.

Proper lighting, a detailed examination of both feet without coverings, and careful inspection for any skin colour changes are essential practices that should have alerted medical professionals to the necrotic area.

Unfortunately for Adesola, this oversight led to an emergency foot amputation a few days later to prevent further spread and preserve the remaining part of the limb."

▲ (Above) A view of the feet's dorsum and ankle. Notice the change in colour between the two areas. The dark patch should have been a red flag. (photograph courtesy of L. Dhoonmoon).

**Case studies are based on real life. In an effort to maintain the confidentiality of individuals, names and specific aspects of the account have been changed. Photographs are shared with the person's consent.*

Foot ulcers

Diabetes-related foot ulcers can occur as a result of multiple interrelated factors and will affect many people living with diabetes at some point in their lives.

Peripheral neuropathy, combined with impaired blood circulation, can turn a minor injury into a serious condition. These injuries, often unnoticed and caused by ill-fitting footwear or walking barefoot, can lead to foot ulcers with devastating effects on a person's life.

Healthcare professionals can use scoring systems to assess the gravity of an ulcer (see Resources).

These objective tools evaluate an ulcer's depth, area, and progression, offering a roadmap for treatment.

The presence of an infection within an ulcer dramatically escalates the risk of amputation, a stark reminder of the urgency and precision required in treating these wounds.

Addressing foot ulcers with prompt and effective care is crucial, highlighting the importance of attentive foot and diabetes care, particularly for those with dark skin tones where signs may be less obvious.

Diabetes-related foot attack

"Time is tissue," a mantra shared with stroke and heart attack care, underscores the urgency in diabetes foot complications.

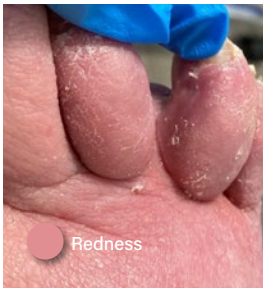
A foot ulcer can swiftly lead to infection, sepsis, and tissue death, particularly with neuropathy and peripheral arterial disease (PAD).

This necessitates treating diabetes-related foot ulcers as " foot attacks," requiring immediate action to prevent irreversible damage and protect health.

Foot ulcers

Common signs of infections like swelling and redness may not be visible in people with dark skin tones. A thorough assessment of the foot can help detect ulcers at an early stage.

Not always red and swollen



Interdigital ulcer
The redness and swelling on this person with light skin tone (2A) is obvious. This allowed the ulcer to be detected early.

What can cause them
Interdigital ulcers often result from fungal or bacterial infections, worsened by diabetes and poor circulation. Contributing factors also include trapped moisture between the toes from humidity or tight shoes, as well as skin conditions like eczema.

Risk level	● ● ○ High
Next visit	< 1 week
Refer to	Podiatrist*

*or diabetes foot clinic

Interdigital ulcer
Maceration and skin breakage has already happened on this person with a dark skin tone (3A). A subtle discolouration can be observed.

Why it's important
Catching interdigital ulcers early prevents infection spread, reduces complications like ulceration and improves healing outcomes. Early detection is key for individuals with diabetes or poor circulation to avoid severe health issues and ensure effective treatment.

Risk level	● ● ● Urgent
Next visit	< 1 day
Refer to	Podiatrist*

*or diabetes foot clinic

Interdigital ulcer
This advanced-stage ulcer may have been signaled earlier by toe discolouration (6B).

The expert says
"Looking for changes in colour -not just redness- is excellent practice It is equally important to inspect between toes systematically, to confirm suspicions of ulcers.

People with dark skin tones frequently notice ulcers late, missing early warning signs. Education for people living with diabetes and healthcare professionals is essential."

Risk level	● ● ● Urgent
Next visit	< 1 day
Refer to	Podiatrist*

*or diabetes foot clinic

Foot ulcers

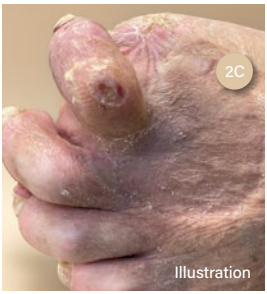
Once they expose flesh, all ulcers become more visible, regardless of skin tone. Monitoring for subtle discolouration signs can early detect diabetes-related foot attacks.

Picking up subtle signs of discolouration

Ulcer on the fourth toe
The swelling and redness around the ulcer make it more noticeable against the light skin tone (1A). The presence of slough requires urgent attention.

Risk	●●● Urgent
Next visit	< 1 day
Refer to	Podiatrist*

*or diabetes foot clinic



Ulcer on the second toe
The person noticed the ulcer early by spotting a color change in their skin. Having previously lost toes to amputation, they are at higher risk for further foot complications.

Risk	●● High
Next visit	< 1 week
Refer to	Podiatrist*

*or diabetes foot clinic

Healing ulcer on the hallux
The presence of new skin cells, known as epithelial tissue, shows that the ulcer is healing, though it is still causing discoloration around the big toe (hallux).

Risk	● Moderate
Next visit	< 1 week
Refer to	Podiatrist*

*or diabetes foot clinic

Plantar aspects

Heel ulcer on person with light skin tone

Heel ulcer on a person with dark skin tone

Note
The stratum corneum, the outermost layer of the epidermis, is thicker in the plantar region of the foot.

This thickness makes the melanin in the basal layer less visible. However, color changes can still occur, so regular monitoring is advised.

Infected foot ulcers

Infected ulcers require immediate attention from a multidisciplinary healthcare team. Early signs include swelling and warmth, but redness may not always be present.

What are the signs of infection?

Infected interdigital ulcer
No obvious redness (erythema) is seen on the left foot's dark skin. There is typical swelling of the foot and the foot is warm on touch. It's possible to see that the big toe is gangrenous and infected. Compare it with an infected ulcer on a lighter skin tone (below). Main photograph courtesy of Z. G. Abbas.

Risk	● ● ● Urgent
Next visit	< 1 day
Refer to	hospital-based diabetes foot clinic

Skin and muscle infections stemming from diabetes-related foot ulcers (DFUs) manifest symptoms such as fever, discharge, warmth, pain, and redness in the affected area. However, the visibility of redness is notably less likely in individuals with dark skin tones.

When the infection reaches the bone, it is called osteomyelitis. At this stage, the outer layer of the bone and the bone itself are damaged.

Infected wounds may exhibit signs such as impaired formation of granulation tissue, steep, rolled-up edges, necrotic tissue, and pus.

Healing ulcers

Healing diabetes-related foot ulcers require optimised diabetes levels, careful wound care, possible advanced treatments, and personalised approaches based on severity.

Skin changes colour during the healing process

Infected punched-out ulcer
A punched-out ulcer, stained by iodine, is on the sole of the right foot, surrounded by callus. Photograph courtesy of Z. G. Abbas

Risk	● ● ○ High
Next visit	< 1 day
Refer to	Podiatrist*

*or diabetes foot clinic

Healing punched-out ulcer
After debridement, the ulcer on the plantar side of the right foot is visible, with the callus removed. Photograph courtesy of Z. G. Abbas

Risk	● ○ ○ Moderate
Next visit	2 weeks
With	Same specialist

Punched-out ulcer
On lighter skin tone, the appearance of the ulcer before debridement is similar. Photograph courtesy of A. Schneider.

As skin cells grow to cover the granulation tissue, the wound starts to close. You may notice a lighter colour forming at the edges of the wound, especially in dark skin, where it can appear as a lighter ring around the wound site.

Particularly in dark skin tones, hyperpigmentation is common around healed areas.

This darker skin may gradually fade but can remain noticeable. Areas of lighter pigmentation may also appear in the healed skin, more evident in people with dark skin.

Key concepts

Erythema on dark skin tone
Redness (erythema) is somewhat noticeable on this right diabetes-affected foot. The big toe is gangrenous. The skin is warm to the touch, and the foot is swollen. Illustration based on photograph courtesy of Prof. Z. G. Abbas

Erythema
Erythema refers to a skin colour change resulting from increased blood flow.

It is vital to understand that while erythema might manifest as redness, it does not uniformly present as such across all skin tones.

In individuals with dark skin, such as those with black or brown complexions, erythema may not readily appear as redness, making it less conspicuous than in those with lighter, less pigmented skin. The colour changes associated with erythema can vary widely, from pink to red to purple, and in some cases, it may simply cause a subtle darkening of the person's natural skin tone.

Detecting erythema in dark skin tones can be challenging, but it is not insurmountable. The most reliable method involves comparing changes in skin colour between affected and unaffected areas.

For example, if one limb is affected, it should be compared with the other, unaffected limb. The exact shade of erythema cannot be predicted with certainty as it greatly depends on an individual's skin tone, which itself varies widely among people.

Key concepts

Discolouration
Mirroring and comparing skin tones over a broader area of the leg highlight the darker patches in this person with peripheral arterial disease (stable without any acute ulceration). Based on photograph courtesy of L. Lovell.

Touch
Touch can help assess a change in skin texture and detect tightness and swelling, for example.

Skin pigmentation

When evaluating a person's skin, it is essential to consider their usual skin tone. For example, what may appear to be age-related pigmentation could either be a natural occurrence or a misdiagnosis. Therefore, establishing the person's baseline skin tone is critical, and vigilant monitoring for any deviations from this baseline is necessary.

Touch and temperature

When assessing a person's skin, it's crucial to go beyond visual examination, particularly when signs may not be easily visible.

Using all senses, especially touch, is vital in the diagnostic process, especially for individuals with dark skin where visual indicators might be less apparent.

For instance, cellulitis-affected skin often feels tighter and differs in texture from unaffected areas.

Additionally, it is important to gather information about the person's subjective experiences, such as changes in sensation like pain, itching, or other discomforts, and any visible changes.

In diagnosing and assessing conditions, the temperature of the skin is a significant marker. Comparing the warmth of various body parts, like between two limbs, can provide valuable insights. For precise temperature measurement, an infrared thermometer can be useful.

Be part of the community

Help us make a difference in diabetes foot care for everyone. Your experiences and ideas are crucial to enriching our understanding and improving our practices.

What's working? What could be better?

Tell us what you found interesting in the handbook, share your insights and learn from others in the community:

- **Post your feedback and ideas on social media** using #DAfootcare and tag us on X/ twitter @diabetes_africa,
- **Email us directly at** info@diabetesafrica.org

Your voice matters. Together, we can build a better future for diabetes care.

Tools and testing

Tools are not essential

to carry out a foot assessment or examination. But it is important to know how to use tools that are available.

In this chapter, we will explore the range of tools that can be used to improve the quality and accuracy of an examination, starting from the most basic to the most advanced.

But for healthcare professionals, developing the ability to conduct examinations through the use of sight, smell, and especially touch remains essential.

In situations where medical tools are scarce or unavailable, the skilled hands of a clinician become indispensable. Employing a direct, literal hands-on approach could be the difference in saving a limb or spotting a condition early on.

Through the simple act of touch, practitioners can perform tests for neuropathy and examine foot pulses to detect signs of peripheral arterial disease.

After learning the examination techniques (see "Clinical assessment"), healthcare professionals can further improve their diagnostic accuracy by using diagnostic tools properly. Correlating data from these tools

with their physical exam findings helps minimise errors that could result from misusing the tools.

Tools, tests and equipment used for examining the feet of people living with diabetes are only as good as the person operating them.

Proper application is critical; misuse may compromise the results. It's advisable to seek guidance from a more experienced colleague when in doubt or using a tool for the first time.

THE EXPERT SAYS

Using a monofilament can add confidence to a neuropathy diagnosis.

Chris Manu
Consultant Diabetologist
Co-lead for Diabetes Foot Service
King's College Hospital NHS Foundation Trust

Daily self-inspection

While self-inspection may seem straightforward, using a tool can provide additional benefits.

Tools: A mirror for viewing the underside of the foot, along with good lighting, is essential for examination and self examination, as changes may be less apparent in people with dark skin tones.

Rationale: people with diabetes are encouraged to inspect their feet daily for any changes or signs of potential problems. This simple act can significantly reduce the risk of complications.

Illustration

Tip:

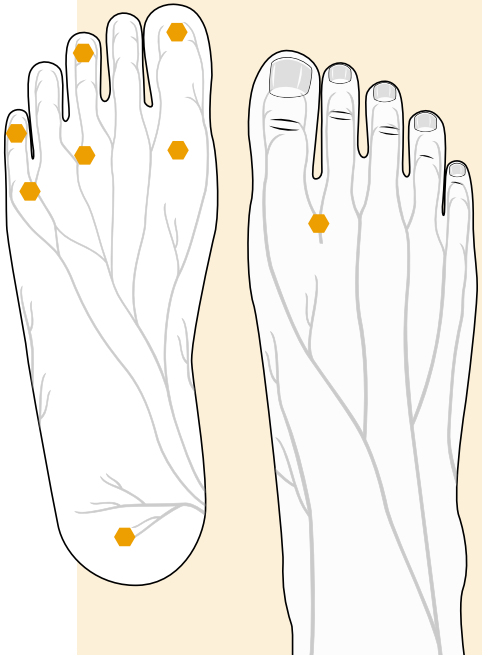
- Discuss the importance of foot inspections and how to do them. They won't replace medical examinations but might pick up a potential problem early.

Monofilament test for sensation

Tool: Nylon monofilament

Rationale: To check for loss of sensation in the feet. The inability to feel this light touch can indicate nerve damage.

Method: Touch the points demonstrated on the dorsal and flexor surface of the feet, and ask the person when they feel the filament.



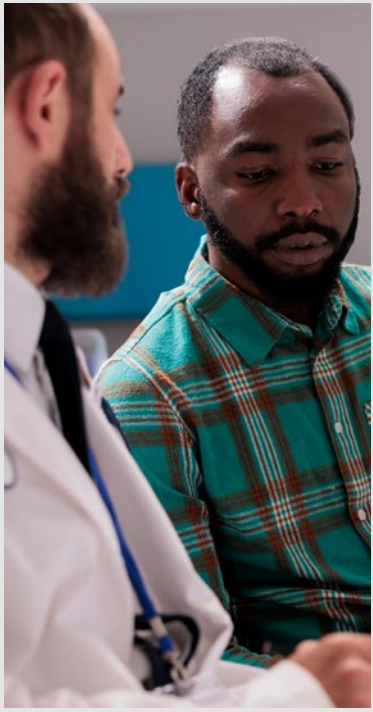
Tips:

- Ensure the monofilament is slightly bending with the pressure applied.
- Do not test over areas of callus.
- Test each site twice if not felt on the first occasion.
- Make sure your monofilament is frequently changed (manufacturers recommend around every 6 months if the monofilament is being used regularly) and always replace it if it is losing its straight shape.
- Explain the result of the test and ensure that the person understands the level of risk (low/medium/ high) risk and the implications of this and what to do if they are concerned about their feet.

Keep in mind

The person's skin tone does not alter the monofilament test, but cultural awareness is relevant:

- The monofilament resembles a needle, and certain people may find it alarming. it's important to initially put the person in front of you at ease by clarifying that it is not a sharp instrument.
- Either demonstrate what you will do on the back of your hand first, then ask permission to do the same on the back of their hand, so the person knows how it feels.
- Explain that you will be touching the sole of the feet with the monofilament and that you are asking them to let you know, each and every time they feel it on the soles of the feet. ' Could you say yes each time you feel it please'? or could you nod your head/ lift your hand when you feel it.
- Ask them to close their eyes, or if they are not comfortable with this, provide some barrier so that they are unable to view their feet and when you are using the monofilament on the feet.



Ipswich Touch Test

Tool: Finger

Rationale: the Ipswich Touch Test detects loss of protective sensation, indicating risk of foot ulcers, guiding preventive measures.

Important: this is not the gold standard test but a test that can be used when/ if the monofilament is not available

Method: The Ipswich Touch Test involves lightly touching or resting the tip of the index finger for one to two seconds on the tips of the first, third, and fifth toes of the person's foot. Thus touching a total of six points, while the person has their eyes closed and if the person is not able to feel the touch in more than two sites then the person is deemed to have neuropathy.

Touch the toes
Search for "touch the toes" and "Diabetes UK" for more information about the test. Photo credit: Diabetes UK.

Tuning fork

Tool: 128 Hz Tuning Fork

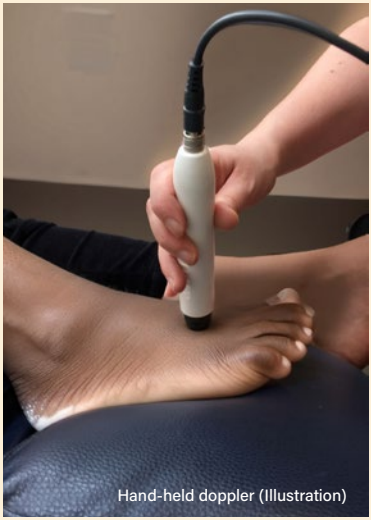
Rationale: This test assesses potential nerve damage by applying vibrations to the person's foot.

Method: The clinician observes whether the vibrations are felt, and if so, where the sensations are diminished or lost entirely.

Photo credit: 360WoundCare

Vascular studies

Feeling for foot pulses is the first step in assessing vascular health in a person with diabetes. A hand-held Doppler device helps assess arterial blood flow quality, which should be evaluated alongside the person's experiences of symptoms like claudication and rest pain. Specialist podiatrists, diabetes foot clinics, and vascular surgeons often use advanced techniques such as Duplex ultrasound scans, arterial scans and CT angiography for more advanced assessments.



Hand-held doppler (Illustration)

Tool: Ankle Brachial Index and Toe-brachial index.

Rationale: To assess blood flow and identify peripheral arterial disease.

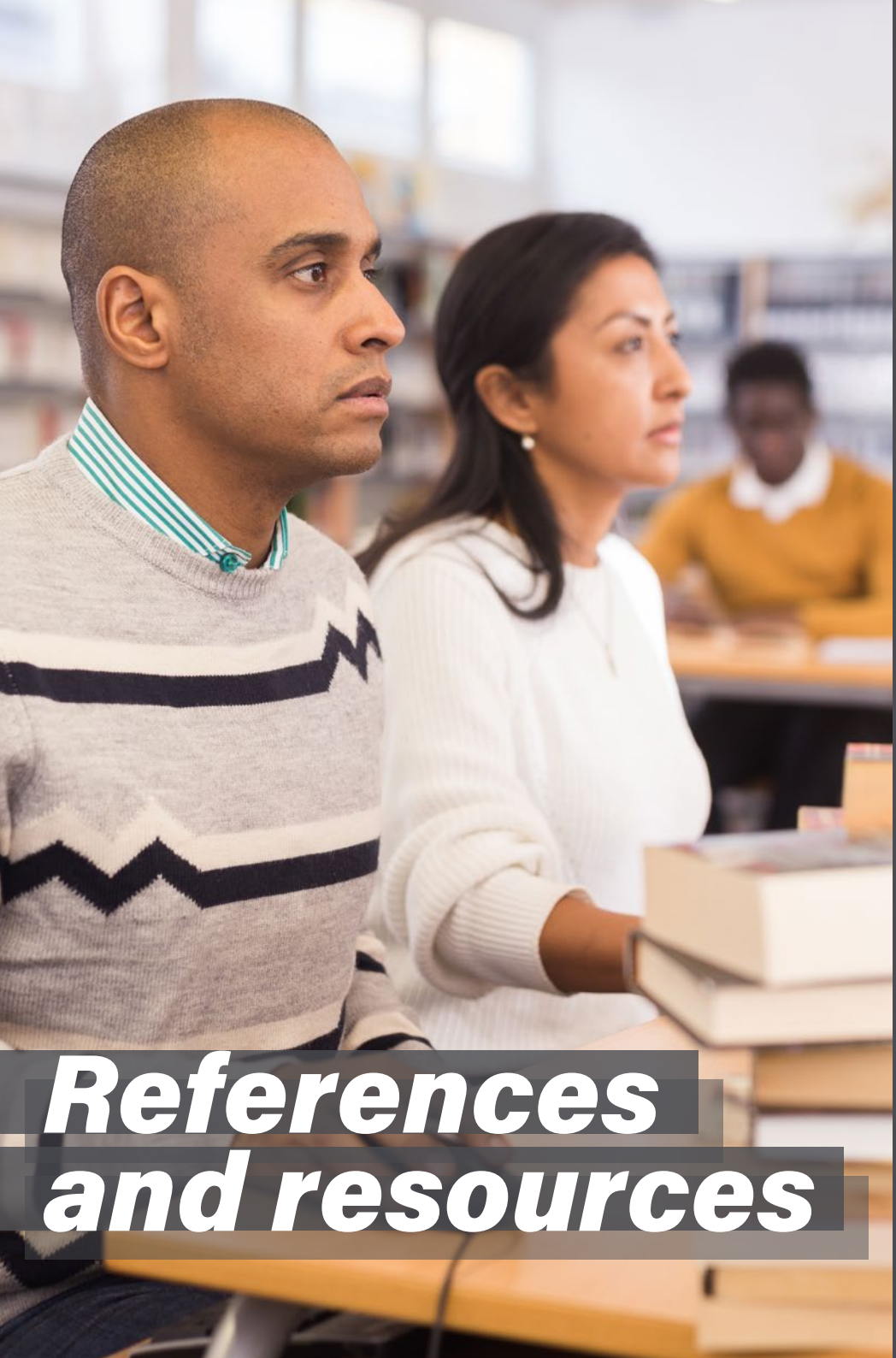
Method: Measure blood pressure in the lower limb by comparing the toe pressure to the arm pressure (Toe Brachial Index, TBI) and the ankle pressure to the arm pressure (Ankle Brachial Index, ABI) to assess blood flow and identify peripheral arterial disease.

Tool: $TcpO_2$ electrode measurement

Method: Measure oxygen levels and blood flow in the body's smallest vessels. The transcutaneous oxygen pressure is measured by applying special electrodes to the skin.

Tool: Doppler studies

Method: Dobbler ultrasounds can also be used to listen to quality of the blood flow and see the waveforms.



References and resources

How would you proceed with this assessment?

Luxmi Dhoonmoon
Nurse Consultant, Tissue Viability, London North West University Healthcare NHS Trust

Illustration

Now that you're familiar with the content of the handbook, let's put your knowledge to the test. Look at the illustration and consider the following:

Initial reaction. How would you respond if someone presented with the condition shown? What are your immediate thoughts and concerns?

Procedure. Outline the steps to assess and address the condition. What would you do in order, and why?

Information. Is there anything not visible that you need to know for a complete assessment?

Considerations for dark skin tones. What specific factors must you consider due to the person's dark skin?

Once you've completed this exercise, listen to Luxmi Dhoonmoon's insights on how she would approach this assessment (Click or scan the link on the left).

THE EXPERT TIP

Consider the person as a whole, not just the hole in the person."

Listen to...

Luxmi Dhoonmoon describe her process for assessing someone with this clinical presentation at her clinic.

Click here

REFERENCES

Abbas ZG, Bal A., (2019) Pocket Guideline of Diabetic Foot for Professionals, Jaypee Brothers Medical Publishers, 2nd edition.

Armstrong DG, Swerdlow MA, Armstrong AA, Conte MS, Padula WV, Bus SA. Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer. J Foot Ankle Res. 2020 Mar 24;13(1):16. doi: 10.1186/s13047-020-00383-2. PMID: 32209136; PMCID: PMC7092527.

Amstrong D.G, A Step Forward in Diabetic Foot Disease , Medscape, 08 August 2023.

Brissett AE, Sherris DA. Scar contractures, hypertrophic scars, and keloids. Facial Plast Surg 2001; 17:263–72.

Dhoonmoon L, Nair HKR, Abbas Z et al (2023) International Consensus Document: Wound care and skin tone signs, symptoms and terminology for all skin tones. Wounds International. Available online at www.woundsinternational.com (below)

Dhoonmoon L, Fletcher J, Atkin L et al (2021) Wounds UK: Best Practice Statement. Addressing Skin Tone Bias in Wound Care: Assessing Signs and Symptoms in People with Dark Skin Tones. London: Wounds UK.

Edmonds M, Phillips A, Holmes P, Odiase C, Robbie J, Grumitt J, Halloum H (2020) To halve the number of major amputations in people living with diabetes, "ACTNOW". Diabetes & Primary Care 22: 139–43

Everett JS, Budescu M, Sommers MS. Making sense of skin color in clinical care. Clin Nurs Res. 2012 Nov;21(4):495-516. doi: 10.1177/1054773812446510. Epub 2012 May 28. PMID: 22645403; PMCID: PMC3465481.

Hampton J R, Harrison M J, Mitchell J R, Prichard J S, Seymour C. Relative contributions of history-taking, physical examination, and laboratory investigation to diagnosis and of medical outpatients. Br Med J 1975; 2 :486 doi:10.1136/bmj.2.5969.486

IWGDF (The International Working Group on the Diabetic Foot), IWGDF Guidelines on the prevention and management of diabetes-related foot disease (2023) https://iwgdfguidelines.org/wp-content/uploads/2023/07/IWGDF-Guidelines-2023.pdf

Miller TA, Campbell JH, Bloom N, Wurdeman SR. Racial Disparities in Health Care With Timing to Amputation Following Diabetic Foot Ulcer. Diabetes Care. 2022 Oct 1;45(10):2336-2341. doi: 10.2337/dc21-2693. PMID: 36069831; PMCID: PMC9862414.

National Institute for Health and Care Excellence (NICE); 2018 Feb. (NICE Guideline, No. 147.) Peripheral Arterial Disease: Diagnosis and : [A] Evidence review for determining diagnosis and severity of PAD in people with diabetes. London: Available from: https://www.ncbi.nlm.nih.gov/books/NBK550332/

Peterson MC, Holbrook JH, Von Hales D, Smith NL, Staker LV. Contributions of the history, physical examination, and laboratory investigation in making medical diagnoses. The Western Journal of Medicine. 1992 Feb;156(2):163-165. PMID: 1536065; PMCID: PMC1003190

ACT NOW is a six-stage triage and risk assessment tool for people with diabetes, their carers and health care professionals. Developed by iDEAL (Insights for Diabetes Excellence, Access and Learning) group, it is designed to help recognise the early warning signs that might lead to amputation and which, if identified, should activate urgent referral to the Multi Disciplinary Foot Protection Team (MDFT).

Afro-caribbean/African skin tone

Asian skin tone

Caucasian skin tone

The acronym stands for

- A: Accident (recent, to toe or foot)
- C: Change (in colour or shape of foot)
- T: Temperature (change in foot or toes, hotter or colder)
- N: New pain (In foot or toes)
- O: Oozing (Discharge or exudate from area of skin or nail on foot or toes)
- W; Wound (New blister or skin break, may be under toenail or corn).

The ACT NOW acronym was designed to be user-friendly, effective, and reliable. It aims to ensure clear referral pathways from primary care, promote rapid access to MDFTs, facilitate the referral of high-risk feet, and empower people with diabetes, their carers, and healthcare professionals to expedite rapid referrals to MDFTs.

To access educational resources online, visit: https://idealdiabetes.com/act-now-education-resources/

Classification and types of ulcers

The International Working Group on the Diabetic Foot (IWGDF) Guidelines on the prevention and management of diabetes-related foot disease (IWGDF 2023), recommend the use of the SINBAD system (see below) to assist in the triage by a specialist team.

IWGDF also recommend classifying the infection severity according to the IWGDF/IDSA system and ischaemia as part of the WIfI system. WIfI is a scoring system that is designed to assist the healthcare team in describing a patient's overall lim status. It stands for Wound, Ischemia and Foot Infection, the three factors associated with limb loss.

The ulcer type can be described as neuropathic (LOPS, but no PAD), neuro-ischaemic (LOPS and PAD), or ischaemic (PAD, but no LOPS).

Category	Definition	SINBAD score
*S*ite	Forefoot	0
	Midfoot and hindfoot	1
*I*schemia	Pedal blood flow intact, one pulse palpable	0
	Clinical evidence reduced pedal blood flow	1
*N*europathy	Protective sensation intact	0
	Protective sensation lost	1
*B*acterial infection	None	0
	Present	1
*A*rea	Ulcer <1 cm^2	0
	Ulcer >1 cm^2	1
*D*epth	Ulcer confined to skin and subcutaneous tissue	0
	Ulcer reaching muscle, tendon, or deeper	1
Total possible score		0–6

Source: Adapted from Ince et al. (31).

Classification and types of ulcers

(continued)

The Wound, Ischemia, and Foot Infection (WIfI) classification system consists of 3 components graded separately from 0 (none) to 3 (severe).

One component may be dominant but the specific combination of scores is used to estimate the risk of limb amputation at 1 year and the need for or benefit of revascularization.[a]

Wound (W)

Grade	Ulcer	Gangrene
0	None	None
1	Small, shallow	None
2	Deep with exposed bone, joint, or tendon	Limited to digits
3	Extensive, deep, and involving forefoot and/or midfoot with or without calcaneal involvement	Extensive and involving forefoot and/or midfoot Full thickness heel necrosis with or without calcaneal involvement

Ischemia (I)

Grade	Ankle-brachial index Ankle systolic pressure	Toe pressure or transcutaneous oximetry
0	≥0.80 >100 mm Hg	≥60 mm Hg
1	0.60-0.79 70-100 mm Hg	40-59 mm Hg
2	0.40-0.59 50-69 mm Hg	30-39 mm Hg
3	≤0.39 <50 mm Hg	<30 mm Hg

Foot infection (fI)

Grade	Clinical manifestation
0	No symptoms or signs of infection
1	Infection indicated by ≥2 of the following: • Local swelling or induration • Erythema 0.5-2.0 cm around ulcer • Local tenderness or pain • Local warmth • Purulent discharge (thick, opaque to white, or sanguineous)
2	Infection as described above with: • Erythema >2 cm around ulcer • Involving structures deeper than skin and subcutaneous tissues (eg, abscess, osteomyelitis, septic arthritis, fasciitis) • No signs of systemic inflammatory response (see below)
3	Infection as described above with ≥2 signs of systemic inflammatory response syndrome: • Temperature >38 °C or <36 °C • Heart rate >90/min • Respiratory rate >20/min or $Paco_2$ <32 mm Hg • White blood cell count >12 000/μL or <4000/μL or 10% immature forms

Armstrong, David & Tan, Tze-Woei & Boulton, Andrew & Bus, Sicco. (2023). Diabetic Foot Ulcers: A Review. JAMA. 330. 62-75. 10.1001/jama.2023.10578.

DIABETES AFRICA

CO-AUTHORS

Zulfiqarali Abbas
MD, Endocrinologist
President,
D-Foot International

Bernadette Adeyileka-Tracz
MPharm, PhD, Exec MBA
Executive Director,
Diabetes Africa

Luxmi Dhoonmoon
Nurse Consultant, Tissue Viability, London North West University Healthcare NHS Trust

Chris Manu
Consultant Diabetologist, Co-lead for Diabetes Foot Service, King's College Hospital NHS Foundation Trust

Joan St John
GPwER Diabetes, Diabetes UK Clinical Champion

HANDBOOK

Diabetes footcare in dark skin tones

How do we address subtle variations in symptoms and disease progression in diabetes-related foot care for individuals with dark skin tones?

Covering essential topics such as physiology, history-taking, assessment techniques, and investigative methods, this handbook also features a visual guide that draws on real-life cases from seasoned professionals. An indispensable resource for medical practitioners and caregivers alike, this book champions a more inclusive and effective healthcare approach, to enhance people's outcomes and understanding.

"A much-needed and clinically-relevant resource for healthcare professionals who care for people with diabetes."

Jane Robbie
Senior Lecturer in Diabetes Care at Birmingham City University and Senior Podiatrist, University Hospitals Birmingham NHS Trust