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DIABETIC FOOT ULCERS AND MICROWORLD: THE ANIMATED WAY TO LEARN

ANDREW SHARPE

ADVANCED PODIATRIST AND NIHR
ARC-GM PRE-DOCTORAL ACADEMIC
FELLOW, NORTHERN CARE ALLIANCE
NHS FOUNDATION TRUST



PAUL CHADWICK

PROFESSOR OF WOUND REPAIR
AND REGENERATION, PHD,
MANAGING DIRECTOR,
INDEPENDENT CONSULTANT



LEARNING OBJECTIVES

At the end of this session, you will be able to:

- **Understand how Microworld can offer an animated way to learn and enhanced learning experience**
- **Understand diabetes and diabetes-related complications**
- **Understand what a diabetic foot ulcer is and the risk factors that can lead to an at-risk foot**
- **Appreciate the importance of a holistic assessment and what the assessment should include**
- **Understand essential components of diabetic foot ulcer prevention and management**
- **Explore Microworld, download the app and register.**

WHAT IS MICROWORLD?

Microworld can connect and educate professionals from around the world.

Completing the module:

- **Counts towards revalidation**
- **Opens other learning areas of the site.**

Complex content delivered through fun, engaging interactive animations, videos, games and illustrations.



CLASS 7: DIABETIC FOOT ULCERS



DIABETES

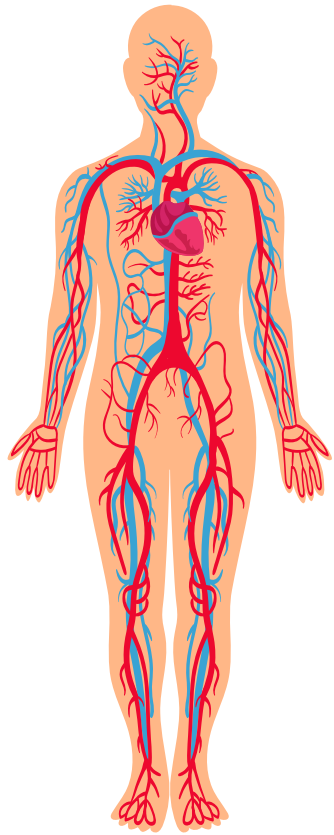
- To understand why diabetic foot ulcers occur, it is important to understand the **underlying disease process** that leads to their development
- Diabetes is a **chronic condition**, characterised by chronic high glucose levels in the blood, also known as **hyperglycaemia**
- Normally, the beta cells of the pancreas produce **insulin**, a hormone which plays several roles in the body's metabolism
- Insulin regulates how the body **uses and stores glucose and fat.**

DIABETES

- Many of the body's cells rely on insulin to take **glucose from the blood for energy** (Diabetes UK, 2019a)
- However, in people with diabetes, a lack of insulin, or insulin that is not very effective, can mean that **blood glucose levels rise** (Diabetes UK, 2019a)
- There are two main types of diabetes, **type 1** and **type 2**.

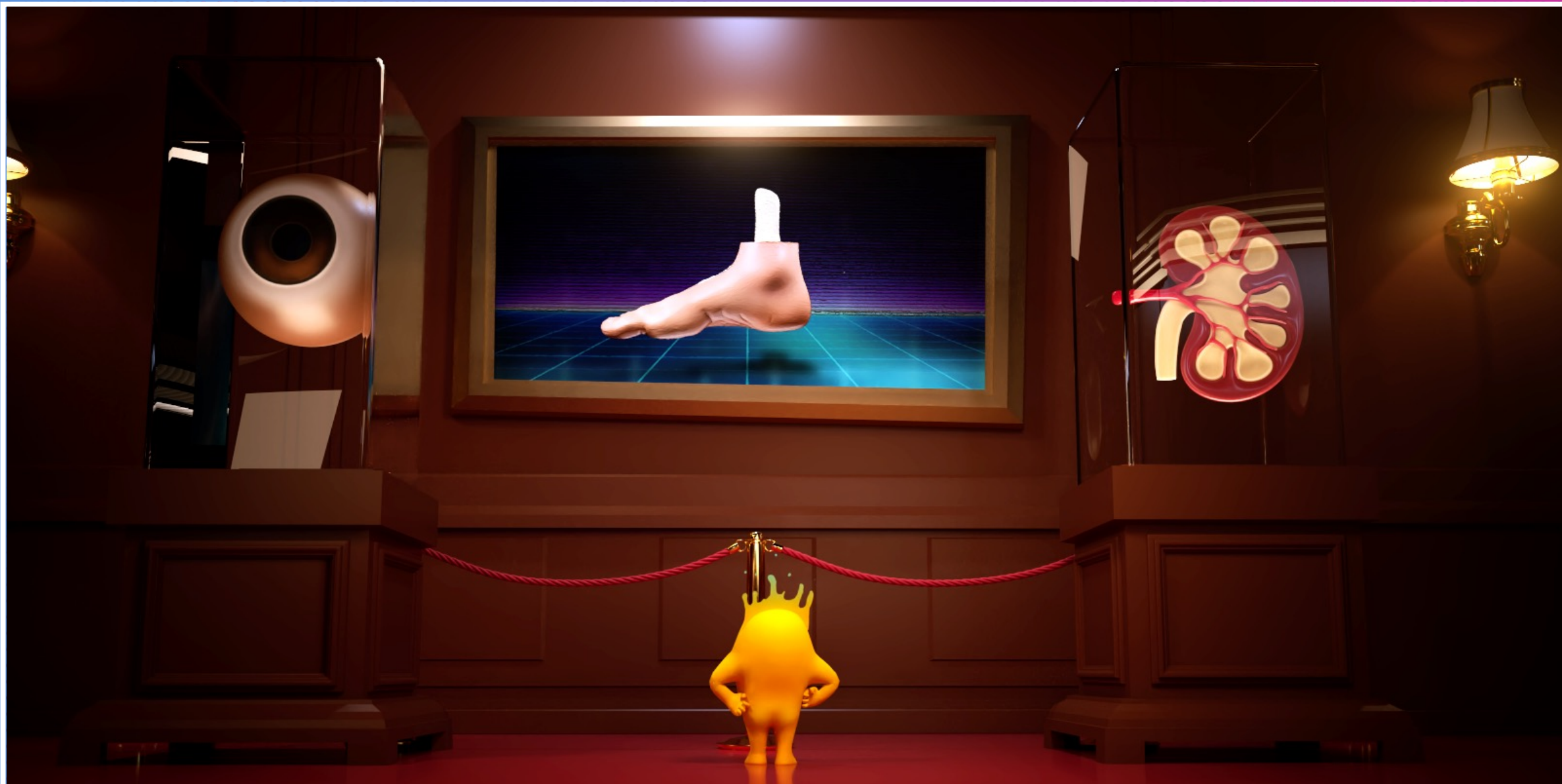


DIABETES RELATED COMPLICATIONS



If high blood glucose levels are not controlled, over time it can result in:

- Damage to blood vessels, compromised blood circulation leading to **vascular disease**
- This in turn can lead to **nerve damage** (neuropathy)
- Areas most affected are **eyes** (retinopathy), **kidneys** (nephropathy), **heart** (Heart attack/stroke) and **feet** (peripheral vascular disease/neuropathy).



WHAT IS A DIABETIC FOOT ULCER?

- A diabetic foot ulcer (DFU) is a **break in the skin of the foot** in people with diabetes
- The ulceration can extend through the epidermis into the **dermis** or penetrate **deeper structures** (Monteiro-Soares et al, 2020)
- **Neurological, vascular** and **biomechanical** factors contribute to DFU (Armstrong et al, 2023)
- Once present, a DFU is at risk of complications such as:
 - **Infection:** mild (surface of the skin), moderate or severe infections (deeper into the foot and may affect the bone)
 - **Acute Charcot, osteoporosis:** neuropathy characterised by osteoporosis, inflammation and severe foot deformity.



Image © C Morris

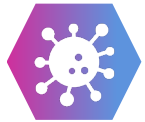
DIABETIC FOOT ULCER

- DFUs are amongst the **most serious complications** of diabetes
- **Considerable burden** on the person's family, healthcare professionals and organisations (Schaper et al, 2023)
- Approximately **56%** of diabetic foot ulcerations **become infected** (Block, 1981; Gibbons and Eliopoulos, 1984; Smith et al, 1987)
- Approximately **20%** of these patients with infected foot wounds end up with some type of **lower extremity amputation** (Schwegler et al, 2002; Wu et al, 2005)
- Worldwide, approximately **18.6 million people are affected by a diabetic foot ulcer each year** (Armstrong et al, 2023).

DFU ASSESSMENT

HOLISTIC ASSESSMENT

Aim:



Monitor disease progression



Identification of risk factors and risk stratification for development of DFU



Diagnose and classify DFU



Patient assessment, e.g. patient history, glycaemic status (Schaper et al, 2023)



Neurological, vascular, skin and foot assessment.

RISK FACTORS

Key risk factors are:

- **Peripheral neuropathy**
- **Foot deformity**
- **Autonomic neuropathy**
- **Peripheral arterial disease**
- **A history of previous diabetic foot ulcer or amputation (Ousey et al, 2018).**



RISK FACTORS

Other risk factors include:

- **Poor glycaemic control**
- **Wearing ill-fitting footwear causing friction shear injury**
- **Skin and nail problems, e.g. fungal nail infections**
- **Sight impairment preventing self-detection of foot problems**
- **History of falls**
- **Older adults.**

THE IWGDF 2023 RISK STRATIFICATION SYSTEM AND FOOT SCREENING FREQUENCY

Category	Ulcer risk	Characteristics	Frequency*
0	Very low	No LOPS and no sign of PAD	Once a year
1	Low	LOPS or POD	Once every 6 months
2	Moderate	LOPS + PAD or LOPS + foot deformity or PAD+ foot deformity	Once every 3 months
3	High	LOPS or PAD and one or more of the following: - History of a foot ulcer - A lower-extremity amputation (minor or major) - End-stage renal disease	Once every 3-6 months

LOPS = Loss of protective sensation, **PAD** = peripheral arterial disease (Schaper et al, 2023).

*Screening frequency based on expert opinion as there is no published evidence to support these intervals

NEUROLOGICAL ASSESSMENT

- Symptoms of peripheral neuropathy will depend on type of nerve damaged: **sensory**, **motor** or **automatic nerve**
- Assessment of sensory neuropathy is done with the **10g** (5.07 Semmes-Weinstein) **monofilament** (detects loss of protective sensation)
- A **tuning fork** (128 Hz, detects loss of vibratory sensation)
- If not available a simple test called **Ipswich Touch Test** can be used:
 - The examiner lightly sequentially touches with the tip of their index finger the tips of the first, third, and fifth toes of both feet.

VASCULAR ASSESSMENT

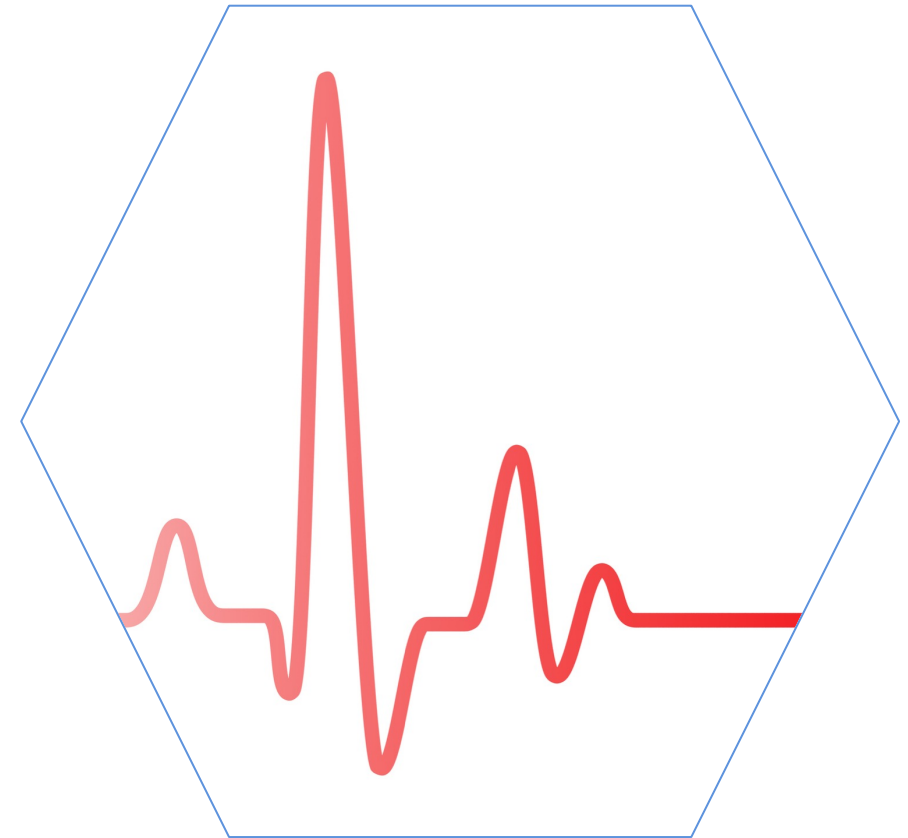
Simple tests – minimal intervention:

- **Assessing colour and temperature**
 - A cold foot, in comparison with other limbs warm may suggest ischaemia
 - A dusky or blue foot could indicate poor circulation
- **Pain assessment – be aware that patient may have sensory neuropathy**
- **Pulse palpation combination with examination of the foot.**

VASCULAR ASSESSMENT

Specialist equipment:

- Doppler – ankle-brachial pressure index (ABPI)
- Doppler – toe-brachial index (TBI).



SKIN AND FOOT ASSESSMENT

Patients will also need:

- **Regular skin and foot checks to prevent infections and DFU**
- **A red, swollen foot, with or without pain, warrants immediate specialist referral.**



ASSESSMENT OF DFU

- Foot ulcers are categorised as **neuropathic**, **neuroischaemic**, or **ischaemic**
- Each has distinct management
- DFU classification – SINBAD (Ince et al, 2008):
 - **Sit**
 - **Ischaemia**
 - **Neuropathy**
 - **Bacterial infection**
 - **Area**
 - **Depth**

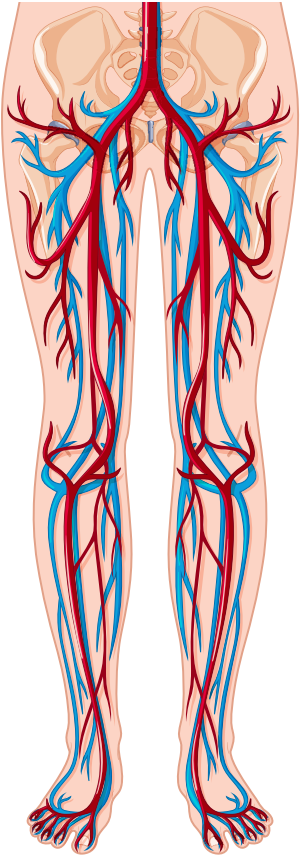


SIGNS OF A NEUROPATHIC FOOT

General clinical signs include one of these three types of neuropathy:

- **Sensory neuropathy**
Reduces the ability to feel touch vibrations, temperature, pain and loss of protective sensation
- **Motor neuropathy**
Can cause foot deformities such as hammer toes and claw toes
- **Autonomic neuropathy**
Causes loss of sweating that leads to dry skin, cracking and callus formation. It also increases the peripheral blood flow that leads to a warm foot.

SIGNS OF PERIPHERAL ARTERIAL DISEASE



Signs of peripheral arterial disease (PAD) include:

- **Dry, thick skin, hair loss and pale skin**
- **A cool foot with weak or no pulses**
- **Ulcers typically present as small, dry wounds with black necrotic tissue, well-defined, demarcated edges, and minimal callus formation**
- **Often located on the toes**
- **May appear as black necrotic toes that need spontaneous amputation.**

DFU MANAGEMENT

FIVE KEY AREAS OF MANAGEMENT

- 1. Offloading**
- 2. Metabolic control**
- 3. Infection**
- 4. Perfusion/ischaemia**
- 5. Local wound management (NICE, 2019).**

OFFLOADING

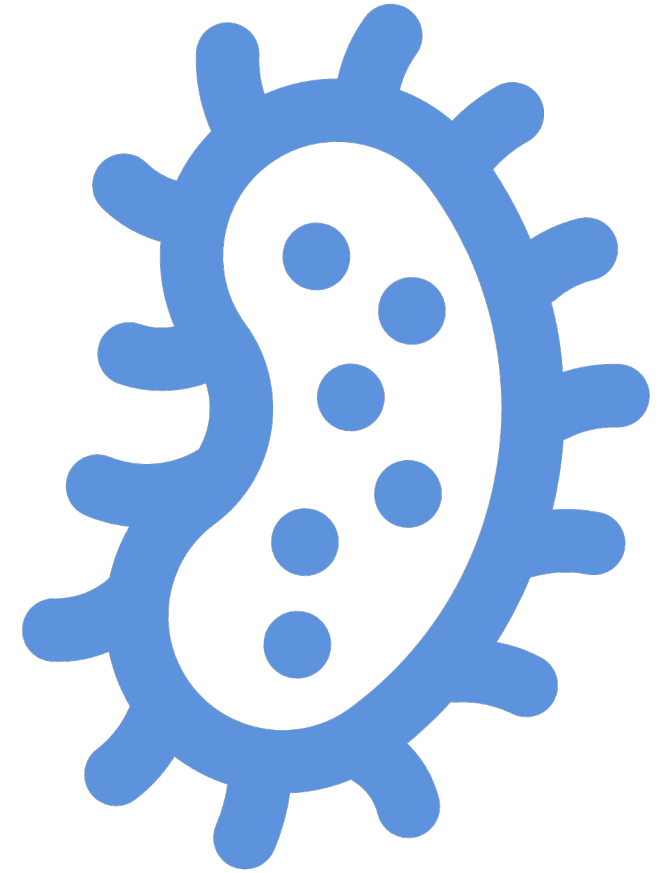
- For a patient with a non-infected neuropathic plantar forefoot or midfoot ulcer, a **non-removeable knee-high offloading device** is recommended to **reduce pressure** and **promote wound healing** (Munro et al, 2021)
- Other offloading devices or tools, such as insoles, orthotic devices, casts, walkers or custom-made footwear, can also be used (NICE, 2019; Munro et al, 2021).

METABOLIC CONTROL

- Individuals with a DFU require **close monitoring of their blood glucose**
- Advised to monitor their **HbA1c** closely and to keep the value as close to **48 mmol/mol (6.5%)** as possible to minimise the risk of complications (Diabetes UK, 2019b)
- A target should be set taking into consideration factors such as their **level of activity**, and **risks presented by hypoglycaemia**
- The presence of a wound, especially an infected wound, can lead to **poor glycaemic control** (Ousey et al, 2018).

INFECTION

- **Hyperglycaemia has an adverse impact on the body's immune system, and so patients are at risk of infection (Ousey et al, 2018)**
- **Usual signs of infection (e.g. redness, pain, heat, swelling) may be absent or less noticeable with DFU, so vigilance is required**
- **Early management of diabetic foot ulcer infection will reduce the risk of hospitalisation and amputation (Armstrong et al, 2023).**



POINTS FOR PRACTICE



- **Mild diabetic foot infection, or local infection, involves only the skin and subcutaneous tissue (NICE, 2019)**
- **Moderate diabetic foot infection is a local infection with erythema more than 2cm around the ulcer or involving structures deeper than skin and subcutaneous tissues (NICE, 2019)**
- **Severe diabetic foot infection is a local infection with signs of systemic inflammatory response (NICE, 2019).**

PERFUSION/ISCHAEMIA

- Peripheral arterial disease relates to a partial or complete obstruction of blood vessels and may be **initially asymptomatic** (Sharpe, 2020)
- Ischaemia is usually seen with clinical signs and symptoms such as **intermittent claudication, ischaemic rest pain, ulceration, necrosis** and/or **gangrene**
- There are two main types: **acute** and **chronic limb-threatening** ischaemia (Sharpe, 2020)
- The main treatment is **vascular imaging** and **revascularisation** as soon as possible.

LOCAL WOUND MANAGEMENT

- Wound care should be based on **assessment** and follow the principles of **wound bed preparation** (WUWHS, 2016)
- For some black, dry necrotic areas due to ischaemia, the aim may be to **keep necrotic tissue dry** to **prevent infection** and to allow for **autodebridement** (Collier, 2014)
- The selection of a wound dressing will depend on the assessment and priorities of treatment
- If a diabetic foot ulcer has not reduced in size by **50% in four weeks**, advanced therapies may be required (WUWHS, 2016), e.g. topical oxygen therapy (Chadwick et al, 2022).

SUMMARY

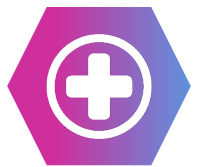


The risk of developing a DFU can be minimised by optimising glycaemic control, regular foot assessment, screening for peripheral neuropathy and peripheral arterial disease, the use of appropriate footwear and patient education (Armstrong et al, 2023).

SUMMARY



Management should focus on five key areas of standard care following a thorough and holistic assessment (NICE, 2019)



DFUs should be referred to a multidisciplinary team specialising in the diabetic foot, to prevent devastating complications (NICE, 2019; Armstrong et al, 2023).

AT THE END OF THE MODULE

- **Repeat and recap on information**
- **Undertake a test to assess learning**
- **Monitor progress on the dashboard.**



LEARNING CAN BE ALL FUN AND GAMES...



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- Register at Microworld www.mymicroworld.online/ to undertake the modules.





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