SESLHD PROCEDURE COVER SHEET

NAME OF DOCUMENT	Wound - High Risk Foot Ulcer Management
TYPE OF DOCUMENT	Procedure
DOCUMENT NUMBER	SESLHDPR/653
DATE OF PUBLICATION	June 2021
RISK RATING	Medium
LEVEL OF EVIDENCE	National Safety and Quality Health Service Standards – Standard 5 – Comprehensive Care Standard 6 – Communicating for Safety
REVIEW DATE	June 2024
FORMER REFERENCE(S)	Nil
EXECUTIVE SPONSOR or EXECUTIVE CLINICAL SPONSOR	SESLHD Clinical Stream Director - Surgery, Perioperative & Anaesthetics
AUTHOR	Jointly between the SESLHD and ISLHD Podiatrist's Working Party (full list of contributors listed in section 8) and the SESLHD and ISLHD Wound management committee.
POSITION RESPONSIBLE FOR THE DOCUMENT	Andrewina Piazza-Davies Clinical Stream Nurse Manager Surgery, Perioperative & Anaesthetics Andrewina.Piazza-Davies@health.nsw.gov.au
FUNCTIONAL GROUP(S)	Surgery, Perioperative and Anaesthetic
KEY TERMS	Diabetic foot ulcer, High Risk foot, Peripheral Arterial Disease, Nerve damage, Loss of Protective Sensation
SUMMARY	This procedure outlines the scope of practice for clinicians in relation to the management of foot ulcers and related conditions. It provides procedures for assessment, management and referral for on-going management of diabetic related foot conditions.

1. POLICY STATEMENT

This procedure will assist health professionals working in hospital and community settings across SESLHD to appropriately manage foot ulcers, within their scope of practice. It will facilitate evidence based management pathways and is underpinned by international and local guidelines[1, 2].

The procedure will improve outcomes for people with foot ulcers through timely referral to multidisciplinary and/or interdisciplinary teams and ensure continuity of care across inpatient and outpatient/ambulatory care settings[2]. The procedure will not specifically include the surgical and endocrine management of patients but will provide the indications for referral.

Patients with Peripheral Arterial Disease (PAD) and Loss of Protective Sensation (LOPS) have an extreme risk of Pressure Injury. Prevention strategies must be implemented immediately, refer to SESLHDPD/326 - Pressure Injuries – screening, preventing and managing.

Within SESLHD there are dedicated multidisciplinary High Risk Foot Services (HRFS) for the management of patients with diabetes-related foot ulceration and Charcot's neuro-arthropathy. There are also podiatry wound clinics based at various sites across SESLHD. Only some facilities across SESLHD will be able to provide services for people with foot ulcers who do not have diabetes.

2. BACKGROUND

The way in which foot ulcers develop are similar in most patients. Patients with foot ulcers commonly present with having two or more risk factors, frequently in the presence of diabetes. The risk factors are

- Peripheral Neuropathy (nerve damage)
- Peripheral Arterial Disease (PAD - poor circulation)
- High plantar pressures/foot deformity.
- Previous foot ulcer or Lower Extremity Amputation (LEA)

Multidisciplinary High Risk Foot Service (MD HRFS) models of care are associated with a decrease in the frequency of LEAs in this patient cohort and are universally acknowledged as best practice models of care. [1, 2, 3.]

Podiatry Wound Clinics and High Risk Foot Service sites for ISLHD can be found in the appendix 1 and appendix 2.

Evidence shows that up to 28% of people who have a diabetes related foot ulcer (DFU) will require an amputation[3]. People who have had a diabetes related foot ulcers are at a lifelong risk of re-ulceration, with 40% of re-ulceration occurring within one year of the foot ulcer 'healing'[4]. The risk factors for foot ulcer development, and the comorbidities that

occur along side, they increase the mortality risk of this cohort of people. Preventing foot ulceration and associated risk factors is a vital part of the overall patient care plan.

Management of foot ulceration is guided by the following principles:

- Risk factor identification: peripheral neuropathy/LOPS, PAD, high plantar pressures, foot deformity, previous foot ulcer, previous toe/foot/leg amputation
- Pressure offloading and ulcer protection
- Restoration of tissue perfusion
- Treatment of infection
- Metabolic control and treatment of co-morbidities (including glycaemic control, obesity, oedema and malnutrition)
- Local foot ulcer care (including debridement, wound dressing and exudate management)
- Patient and caregiver education.

3. RESPONSIBILITIES

3.1 Employees who attend wound management will:

- Adhere to the content of this document
- Ensure they work within their scope of practice
- Attend relevant education related to this procedure
- Obtain and document valid consent before and during the proposed treatment/ procedure as per the NSW Health Consent to medical and Healthcare Treatment Manual
- Assess the wound, and in consultation with the patient/caregiver
    - develop an appropriate wound management plan
    - complete the wound management documentation
    - continue ongoing re-evaluation of the wound management plan (in collaboration with the multi-disciplinary team and the patient/caregiver)

3.2 Line Managers will ensure all clinical staff who attend wound management will:

- Be given the opportunity to attend district wound management education
- Work within the recommendations of this procedure
- Have appropriate resources to implement this procedure

4. DEFINITIONS

Autonomic neuropathy	Damage to the nerves which control involuntary actions, such as digesting food, gland function and temperature regulation. In the lower limb this can be noted with, but not limited to, a loss of skin integrity or dry skin.
Callus	Hyperkeratosis caused by excessive mechanical loading. Appears as a hardened area of skin.
Charcot Foot	Non-infectious destruction of bone and joint(s) associated with neuropathy, which, in the acute phase, is associated with signs of inflammation. Also known as Neuro-osteoarthropathy, neuropathic arthropathy or Charcot arthropathy.
Chronic Limb	The presence of PAD in combination with rest pain, gangrene, or a lower limb

Threatening Ischemia (CLTI)	ulceration >2 weeks duration. Note Venous, traumatic, embolic, and non-atherosclerotic aetiologies are excluded.
Debridement	Removal of callus or dead tissue by “sharp” or surgical method (e.g. using a scalpel at bed/chair-side or in surgery) or non-surgical (e.g. abrasion, chemical) method.
Diabetes foot infection (DFI)	Person with currently or previously diagnosed diabetes mellitus and infection in the foot (see Infection) where the person’s immune response is overwhelmed by infectious organisms.
Diabetes foot ulcer (DFU)	Foot ulcer in person with currently or previously diagnosed diabetes mellitus and usually accompanied by neuropathy and/or PAD in the lower extremity.
Electronic Medical Record (eMR)	An electronic record which tracks and details a patient’s care during the time spent in a health environment in a central database.
Exudate	Fluid that is released from the wound; it is composed of blood (serum, fibrin, and white blood cells) metabolic waste products, micro-organisms, liquid wound slough and devitalised tissue debris that escapes into a superficial lesion or area of inflammation . Also referred to as wound fluid or wound drainage.
Foot Ulcer/ Foot Wound	A break in the skin on a foot that is, at a minimum, to the depth of the epidermis and part of the dermis; but may affect deeper structures of the foot, such as tendon, joint capsule and bone.
Forefoot	The anterior part of the foot, that is composed of the metatarsal bones, the phalanges and associated soft tissue structures.
Health Literacy	The ability to obtain, read, understand, and use healthcare information in order to make appropriate health decisions and follow instructions for treatment.
High Risk Foot Service (HRFS)	A model of care supported by NSW Health where there is specialised, co-ordinated, multidisciplinary management of foot complications. There is evidence that HRFS improve patient outcomes in a cost-effective manner.
Infection	A pathological state caused by invasion and multiplication of microorganisms in host tissues accompanied by tissue destruction and/or a host inflammatory response.[1]
Interdisciplinary clinical team	A generally consistent grouping of clinicians who work together and whose interactions are guided by specific team functions and processes to achieve team- and patient-defined favourable outcomes. Members of interdisciplinary teams build on each other’s expertise to achieve common, shared goals.
Limited joint mobility	Reduced mobility of the joints of the foot, including the ankle, caused by changes in joints and associated soft tissues.
Loss of Protective Sensation (LOPS)	A sensory neuropathy that commonly affects the feet and hands. Occurs when nerves which detect touch and temperature are damaged.
Malnutrition	A state resulting from lack of uptake or intake of nutrition leading to altered body composition (decreased fat free mass) and body cell mass leading to diminished

	physical and mental function and impaired clinical outcome from disease.
Motor neuropathy	Damage to the nerves affecting muscle movement. This can commonly be seen as clawing of the lesser digits or muscle weakness.
Multidisciplinary (MD) team	A group of clinicians who work together and use their own expertise to develop individual care goals in a comprehensive care plan.
Obesity	Excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. Obesity can be associated with malnutrition.
Oedema	Observable swelling from fluid accumulation in body tissue.
Offloading device	An appliance or tool that moves pressure away from any area.
Orthotics	Any externally applied device used to modify the structural and functional characteristics of the neuromuscular and skeletal system.
Perfusion	The passage of fluid through the circulatory system or lymphatic system to an organ or a tissue, usually referring to the delivery of blood to a capillary bed in tissue.
Peripheral Arterial Disease (PAD)	Obstructive atherosclerotic vascular disease with clinical symptoms, signs or abnormalities on non-invasive vascular assessment, resulting in disturbed or impaired circulation in one or more extremities[1] In simple terms it causes a narrowing of arteries which results in reduced arterial blood flow.
Peripheral Neuropathy	A result of damage to the nerves outside of the brain and spinal cord (peripheral nerves) that causes weakness, numbness and/or pain; usually occurs hands and feet.
Plantar Foot Surface	The underside or surface of the foot that a person stands on.
Plantar Pressure	The distribution of forces over a given plantar foot surface, mathematically defined as ‘force divided over the contact area’. Often expressed as peak pressure or pressure-time integral.[1] Foot plantar pressure is the pressure field that acts between the foot and the support surface during any weight bearing action, such as walking or standing. Can also occur when in a resting state.
Pressure garment	A garment that applies continual pressure over large areas of healing skin. The garment adds additional compression beyond what normal clothing would, to help reduce swelling.
Prosthetics	Any artificial device that replaces a body part.
Rear foot	The posterior part of the foot that is composed of the talus and calcaneus, and associated soft tissue structures.[1]
Recurrent Foot Ulcer	A foot ulcer that occurs in the same location where they have had a foot ulcer before, that had healed.
Sensory	Dysfunction of sensory nerves. Disrupts detection of pain, vibration, pressure,

neuropathy	light touch, temperature and proprioception.
Strike-through	Refers to wound drainage that becomes visible on the outside of the wound dressings. Indicates the need for a more absorbent dressing regimen or more frequent dressing/wound reviews. Provides a possible portal of entry for micro-organisms to a wound.
Swab /Culture	A specimen collection of fluid (wound) to determine number and type of bacteria present. A wound should be cleansed prior to a swab being taken.
Vibratory Perception Threshold (VPT) test	A test performed using a handheld device to quantitatively measure the level at which vibratory sensation is felt. The device uses a specialized probe set at 100-Hz and has an adjustable amplitude ranging from 0-50 volts.
Wound Biopsy	Removal of cell or skin samples from the wound for the purpose of investigation. The main types of skin biopsy are shave biopsy, punch biopsy and excisional biopsy.

5. PROCEDURE

The following table outlines the actions staff must attend to within their scope of practice.

It is acknowledged that there will be some overlap across the fields (Patient/Foot/Wound) and the actions required.

Further information about how to perform the procedure and supporting education can be found in the appendices and International Working Group on the Diabetic Foot (IWGDF) Guidelines.

If the diagnosis of the foot wound is a Pressure Injury then the SESLHDPD/326 - Pressure Injuries – screening, preventing and managing must also be followed.

5.1 Assessment		
Field	**Actions**	**How**
Patient	Assess the patient to identify reasons that: • contribute to or cause foot wounds • impair wound healing • impact on the wound care plan	Include assessment of: • lifestyle factors • social factors • metabolic factors/co-morbidities • body mass • medications • nutrition • previous ulcer/amputation • falls risk • mobility • health literacy Refer to IWGDF Practical Guidelines

Foot	Look at the foot/feet and footwear to identify reasons that:
	• contribute to or cause wounds
	• impair wound healing
	• will impact on the wound care plan
	
	Note: The absence of symptoms of neuropathy or PAD in a person with diabetes does not exclude these conditions.
		Include assessment of
		• High Plantar Pressure:
		  ○ foot shape/structure/movement
		  ○ skin and nails (integument) e.g. callus, blisters, colour etc.
		  ○ walking patterns
		  ○ foot position when resting e.g. ensure patient's feet are not pressing against the end of bed plate
		• The fit, shape, condition, and suitability of footwear and devices:
		  ○ orthotics/ prosthetics
		  ○ shoes
		  ○ socks
		  ○ paddings
		  ○ pressure garments
		  ○ mobility devices
		• Neuropathy
		  ○ sensory
		  ○ autonomic
		  ○ motor
		• PAD
		Refer to IWGDF Practical Guidelines addendum for information on sensory foot examination.
		
		Refer to IWGDF PAD Guideline for clinical examinations and bedside diagnostic procedures recommended to identify or exclude PAD, and for which clinical signs, symptoms and/or non-invasive tests may predict ulcer healing and amputation

Wound	Complete wound assessment and documentation in eMR
	
	It is recommended that HRFS use a validated wound grading system to assess the wound.
	
	Note: clearly describe the anatomical location of the foot ulcer.
		Refer to SESLHDPR/297 - Wound assessment and management procedure
		
		See Appendix 3 for foot anatomical descriptors.
		Describe:
		• Foot (left or right)
		• Surface (plantar, dorsal, lateral, medial)
		• Location
		  ○ Toe (1st,2nd,3rd, 4th or 5th)
		  ○ Metatarsal area (base or head)
		  ○ Midfoot
		  ○ Heel
		  ○ Malleoli
		• Validated wound grading systems include but not limited to:
		  ○ 'WIFI' (Wound Ischaemia and Foot Infection),
		  ○ In diabetes related wounds 'SINBAD' (Site Ischaemia Neuropathy Bacterial Infection Area and Depth) or the University of Texas Diabetic Foot Ulcer Classification System.
		Refer to IWGDF Classification Guidelines

	Diagnose a soft tissue diabetic foot infection clinically, based on the presence of local or systemic signs and symptoms of inflammation.	See Appendix 4
	When indicated, refer for investigations: • X-ray • CT/MRI/Bone scan	Refer to IWGDF Infection Guidelines Note: Check with the multidisciplinary team for the X-ray views the team prefers. Commonly ordered views include weight bearing true lateral, anterior posterior (AP) and oblique views.

	When indicated, investigate with: • wound swab *and/or* • tissue biopsy *and/or* • bone culture	Refer to IWGDF Infection Guidelines for indicators
	Order relevant pathology E.g.: HBA1c (in diabetes), ESR, CRP Review results	Refer to IWGDF Infection Guidelines for recommendations
Consider the above assessments and develop the wound care plan in consultation with the patient or patient's advocate. This plan must be clearly documented in the patient's eMR. Appropriate treatment strategies, support and referral should be based on patient /advocate preference and evidence from the assessment.		

5.2 Management strategies		
Field	Actions	**How**
Patient	Promote lifestyle services and information that can assist with wound healing, including but not limited to: • smoking cessation • weight loss • nutrition • diabetes management • drug and alcohol education	Prescribed treatments, support and referral should be based on patient /advocate preference and evidence from the assessment. Note: Weight bearing exercises or water immersion activities such as swimming may not be appropriate in the presence of a foot wound.
	Refer for medical review when wound healing is delayed due to metabolic reasons, co-morbidities and /or medications. Promote referral to multidisciplinary teams for comprehensive care plan management.	Medical teams that may need to review include, but are not limited to: • Bariatric medicine • Endocrinology • Hyperbaric medicine • Infectious disease • Orthopaedic surgery • Plastic surgery • Vascular surgery • Rehabilitation • Renal medicine

	Refer for medical review when assessment suggest a serious foot infection and/or potential indicators for hospitalisation.	Refer to Table 2 in the IWGDF Infection Guidelines Out-patients Refer to Appendix 5 Pathway for Outpatient Podiatry Patients for Acute Medical Care
Foot	Refer patient for devices that promote healing by relieving pressure when resting and/ or walking.	Offloading devices include but are not limited to: • total contact casts • controlled ankle motion boots • orthoses and splints • padding • pressure care products and devices Refer to IWGDF Offloading Guidelines for recommended off-loading device selection Refer to Diabetic Foot Australia Guideline on Footwear for People with Diabetes[10]
	Ensure patient's footwear, offloading devices and socks are safe for the affected and unaffected foot and not likely to contribute to pressure or falls risk. Note: patients who have a foot ulcer should not walk without a protective dressing and offloading device in place.	Shoe lift products such as an "Even up" device can be used to reduce leg length differences when patients are walking. Post-operative shoes can be used to accommodate bulky wound dressings. Refer to IWGDF Offloading Guidelines for footwear recommendations. Refer to Diabetic Foot Australia Guideline on Footwear for People with Diabetes[10]
	Refer patient for suitable pressure garments when indicated.	Refer to SESLDHPR/398 - Wound – Compression Therapy
	Refer patient for mobility devices when indicated.	Mobility devices include but are not limited to: • walking stick • crutches • knee scooter • wheelchair Note: physiotherapists, occupational therapists and/or podiatrists can advise on referral pathways for assessing a patient's

		suitability to use a device and accessing devices.
Wound	Debride wound when indicated.	Refer to SESLHDPR/348 - Wound Debridement Refer to IWGDF Wound Healing Interventions Guideline
	Select appropriate wound dressing. Note: not all wound dressing products are suitable for use on feet. For example, occlusive and silicon-based dressings are not usually recommended for use on plantar foot ulcers.	Refer to IWGDF Wound Healing Interventions Guideline Refer to SESLHDPR/297 - Wound assessment and management procedure
	Apply wound dressing and then apply prescribed offloading.	
	Inspect the dressing regularly for exudate strike through and/ or dislodgement and modify wound care plan accordingly. In the non-admitted patient setting, advise the patient or their advocate/caregiver to inspect the dressing regularly for exudate strike through and/ or dislodgement and provide contact details on who to contact for prompt wound plan review.	
	Where appropriate, promote the use of a cast protection sleeve or plastic bag sealed	

	around leg to keep dressings dry when patient is showering/washed	
	Refer to IWGDF Infection Guideline for treatment recommendations of Diabetic Foot Infection (DFI).	Refer to IWGDF Infection Guidelines
	Consider the use of systemic hyperbaric oxygen therapy as an adjunctive treatment in non-healing foot ulcers.	Refer to IWGDF Infection Guidelines Refer to POWH Department of Diving and Hyperbaric Medicine when appropriate (or private hyperbaric services where available).
	Consider the use of sucrose-octasulfate impregnated dressings in neuro-ischaemic diabetes relate foot ulcers that are difficult to heal despite best standard of care, once treatment of foot ulcer has been initiated.	Refer to multidisciplinary team for dressing prescription as part of the comprehensive care plan. Refer to IWGDF Wound Healing Interventions Guideline
All aspects of the agreed management plan must be provided with supporting education to the patient or the patient's advocate and include education about preventative care. This information must be clearly documented in the patient's eMR. For more information about preventative care see Refer to IWGDF Prevention Guidelines and IWGDF Practical Guidelines		

If any adverse events occur during the management of a foot ulcer report via the IMS+ notification system see NSW Ministry of Health Policy Directive PD2020_047 - Incident Management Policy.

6. DOCUMENTATION

- Wound assessment and management plan (form number S0056) or electronic equivalent e.g. Wound Assessment Treatment Evaluation Plan (WATEP).
- Any additional comments are to be recorded in the patient's health care record, including:
    - valid consent given
    - discussion re treatment options
    - discussion re patient goals (short and long term)
    - aspects of the education given on

    - prevention of foot ulcers
    - managing wound dressing
- Transfer or clinical handover documentation e.g. from community to hospital or vice versa
- Discharge letters should include wound assessment and management plan information
- When appropriate, attach digital wound photo/images to patient's health care record per SESLHDPR/285 - Wound-Clinical Digital Photography procedure.
- Complete IMS+ if:
    - any adverse events occur during the management of a foot ulcer
    - there were any breaches in Aseptic Non-Touch Technique during dressing procedures

6. AUDIT

Not required

7. REFERENCES

7.1 Internal references

Infection prevention and control policies and procedures

- NSW Ministry of Health Policy Directive PD2017_013 - Infection prevention and control policy
- CEC Infection prevention and control practice handbook 2020

Wound Care policies and procedures

- SESLHDPR/146 - Wound - Antiseptic Dressings
- SESLHDPR/285 - Wound - Clinical Digital Photography
- SESLHDPR/400 - Wound - Management of Hypergranulation Tissue
- SESLHDPR/136 - Wound - Negative Pressure Wound Therapy (NPWT)
- SESLHDPR/437 - Wound - Managing Pain at dressing change
- SESLHDPR/297 - Wound - Wound assessment and management procedure
- SESLHDPR/398 - Wound - Compression Therapy
- SESLHDPR/348 - Wound - Wound Debridement

Falls prevention policies and procedures

- SESLHDPR/380 - Falls prevention and management for people admitted to acute and sub-acute care
- SESLHDGL/044 - Falls Prevention and Management for non-admitted patients
- SESLHDGL/088 - Standard 5 Comprehensive Care – Guidelines

Clinical incident

- NSW Ministry of Health Policy Directive PD2020_047 - Incident Management

7.2 External references

Number	Reference
1	Diabetic foot disease - IWGDF Guidelines on the prevention and management of diabetic foot disease assessed December 2020 Chapters • Classification - Monteiro-Soares_et_al-2020-IWGDF-clasification-review.pdf • Definitions - van-Netten_et_al-2020-definitions-and-criteria.pdf • Infection - Lipsky_et_al-2020-IWGDF-infection-guideline.pdf • Off-Loading - Bus_et_al-2020-IWGDF-offloading-guideline.pdf • Peripheral Artery Disease - Hinchliffe_et_al-2020-IWGDF-PAD-guideline.pdf

	• Practical - Schaper-et-al-2020-IWGDF-practical-guidelines.pdf • Prevention - Bus_et_al-2020-IWGDF-prevention-guideline.pdf • Wound-Healing - Rayman_et_al-2020-IWGDF-wound-healing-guideline.pdf
2	Standards for High Risk Foot Services (HRFS) in New South Wales. Agency for Clinical Innovation 2014
3	National Evidence Based Guideline, Prevention, Identification and Management of Foot Complications in Diabetes, The George Institute, Baker IDI, AHTA, Commonwealth of Australia, April 2011
4	World Union of Wound Healing Societies (WUWHS), Consensus Document. Wound exudate: effective assessment and management, Wounds International, 2019
5	Wounds Australia. Standards for Wound Prevention and Management. 3rd edition. Cambridge Media: Osborne Park, WA; 2016
6	Diabetes. 2019. Diabetes Neuropathy. Available at https://www.daibetes.co.uk/diabetes-complications/diabetes-neuropathy.html. Accessed 12 June 2019
7	Armstrong DG, Lavery LA, Vela SA, Quebedeaux TL, Fleischli JG. 1998. Choosing a Practical Screening Instrument to Identify Patients at Risk for Diabetic Foot Ulceration. *Arch Intern Med*. 158(3):289–292. doi:10.1001/archinte.158.3.289
8	Boulton, AJM, Armstrong, DG, Albert, SF, Frykberg, RG, Hellman, RM. Comprehensive Foot Examination and Risk Assessment
9	Conte MS, Bradbury AW, Kolh P et al. 2019.Global Vascular Guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg Jun; 69; S3-1255 e40
10	van Netten, JJ., Lazzarini, PA., Armstrong, DG. et al (2018). Diabetic Foot Australia guideline on footwear for people with diabetes. J Foot Ankle Res 11, 2 (2018).
11	Santema TB, Poyck PPC, Ubbink DT. Skin grafting and tissue replacement for treating foot ulcers in people with diabetes. Cochrane Database of Systematic Reviews 2016, Issue 2. Art. No.: CD011255. DOI: 10.1002/14651858.CD011255.pub2
12	NSW Health Consent to Medical and Healthcare Treatment Manual 2020 https://www.health.nsw.gov.au/policies/manuals/Publications/consent-manual.pdf accessed Jan 2021

8. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
August 2020	DRAFT	SESLHD and ISLHD Wound Management Committee with content supplied by SESLHD & ISLHD podiatrist's working party: Jayne McGreal (Lead), POWH Podiatrist co-ordinator Diabetes HRFS; Siobhan Sullivan, POWH Podiatrist Diabetes HRFS; Corina Billingham, SGH/TSH Podiatrist Diabetes HRFS; Alan Kennedy, SGH/TSH Podiatry HOD/ Podiatry advisor SESLHD; Jessica Kronenberg, SGH/TSH Podiatrist Diabetes HRFS; Sukhmani Kalra, ISHLD Podiatrist HRFS; Leah Valentine, ISHLD Podiatrist HRFS
August 2020	DRAFT	Draft for comment period.
March 2021	DRAFT V2	SESLHD and ISLHD Wound Management Committee with content supplied by SESLHD & ISLHD podiatrist's working party: Jayne McGreal (Lead), POWH Podiatrist co-ordinator Diabetes HRFS; Siobhan Sullivan, POWH Podiatrist Diabetes HRFS; Corina Billingham, SGH/TSH Podiatrist Diabetes HRFS; Alan Kennedy, SGH/TSH Podiatry HOD/ Podiatry advisor SESLHD; Jessica Kronenberg, SGH/TSH Podiatrist Diabetes HRFS; Sukhmani Kalra, ISHLD Podiatrist HRFS; Leah Valentine, ISHLD Podiatrist HRFS
April 2021	DRAFT	Final version approved by Executive Sponsor. To be tabled at Clinical

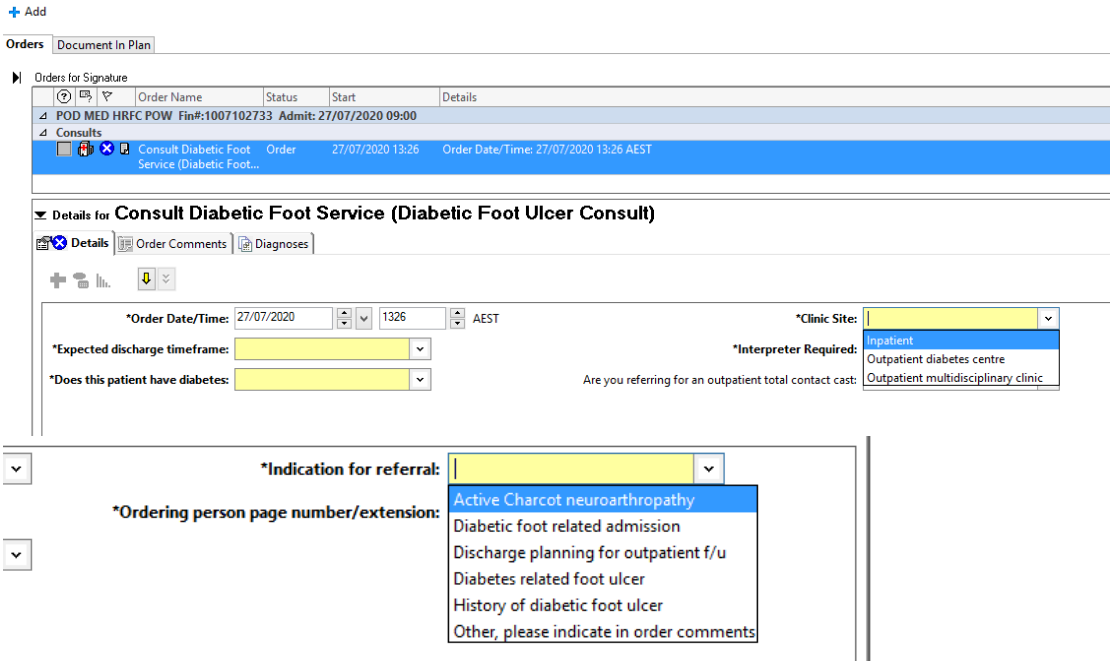
		and Quality Council meeting.
June 2021	1	Approved at Clinical and Quality Council.

Appendix 1: Podiatry Wound Clinics and High Risk Foot Service (HRFS) referral pathways: SESLHD

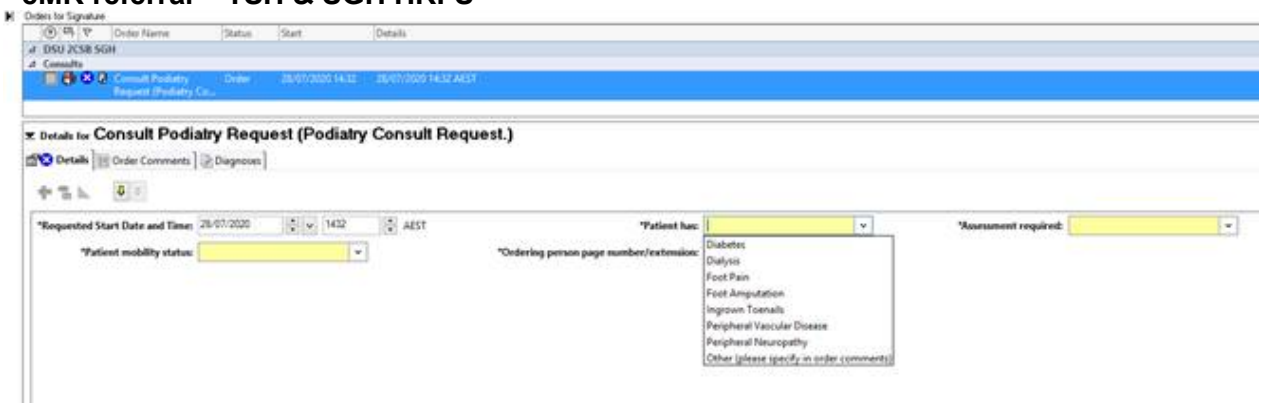
High Risk Foot Clinics are located at the following sites within SESLHD

- Prince of Wales Hospital
- St George Hospital
- The Sutherland Hospital
- St Vincent's Hospital

eMR referral – POW HRFS



eMR referral – TSH & SGH HRFS

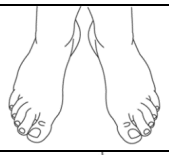
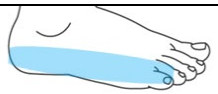
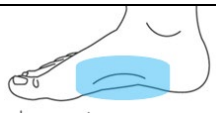
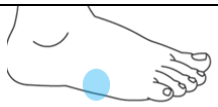
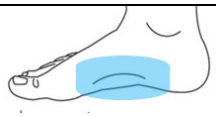
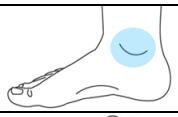
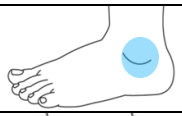
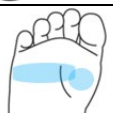


SVH HRFS email referral to SVHS.HRFS@svha.org.au or fax to 8382 3327

Appendix 2: NSW HEALTH High Risk Foot Services

A Directory of High Risk Foot Services across NSW is available on the ACI website Diabetes High Risk Foot Hub. The directory is updated every 6 months. It can be viewed once NSW Health employee has applied for permission to access via the webpage link below. High Risk Foot Service staff can assist with linking patients into local HRFS.

Appendix 3: Descriptors of Foot Anatomy

Plantar surface			Dorsal surface	
Lateral side of foot			Medial side of foot	
Interdigital or inter toe area			Base of the 5th metatarsal	
1st toe or Hallux			Base of the 1st Metatarsal	
2nd toe			Midfoot Area	
3rd toe			Forefoot Area	
4th toe			ILA	
5th toe			Calcaneal area	
Medial Malleoli			Lateral malleoli	
MTP Joints			IP Joints	
Apex of toes			Nail sulci area	

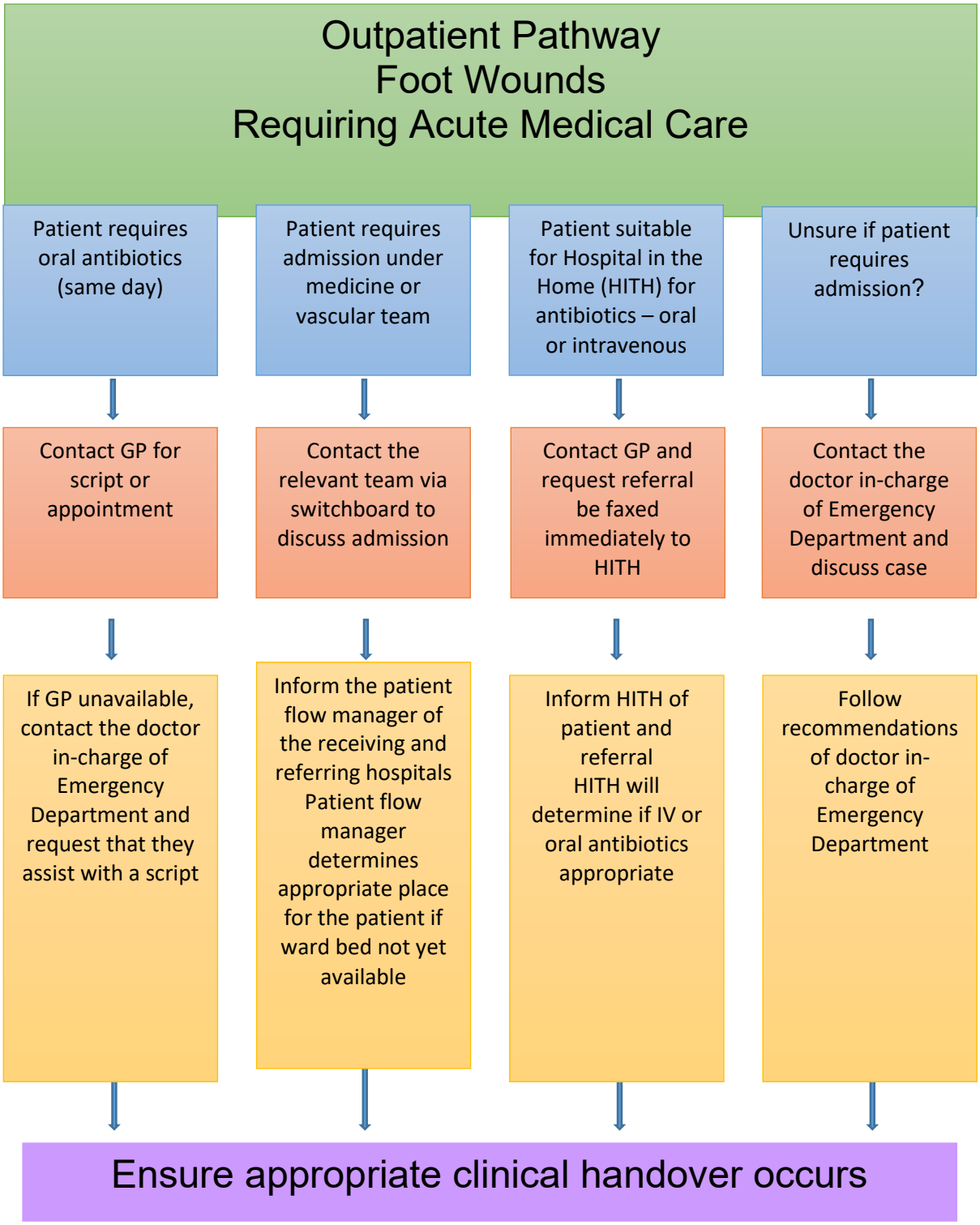
Appendix 4: Defining the presence and severity of an infection of the foot in a person with diabetes

TABLE 1 from the IWGDF Infection Guideline: The classification system for defining the presence and severity of an infection of the foot in a person with diabetes

Clinical classification of infection, with definitions	IWGDF classification
Uninfected: No systemic or local symptoms or signs of infection	1 (uninfected)
Infected	
At least two of these items are present: • Local swelling or induration • Erythema >0.5 cm*around the wound • Local tenderness or pain • Local increased warmth • Purulent discharge And no other cause(s) of an inflammatory response of the skin (e.g. trauma, gout, acute Charcot neuro-osteoarthropathy, fracture, thrombosis, or venous stasis)	
Infection with no systemic manifestations (see below) involving • only the skin or subcutaneous tissue (not any deeper tissues), and • any erythema present does not extend >2 cm** around the wound	2 (mild infection)
Infection with no systemic manifestations and involving • erythema extending ≥2 cm* from the wound margin, and/or • tissue deeper than skin and subcutaneous tissues (e.g., tendon, muscle, joint, and bone,)	3 (moderate infection)
Any foot infection with associated systemic manifestations (of the systemic inflammatory response syndrome [SIRS]), as manifested by ≥2 of the following: • Temperature, >38^{0}C or <36^{0}C • Heart rate >90 beats/min • Respiratory rate, >20 breaths/min or PaCO2 < 4.3 kPa (32 mmHg) • White blood cell count >12 000/mm^3, or <4000/mm^3 , or >10% immature (band) forms	4 (severe infection)
Infection involving bone (osteomyelitis)	Add “(O)” after 3 or 4***

Note: * Infection refers to any part of the foot, not just of a wound or an ulcer.
** In any direction, from the rim of the wound.
***If osteomyelitis is demonstrated in the absence of ≥2 signs/symptoms of local or systemic inflammation, classify the foot as either grade 3(O) (if
The presence of clinically significant foot ischemia makes both diagnosis and treatment of infection considerably more difficult.

Appendix 5: Outpatient Pathway Foot Wounds



Education Section

1. Patient assessment

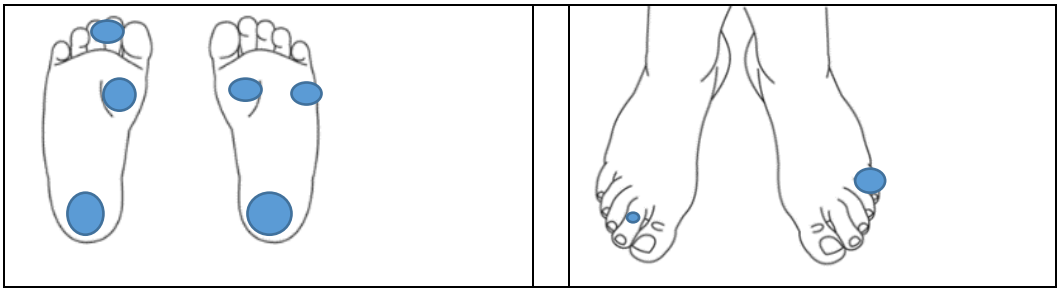
In addition to assessing a patient with a foot ulcer for metabolic co-morbidities, people who have had a previous foot ulcer or lower extremity amputation due to diabetes foot disease are considered high risk of developing ulceration for the remainder of their life. [I,2,3]
Please ensure this patient cohort are aware of how to access podiatrists or HRFS in their local health district.

2. Foot assessment

High plantar pressures:

2.1 Foot shape/structure/movement

- In the presence of PAD and/or LOPS, foot deformity and high pressures within and on the feet increase the risk of developing foot ulcers.
- Wound healing will be delayed if high foot pressures are not identified and appropriately managed.
- A change in foot shape is likely to result in high pressures in the foot when standing or walking. Some common foot shape changes include toe retractions (sometimes called clawing) and bunions.
- High plantar pressures can also be the outcome of loss of joint range of movement from bone, muscle, or tendon/ligament changes.
- Common sites of high foot pressure areas in the feet are at the apex or tips of toes, between toes, the ball of the foot, heel areas, malleoli (ankle bones), and the dorsal surface of toe joints. See diagram below:



2.2 Skin and toenails

- High foot pressures are indicated when there is hardened hyperkeratosis (calluses/corns) on the foot and may be a contributing factor when there are changes in skin integrity, such as blistering or soft tissue inflammation. A foot callus with bleeding underneath (can appear brown, red, dark and/or blister like) indicates underlying soft tissue damage and possible ulceration. This requires prompt assessment for callus debridement.
- Referral to a podiatrists for callus debridement and offloading is indicated when plantar callus is noted in people who have LOPS.
- A thick toenail can lead to high pressure on the nail bed. This can cause a wound. A wound under the nail can be difficult to see. The nail will usually appear to have a shadow underneath it.

2.3 Walking patterns

- Reduced joint range of motion and toe or foot amputations affect the way a person walks and can lead to abnormally high pressures in and on the foot.
- Full biomechanical assessment can identify potential areas of high pressure that can cause wounds and/or prevent wound healing.
- It is important to look for potential areas of high pressure when the person is standing still and while they are walking as pressure patterns change with motion, including sheer, friction and direct pressure.
- Some HRFS have access to computerised gait assessment / analysis of in-shoe plantar pressure to evaluate pressure offloading. Pressure mapping using this technology can be useful for demonstrating the effectiveness of offloading devices and thus promoting their use to patients and advocates.

2.4 Foot position when resting

- In the presence of neuropathy there may be a loss of twitch and reduced movement in the foot at rest. This low pressure applied over a long period of time to areas such as heels, causes a heightened risk for pressure injury especially when the patient has loss of feeling in the feet.

3. Footwear and Devices:

- Inspect orthotics/ prosthetics, shoes, and socks for wear. Inspect inside and outside of the shoe. The patient may not be able to feel shoe linings that are rough or have worn away.
- The shoe should fit the foot well. A shoe that is too narrow or too short or not deep enough will cause pressure damage to the foot. A shoe that is too big will cause injury to the foot from friction.
- Paddings that are used to protect the foot must be in good condition and fit inside the footwear.
- Mobility devices such as walking sticks, walking frames, crutches, knee scooters and wheelchairs can be helpful by reducing load on the wound. Before recommending such devices, suitability will need to be established by staff if assessment is within their scope of practice. A referral to see a physiotherapist, occupational therapist or podiatrist may be required.

4. Neuropathy:

One of the primary risks leading to the development of foot ulcerations is LOPS associated with neuropathy (nerve damage). Symptoms in the feet that are suggestive of LOPS include:

- numbness
- hyperaesthesia and pain
- tingling sensations
- burning sensations

4.1 Sensory neuropathy is assessed using:

- 10g monofilament (5.07 Semmes-Weinstein) which detects loss of protective sensation
- 128Hz tuning fork or a Vibratip© (detects loss of vibration sensation)
- A biothesiometer, also known as a neurothesiometer (measures vibratory perception

thresholds)

If these assessment tools are not available then the “Light touch test” can be attended. This test has reasonable agreement with these tests to determine LOPS, but its accuracy in predicting foot ulcers has not been established.

The addendum in the International Working Group on the Diabetic Foot (IWGDF) 2019 Practical Guidelines on the Prevention and Management of Diabetic Foot Disease[1] contains additional information about assessing for neuropathy and instructions on how to assess using:

- 10g monofilament
- 128Hz tuning fork
- Light touch test

There is no treatment to reverse sensory loss, however tight glycaemic control provides the best protection against progression of peripheral neuropathy. Risk factors for peripheral neuropathy include advanced age, long duration of diabetes, higher glycosylated haemoglobin level and increased height (independent of ethnicity and sex). Inability to detect the 10g monofilament and reduced vibratory perception are the tests most predictive of foot ulceration and hence are the most important tests to perform. Current wisdom urges early detection of neuropathy, so that people who have lost protective sensation can be offered preventive strategies such as foot care education and preventive foot care for non-ulcerative foot pathology.

The biothesiometer provides a semi-quantitative measure of neuropathy by providing a measure of VPT. The threshold is dependent on age, presence of neuropathy and the patient's ability to interpret the test.

There is a strong association between foot ulceration in people with diabetes and increased VPT. Elevated VPT is a useful predictor of ulcer risk. See Table 1

VPT	Risk of ulceration
Result greater than 25	10 times more likely to ulcerate
Result greater than 43	30 times more likely to ulcerate

Table 1 Risk of ulceration based on vibratory perception threshold (VPT)

A 128Hz tuning fork can be used as an alternative to the biothesiometer, in addition to the 10g monofilament for assessing protective sensation.

4.2 Autonomic Neuropathy

Damage to autonomic nerves can cause skin dryness and changes to the skin integrity. If the skin cracks from dryness, the risk of infection increases. Poor skin integrity is easily damaged from pressure, including walking, and is at a high risk of ulcerating. Sudoscan is a non-invasive measure of sudomotor function and may be available in some departments. It measures sweat gland function controlled by small nerve fibres.

4.3 Motor Neuropathy

Motor neuropathy damages to the nerves affecting muscle movement. It can lead to changes in foot shape, muscle strength, joint flexibility and loading of the foot and so affects pressure patterns on the foot when resting and walking.

Nerve Conduction studies are invasive medical diagnostic tests that evaluate the function of motor and sensory nerves.

5. Peripheral Arterial Disease (PAD):

The presence of PAD in people with foot ulceration is associated with most severe adverse outcomes such as:

- lower probability of healing
- longer healing times
- higher probability of ulcer recurrence
- increased amputation risk

Patients with PAD and diabetes represent a special subgroup compared to patients with PAD who do not have diabetes. Patients with PAD plus diabetes tend to present with:

- severe tissue loss without significant symptoms
- onset of PAD at an earlier age
- disease that advances more aggressively with higher risk for amputation
- a different distribution of involved vessels i.e. tibial, peroneal and popliteal arteries with impaired collateral formation and more medial calcification.

The presence of lower limb ischemia is a predictor of amputation because it delays or may even prevent healing. Delivery of systemic antibiotics can be compromised, leaving infections uncontrolled to the affected foot.

The presence and severity of ischemia has important implications for treatment and management of wounds. All patients need to have a vascular history taken and baseline clinical assessment of their pedal pulses to determine the aetiology of the wound prior to treatment.

Every patient who presents with a foot ulcer should have an assessment for PAD at their initial assessment and regularly throughout their treatment. Those who present with ulceration > 2 weeks duration or gangrene in the presence of atherosclerotic PAD can be diagnosed with Chronic Limb Threatening Ischemia (CLTI) which requires specialist vascular review and treatment.

All patients with foot ulcers plus signs and /or symptoms of PAD, including slow healing foot ulcers, should be referred for non-invasive clinical tests such as:

- Pedal Doppler Arterial Waveforms
- Ankle Systolic Pressure
- Ankle Brachial Pressure Index (ABPI)
- Toe Systolic Pressure
- Toe Brachial Pressure Index (TBPI)
- Transcutaneous Oxygen Pressure

Specialist imaging of vascular anatomy, such as colour duplex ultrasound and computed tomographic angiography, magnetic resonance angiography or intra-arterial subtraction angiography is recommended to evaluate both the level and presence of PAD as well as to plan for surgery. Selection of examination is at the discretion of the vascular team, as multiple factors including availability of testing, patient co-morbidities and local expertise need to be taken into account regarding modality choice.

5.1 Symptoms of peripheral arterial disease

Medical history and clinical examination can suggest the presence of PAD in a patient with a foot ulcer, however a lack of symptoms may occur when the patient has neuropathy.

Symptoms and signs of PAD include:

- rest pain
- intermittent claudication
- temperature coolness of the feet and toes
- pallor on elevation of the limb or rubor/reactive hyperaemia on dependency
- poor skin and nail integrity
- wound(s) that are slow to heal and ischaemic in appearance (pale granulation tissue with or without eschar and with irregular margins) where other causes of delayed healing have been excluded.

Rest pain and claudication pain can be masked by neuropathy and arterio-venous shunting from autonomic neuropathy can result in warm foot, making assessment of foot temperature unreliable.

Patients with significant PAD may describe symptoms of intermittent claudication. This type of pain is induced by exercise and alleviated rapidly (within 15 minutes) with rest. Patients may describe a cramp-like or severe pain in the region of the calf, thigh and gluteal muscles that has a predictable course. Onset occurs with walking a certain distance or climbing stairs and will dissipate when they stop to rest.

Rest pain represents more severe PAD as the ischemia occurs without exercise. Pain is typically worse at night or when the feet are elevated, and is described as a burning or aching pain. It is alleviated by hanging the legs in a dependent position or walking to improve blood flow.

Initial investigations for PAD can be completed in a clinical setting without specialist equipment. Minimum recommended assessment includes:

Assessment	Investigations	Considerations
History taking	• ischemic rest pain >2 weeks duration • claudication pain • previous ischaemic ulceration or gangrene • cardiovascular risk factors • medication history • previous revascularisation procedures • previous amputations • frailty assessment • functional status	
Physical examination	Palpation of lower limb pulses: • posterior tibialis • dorsalis Pedis	Palpable pulses do not exclude the presence of PAD. They may help determine

		the presence and distribution of arterial disease.
	• Buerger's sign (pallor of the foot on elevation and rubor on dependency) • capillary fill time	
Observations of nonspecific features frequently observed in patients with PAD	• skin colour and integrity e.g. pallor, cyanosis, cold and shiny • toenail changes – thick, chalky • hair loss • muscle atrophy	

Assessment of Doppler waveforms in combination with ankle systolic pressure (AP) and systolic Ankle Brachial Pressure Index (ABPI) or Toe Systolic Pressure (TP) and Toe Brachial Pressure Index (TBPI) measurement		
Investigation	**Result**	**Considerations**
Hand held Doppler waveforms	• a triphasic waveform being present indicates a less likely diagnosis of peripheral arterial disease • a biphasic waveform indicates mild to moderate artery disease but is not diagnostic • a monophasic waveform indicates incompressibility of the arteries commonly seen with medial arterial wall calcification	Note: Falsely elevated ABPI can be suspected when ABPI falls in or near the normal range but is associated with dampened monophasic waveforms.
Ankle Pressure (AP) and Ankle Brachial Pressure Index (ABPI)	• AP and calculation of ABPI (highest AP of the Dorsalis Pedis and Posterior Tibial artery divided by highest brachial systolic pressure) is recommended as the first-line non-invasive hemodynamic test in all patients presenting with foot ulcer. • AP and ABPI results are not accurate in people with diabetes or end stage renal disease if the arteries are incompressible (from calcification)	• AP <50 mm Hg or ABPI <0.4 is associated with CLTI and *requires urgent vascular review.* • An ABPI >1.4 indicates incompressibility of the arteries falsely elevating the ABPI • Falsely normal AP and ABPI may be noted when calcification of arteries is present

	• TP or TBPI is the preferred first line hemodynamic measure in this cohort of patients.	

Refer to IWGDF PAD Guidelines[1] for more information

Palpation of dorsalis pedis (Figure 4a) and posterior tibial arteries (Figure 4b).

Figure 4a

Figure 4b

6. Wound assessment

6.1 Foot Ulcer assessment

Assessment of a foot ulcer follows the same principals of universal wound care for observing and describing the wound. In addition, it is important to assess:

- off-loading strategies or devices
- contributing muscular skeletal issues
- footwear and socks or pressure garments
- co-morbidities such as diabetes, loss of protective sensation and/or impairment of peripheral arterial flow and nutrition.

These are complex patients that require multidisciplinary care and thus are best managed by HRFS teams.

6.2 Imaging

In a person with diabetes and suspected osteomyelitis of the foot, IWGDF[1] recommends using a combination of the probe-to-bone test, the erythrocyte sedimentation rate (or C-reactive protein and/or procalcitonin), and plain film X-rays as the initial studies to diagnose osteomyelitis.

If the diagnosis of osteomyelitis remains in doubt, consider ordering an advanced imaging study such as magnetic resonance image (MRI) scan, 18F-FDG-positronemission tomography/computed tomography (CT) or leukocyte scintigraphy (with or without CT). Weight bearing X-rays are useful for assessing bone alignment and in evaluating underlying pressure sources.

7. Management:

7.1 Patient

Patient and caregiver education

Education consists of information (verbal and written given in an appropriate manner and /or language to assist the patient's understanding) on how foot ulcers can occur and their consequences. It should be continued throughout the patient's episode of care. It includes

information on:

- Preventative behaviours such as:
  - protecting feet with footwear at all times
  - wearing socks
  - avoiding thin-soles slippers/footwear indoors as well as outdoors
- How to perform:
  - regular foot checks
  - foot hygiene
  - safe foot care
  - general first aid appropriate to wound cause including burns first aid
- Reasons why there could be delays in wound healing see poster Why Won't My Foot Wound Heal
- Directions on seeking help after identifying a foot problems.

Identifying a patient's goals with respect to their foot ulcer will guide education provided. At a minimum, patients and their advocates will need to be informed of/about:

- dressing plan including dressing frequency and who will be performing re-dressings
- offloading plan (e.g. total contact cast)
- ongoing wound review appointments
- contact details for the treating clinician and clinic contact details
- foot hygiene and safe foot care
- monitoring signs of infection Appendix 4

Therapeutic footwear should be recommended for people who have had a foot ulcer, once healed. Footwear needs to be wide and deep enough to avoid pressure from changes in foot shape. The MD team will advise on strategies to reduce foot pressures, which may include surgical or conservative interventions. Conservative measures include orthotics, silicon wedges and toe props as well as foot mobility and exercises that target increased range of motion (ROM) to the foot and ankle.

MD HRFS can assist with providing education resources.

See the Diabetic Foot Australia Guideline on Footwear for People with Diabetes[10]

And IWGDF Preventative Care Guideline[1]

Restoration of tissue perfusion
Patients with a foot ulcer that does not improve within 4-6 weeks despite optimal wound care, offloading, management of co-morbidities and management of infection, are recommended to be reviewed by a vascular specialist for assessment of current tissue perfusion regardless of hemodynamic testing results and clinical examination.

7.2 Foot

- All patients with DFUs need to have offloading as part of their wound care plan.
- A large range of offloading devices are available including TCC, CAM boots, post-operative shoes (often referred to as Darco shoes NB Darco is one brand of post op shoe), orthotic devices, padding and splints that may be incorporated into therapeutic footwear

- Surgical interventions may be indicated to achieve optimal offloading
- The prescription of offloading will be governed by the patient's clinical presentation and best practice guidelines
- Patients may be advised to limit the amount of weight bearing activity as part of their treatment plan
- No patient with a foot ulcer should walk on an unprotected foot
- The multidisciplinary team will advise on strategies to reduce foot pressures, which may include surgical or conservative strategies. Conservative measures include orthotics, moulded wedges and toe props, paddings as well as foot mobility exercises that target increased motion at the foot and ankle.

Refer to IWGDF Offloading and Intervention Guidelines for additional comprehensive information

7.3 Wound

7.3.1 Debridement

The IWGDF's first recommendation regarding wound care is that slough, necrotic tissue and surrounding callous be removed with sharp debridement in preference to other methods. Patients are to be assessed for relative contraindications such as pain or severe ischemia prior to debridement being undertaken.

Doctors, nursing staff who have undertaken training, and podiatrists are able to complete sharps debridement of a foot ulcer when clinically indicated. In line with SESLHDPR/348 - Wound Debridement.

7.3.2 Dressings

Dressing selection is based upon ulcer findings (characteristics of wound bed, exudate, size, depth, local pain). Refer to SESLHDPR/297 - Wound assessment and management procedure.

In addition to usual universal wound care principals, special consideration needs to be given to dressings being applied to feet. Not all products are suitable for use on feet. Consideration must be given to patient's wound location, offloading device, activity levels and foot structures. Occlusive and silicon-based dressings are not usually recommended for use on plantar foot ulcers. If prescribed, they require frequent monitoring.

Please note-foam dressings are not designed to take pressure off the foot ulcer and they should not be cut with apertures or holes for this purpose.

In neuro-ischaemic ulcers, dressing containing sucrose octosulphate should be considered.

7.3.3 Exudate Management

Wound exudate is a normal part of healing however, it can cause problems if there is too much exudate, if it occurs in the wrong place or at the wrong time. Refer to the WUWHS Consensus Document Exudate[4] effective assessment and management[10].

7.3.4 Hyperbaric Oxygen Therapy (HBOT)

HBOT is the administration of oxygen at greater than one atmosphere. It works by significantly increasing oxygen tensions in the non-healing wound. There is evidence that HBOT results in an increase in stem cell mobilisation, increases fibroblast proliferation,

increases angioneogenesis, increases collagen production and improves the killing of bacteria. These processes occur as a result of reduced oxygen, reduced nitrogen species and stimulation of the release of cytokines. Once a patient has been optimised with vascular intervention, off-loading, infection control, diabetic control and surgical debridement, and the foot ulcer is not healing, referral for HBOT may be indicated. There have been many trials and a number of systemic reviews and meta-analyses. The current conclusion is that HBOT may improve healing and reduce amputation rate in patients with DFU who have deep ulcers and bony involvement.

The Prince of Wales hospital has the facility to treat patients using hyperbaric oxygen. The current recommendations for referral are:

- Patients with a non-healing DFU that has failed to respond to conventional wound management and has been present for greater than 30 days
- Patients with a non- healing DFU who have just had surgical debridement.

Referral can be made to The Prince of Wales Hospital Department of Diving and Hyperbaric medicine (located level 1, Dickinson building)

7.3.5 Skin Grafts

Skin grafting is a recognised method of managing foot ulcers. Evidence is currently limited in relation to the effectiveness of this method as a standalone treatment and should be used in conjunction with current offloading and treatment methods.

Skin grafts and tissue replacements, used in conjunction with standard care, increase the healing rate of foot ulcers and lead to slightly fewer amputations in people with diabetes compared with standard care alone. However, evidence of long term effectiveness is lacking and cost-effectiveness is uncertain. There was not enough evidence for us to be able to recommend a specific type of skin graft or tissue replacement.[9]