Primary care practitioner guide to the International Working Group on the Diabetic Foot: Recommendations for the Australian context

Rajna Ogrin, Jane Tennant

Diabetes-related foot complications negatively impact on the lives of people with diabetes and increase healthcare costs. Practical, evidence-based guidance has been developed by the International Working Group on the Diabetic Foot (IWGDF), focusing on five main topics: prevention, footwear and offloading, peripheral arterial disease, infection and wound management. This article will discuss the prevention of diabetes-related foot ulcers and apply the IWGDF recommendations to the Australian context for primary care providers. By applying the evidence to the local context, the authors anticipate that these guidelines will be more easily implemented into practice.

Currently, more than 1.2 million Australians are estimated to be living with diabetes (National Diabetes Strategy Advisory Group, 2015) with approximately 2–3 million Australians projected to develop diabetes by 2025 (Magliano et al, 2009). Up to 25% of people with diabetes will develop foot ulcers in their lifetime (Singh et al, 2005) and, in 2012–13, 4402 Australians required an amputation related to diabetes (Australian Commission on Safety and Quality in Health Care, 2015). The negative effect of diabetes on quality of life is high; people with diabetes who have foot ulcers have significantly lower quality of life and higher rates of depression compared to the people without diabetes and to those who do not have foot complications (Ribu et al, 2007). Further, people with diabetes who have a foot ulcer or undergo a lower-extremity amputation have double the risk of death at 5 years, compared to those without diabetes (Faglia et al, 2001).

Prevention of foot ulceration in people with diabetes is the most effective way to prevent the individual and economic burden associated with foot complications, and primary care providers have an important role to play in doing this (Harris, 2009). In September 2016, *Diabetes & Primary Care Australia* published an article about foot screening of people with diabetes to identify the risk of amputation in people with diabetes (Ogrin and Forgione, 2016). The current article builds on this, by outlining the recommendations for prevention of diabetes-related foot ulcers, developed by the International Working Group on the Diabetic Foot (IWGDF). The IWGDF have developed guidance in five main areas: prevention, footwear and offloading, peripheral arterial disease, infection and wound management. This article covers the prevention of foot ulcers in people with diabetes at risk of serious foot complications, and includes how the IWGDF recommendations can be applied in the Australian context. We anticipate that this will make it easier for primary care providers to access and use the recommendations.

IWGDF guidance

The IWGDF was founded in 1996 and in 2000 became a Consultative Section of the International Diabetes Federation (IDF). The aim of the IWGDF is to create awareness and improve

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Article points

1. Primary care health professionals have an important role to play in the prevention of foot ulceration.
2. If you are unsure of how to complete a procedure or do not have the relevant equipment, seek a podiatry clinic or specialist that does.

Key words

- Diabetic foot
- International guidelines
- Prevention

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1. The International Working Group on the Diabetic Foot guidance documents aim to support any healthcare provider, regardless of their level of training, to incorporate the content into clinical practice, and should be used as a basis for developing local guidance.
2. Foot screening to ascertain the risk for amputation for all people with diabetes should be undertaken at least annually.
3. After screening, people with diabetes are to be stratified as being at low, intermediate or high risk of serious foot complications.

the management and prevention of diabetes-related foot complications. The IWGDF have developed guidance documents, with updates every 4 years, based on systematic reviews of the literature combined with expert consensus, resulting in credible evidence-based documents. The Grading of Recommendations Assessment Development and Evaluation (GRADE; Guyatt et al, 2008) system was used to guide the approach. The guidance documents aim to support any healthcare provider, regardless of their level of training, to incorporate the content into clinical practice, and should be used as a basis for developing local guidance (Bakker et al, 2016).

Australian guidelines

The *National Evidence-Based Guideline: Prevention, Identification and Management of Foot Complications in Diabetes* guidelines (Baker IDI Heart & Diabetes Institute, 2011) were developed based on a literature review from 2009 and are approved by the National Health and Medical Research Council (NHMRC). These guidelines provide information on the quality of the evidence, unlike the IWGDF guidelines, which provide both the quality and strength of the evidence behind their recommendations. The IWGDF guidance documents include additional information on peripheral arterial disease and infection, not included in the NHMRC guidelines. For those interested in the differences between the guidance documents, Diabetic Foot Australia (2016) has developed an extensive, in-depth, comparison.

IWGDF guidance recommendations

As stated earlier, the IWGDF guidelines have been separated into five main topic groups:

- Prevention (Bus et al, 2016a);
- Footwear and offloading (Bus et al, 2016b);
- Peripheral artery disease (Hinchliffe et al, 2016);
- Infection (Lipsky ey al, 2016); and
- Wound management (Game et al, 2016).

Each topic is provided in an open-access article, published in the 2016 January supplementary issue of *Diabetes Metabolism Research and Reviews,* and this article will focus on the prevention topic.

Prevention of foot ulcers in at-risk people with diabetes

1. To identify a person with diabetes at risk for foot ulceration, examine the feet annually to seek evidence for signs or symptoms of peripheral neuropathy and peripheral artery disease.
(GRADE strength of recommendation: strong; Quality of evidence: low)

Foot screening to ascertain the risk for amputation for all people with diabetes should be undertaken at least annually (Baker IDI Heart & Diabetes Institute, 2011; Bakker et al, 2016). As most people with diabetes who develop foot ulcers and then require amputation have developed peripheral neuropathy and/or peripheral artery disease, these are the focus of the IWGDF guidance documents. Full screening for risk factors for amputation includes a standardised assessment of the following:

- Presence of neuropathy.
- Presence of peripheral arterial disease.
- Presence of joint or nail deformity or skin pathology.
  - Presence of foot deformities include restricted dorsiflexion of the hallux (great toe).
  - Presence of nail and skin pathologies must be viewed as pre-ulcerative lesions.
- Ability to self care.
  - Including those with reduced vision, restricted mobility to reach their feet and those with cognitive deficits.
- Past history of foot ulceration
  - Including past history of infection.
- Past history of lower-extremity amputation.

Further, in Australia, until adequately assessed, all Aboriginal and Torres Strait Islander people with diabetes are considered to be at high risk of developing foot complications and, therefore, will require foot checks at every clinical encounter and active follow-up (Bus et al, 2016b).

After screening, people with diabetes are to be stratified for risk of serious foot complications in

the following manner (Bus et al, 2016b):

- "Low risk": people with no risk factors and no previous history of foot ulcer or amputation.
- "Intermediate risk": people with one risk factor (e.g. neuropathy, peripheral arterial disease or foot deformity) and no previous history of foot ulcer or amputation.
- "High risk": people with two or more risk factors (neuropathy, peripheral arterial disease or foot deformity) and/or a previous history of foot ulcer or amputation.

For more information, see Ogrin and Forgione (2016).

Any healthcare providers, with some training, can undertake foot screening (Baker IDI Heart & Diabetes Institute, 2011). In Australia, podiatrists, GPs, credentialled diabetes educators and practice and community nurses generally undertake these assessments. The equipment needed to undertake these assessments includes a 10-g monofilament and a hand-held Doppler (Baker IDI Heart & Diabetes Institute, 2011; McAra et al, 2016).

If your practice does not have this equipment, we suggest you seek a podiatry clinic that does, and also has the knowledge and skills to undertake these assessments, as not all podiatrists have an interest in diabetes. The Primary Health Networks around Australia have developed, or are currently developing, evidence-based pathways for care for people with diabetes called HealthPathways. The HealthPathways are worth reviewing as they list local services, healthcare providers and resources for people with diabetes to access based on their needs.

2. In a person with diabetes who has peripheral neuropathy, screen for a history of foot ulceration or lower-extremity amputation, peripheral artery disease, foot deformity, pre-ulcerative signs on the foot, poor foot hygiene and ill-fitting or inadequate footwear.

(GRADE strength of recommendation: strong; Quality of evidence: low)

The presence of neuropathy is the single most common risk factor for foot ulcer development in people with diabetes (Reiber et al, 1999). The presence of an additional risk factor for amputation significantly increases the risk of individuals developing a foot ulcer and requiring amputation (Lavery et al, 2008). Therefore, identifying these additional risk factors is important so that management can be implemented to prevent escalation to serious foot complications.

As above, in Australia, podiatrists, GPs, credentialled diabetes educators and practice and community nurses generally undertake foot screening, including screening for the listed risk factors. However, the presence of neuropathy leads to changes in the arteries of the lower limb; therefore, no single modality has been shown to be optimal to identify peripheral artery disease (Hinchliffe et al, 2016). Measuring ankle–brachial index (ABI; with <0.9 considered abnormal) is useful for the detection of peripheral artery disease. Tests that largely exclude peripheral artery disease are the presence of ABI 0.9–1.3, toe brachial index ≥0.75 and the presence of triphasic pedal Doppler arterial waveforms (Hinchliffe et al, 2016). In the presence of abnormal ABI values, a duplex scan may be warranted (Hinchliffe et al, 2016). A more in-depth analysis of various screenings for peripheral artery disease was published in the December issue of *Diabetes & Primary Care Australia*, and can be reviewed for more information (McAra et al, 2016).

The equipment needed to undertake these assessments includes a hand-held Doppler. Again, if your practice does not have the correct equipment, or you do not have the skills and experience to undertake these tests, we suggest you seek a podiatry, vascular or other clinic that does, as well staff who have the knowledge and skills to undertake these assessments. Check your Primary Health Network website for whether they have developed HealthPathways for diabetes management, as this might include local resources for vascular assessment.

3. Treat any pre-ulcerative sign on the foot of a person with diabetes.

(GRADE strength of recommendation: strong; Quality of evidence: low)

This will require referral to a podiatrist and may

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1. Any healthcare providers, with some training, can undertake foot screening.
2. Identifying additional risk factors for diabetic foot ulceration is important so that management can be implemented to prevent escalation to serious foot complications.
3. If your practice does not have the correct equipment to carry out screening, or you do not have the skills and experience to undertake these assessments, seek a podiatry, vascular or other clinic that does.

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1. Any foot condition that develops in a person with diabetes is best treated by a healthcare provider with skills and experience in this area.
2. If the person with diabetes has inadequate vision, poor mobility or poor comprehension that limits their ability to undertake safe foot care, a referral to a podiatrist for ongoing regular care will be required.

include callus debridement and biomechanical assessment and management to address the aetiology of any callus.

If a person with diabetes develops a blister:

- Shallow blisters: Apply compressive taping to prevent skin breaking and becoming a potential source of infection, then review in 1 week. In addition, it is important to advise the individual that should the area become red, hot or swollen, urgent review is required.
- Distended blisters where peripheral tissue exhibits evidence of erythema: Drain the blister and dress with a non-adherent, non-occlusive dressing and review again in 2–3 days. As above, it is important to advise the individual that should the area become red, hot or swollen, urgent review is required.

For infected ingrown toenails, prescribe appropriate antibiotics. Refer to a podiatrist or surgeon for nail surgery for those people with ongoing ingrown toenail problems. Thickened nails must be reduced by a podiatrist to prevent subungual ulcers and tissue trauma to abutting toes.

Fungal nail infections should be identified with microscopy and culture (Cathcart et al, 2009; Gupta et al, 2013). There is no one best treatment for fungal nail infections, with the decision to be made on a case-by-case basis, with consideration given to the causative agent, the number of nails involved, and the risks and benefits associated with the different treatments (Gupta et al, 2013). Oral therapy is recommended for proximal subungual onychomycosis (when at least 50% of the distal nail plate, the nail matrix, or multiple nails are involved) and for individuals whose conditions have not responded after 6 months of topical therapy (Gupta et al, 2013). It is important to note that people with diabetes generally use concomitant treatments for their comorbid conditions, which increases the risk of drug–drug interactions with the systemic antifungal agents (Gupta et al, 2013). Topical antifungal agents should be used for fungal skin infections, with instructions on avoidance of cross contamination from footwear worn without socks.

Any foot condition that develops in a person with diabetes is best treated by a healthcare provider with skills and experience in this area, such as:

- Community health service podiatry department.
- Private podiatrist.
- Footcare nurse/healthcare provider trained in providing diabetes footcare (particularly for those individuals living in rural and remote areas).
- High-risk/diabetes foot clinic.

As long as the healthcare providers in the available local service have experience in working with people with diabetes and are confident and skilled in managing foot complications, they should be able to address the foot issue initially, until access to a dedicated multidisciplinary team is available. Check your Primary Health Network website for whether they have developed HealthPathways for diabetes management, as this might include local resources for diabetes foot complication care.

4. To protect their feet, instruct a person with diabetes at risk of serious foot complications to never walk barefoot, in socks only, or in thin-soled standard slippers, whether at home or when outside.
(GRADE strength of recommendation: strong; Quality of evidence: low)

This includes during any episodes of nocturia (Tennant et al, 2015), or any other perceived quick or short trips.

5. Instruct a person with diabetes at risk of serious foot complications to daily inspect their feet and the inside of their shoes, daily wash their feet (with careful drying particularly between the toes).
(GRADE strength of recommendation: weak; Quality of evidence: low)

Identify if there are any cutaneous lesions or thickened nails that need a podiatry referral. If the person with diabetes has inadequate vision, poor mobility or poor comprehension that limits their ability to undertake safe foot care, a referral to a podiatrist for ongoing regular care will be required. For those with adequate mobility and

vision, education on daily care should include daily application of emollients to any dry skin, and daily inspection looking for "anything that was not there yesterday". Nails should be trimmed to the shape of the toe edge to prevent sharp nail edge damage to abutting toes. Seek early assistance from a specialist for any small problem with the feet that can be managed before it becomes problematic.

6. To prevent a first foot ulcer in a person with diabetes at risk of serious foot complications, provide education aimed at improving foot care knowledge and behaviour, as well as encouraging the individual to adhere to this foot care advice.
(GRADE strength of recommendation: weak; Quality of evidence: low)

All people with diabetes need access to footcare education, as everyone with diabetes is at greater risk of amputation when compared to people without diabetes (Bakker et al, 2016). Amputations can be prevented by early identification and intervention for individuals with foot injuries or abnormalities. It is important to provide written foot care information for people with diabetes at risk of foot complications, in their language of preference, if possible. Diabetes Australia has good pictorial guides in many languages to support people with diabetes in the understanding and implementation of foot care.

For those individuals who are at increased risk of amputation, this education needs to include advice for protecting and caring for the feet, and wearing appropriate footgear (Bakker et al, 2016). Early identification of foot abnormalities by all healthcare workers enforces the principals of protecting the feet of people with diabetes. This will also reinforce the need for individuals with diabetes at increased risk of amputation to wear their prescriptive footgear (footwear, socks and foot orthotics). Any education needs to encourage increasing knowledge and behaviour change (Price, 2016). Guidance for footcare education content is available from Diabetes Australia, National Diabetes Service Scheme (NDSS), State Diabetes Australia websites and centres and the Australian Podiatry Council website.

7. Instruct a person with diabetes at risk of serious foot complications to wear properly fitting footwear to prevent a first foot ulcer, either plantar or non-plantar, or a recurrent non-plantar foot ulcer. When a foot deformity or a pre-ulcerative sign is present, consider prescribing therapeutic shoes, custom-made insoles or toe orthosis.
(GRADE strength of recommendation: strong; Quality of evidence: low)

Ill-fitting footwear is one of the leading causes of foot ulceration (Baker IDI Heart & Diabetes Institute, 2011). Where available, refer to a shoe fitting service or store (e.g. sports store) to optimise the best fitting shoe. All footwear should be fitted and worn with socks to prevent fungal infections and prevent blisters that may develop into ulcers. Not all people with diabetes will need extra depth/width footwear or bespoke footwear. Ideally, all healthcare providers should assess if the presenting worn footwear is creating any pressure areas on the feet at every visit. This enables the foot to be exposed to identify the presence of any other footwear problems. Those individuals with identified footwear problems should be referred to a podiatrist or an orthotist for footwear education, prescription or provision. Off-the-shelf shoes from general retailers are appropriate for individuals without foot deformities. Extending simple advice such as trying shoes on at the end of the day, when the feet are at their largest, and ensuring the footwear fits the foot shape (allowing sufficient length of one thumb's width beyond the longest toe), has lace or strap fastenings and does not rub any bony prominences is sufficient to minimise risk of footwear causing ulceration. Of particular importance is the presence of peripheral neuropathy. As a learnt behaviour during shoe fitting with intact sensation, a shoe is tried on to see what "fits" which, in the presence of peripheral neuropathy, is often too small or too tight as manufacturers may have differing sizes to the individual's usual size. Advice on shoe fitting is also available from Diabetes Australia and Australian Podiatry Council websites.

For individuals where there is significant foot deformity or partial amputation, custom-

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1. All people with diabetes need access to footcare education, as everyone with diabetes is at greater risk of amputation when compared to people without diabetes
2. Ill-fitting footwear is one of the leading causes of foot ulceration.
3. For individuals where there is significant foot deformity or partial amputation, custom-made footwear from a reputable pedorthotist or bootmaker may be required.

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1. A person with diabetes who has had a foot ulcer places them at high risk of future ulcerations and amputations.
2. Referring to a local podiatrist, orthotist or high risk/diabetes foot clinic can support people with diabetes to access any funding that may be available and can link in with providers who can make the appropriate footwear adjustments.

made footwear from a reputable pedorthotist or bootmaker may be required. These usually include custom insoles to balance the foot within the shoe. Not all regions in Australia will have footwear retailers that stock footwear appropriate for individuals with different foot shapes. Referring to a local podiatrist, orthotist or high risk/diabetes foot clinic can support people with diabetes to access any funding that may be available and can link in with providers who can make the appropriate footwear adjustments.

We recommend that you consider the footwear retailers in your area, and generate a list of stores that have some understanding of this issue. We also recommend that you consider the podiatrists and orthotists or other healthcare providers with training to support people with diabetes to access appropriate footwear. Whether the podiatry clinic has a hand-held Doppler is an important determinant in choosing a podiatrist – not every podiatrist has an interest in diabetes. There are also shoemakers and repairers that have experience in adjusting shoes who may be of help. Having this information available to people with diabetes may help them avoid developing serious foot problems. Check your Primary Health Network website for whether they have developed HealthPathways for diabetes management, as this might include local resources for diabetes foot complication care, including footwear retailers or at least specialist podiatrists or clinics who might have this information.

8. To prevent a recurrent plantar foot ulcer in a person with diabetes at risk of serious foot complications, prescribe therapeutic footwear that has a demonstrated plantar pressure-relieving effect during walking (i.e. 30% relief compared with plantar pressure in standard of care therapeutic footwear) and encourage the patient to wear this footwear.

(GRADE strength of recommendation: strong; Quality of evidence: moderate)

Having had a foot ulcer places a person with diabetes at high risk of future ulcerations and amputations (Baker Institute and International Diabetes Institute, 2011; Bakker et al, 2016). It also increases their risk of mortality (Iversen et al, 2009). Ideally, these individuals would be under the care of a clinic with specialist skills in managing people with diabetes who have serious foot complications, such as a multidisciplinary high-risk foot clinic or diabetes foot clinic. These clinics are usually situated within tertiary health services and ideally include healthcare providers with training in footwear and orthotics to provide effective pressure redistribution to avoid ulcer recurrence (Schaper et al, 2016). This is a specialist skill and not all generalist providers have it. There are a number of people with diabetes who have foot ulcers who choose not to attend a high-risk foot clinic for various reasons, or who may not be able to access a foot ulcer clinic. It is likely that there are numerous healthcare providers involved in the care of an individual with a diabetes-related foot ulcer, such as a community nurse, GP, podiatrist, endocrinologist, dietitian, diabetes educator and vascular surgeon. It is important that good communication is in place to link all healthcare providers involved in managing the individual with a foot ulcer. Further, all involved in this management need to understand that a foot ulcer that does not reduce in size within 4 weeks needs reconsideration of treatment provided. Ideally, referral to a high-risk foot clinic or private wound/podiatrist service with knowledge in specialised pressure redistribution skills is required at this stage.

As above, we recommend that you consider the available services in your area. Do you have a tertiary centre with a high-risk foot/diabetes foot clinic? If not, are there healthcare providers that have some expertise in this area? Having this information available to people with diabetes may help them avoid foot ulcer recurrence.

9. To prevent a recurrent foot ulcer in a person with diabetes at risk of serious foot complications, provide integrated foot care, which includes professional foot treatment, adequate footwear and education. This should be repeated or re-evaluated once every 1 to 3 months as necessary.

(GRADE strength of recommendation: strong; Quality of evidence: low)

As stated earlier, ideally individuals who have healed a foot ulcer would be under the care of a

clinic with specialist skills in managing people with diabetes who have foot complications, such as a high-risk/diabetes foot clinic, multidisciplinary wound clinic or private podiatrist with experience and skills in the area. These clinics would provide professional foot treatment, ongoing footgear assessment, ongoing arterial assessments and education. Once the individual is stable, referral to community healthcare providers who have expertise in this area, such as podiatrists, is required for ongoing care. It is important that healthcare providers have experience in identifying the development of pre-ulcerative lesions and can effectively treat foot issues and monitor for arterial changes that arise.

Again, consider the available services in your area. If there is tertiary centre with a high risk foot/diabetes foot clinic, these clinics would have an established network to support individuals with diabetes-related foot complications. If not, you will need to source healthcare providers that have some expertise in this area. This information may help people with diabetes avoid foot ulcer recurrence and amputation.

10. Consider digital flexor tenotomy to prevent a toe ulcer when conservative treatment fails in a person with diabetes at high risk of amputation, hammertoes and either a pre-ulcerative sign or an ulcer on the distal toe.
(GRADE strength of recommendation: weak; Quality of evidence: low)

Flexor tenotomies may be associated with high healing rates, relatively low recurrence rates and low incidences of post-operative complications in people with diabetes (Scott et al, 2016). These procedures can only be undertaken by healthcare providers who have the scope of practice and understanding of the biomechanics of the foot to release the tendon. These are usually orthopaedic surgeons or accredited podiatric surgeons. The flexor tenotomy is a fairly simple procedure to undertake. However it is important that people with diabetes have adequate blood flow to allow healing of the surgical site.

11. Consider Achilles tendon lengthening, joint arthroplasty, single or pan metatarsal head resection, or osteotomy to prevent a recurrent foot ulcer when conservative treatment fails in a high-risk patient with diabetes and a plantar forefoot ulcer.
(GRADE strength of recommendation: weak; Quality of evidence: low)

An example of these procedures is the Achilles tendon lengthening, which is considered to addresses the overloading of the forefoot for people with recurrent ulceration where the heel does not bear much of the load during gait. Any person with diabetes who may fit these criteria will need to be assessed for the appropriateness of any of these procedures by a foot and ankle surgeon with expertise in undertaking these procedures in people with diabetes.

12. Instruct a person with diabetes at high risk of serious foot complications to monitor foot skin temperature at home to prevent a first or recurrent plantar foot ulcer. This aims at identifying the early signs of inflammation, followed by action taken by the patient and care provider to resolve the cause of inflammation.
(GRADE strength of recommendation: weak; Quality of evidence: moderate)

This is valuable for those with poor mobility or vision using an infrared temperature scanner. It enables the person with diabetes with a history of ulceration, infection, amputation and/or Charcot neuro-arthropathy to monitor their feet by comparing to the same site to the contralateral foot. Any temperature difference greater than 2°C should alert the person with diabetes to seek professional advice (Armstrong et al, 1997). These temperature scanners can be obtained from some large chain hardware stores.

Conclusion

The recommendations developed by IWGDF are based on the collective evidence of systematic reviews and the consensus of experts. They aim to provide guidance for healthcare providers working with people with diabetes to prevent foot ulcerations and amputations. At this stage,

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1. It is important that healthcare providers have experience in identifying the development of pre-ulcerative lesions and can effectively treat foot issues and monitor for arterial changes that arise.
2. An infrared temperature scanner may be valuable for those with poor mobility or vision to monitor temperature difference between each foot.

"This article provides the recommendations on prevention of foot amputation in at-risk individuals with diabetes, and applies them to the Australian context."

evidence based on high-quality research is still lacking in many areas; however, people with diabetes are presenting to primary care providers for immediate intervention and need care. This article provides the recommendations on prevention of amputation in at-risk individuals with diabetes, and applies them to the Australian context. Further work is underway to support the generation of evidence to better prevent and manage people with diabetes, to work towards reaching the aim of significantly reducing foot ulcerations and amputations in people with diabetes. ■

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