APPROPRIATE CARE GUIDE

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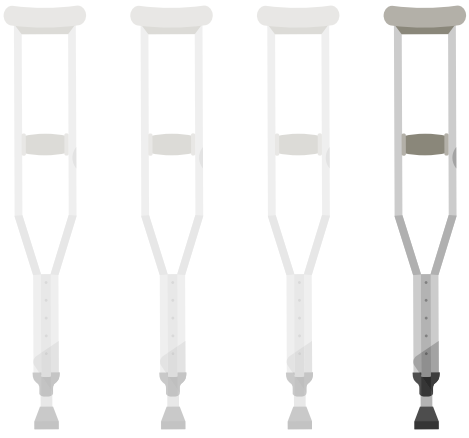
Foot assessment in people with diabetes mellitus

Key messages

1. Reduce risk of diabetic foot ulcers through regular foot assessment.
2. Perform foot assessment in people with diabetes at least once a year. Check feet more frequently for those at a higher risk of diabetic foot ulcers.
3. Regularly educate people with diabetes on good foot care and appropriate footwear.

Regular foot assessment reduces risk of diabetic foot ulcers



In Singapore, there is an average of four amputations a day in people with diabetes.

About 3 out of 4 amputations could be avoided through regular foot assessment.

Diabetes is a major global health concern. It is associated with macro- and microvascular complications, including diabetic foot ulcers (DFU). In Singapore, there is an average of four lower extremity amputations (LEA) a day in people with diabetes.[1] About 3 in 4 LEA are preceded by DFU.[2] In addition to LEA, DFU are associated with mobility loss, poorer quality of life, and decreased overall productivity.[3] Regular foot assessment is recommended to identify and manage DFU risk.[4,5]

ACE agency for care effectiveness

MINISTRY OF HEALTH SINGAPORE

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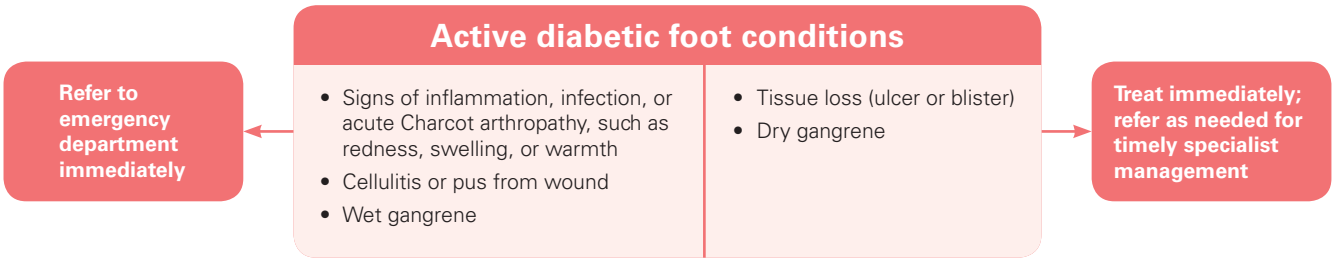
Foot assessment

Components of foot assessment include risk stratification, referral, and patient education.

Risk stratification

People with diabetes should first be checked for active diabetic foot conditions. If present, patients should be immediately treated or referred (Figure 1).

Figure 1. Active diabetic foot presentation



Of the factors related to DFU risk identification and management presented in Figure 2, the following are used in risk stratification to determine the risk category:[4-9]

- Previous foot ulcer or amputation
- Chronic kidney disease stage 5 (estimated glomerular filtration rate <15 ml/min/1.73m^2)
- Examination or test findings of:
  - Callus
  - Deformity
  - Peripheral arterial disease (PAD)
  - Neuropathy

Figure 3 describes the foot examination and tests in assessing callus, deformity, PAD, and neuropathy.

Foot assessment should be performed at least:

- Once a year for patients in the low risk category
- Every six months for patients in the moderate risk category
- Every three to four months for patients in the high risk category

Referral

Referral decisions are informed by various factors, including symptoms of deformity, PAD, or neuropathy (Figure 2). When referring for these symptoms, assign the patient a risk category as though the deformity, PAD, or neuropathy is present and follow up based on the assigned category. If cleared of the factor, reassign a risk category without that factor and manage accordingly.

Patient education

Advise patients to maintain optimal glycaemic control. Regularly educate them on good foot care and appropriate footwear (Figure 4). Encourage smokers to quit; smoking elevates LEA risk by 37%* in people with diabetes.[10]

Referral example

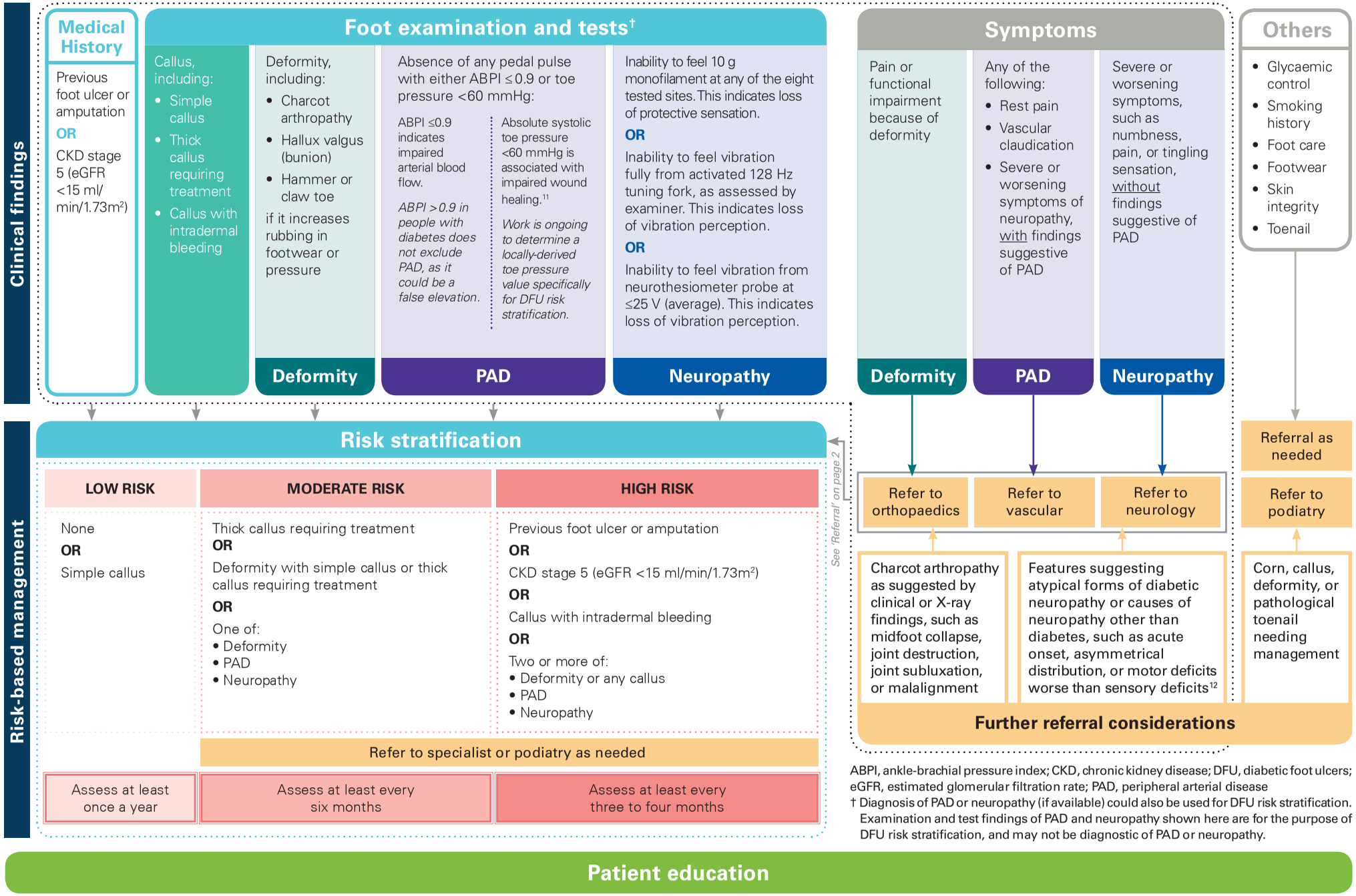
A patient referred for symptoms of PAD should be deemed to have the PAD risk factor (until proven otherwise by the vascular specialist). If no other factor is present, this patient should be assigned the moderate risk category and be followed up in no later than six months' time.

At the next appointment, reassess feet and review vascular input to stratify the patient's risk accordingly.

*This estimate, of low heterogeneity, was derived from a fixed effect meta-analysis of cohort studies extracted from Liu et al. (2017).[10]

Figure 2. Foot assessment in people with diabetes

(For features of active diabetic foot conditions, see Figure 1)

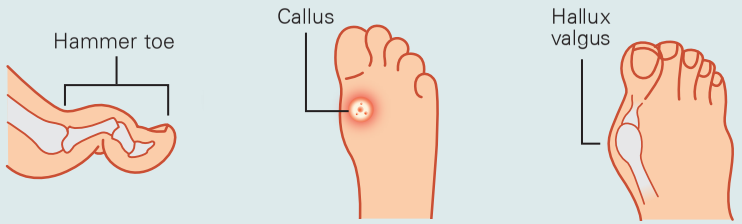


ABPI, ankle-brachial pressure index; CKD, chronic kidney disease; DFU, diabetic foot ulcers; eGFR, estimated glomerular filtration rate; PAD, peripheral arterial disease

† Diagnosis of PAD or neuropathy (if available) could also be used for DFU risk stratification. Examination and test findings of PAD and neuropathy shown here are for the purpose of DFU risk stratification, and may not be diagnostic of PAD or neuropathy.

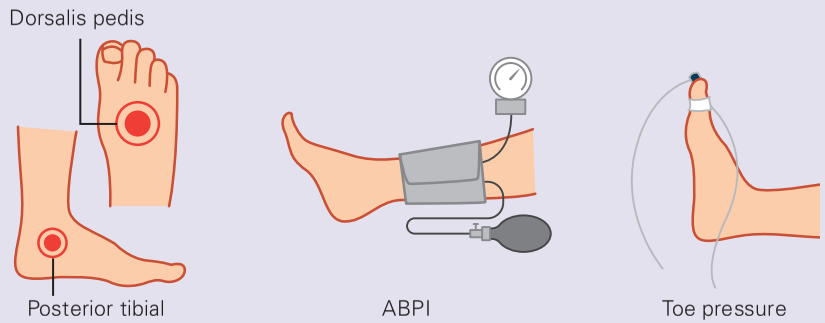
Figure 3. Foot examination and tests in risk stratification for diabetic foot ulcers

Deformity



- Inspect both feet thoroughly by examining skin integrity, especially areas with callus or deformity.
- Look for deformity that increases rubbing in footwear or pressure.

PAD

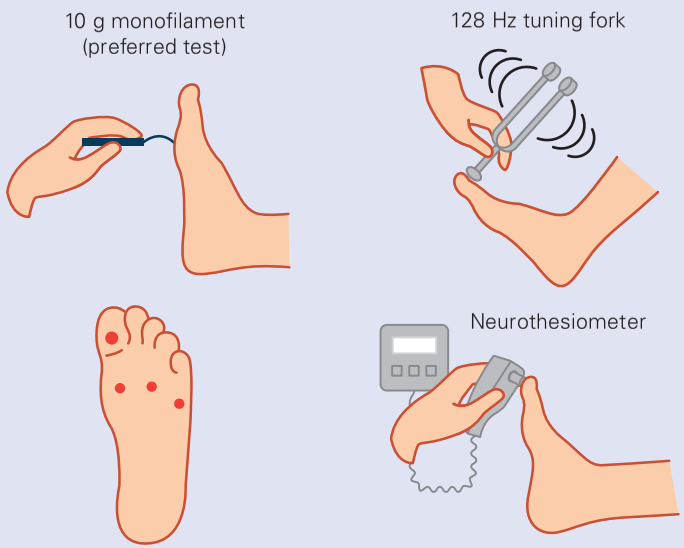


- Palpate **pedal pulses** (dorsalis pedis and posterior tibial) on each foot.
- If any pedal pulse is absent:
  - Obtain **ankle-brachial pressure index (ABPI)** of each foot: measure systolic ankle pressure of each foot; measure systolic brachial pressure of each arm; divide each ankle pressure by the greater of the two brachial pressures.

OR

  - Obtain **absolute systolic toe pressure** of each big toe.

Neuropathy



- Ask patient to close both eyes.
- Apply pressure with a **10 g monofilament** on back of patient's hand until it buckles. This will be the baseline sensation for subsequent comparison.
- Assess plantar region of first, third, and fifth metatarsal heads, and the big toe of each foot — a total of eight sites for both feet. Ask patient to inform examiner whenever pressure is felt.

OR

- Ask patient to close both eyes.
- Place an activated **128 Hz tuning fork** over the interphalangeal joint of each big toe.
- Ask patient to inform examiner when vibration is no longer felt.

OR

- Place the **neurothesiometer** probe at the distal tip of each big toe.
- Begin at 0 V, increasing voltage gradually until patient feels vibration.
- Take three measurements and average the readings.

PAD, peripheral arterial disease

Figure 4. Patient education aid on foot care and footwear

(This aid is designed to complement, and not replace, education or advice provided by a healthcare professional)

Foot care

Monitor feet every day

Watch out for:

- Blister, wound, corn, callus, or toenail abnormality
- Redness, swelling, bruise, or increased warmth

Apply simple first aid for small wound

- Clean small wound with saline before applying antiseptic and covering with a plaster
- Seek medical help if there is no improvement after two days or if there are signs of infection

Wear well-fitting and covered footwear

- Wear well-fitting covered shoes with socks
- Home sandals are recommended
- Check and remove any stones or sharp objects inside shoes before wearing them

Seek medical help if wound is not healing well, or worsens

If signs of infection are present, such as redness, swelling, increased pain, pus, fever, or the wound starts to smell, seek medical help as soon as possible

Maintain good foot care and hygiene

- Clean feet daily with mild soap and water
- Dry thoroughly between each toe
- Use a pumice stone or foot file to gently remove hard skin
- Avoid cutting nails too short; cut them straight across and file corners

Moisturise regularly

- Avoid using harsh soap
- Apply moisturiser daily but not between each toe
- Avoid scratching skin as it may lead to wound or bleeding

Footwear

Adjustable ankle fastening (lace or velcro)

To hold feet in place and reduce rubbing within shoes

Soft cushioning inner sole

For better comfort

Firm back (heel counter)

Low heel

Soft and breathable materials

To prevent too much moisture within shoes

Deep and wide toe box

- To let toes wiggle freely
- Make sure shoes are broad enough for feet and any deformities
- Make sure there is one thumb's width of space between toes and tip of the shoes

Firm at back and middle sections of the sole

To support middle part of the foot (arch)

Flexible at front section of the sole

To allow natural movement of toes when walking

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Expert Group

About the Agency

The Agency for Care Effectiveness (ACE) is the national health technology assessment agency in Singapore residing within the Ministry of Health (MOH). ACE develops evidence-based "Appropriate Care Guides" or ACGs to guide a specific area of clinical practice. ACGs are aimed at complementing MOH Clinical Practice Guidelines when these are available, by providing additions and updates as reflected in the evidence at the time of development, and incorporating cost-effectiveness considerations where relevant. The ACGs are not exhaustive of the subject matter. When using the ACGs, the responsibility for making decisions appropriate to the circumstances of the individual patient remains with the healthcare professional. This ACG will be reviewed 3 years after publication, or earlier, if new evidence emerges that requires substantive changes to the recommendations.

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