Gulf Diabetic Foot Working Group

THE GULF **CONSENSUS**

UNMET NEEDS IN MANAGING DIABETIC FOOT AND ITS COMPLICATIONS

RECOMMENDATIONS FOR THE GULF REGION

WOUNDS | INTERNATIONAL

Published by:
Wounds International
108 Cannon Street
London EC4N 6EU, UK
Tel: +44 (0)20 3735 8244
www.woundsinternational.com

This document has been developed by Wounds International and supported by Mölnlycke Healthcare.

The views expressed are those of the authors and do not necessarily reflect those of Mölnlycke Healthcare.

How to cite this document:

Wounds International (2024) *Unmet needs in managing diabetic foot and its complications. Recommendations for the Gulf region.* Available from: https://woundsinternational.com/

In association with

Facilitators and organisers

Mrs Aisha Al-Mahrizi, The Gulf Diabetic Foot Working Group
Dr Muneera Ben Nakhi, The Gulf Diabetic Foot Working Group
Sinead Fahy, Mölnlycke Healthcare

Expert panel

Dr Talal Khander Al-Enezy, Senior Consultant Podiatrics, Hamad Medical Corporation, Doha, Qatar
Mr Saad Alfaez, Podiatrist, Al Hada Military Hospital, Taif, KSA
Dr Ayman Al-Hadidi, Radiologist, Al Nahda Hospital, Muscat, Oman
Dr Saud Al-Harthi, Consultant Endocrinologist, Al Nahda Hospital, Muscat, Oman
Mrs Aisha Al-Mahrizi, Diabetic Foot and Wound Specialist, Vice President, Gulf Diabetic Foot Working Group, Oman
Dr Mustafa Alshaaibi, Al Nahda Hospital, Oman
Dr Khalifa Al-Wahibi, Vascular Surgeon, Sultan Qaboos University Hospital, Muscat, Oman
Dr Hani Badahdah, Podiatric Surgeon, Jeddah, KSA
Dr Moez Ballal, Consultant Foot and Ankle Surgeon, Sheikh Shakbout Medical City, Abu Dhabi
Professor Paul Chadwick, Visiting Professor, Birmingham City University, Birmingham, UK
Dr Elizabeth Ruth Choudry, Senior Podiatrist, Healthpoint, Mubadala, Abu Dhabi
Dr Nashat Ali Ghandoum, Consultant Surgeon, KSA
Dr Kartik Hariharan, Consultant Trauma and Orthopaedic Surgeon, Aneurin Bevan University Health Board, Wales, UK
Dr Hussam Itani, Wound Care Consultant, Canada
Dr Noor Janahi, Consultant Podiatrist, Awali Hospital, Awali, Bahrain
Dr Muneera Ben Nakhi, Consultant Plastic Surgeon, Al Adan Hospital, Kuwait
Col Professor Dhafer Kamal, Senior Consultant Vascular and Endovascular Surgeon, Bahrain Defense Force Royal Medical Services, Bahrain
Dr William Tettelbach, President, American Professional Wound Care Association (APWCA), USA; Duke University School of Medicine, Durham, NC, USA

Foreword

Type 2 diabetes is fast becoming a 'modern preventable pandemic' around the globe (Singer et al, 2022). The World Health Organization (WHO) estimates that the global number of people living with diabetes between 1980 to 2014 increased from 108 million to 422 million (WHO, 2023). Approximately 90% of all people with diabetes have type 2 diabetes (National Library of Medicine [NLM], 2023a). By 2021, approximately 537 million adults (aged 20-79 years) had type 2 diabetes, a number that is expected to increase to 783 million by 2045 (Sun et al, 2022).

This global rise in diabetes prevalence is alarming. Even more concerning is the fact that diabetes prevalence in the Arab countries is increasing at a faster pace than the rest of the world (Mairghani et al, 2017). Six Arab countries are already among the top 10 countries in the world with the highest prevalence rate, with 20.5 million people living with diabetes in the Arab nations (Mairghani et al, 2017). This is consistent with estimates by the WHO that, in 2023, the vast majority of people with diabetes (80%) will be in the developing world, with a rise in diabetes among younger people (i.e. within working age; Mairghani et al, 2017).

Diabetes causes several comorbidities and is a major cause of limb- and life-threatening disorders, such as blindness, impaired immunity, kidney dysfunction, heart failure, stroke and lower limb amputation (WHO, 2023). In addition, it increases the risk of infection in patients by 1.5–4 times, with the highest risk in the extremities (Holt et al, 2024; Edmonds et al, 2021).

However, in the Gulf region, there is a lack of type 2 diabetes prevalence data and guidelines that address region-specific challenges for patients, clinicians, healthcare systems and governments.

To address these significant unmet needs, this consensus document sets out to achieve the following Gulf-specific objectives, based on recommendation from global and regional diabetes experts:

- Elevate current practices in managing diabetic foot and its complications
- Highlight the gaps in current clinical practices and recommend strategies to fill them
- Develop and outline a pathway to create Gulf-specific, evidence-based recommendations for early detection and diagnosis of diabetic foot complications
- Promote throughout the region multidisciplinary approaches to diabetic foot care for all healthcare professionals involved in diabetes care
- Highlight the importance of patient education and self-care practices to prevent diabetic foot complications.

This consensus document is aimed at identifying the unmet needs, specific to the Gulf region, in managing diabetic foot complications. The expert panel agreed that the International Working Group on the Diabetic Foot (IWGDF) guidlines (2023) are the gold standard for developing Gulf-specific adaptations. Each disease area covered in this document is presented as a section, each of which can be used as a standalone document to provide focused recommendations to relevant field experts.

This document does not provide detailed guidelines or clinical pathways/algorithms on managing these complications. Based on the recommendations from the expert panel, this consensus document provides actionable insights and recommendations to adapt the IWGDF guidelines as per Gulf needs. Its implementation can help reduce the impact of the modern preventable pandemic that type 2 diabetes has become.

Mrs Aisha Al-Mahrizi
Dr Muneera Ben Nakhi

What are diabetic foot disorders?

Holistic patient assessment, early identification of risk factors and red flags, and timely intervention are key to managing diabetic foot disorders (Fletcher et al, 2024).

Consensus Statement

Clinicians label a diabetic foot infection (DFI) an 'immediate threat' to a person with diabetes (International Working Group on the Diabetic Foot [IWGDF] Practical Guidelines, 2023).

Consensus Statement

DFUs have a complex pathology. They occur as a result of a combination of factors, such as peripheral neuropathy, peripheral arterial disease (PAD), and some form of trauma/injury to the foot (Armstrong et al, 2023). Neuropathy in the diabetic foot may also dampen the symptoms of DFUs and infections, resulting in late diagnosis and exacerbated complications (IWGDF, 2023).

Consensus Statement

Diabetic foot disorders are diabetes-related pathologies that deteriorate the normal physiological functions in one or both feet. As per the IWGDF guidelines (IWGDF, 2023), these disorders consist of: 'one or more of the following in the foot of a person with current or previously diagnosed diabetes mellitus: peripheral neuropathy, peripheral artery disease, infection, ulcer(s), neuro-osteoarthropathy, gangrene, or amputation.'

Among these disorders, diabetic foot ulcers (DFUs) are the most common and people with diabetes are at a lifetime risk of ≥34% for developing a DFU (Edmonds et al, 2021). At least half of all DFUs are infected upon presentation, with the infection spreading quickly and often becoming devastating, typically within 48 hours (IWGDF, 2023).

There are several underlying mechanisms behind diabetic foot disorders, affecting the function of the foot even when blood glucose levels appear under control [Figures 1-3; also see Myth/Truth, page 5]. Their complexity [Figure 3] and, therefore, their prevention and management, requires a multidisciplinary approach.

Due to predisposition to infection and the lack of sensation in the feet of people with diabetes, ulcer and infection signs can be subtle. It is crucial for all healthcare professionals (HCPs) to understand these symptoms so patients can receive timely diagnosis and interventions.

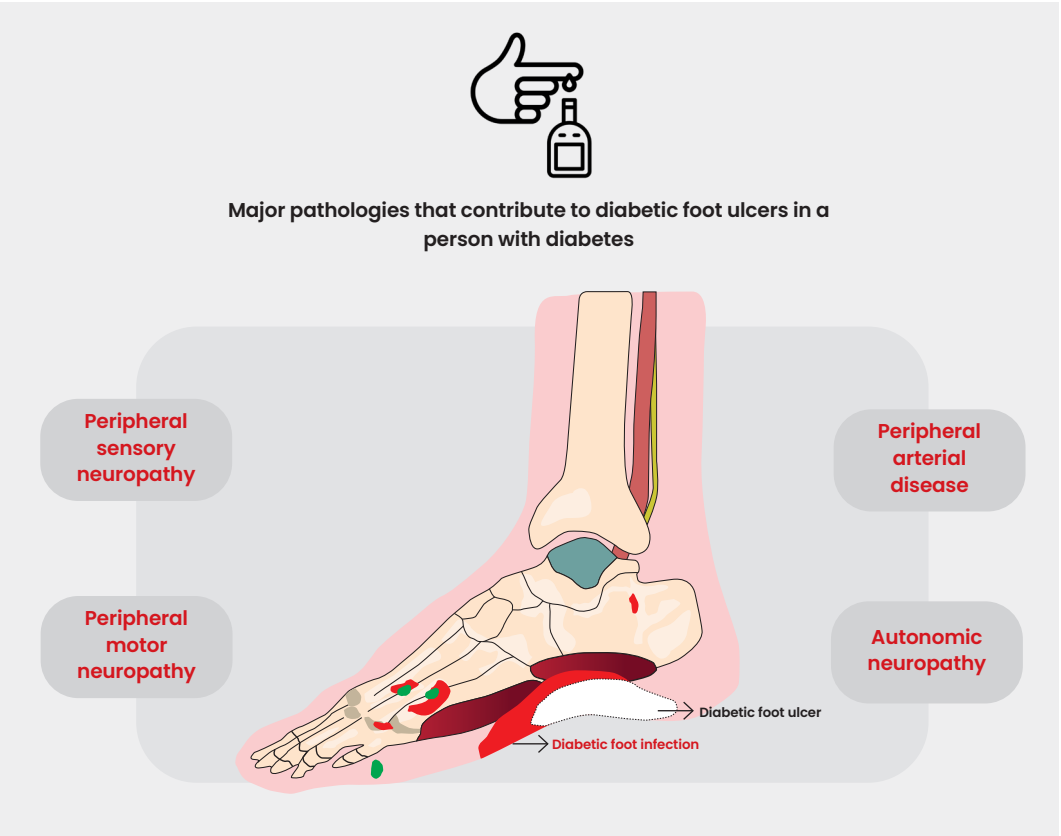

Figure 1: Major neuropathic dysfunctions affecting the feet of people living with diabetes (Armstrong et al, 2024; Bandyk, 2018). These dysfunctions, along with deformity, can contribute to the fast spread of infection throughout the foot.

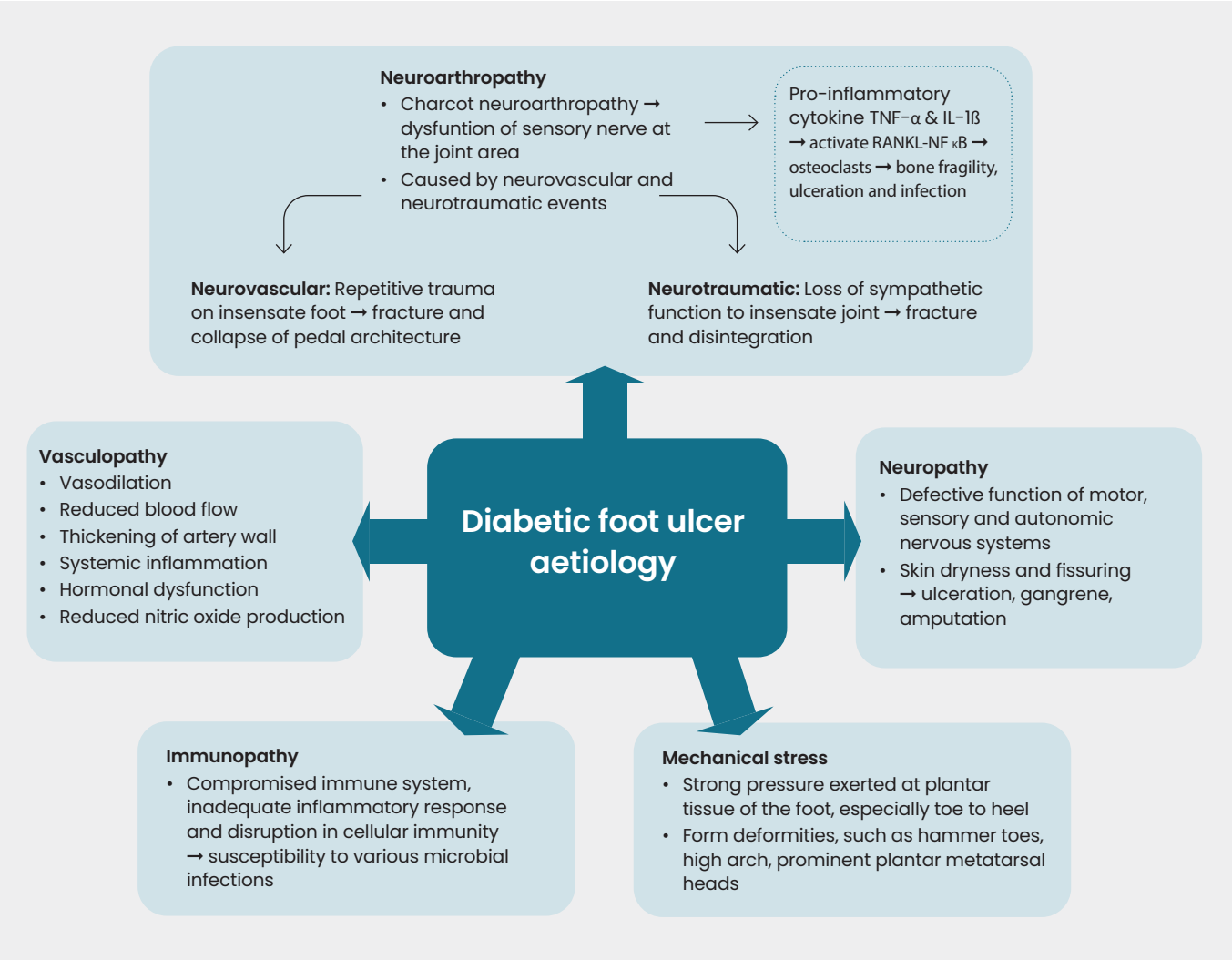

Figure 2: Diabetic foot ulcers are one of the most common diabetic foot disorders, have a complex pathophysiology and, therefore, require a multidisciplinary approach for optimal management (adapted from Maheswary et al, 2021).
Abbreviations: TNF-α, *tumour necrosis factor alpha*; IL-1ß, *interleukin-1 beta*; RANKL-NF κB, *receptor activator of NF-kappa B ligand*.

MYTH

If the blood glucose level is kept under control in a person with diabetes, it is unlikely that they will experience a significant diabetic foot complication (e.g. a diabetic foot infection [DFI]).

TRUTH

DFIs can occur in any DFU. This is because diabetes is a multi-system disorder. Even if the blood glucose level is well-controlled for a person with diabetes, the multi-system dysfunction in diabetes may still lead to infections. The impaired metabolic, immune and nervous systems may further contribute to a fast spread of DFIs (Fletcher et al, 2024).

What are diabetic foot disorders?

Diabetic foot ulcers

Ischaemic ulcer

Neuropathic ulcer

Ischaemic ulcer

Neuropathic ulcer

Diabetic foot ulcers

Diabetic foot ulcer

Charcot arthropathy

Charcot foot with ulcer

Osteomyelitis

Post-amputation

Neuropathic ulcer

Ulcer with osteomyelitis

Osteomyelitis

Figure 3: These patient images depict the complexity and need of timely diagnosis in diabetic foot disorders. (All images provided by Aisha Al-Mahrizi, The Gulf Diabetic Foot Working Group.)

Gulf consensus development

There is a significant need to collect and assess Gulf-specific clinical data on prevalence and management of diabetic foot disorders. Lack of such data is a major gap in optimally adapting international diabetic foot guidelines to the needs of the Gulf population.

Consensus Statement

The conception

The Gulf Diabetic Foot Working Group (GDFWG) conceived the idea for the development of a Gulf-wide consensus on creating diabetic foot guidelines. This concept took shape during the 2023 Global Diabetic Foot course organized by the GDFWG, where over 70 delegates and field experts participated. A significant and imminent need was identified to improve the outcomes for diabetic foot complications in the region. It was highlighted that Gulf-specific guidelines for diabetic foot complications will be a crucial step towards this goal. These guidelines will be based on the regional needs and clinical data, and will fill the significant gaps that the IWDFG guidelines do not currently address.

The objectives

An expert panel was appointed to achieve the following objectives:

- Review the IWGDF guidelines (2023) to identify gaps in managing diabetic foot complications in the Gulf region
- Create a roadmap/pathway to develop Gulf-specific diabetic foot guidelines.

The roadmap for improving diabetic foot management in Gulf

Consensus development helps simplify complicated and multifactorial decision-making. It helps generate actionable expert insights whilst also maintaining rigorous scientific objectivity and transparency (Arakawa and Bader, 2022).

The Delphi methodology is a widely used consensus development method in the field of medicine (Diamond et al, 2014; Arakawa and Bader, 2022). A modified Delphi approach was used to achieve the recommendations outlined in this document (Nasa et al, 2021). To cover the vast field of diabetic foot complications, six sub-groups were created and meetings conducted on:

- Diabetic foot complications: classification, diagnosis, investigation and assessment
- Diabetic foot disease prevention: overall strategies and screening tools
- Vascular complications: investigations and management
- Diabetic foot ulcers: assessment and management; post-rehabilitation.
- Diabetic foot infection and osteomyelitis
- Charcot foot: surgical intervention and management.

Each sub-group meeting comprised of an in-depth presentation by a leading field expert. This was followed by a polling-based survey that collected the participating experts' responses. The surveys were aimed at highlighting major advances in diabetic foot management and identifying gaps in delivering these solutions in the Gulf region.

Based on the information put forward in the polling questions, consensus recommendations were generated for each of the six sub-groups. **Figure 4** depicts the consensus roadmap.

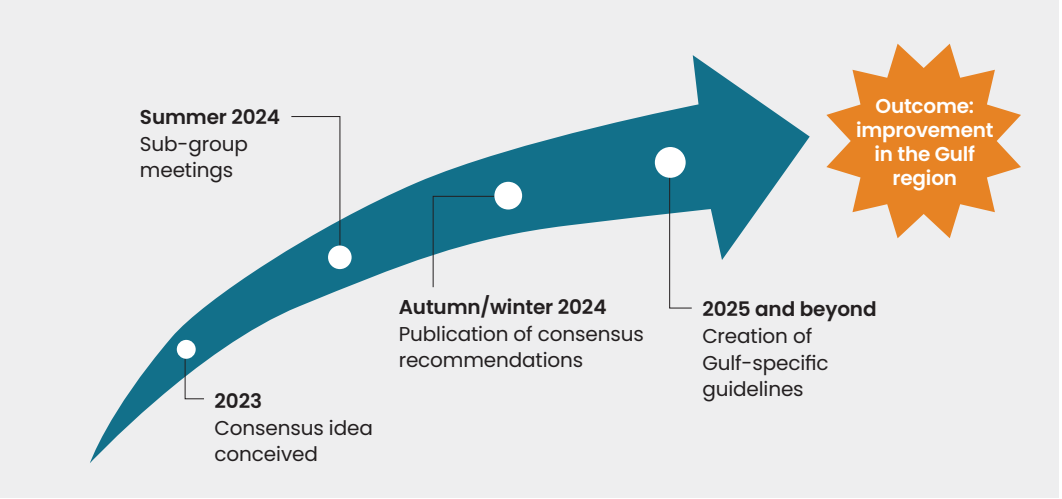

Figure 4: The roadmap to creating Gulf-specific diabetic foot guidelines.

Gulf region adaptation of diabetic foot wound care

1. Prevention of diabetic foot ulcers (DFUs)

1.1 Screening and risk identification

1. Perform annual screening for all patients with diabetes, and more frequently (every 1–3 months) for patients at high risk of developing a foot ulcer, using the IWGDF 2023 risk classification system.
   - Assess for peripheral neuropathy, peripheral artery disease (PAD), and foot deformities
   - Assess vascular status via palpation of pedal pulses and consider non-invasive vascular testing for patients with reduced or absent pulses
   - For patients with a history of DFUs, regular podiatric evaluation should be incorporated into their care plan.
2. Perform a comprehensive foot examination:
   - Inspect the skin for dryness, cracks, or abnormal callus formation
   - Examine footwear for suitability, providing guidance on appropriate footwear that minimises risk of ulceration
   - Inspect the foot for deformities, such as bunions (hallux valgus), toe deformities, flat feet (pes planus) or high arch feet (pes cavus)
   - Screen for neuropathy using a 10g monofilament test and tuning fork (128 Hz) for vibration perception.

1.2 Patient education

1. Educate patients on daily foot care practices. Patients should:
   - Inspect feet daily for blisters, cuts or sores
   - Wear appropriate, well-fitting footwear at all times to avoid trauma
   - Avoid walking barefoot, even indoors.
2. Provide lifestyle advice on:
   - Smoking cessation to reduce PAD risk
   - Glycaemic control, aiming for haemoglobin A1c (HbA1c) targets as per international standards
   - Weight management to reduce pressure on the feet.

2. Treatment of diabetic foot infections (DFIs) and osteomyelitis (OM)

2.1 Diagnosis

1. Classify DFIs using validated clinical tools such as WiFI, SINBAD, or the IDSA/IWGDF classification systems to guide severity-based management:
   - Use clinical signs such as redness, warmth, swelling, and discharge to confirm infection
   - For suspected OM, perform clinical evaluation (patient history, wound characteristics) and confirm with imaging (X-ray, magnetic resonance imaging [MRI]) and laboratory markers (elevated erythrocyte sedimentation rate [ESR] and C-reactive protein [CRP]).
2. Differentiate Charcot foot from OM through the use of clinical findings, imaging and laboratory markers (ESR, CRP and white blood cell [WBC] count).

2.2 Treatment

1. Start empirical antibiotic therapy for DFIs as per IWGDF/IDSA guidelines while awaiting microbiology results:
   - Administer a broad-spectrum antibiotic regimen initially, adjusted based on culture results
   - Address any underlying vascular insufficiency that might impair wound healing.
2. For cases of OM:
   - Consider conservative management (prolonged antibiotics) or surgical debridement, guided by infection severity, patient comorbidities, and limb viability.

2.3 Referral

1. Refer patients with moderate to severe DFIs (including suspected OM) to a multidisciplinary foot care team for advanced wound care, imaging, and possibly surgical management.
2. If any vascular abnormalities are suspected, refer to vascular specialists for further diagnostic testing and possible intervention.

3. Management of Charcot neuroarthropathy (also referred to as Charcot foot)

3.1 Diagnosis

1. Suspect Charcot neuroarthropathy in any patient with diabetes presenting with a warm, red, swollen foot, especially if they have a history of trauma or overuse, even in the absence of an open wound.
2. Confirm diagnosis through:
   - Imaging: X-rays showing subluxation, fractures or deformities (e.g. "rocker-bottom" foot)
   - Laboratory tests to differentiate from infection (normal WBC count, CRP, ESR in the absence of OM).

3.2 Treatment

1. Immobilise the foot using a Total Contact Cast (TCC) for at least 3 months, with re-evaluation every 4–6 weeks; if TCC is not available, use normal casting or air cast boots.
2. After TCC removal, transition the patient to diabetes-specific therapeutic footwear or custom-made shoes with insoles.
3. Continue to monitor and re-evaluate for recurrence of Charcot symptoms.

3.3 Surgical consideration

1. Consider surgery only for patients with severe deformity or joint instability that cannot be managed with bracing or custom footwear.
   - Avoid surgery in patients living alone, as post-operative care often requires significant support.

4. Follow-up care and recurrence prevention

4.1 Monitoring after treatment

1. For patients treated for DFIs or OM:
   - Active infection must be monitored closely and on alternate days or every 3-4 days. Once the infection has been addressed, follow-up regularly, based on infection severity and patient response to therapy (at least every 1–2 months)
   - Educate patients on signs of infection recurrence and ensure routine foot checks.
2. For Charcot foot:
   - Perform long-term follow-up, focusing on foot health and preventing deformities
   - Re-assess both feet frequently to monitor for recurrence or onset of new symptoms.

4.2 Long-term management

1. Provide patients who have healed from a DFU or Charcot foot with a structured foot care plan, including:
   - Regular podiatry visits every 1–3 months, depending on the risk level
   - Continuous use of therapeutic footwear and foot orthotics.
2. Incorporate patient and caregiver education into long-term care strategies, focusing on early identification of new foot complications, maintenance of proper foot hygiene, and adherence to prescribed footwear.

Key considerations for Gulf region implementation

- Establish multidisciplinary diabetic foot care teams in all tertiary care centres to streamline the management of DFUs, DFIs, and Charcot foot
- Develop region-specific pathways that address resource availability and the unique healthcare needs of the Gulf population
- Ensure access to diabetes-specific therapeutic footwear and advanced wound care technologies across the region.

Prevention of diabetic foot complications

The focus of diabetic foot management should be on prevention, wherever possible, and timely identification of risk factors and red flags. A multidisciplinary (MDT) management approach can help achieve this goal. All MDT members should have awareness of holistic patient assessment, risk factors and referral pathways if a complication is suspected.

Consensus Statement

Introduction

Prevention of DFUs is very important because, after experiencing a DFU and infection, the person with diabetes becomes even more susceptible to diabetic foot complications. This susceptibility makes it hard to break the cycle of ulceration and infection (Maity et al, 2024).

The IWGDF guidelines (2023) provide prevention recommendations that do not take into account the Gulf-specific factors listed below:

- **Cultural and lifestyle factors**
  - Traditional footwear
  - Dietary considerations
  - Exercise, activity and movement habits for people with or at-risk of complications.
- **Environmental conditions**
  - High temperatures and humidity, and their impact on skin integrity and wound healing
  - Impact of high temperatures and humidity on footwear, foot care routines, and moisture management.
- **Resources and access to healthcare**
  - Inadequate specialised diabetic foot care centres and trained clinicians
  - Inadequate medical supplies and services.
- **Education and awareness**
  - Lack of tailored, accessible patient and clinician education, based on Gulf-specific issues
  - Lack of awareness campaigns on early detection of diabetic foot problems, self-care practices and regular foot examinations.
- **Research and data**
  - Need for Gulf-specific diabetic foot data on care practices, outcomes and challenges
  - Unmet need in supporting research initiatives to obtain Gulf-specific data.
- **Collaborations**
  - Need to create and improve multidisciplinary teams (MDTs) for diabetic foot care
  - Unmet need to encourage collaboration between international and local experts and healthcare providers to adapt and implement IWGDF guidelines effectively.

Consensus recommendations

Based on these overall unmet needs in preventing diabetic foot complications, **Table 1** presents the consensus findings and recommendations.

Table 1: Consensus findings and recommendations to improve DFU risk assessment in the Gulf region.

Consensus statement/question	Experts' consensus
Current guidelines recommend routine screening for diabetic foot complications and that the frequency of screening should be based on patient risk factors. How can this be best implemented?	Improve adherence to the following principles: • Annual, comprehensive foot exams for all people with diabetes • More frequent screenings (every 3–6 months) for high-risk individuals (e.g. people with neuropathy or vascular disease).
How can we integrate emerging technologies and diagnostic tools that show promise in early detection of diabetic foot complications?	To identify temperature changes, pressure points and vascular status, the following new tools should be considered in clinical prevention routines: • Thermal imaging • Smart socks • Hand-held Doppler devices.
There are differences between type 1 versus type 2 diabetes. How does this affect optimisation of wound care and healing outcomes?	Deploy aggressive DF management pathways regardless of the type of diabetes.
How can personalised medicine help in both prevention and treatment of diabetic foot diseases?	Personalised approaches should be tailored as per: • Patient's age • Comorbidities • Lifestyle • Risk factors • Barriers to adherence.

Table 1: Consensus findings and recommendations to improve DFU risk assessment in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus
Do MDTs play an integral role in diabetic foot care?	Diabetic foot disease is a multi-system disorder; therefore, glycaemic status, obesity, neuropathy, vascular insufficiency and wound healing should be managed through a multidisciplinary care approach via: • Podiatrists • Endocrinologists • Vascular surgeons • Wound care specialists • Podiatric or orthopaedic surgeons • Infection specialists.
How can we differentiate the need for conservative versus surgical DFU management?	Employ conservative management: • Pressure offloading • Optimal wound care • Infection control • Sharp debridement • Optimise cardiovascular risk • Manage diabetes. If this approach fails, or if the vascular impact is severe, it is important to employ surgical DFU management via: • Surgical debridement • Revascularisation • Amputation.
How can we best manage active Charcot foot, in the absence of clear guidelines on the timeline for immobilisation?	Use immobilisation (i.e. complete immobilisation via TCC) urgently if Charcot foot is suspected. Reduce immobilisation based on serial imaging and serial temperature monitoring. A pneumatic walker is not recommended at this stage. Perform periodic patient assessment.
How can we best provide adequate and timely patient education to promote treatment commitment and early symptom identification to prevent DFUs?	Improve engagement by educating people with diabetes on the importance of the following factors ('foot schools' and periodic open days for staff and patients can help explain these concepts): • Daily inspection • Foot hygiene • Appropriate and well-fitted footwear • Prompt reporting of changes or injuries.
For DFU management, there is emerging evidence on improved outcomes with advanced wound care therapies (e.g. bioengineered skin substitutes and growth factors). How should the efficacy of these therapies be assessed in clinical practice?	Bioengineered skin substitutes and growth factors enhance wound healing by promoting tissue regeneration and reducing healing time. Assess their efficacy and integration into clinical practice through: • Clinical trials • Real-world outcomes.
Socioeconomic barriers in accessing diabetic foot care resources can impact outcomes. What approaches can healthcare providers take to mitigate disparities in care?	Socioeconomic status influences access to care, engagement with treatment and overall outcomes. Reduce disparities by: • Offering education • Providing access to resources and culturally sensitive care • Ensuring equitable diabetic foot management.
Can Quality Improvement Programs (QIPs) be a viable method to reduce DFU incidence in the Gulf region?	There is a significant unmet need in the Gulf region to reduce DFU incidence. To achieve continuous and consistent reduction, harness QIPs for: • Ongoing health force training • Protocol refinement.
To achieve these targets, is there an unmet need to create and utilise a multidisciplinary DFU protocol?	There is a significant unmet need and a health force desire for a unified multidisciplinary approach.

Diabetic foot ulcer risk assessment

Introduction

Appropriate risk assessment can improve early identification and intervention (Rossboth et al, 2020; IWGDF, 2023). There is a significant unmet need in the Gulf region to improve this risk assessment process at every level of care, and with full engagement of the patient and their carer(s). In addition to the higher prevalence of type 2 diabetes and subsequent complications (Mairghani et al, 2017), the lack of thorough surveillance and continuity of diabetic foot care are significant regional needs. The expert panel agreed that these needs can be best addressed via an MDT approach, highlighting MDT development as a major next step in the region. Furthermore, socioeconomic and patient-level factors can also lead to lack of appropriate and timely DFU risk assessment. For example, not all patients may be able to afford and access appropriate diabetic foot treatments. Due to lack of suitable patient education and support, some patients may also feel disengaged with their treatment and follow-up. Some patients may even experience the stigma that can be associated with a chronic disease (i.e. type 2 diabetes).

For DFU risk assessment, there is a significant need to investigate the role of socioeconomic, demographic, clinical and patient behavioural factors, especially in primary care settings.

The expert panel recommended initial steps to achieve these goals and improve risk assessment execution and patient outcomes in the region.

Consensus recommendations

Founded on the main unifying principles in DFU risk assessment (IWGDF, 2023), **Table 2** presents the

Table 2: Consensus findings and recommendations to improve DFU risk assessment in the Gulf region.

Consensus statement/question	Experts' consensus
Definition and identification of diabetic foot	
The diabetic foot ulcer definition as per the IWGDF 2023 guidelines can be implemented across the Gulf region	There are no Gulf-specific obstacles in implementing this foot ulcer definition from the IWGDF 2023 guidelines: • When defining diabetic foot ulcers it is important to include both ankle and below-ankle foot areas in the definition.
Can the IWGDF 2023 guidelines be implemented for classification of neuropathy for people living with diabetes in the Gulf region?	When assessing diabetic foot neuropathy, all current methods of neuropathy assessment can be offered in the Gulf region with local adaptation.
The Gulf region experiences certain obstacles in the implementation of the IWGDF 2023 guidelines	The following obstacles exist in the region in implementation of the IWGDF 2023 guidelines: • Budget restrictions • Inaccurate assessment of diabetic foot complications • Issues related to insurance and healthcare providers.
To implement the IWGDF 2023 guidelines, Gulf-specific obstacles must be overcome	The following recommendations can help remove Gulf-specific obstacles in the implementation of the IWGDF 2023 guidelines: • Introduction of disease prevention measures • A multidisciplinary approach to management and risk assessment • Improved and adequate healthcare provisions.
Assessment of the diabetic foot	
Throughout the Gulf region, the IWGDF 2023 guidelines can form the foundation of assessment of the diabetic foot in people living with diabetes	The IWGDF 2023 guidelines can be implemented in the Gulf region with region-specific adaptations. Currently, these guidelines lack Gulf-specific elements based on regional climate and temperature.

Table 2: Consensus findings and recommendations to improve DFU risk assessment in the Gulf region. (Continued)	
Consensus statement/question	**Experts' consensus**
Assessment of diabetic foot	
Several elements of the IWGDF 2023 guidelines are in use in clinical settings across the Gulf region	In this regard, the following elements of the guidelines were highlighted: • Detailed patient history • Vascular assessment • Skin assessment • Cognitive function tests • Foot care regimens • Utilisation of relevant knowledge.
In local clinical settings, how is consistency currently achieved in assessing people with a diabetic foot?	The following avenues were highlighted in achieving assessment consistency in their clinical settings: • Training for nurses • Patient education • Training programmes for assessors.
There are obstacles in achieving the successful implementation of the IWGDF 2023 guidelines in the Gulf region that can be overcome with region-directed interventions	The following major obstacles were highlighted: • Lack of adequate education • Constraints in clinical settings • Lack of disease awareness. The following interventions were recommended by the participants to overcome these obstacles: • Development of a Gulf-specific diabetic foot protocol • Structured, national training and education programmes for HCPs and patients/carers • Provision of female and male assessors for female and male patients, respectively
DFU classification	
WIfI, SINBAD and IDSA are well-established systems for DFU classification	These systems should be implemented across the Gulf region, but with local adaptations.
There are obstacles in the implementation of the WIfI, SINBAD and IDSA systems in the Gulf region	The following obstacles were highlighted in implementing these systems across the Gulf region: • Physician preference • Reluctance among HCPs in adapting these systems. The following solutions were recommended for overcoming these obstacles: • Improvement of education for HCPs • Addressing the restrictions imposed by insurance companies.
Achieving Standard of Care (SoC) in diabetic foot management	
To achieve optimal outcomes, it is crucial to achieve the SoC in diabetic foot management	Established SoC in the Gulf region includes optimisation of systemic diabetes symptoms, offloading, infection prevention and management, tissue management and moisture balance. In addition, the following principles are also practiced in some clinical settings: • Clinical leadership development • HCP education provision.

Table 2: Consensus findings and recommendations to improve DFU risk assessment in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus
Achieving Standard of Care (SoC) in diabetic foot management	
Across the Gulf region, there are certain obstacles in successfully implementing SoC in diabetic foot management	The following obstacles were highlighted: • Lack of assessment tools and treatment modalities used for diabetic foot management (e.g. casting) • Restrictions imposed by insurance companies. The following measures were recommended to overcome these hurdles: • Action from the Department/Ministry of Health from each Gulf country • Regulation of regional insurance companies.
Further consensus outcomes	
• For achieving SoC in their clinical setting, approximately 66% and 33% of participants use advanced wound care dressings and conventional dressings, respectively • In addition to SoC, 50%, 25% and 25% of participants use topical oxygen therapy, single-use NPWT and casting, respectively • The following elements drive the use of advanced therapies in local clinical settings, in the order of appearance below: - Education - Clinical evidence - Availability - Ease of use - Cost.	

Vascular issues in the diabetic foot

Introduction

Diabetes is a multisystem disorder and several physiological pathways are impaired due to diabetes pathology (Viigimaa et al, 2020; IWGDF, 2023). Driving and mutually reinforcing each other, these impaired pathways cause vascular disorders (e.g. heart, peripheral arterial and cerebrovascular disease), immune system dysfunction and fatty liver disease (Viigimaa et al, 2020).

Cardiovascular disease is the largest contributor to morbidity and mortality in people with diabetes, and vascular complications in the diabetic foot significantly deteriorate the patients' quality of life (Galicia-Garcia et al, 2020; Yachmaneni et al 2023). For prevention of these macrovascular and microvascular complications, the IWGDF guidelines (2023) provide a global foundation for patient screening and risk stratification. However, there is a significant need to adapt these recommendations as per regional needs in the Gulf countries.

Consensus recommendations

Table 3 presents the findings and recommendations from the expert panel to adapt the IWGDF 2023 guidelines to regional needs in the Gulf region.

Table 3: Consensus findings and recommendations to improve vascular assessment in the Gulf region.

Consensus statement/question	Experts' consensus
When and how often should vascular assessment for PAD be performed in people with diabetes?	Undertake vascular assessment: • while the person with diabetes is still asymptomatic • while the person with diabetes has not yet presented with claudication, tissue loss or pain at rest • vascular reviews
If a diabetic person presents with no foot pulses and no PAD symptoms, which of the following non-invasive assessments should be performed: hand-held Doppler, ABPI and/or toe pressure assessments?	Employ ABPI as the first choice of assessment.
In people with diabetes, medical history and physical examination are always sufficient for an accurate PAD diagnosis	Patient history and physical examination are fundamental in diagnosing PAD. However, in most cases, the diagnosis should be supplemented by measurements of: • ABPI • Toe brachial pressure index (TBPI) • Transcutaneous oxygen pressure (TcPO2).
Among people with diabetes, it is recommended to identify certain symptoms that can help select and prioritise strong candidates for revascularisation	Perfusion tests and risk stratification systems (e.g. WIfI and Rutherford) can help identify strong candidates for revascularisation. Prioritising people with the following symptoms can help prevent loss of limb and life: • Signs of critical ischaemia • Non-healing wounds • Progressive tissue loss.
For high-risk patients, clinicians often prefer endovascular revascularisation methods for being minimally invasive. However, for people with advanced or complex diabetic foot disease, open or hybrid revascularisation procedures may be required to improve outcomes	This decision should be made in a multidisciplinary setting involving vascular surgeons, interventional radiologists and wound care specialists. Choose a revascularisation approach based on the following factors: • Patient's overall health • Extent and nature of the vascular disease • Extent of tissue loss. The goal of this revascularisation approach should be to: • Improve quality of life (consider limb salvage and preservation of limb function) • Minimise the risk of complications.

Table 3: Consensus findings and recommendations to improve vascular assessment in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus
There is a need to differentiate between the use of direct angiosome revascularisation (DAR) from indirect angiosome revascularisation (IDAR)	Employ DAR as the first-choice approach, wherever possible, because it can help achieve better wound healing and limb salvage outcomes: • IDAR should be employed if DAR is not feasible because IDAR may lead to lower success rates, when compared with DAR.
In people with DFUs, post-revascularisation perfusion outcomes are strong predictors of future complications	In case of sub-optimal perfusion outcomes, use diabetic foot assessment to predict the increased risk of the following complications: • The likelihood of a non-healing wound • The need to perform additional revascularisation procedures • Minor or major amputation. Next steps in the treatment pathway should be based on the outcome of this risk prediction.
In a person with diabetes, PAD and a foot ulcer, the primary treatment goal is to prevent major adverse cardiovascular events (MACE), major adverse limb events (MALE) and death	For this patient group, combine all of the following approaches to ensure optimal outcomes: • Antiplatelet therapy • Lipid-lowering agents • Glycaemic control • Antihypertensive treatment • Smoking cessation • Revascularisation • Correct wound care follow-up.
Revascularisation may not be the best approach for some people with DFUs and minor or major primary amputation must be considered	Consider primary amputation if the following situations occur: • Non-salvageable limb • Failed revascularisation • Sepsis.
Surveillance is strongly recommended after revascularisation for a DFU (healing or healed)	Recommended surveillance tools/techniques include: • Frequent clinical follow-ups every 1–3 months • TcPO2 • ABPI/toe pressure • Duplex ultrasound every 3–4 months for the first 2 years, and then annually.
The high prevalence of PAD in people with diabetes requires evidence- and knowledge-based interventions to reduce limb and life loss	To improve the evidence and knowledge base: • Provide comprehensive education to HCPs • Educate patients and caregivers about the prevalence of PAD and the PAD management pathway • Create 'Diabetic Educator' roles for those who can educate patients/caregivers on the importance of taking practical, routine preventive measures, such as avoiding injury and attending appointments as early as possible once a potential complication presents itself.
In the Gulf region, people living with diabetes experience several region-specific challenges including cultural obstacles (e.g. stigma), footwear choices, smoking and renal failure	Increase education for both primary care professionals and patients/caregivers to inform on the risks and challenges in the Gulf region and how to tackle them.
There is a significant unmet need across the Gulf region to reduce the DFU incidence and improve patient outcomes	Throughout the Gulf region, Quality Improvement Programs (QIPs) aimed at training and protocol refinement are needed to help HCPs increase their skill base in preventing and managing DFU cases. More research is needed in the Gulf region to detect the prevalence of PAD in the general population and in people with diabetes. More research is also needed to measure the effect of vascular revascularisation on the outcome (e.g. on the value of revascularisation methods on rate of limb salvage).

Diabetic foot ulcers

Introduction

People living with diabetes have a lifetime DFU risk of 19–34%, and a 5-year ulcer recurrence rate of 65% (Edmonds et al, 2021). DFUs occur as a result of peripheral neuropathy (loss of pain sensation), PAD (impaired blood circulation), and some form of trauma (Armstrong et al, 2023).

For people with diabetes, presence of a callus can increase the risk of DFUs up to 11 times (NLM, 2023b). At least half of all DFUs are infected upon presentation, and this infection can spread very quickly, causing limb and life loss (IWGDF/ Infectious Disease Society of America [IDSA], 2023). However, it is estimated that approximately 49–85% of all DFU-related amputations may be preventable with timely intervention (Driver and de Leon, 2008; Thornburg et al, 2021). Therefore, it is possible to improve outcomes for people with diabetes in the Gulf countries if region-specific protocols for DFU prevention and management can be developed.

Consensus recommendations

Table 4 shows the expert panel's recommendations to improve DFU management in the Gulf region.

Table 4: Consensus findings and recommendations to improve DFU management in the Gulf region.

Consensus statement/question	Experts' consensus
Adequate patient support and education on foot care routines (e.g. routine self-inspection and hygiene standards) is very important in preventing DFUs	Only a limited number of healthcare facilities in the Gulf countries have specialised patient education departments with HCPs who can provide this education: • Increase the number of trained HCPs • Create a data management system to record and audit the effectiveness of patient education by measuring patient outcomes
There is a lack of awareness among HCPs, patients and carers in recognising signs of infection in people with diabetes. This results in misdiagnosis, inadequate education and potential for inadequate treatments for patients	There is a significant unmet need in the region to: • Create standardised and unified diabetic foot management guidelines for hospitals, health ministries and healthcare systems • Create patient education, based on these region-specific guidelines.
The inadequacy of training and education for HCPs in wound care may result in delays in adoption of newer treatments	The following steps should be taken to address this significant gap: • With the support of the Ministry of Health (MoH) in the Gulf, create formal working groups that can provide unbiased, region-focused DFU recommendations • Provide accredited HCP training programmes aimed at specialisation in DFU management.* **Existing working groups (e.g. the Gulf Diabetic Foot Working Group [GDFWG]) are dependent on the efforts of the group members and not formally supported and registered by the MoH. This limits the impact when providing HCP education.*

Table 4: Consensus findings and recommendations to improve DFU management in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus
Several DFU treatment options are currently available in the Gulf region, as part of SoC	It must be ensured that the following SoC methods are readily available to wound care HCPs throughout the Gulf region. *DFU prevention methods*: • Offloading (wedges, footwear and TCC) • Semi-compressed felts • Materials for customised insoles • Total contact casts and similar offloading devices • Diabetic footwear with movable insoles *Wound bed management*: • Periwound/skin care: Silicone, petroleum-based, Zinc Oxide creams/ointments. Skin wipes with aloe vera • Cleansing: Saline, hypochlorous acid and iodine solution • Debridement: Bedside, sharp, surgical, hydrogel, mechanical pads, ultrasonic and waterjet • Antimicrobial dressings, when required: Silver, iodine-based, poly-hexamethylenebiguanide (PHMB) • Exudate management • Protease control: Collagen, collagen/oxidised-regenerated cellulose dressings. *Advanced wound care treatments*: • Negative pressure wound therapy (NPWT) • Biological dressings: amniotic membranes, skin substitutes (porcine, bovine, sheep, and synthetic) • Hyperbaric oxygen (chambers and topical devices) • Electrical stimulation • Skin grafts and flaps.
There are significant hurdles in the Gulf region in adopting newer/specialist DFU treatments (e.g. NPWT, advanced dressings)	Three major impediments exist in the region in adopting NPWT and advanced dressings. The following challenges must be addressed in the Gulf countries: 1. *Lack of awareness* about non-healing wounds and available advanced treatments that are now the norm in developed countries. 2. *Health economics challenges*: Reduce the Gulf healthcare sector's dependance on government funding. Conduct and implement outcomes of health economics studies. Improving clinical outcomes should form the basis of product selection. 3. *Limited access to advanced treatments*: Improve access to advanced wound care options in the region.

Diabetic foot infection and osteomyelitis

There is a perception among diabetic foot specialists that the majority of current infection-treatment guidelines do not address the subtleties of diabetic infections in people with DFUs, which can lead to catastrophic patient outcomes faster than other wound aetiologies.
Refer to Fletcher et al (2024) for an in-depth discussion of this challenge.

Consensus Statement

Introduction

Diabetes increases susceptibility to infections (by 1.5–4 times) and leads to a higher rate of infection in extremities and a faster rate of infection spread (Edmonds et al, 2021; Holt et al, 2024). This means timely identification and infection treatment is crucial for people living with diabetes.

It is, however, more difficult to identify a newly developed infection in a person with diabetes because the symptoms may be subtle and not systemic (IWGDF, 2023). With at least half of all DFUs being infected at the time of presentation, identifying infection risk factors and early signs of a diabetic foot infection (DFI) is crucial. Awareness of local trends in infection pathogenesis and antibiotic stewardship are also important to ensure that the patient receives antibiotics as per their needs. Although some elements may be applicable, the current DFI recommendations from the IWGDF guidelines (2023) are not based on Gulf-specific data.

Consensus recommendations

Table 5 presents the recommendations from the panel experts.

Table 5: Consensus findings and recommendations to improve the management of diabetic foot infection and osteomyelitis in the Gulf region.

Consensus statement/question	Experts' consensus
The IWGDF 2023 guidelines defines infection as: 'A pathological state caused by the invasion and multiplication of microorganisms in host tissues that induce an inflammatory response, usually followed by tissue damage.'	The participants agree with this definition and find it applicable in the region.
The IWGDF/IDSA 2023 guidelines diagnose and classify DFIs in stages from 1–4 (uninfected, mild, moderate and severe, respectively), with an addition of 'O' if the infection involves bone (i.e. osteomyelitis) Do the consensus participants agree with this classification or is additional, Gulf-specific classification/ guideline required? Does this classification apply to chronic infection? Anecdotally, a rise in chronic DFIs has been recorded in the West and there is a need to investigate this in the Gulf region	Consensus was achieved that, although the IWGDF/IDSA classification is evidence-based, there is a need to: • Simplify the classification to an easy-to-follow flow chart that can be used by clinicians with any level of experience • Provide education to increase the confidence of clinicians in identifying DFI symptoms in a timely manner and make a treatment decision or escalate the case • Create a Gulf-specific DFI guideline after assessing published literature from the region; the IWGDF/IDSA guideline is based on PubMed publications or studies from countries outside Asia/Africa, hence not an accurate reflection of the Gulf DFI landscape.
The IWGDF/IDSA 2023 guideline provides wound-specific and general criteria for when a hospital admission is necessary in people with DFIs Are these criteria achievable and accepted in Gulf hospitals? If not, should the IWGDF/IDSA 2023 guideline be adapted to regional needs?	The guideline is not easy to apply to regional needs and should be made more user-friendly.
When investigating DFIs, general parameters/symptoms, blood tests, imaging and other specialised investigations are recommended by the IWGDF/IDSA 2023 guidelines What are the minimum tests required to assess diabetes patients for infections/osteomyelitis? Is achieving this minimum target feasible in the Gulf region?	The guideline does not set targets achievable in the Gulf region: • Create more realistic goals, especially with imaging and other specialised targets (e.g. positron emission tomography [PET] and computed tomography [CT]) because they are not consistently available across the region • Develop a short list of the minimum required number of tests required for DFI diagnosis, with a focus on regional availability of tests.

Table 5: Consensus findings and recommendations to improve the management of diabetic foot infection and osteomyelitis in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus

The IWGDF/IDSA 2023 guidelines outline empirical antibiotic treatment regimens based on DFI severity and patient history
 	
There is a significant need to alter these regimens, based on the type of infection and regional variations in microbial profile and growth patterns in the Gulf region, and manage the rise of antimicrobial drug resistance
	When a DFI is diagnosed:
	• Treat with broad-spectrum antibiotic until the microbial profile is received
	  - This can be best achieved within a MDT where microbiologists are included in both treatment decisions and follow-up.
	
	There was further consensus on the following points:
	• Currently, there is no regional consensus on the antibiotics that should be used for DFIs, with some antibiotics not available
	• The most common organisms causing DFIs are gram-negative (*Bacillus* species) in the Gulf countries; this contrasts the overall global data that show a predominant overall involvement of gram-positive organisms in DFIs
	• Therefore, there is a need to bring together infectious disease experts in the Gulf region to:
	  - Understand region-specific DFI patterns
	  - Assess treatment availability, cost-effectiveness and outcomes
	  - Amend the IWGDF/IDSA (2023) guidelines based on this data.

There is a need to define where the responsibility of DFI identification (e.g. emergency care staff versus other primary care professionals) and management lies Is there a need to ensure improved traceability of a person with DFI by creating a regional registry for the Gulf countries? In the Gulf region, should an MDT approach be made a compulsory part of DFI care, especially after hospital admissions or surgical infections? For diagnosis and management of a suspected DFI, the IWGDF/IDSA 2023 guidelines provide a suitable algorithm to optimise patient outcomes Are the targets set out in this algorithm acceptable and achievable in the Gulf region? If not, how can these targets be achieved?	There was an agreement on the overall management algorithm from the IWGDF/IDSA 2023 guidelines. In this regard, there is a need to: • Adapt and make DFI management targets achievable as per regional needs • Develop MDTs to manage DFIs • Provide education to HCPs and patients/carers to improve awareness of DFI management goals • Create a regional registry to ensure prompt and appropriate follow-up of people with DFIs.
To reduce DFI incidence across the Gulf region, there is a significant unmet need to introduce Quality Improvement Programmes (QIPs) via ongoing training and protocol refinement.	The participants agree with this need in the region.
There is a significant unmet need to create and implement a MDT protocol for the Gulf region for improving outcomes of diabetes-related infections and osteomyelitis.	There was a consensus on creating a MDT protocol for the Gulf region to improve outcomes of diabetes-related infections and osteomyelitis.

Charcot foot

In the Gulf region, there is a significant lack of surgeons who can treat Charcot foot deformity and DFIs. It is crucial to find suitable experts with the skills of modern limb salvage techniques, rather than experts in amputation of infected and deformed limbs. Surgical experts need to be identified regionally as a point of contact for clinicians to refer specific patients to.

Consensus Statement

Introduction

Charcot arthropathy (or simply, 'Charcot foot') is a disorder that affects people with neuropathy, such as those living with diabetes (Grant and Grant-McDonald, 2022). In Charcot foot, the bones and joints of the foot become fragile due to the multi-system effects of diabetes, leading to significant deformity and/or DFUs (Grant and Grant-McDonald, 2022; NLM, 2023c). This significantly impacts the daily life activities of the person with diabetes and can lead to amputations. Although Charcot foot is relatively rare (a prevalence of up to 1% of all people with diabetes), approximately 63% of all patients with Charcot foot develop ulceration with the associated complications (NLM, 2023c).

Due to the rarity and lack of awareness when conducting differential diagnosis of Charcot foot, there are significant challenges in managing Charcot foot in people living with diabetes.

Consensus recommendations

Consensus findings and recommendations on improving Charcot foot management are summarised in **Table 6**.

Table 6: Consensus findings and recommendations to improve Charcot foot outcomes in the Gulf region.

Consensus statement/question	Experts' consensus
There are useful clues in the history of a patient that can indicate Charcot arthropathy	Educate HCPs on the following warning signs in the patient's history: • Trauma (e.g. ankle sprain or falls) • Overuse activity • Recent angioplasty • No history of an open wound.
There are certain 'silent' Charcot foot symptoms that should trigger a check for detailed investigation	Increase awareness among HCPs of the following silent Charcot foot symptoms in people living with diabetes: • Erythema • Hotness • Swelling • Medial arch collapse • Adduction deformity • Lack of pain.
There are no definite laboratory tests that can help diagnose active Charcot foot	There was a consensus that the following laboratory tests can help differential diagnosis: • Differentiating with OM - Diffused bone marrow oedema seen in MRI can indicate Charcot arthropathy - In people with Charcot foot, blood tests for white blood cells (WBCs) and c-reactive protein (CRP) appear within normal range or show slight elevation - However, the erythrocyte sedimentation rate is also typically <70, which should be used to differentiate it from OM where ESR is higher (as well as CRP).
There is a need to highlight the appropriate use of imaging in early Charcot foot diagnosis	In stage 0 of Charcot foot, X-ray imaging does not provide any diagnostic indication. To diagnose Charcot foot, the following imaging should be performed, in the order of appearance: • Foot/ankle X-ray imaging • If X-ray imaging appears normal and Charcot foot is still suspected, perform an MRI of foot/ankle; if the MRI results also appear normal, Charcot foot is likely absent • Duplex venous ultrasound to rule out deep vein thrombosis.

Table 6: Consensus findings and recommendations to improve Charcot foot outcomes in the Gulf region. (Continued)

Consensus statement/question	Experts' consensus
There is an unmet need to educate HCPs on deciding when a patient has achieved active remission from Charcot foot	Undertake the following clinical and radiological assessments to assess whether remission of active Charcot foot has occurred: • Temperature: both feet appear at normal temperature • Reduced swelling and erythema • Use X-ray imaging to assess disease progression: bone consolidation indicates inactive Charcot foot stage.
Currently, there is a gold standard for initiating active Charcot foot management: TCC	Use complete immobilisation, via TCC, once active Charcot foot is confirmed: • A pneumatic walker is not recommended at this stage • Except in case of peripheral vascular disease or infected wounds.
There are no clear guidelines on the timeline for immobilisation when managing active Charcot foot	The following order of interventions was recommended: • TCC: 3 months, followed by re-evaluation of active Charcot foot presence; if no active Charcot foot, follow the steps below • Pneumatic walker: 2–3 months, followed by • Re-evaluation and assessment: – if the Charcot foot is suitable for conservative treatment, use diabetic shoes/ custom-made insole/large CROW boots – if the foot is unstable or there is an impending ulcer, refer to an orthopaedic or podiatric surgeon.
There is no medical need for surgical intervention in every Charcot foot case	Surgery should be considered in the following situations: • Instability • Impending ulcer/presence of ulcer • Non-braceable foot/ankle • Rear foot/ankle Charcot arthropathy. Avoid surgical treatment if the patient lives alone.
Charcot foot progression can be decreased with suitable interventions	People with Charcot foot in one limb are at higher risk of developing it in the unaffected foot. To prevent this risk and for a stable Charcot foot, use the following footwear as per the location of the deformity: • Diabetic shoes/custom-made insole • Charcot Restraint Orthotic Walker (CROW) boots/high-neck diabetic shoes.
In the Gulf region, active Charcot foot is nearly always diagnosed late.	To achieve early diagnosis and intervention: • Educate frontline HCPs (general physicians and nurses) about early diagnosis and management of both active and chronic Charcot arthropathy • Create a clear, simple clinical guideline that can be used by frontline HCPs • Provide clear pathways to HCPs for differential diagnosis (there are only a few Charcot foot specialists in the Gulf region, putting the burden of diagnosis on primary care HCPs)
There are significant challenges in the Gulf region in managing Charcot arthropathy	To improve patient outcomes in the Gulf region, there is an imminent need to implement the following solutions: • Create an expedited pathway for early referrals to specialised surgeons if Charcot arthropathy is suspected • Increase the number of specialised health care providers • Create a clear policy/guideline for Charcot foot management based on publications from databases originating within Asian and African countries (e.g. SCOPUS and Index Copernicus) – There is a need to include treatment options based on medicinal practices of Asia and Africa when traditional/modern options are not available (e.g. a TCC may not be available in a rural area but a similar treatment effect may be achieved by using alternative medicinal practices or adaptation of locally available materials).

The value proposition of the consensus

Overall, these recommendations have identified areas of significant need in improving diabetic foot management in the Gulf region [Figure 5]. The expert panel recommends to adapting the **'Four Cs'** of the consensus as outlined in Figure 6.

Figure 5: Major hurdles identified by the expert panel. *Abbreviation: HCP, healthcare professional.*

Figure 6: The four Cs recommended for improving the diabetic foot landscape in the Gulf region. *Abbreviation: HCP, healthcare professional.*

The future

Diabetes is highly prevalent in the Gulf region. Estimates on diabetes prevalence show the following numbers as percentage of the population living with diabetes: UAE, 12.3%; Oman, 15.7%; KSA, 23.7%; Kuwait, 25%; Bahrain, 14.7%; Qatar, 19–23% (Bandarian et al, 2022). Therefore, unsurprisingly, the prevalence of diabetic foot problems in the Gulf region stands at 15% (Data on File) — a number that needs urgent, focused attention from the governments, diabetes experts and healthcare professionals in the region.

In the short-term, urgent steps are needed to: 1. simplify the IWGDF guidelines (for local clinicians) and create Gulf-specific diabetic guidelines that address local challenges; 2. provide access to advanced, evidence-based wound care methods, such as NPWT and topical oxygen therapy (Widigdo et al, 2024; Hunt and Elg, 2017). These advanced treatments provide limb- and life-saving options, shorten healing time and reduce overall healthcare costs and clinician time. In the longer term, it is crucial to understand the challenges faced by the local population by assessing local clinical data and demographic issues. This can then lead to investment in educating HCPs, with a focus on primary care HCP education. This education should be accredited and adequate to develop decision-making confidence in HCPs when they are presented with a diabetic foot complication.

Diabetic foot complications are a huge burden and present a major challenge for patients, carers, clinicians and all regional governments. There is a significant unmet need to reduce this impact on the Gulf population and economies.

References

Arakawa N, Bader LR (2022) Consensus development methods: Considerations for national and global frameworks and policy development. *Res Social Adm Pharm* 18(1): 2222–9

Armstrong DG, Tan TW, Boulton AJM et al (2023) Diabetic Foot Ulcers: A Review. *JAMA* 330(1): 62–75

Bandarian F, Qorbani M, Nasli-Esfahani E et al (2022) Epidemiology of Diabetes Foot Amputation and its Risk Factors in the Middle East Region: A Systematic Review and Meta-Analysis. *Int J Low Extrem Wounds* 21: 15347346221109057

Bandyk DF (2018) The diabetic foot: Pathophysiology, evaluation, and treatment. *Semin Vasc Surg* 31(2–4): 43–8

Diamond IR, Grant RC, Feldman BM et al (2014) Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol* 67: 401–9

Driver VR, de Leon JM (2008) Health economic implications for wound care and limb preservation. *J Manag Care Med* 11(1): 13–9

Edmonds M, Manu C, Vas P (2021) The current burden of diabetic foot disease. *J Clin Orthop Trauma* 17: 88–93

Fletcher J, Edmonds M, Madden J et al (2024) *Demystifying infection in the diabetic foot.* Wounds UK

Galicia-Garcia U, Benito-Vicente A, Jebari S et al (2020) Pathophysiology of Type 2 Diabetes Mellitus. *Int J Mol Sci* 21(17): 6275

Grant W, Grant-McDonald L (2022) Beaming the Charcot Foot. *Clin Podiatr Med Surg* 39(4): 605–27

Holt RIG, Cockram CS, Ma RCW et al (2024) Diabetes and infection: review of the epidemiology, mechanisms and principles of treatment. *Diabetologia* 67: 1168–80

Hunt S, Elg F (2017) The clinical effectiveness of haemoglobin spray as adjunctive therapy in the treatment of chronic wounds. *J Wound Care* 26(9): 558–68

International Working Group on the Diabetic Foot. (2023) Practical guidelines on the prevention and management of diabetes-related foot disease. Available at: https://iwgdfguidelines.org/practical-guidelines-2023/ (accessed 11.10.24)

International Working Group on the Diabetic Foot/Infectious Disease Society of America (2023) Guidelines on the diagnosis and treatment of foot infection in persons with diabetes. Available at: https://iwgdfguidelines.org/wp-content/uploads/2023/07/IWGDF-2023-04-Infection-Guideline.pdf (accessed 24.07.24)

Maheswary T, Nurul AA, Fauzi MB (2021) The Insights of Microbes' Roles in Wound Healing: A Comprehensive Review. *Pharmaceutics* 13(7): 981

Mairghani M, Elmusharaf K, Patton D et al (2017) The prevalence and incidence of diabetic foot ulcers among five countries in the Arab world: a systematic review. *J Wound Care* 26(Sup9): S27–34

Nasa P, Jain R, Juneja D (2021) Delphi methodology in healthcare research: How to decide its appropriateness. *World J Methodol* 11(4): 116–29

National Library of Medicine (2023a) Type 2 diabetes. Available at: https://www.ncbi.nlm.nih.gov/books/NBK513253/ (accessed 14.10.2024)

National Library of Medicine (2023b) Diabetic Foot Infections. Available at: https://www.ncbi.nlm.nih.gov/books/NBK441914/ (accessed 15.10.2024)

National Library of Medicine (2023c) Charcot neuropathic osteoarthropathy. Available at: https://www.ncbi.nlm.nih.gov/books/NBK470164/ (accessed 15.10.2024)

Rossboth S, Lechleitner M, Oberaigner W (2020) Risk factors for diabetic foot complications in type 2 diabetes - A systematic review. *Endocrinol Diabetes Metab* 4(1): e00175

Singer ME, Dorrance KA, Oxenreiter MM (2022) The type 2 diabetes 'modern preventable pandemic' and replicable lessons from the COVID-19 crisis. *Prev Med Rep* 25: 101636

Sun H, Saeedi P, Karuranga S et al (2022) IDF Diabetes Atlas: Global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract* 183: 109119. Erratum in: *Diabetes Res Clin Pract* 204: 110945

Thornburg DA, Kowal-Vern A, Tettelbach WH et al (2021) Complex Limb Salvage with Placental-Based Allo-grafts: A Pilot Study. *Surgical Sci* 12: 76–94

Widigdo DAM, Sofro ZM, Pangastuti HS et al (2024) The efficacy of negative pressure wound therapy (NPWT) on healing of diabetic foot ulcers: A literature review. *Curr Diabetes Rev* 20(8): 1–11

World Health Organization (2023) Diabetes. Available at: https://www.who.int/news-room/fact-sheets/detail/diabetes (accessed 11.10.2024)

Viigimaa M, Sachinidis A, Toumpourleka M et al (2020) Macrovascular Complications of Type 2 Diabetes Mellitus. *Curr Vasc Pharmacol* 18(2): 110–6

Yachmaneni A Jr, Jajoo S, Mahakalkar C et al (2023) A Comprehensive Review of the Vascular Consequences of Diabetes in the Lower Extremities: Current Approaches to Management and Evaluation of Clinical Outcomes. *Cureus* 15(10): e47525

WOUNDS | INTERNATIONAL