2030 AUSTRALIAN STRATEGY FOR foot health & disease in diabetes

Improving the foot health of people living with diabetes

dfa Diabetes Feet Australia

ads Australian Diabetes Society

Authors

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The authors would like to acknowledge and pay their respects to the Traditional Custodians of the lands on which they live and work. This work includes the nomenclature; First Nations Peoples, First Nations Communities, First Nations people, Aboriginal and Torres Strait Islander Peoples, Aboriginal and Torres Strait Islander people and Indigenous. Neither singularly, nor collectively do they adequately represent the immense diversity of language groups and cultural values across this continent's Traditional Custodians and Sovereign Owners. Non-Indigenous people is the language used to represent and be inclusive of Australians who are not First Nations people.

Diabetes Feet Australia (DFA) recognises that language is powerful.[1,2] Throughout this document and its broader work DFA attempts to decolonise language and prioritise strength-based approaches that reflect the complex multifactorial nature of diabetes and diabetes-related foot disease and acknowledge and value peoples' lived experience of disease.

PLAIN LANGUAGE SUMMARY

Diabetes can cause serious foot problems, which can lead to hospital visits, amputations (losing a part of the foot or leg), and high medical costs. These foot problems include things like not being able to feel the feet, poor blood flow, sores, and infections.

KEY STATISTICS

EACH YEAR IN AUSTRALIA

510,000
people have **foot problems** because of diabetes

47,100
people go to **hospital** because of these foot problems

6,300
people will **lose part of their foot or leg** because of these foot problems

$2.7 billion
is spent to treat these foot problems

If we take better care of people's feet, half of these hospital visits, amputations, and costs could be avoided.

NEW PLAN

The **Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes** is a new plan to help people with diabetes take better care of their feet and prevent serious foot problems. This plan targets how to improve the foot health of all people with diabetes in three main ways.

A Better access to care for everyone

B Make sure care is good quality

C More research and development

A
Better access to care for everyone

1. **Annual foot checkups**
   Make sure all people with diabetes get their feet checked yearly by a health professional to see how likely they are to get foot problems and catch them early.
2. **Care to prevent foot problems**
   When people are found to be more likely to get foot problems, they should get regular foot care, wear the right shoes, and learn how to keep their feet healthy.
3. **Special care teams for foot sores**
   When someone has a sore on their foot, they should get care from a special team of foot care experts to prevent it from getting worse.

B
Make sure care is good quality

4. **Good foot care service standards**
   Make sure the rules for foot care services are based on the latest research and services follow these rules to do a good job for patients.
5. **Collect foot care information**
   Collect information about foot care services to make sure they keep improving and give better results for patients.
6. **Good foot care guidelines**
   Regularly update the guidelines that tell health professionals how to best treat foot problems, based on the latest research.

C
More research & development

7. **More money for research**
   Lobby for more money for research (an extra $30 million per year) to learn more about how to help people with foot problems get better faster.
8. **Plan for research**
   Make sure the money spent on more research is spent in the best ways to help different communities with foot problems.
9. **Create a research network**
   Set up a national group of scientists and researchers to work together, learn from each other, and teach new researchers to help foot care get better faster.

If we follow this plan, the foot health of those living with diabetes should improve, and we can greatly reduce hospital visits, amputations, and medical costs in Australia.

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EXECUTIVE SUMMARY

In 2017, Diabetes Feet Australia (DFA) published the Australian diabetes-related foot disease strategy 2018-2022: The first step towards ending avoidable amputations within a generation. This pioneering strategy aimed to guide the nation towards reducing the substantial impacts of diabetes-related foot disease (DFD) on Australians and Australia. To deliver such nation-wide reductions in DFD impacts, the strategy proposed 32 areas for action that if addressed would likely achieve 9 key goals and in turn improve care across three overarching priorities: improve access to care, safe quality care, and research and development.

Since publication, initiatives addressing some areas for action have been enacted, some key goals achieved and some impacts of DFD reduced on Australians and Australia. However, progress against these key goals and priorities has been inconsistent. For instance, there has been significant progress towards establishing safe quality care for people with DFD via the establishment and implementation of extensive national clinical guidelines and national clinical service standards. Yet, there has been limited progress made towards obtaining the increased resources required for appropriate access to preventative care or much needed research and development. In turn, there has been inconsistent progress towards reducing the impacts of DFD in Australia. There has been reductions in diabetes-related major lower limb amputation rates in Australia, which is a significant national achievement. Yet, there have been increases in DFD-related hospitalisation, minor amputation and disability rates in Australia, which is a significant national concern.

This new **Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes** has been developed by an expert national strategy sub-committee of DFA. The sub-committee reviewed all areas for action, key goals, priorities, and impacts since 2017, determined key principles and enablers to underpin the new strategy, and has renewed all areas for action, key goals and priorities to be achieved by 2030 (Figure 1). This new updated national strategy not only builds upon the recent successes of the first strategy in improving some key goals, priorities and impacts, but also identifies new areas for actions and some that still require urgent attention.

Figure 1 displays the principles, enablers, key goals and overarching priorities of the new Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes. DFA has evaluated that by fully implementing this new national strategy, that this will not only substantially improve the foot health of the over 1.5 million Australians with diabetes, but should also help prevent an estimated 20,250 hospitalisations, 2,840 amputations and $940 million in healthcare costs per year for Australia.

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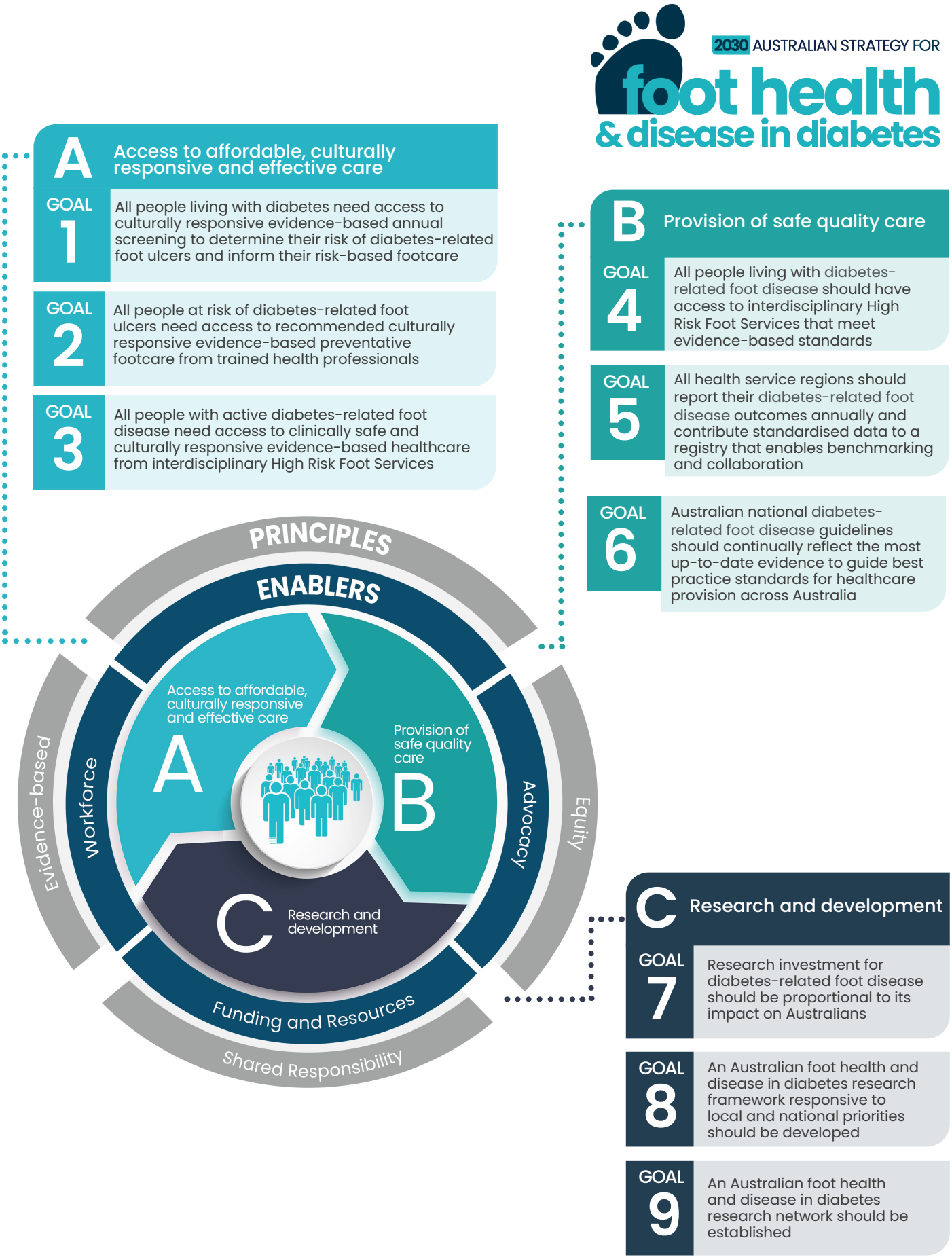

Figure 1 Principles, enablers, key goals and overarching priorities of the Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes

SECTION 1

BACKGROUND

Diabetes Feet Australia (DFA) was established in 2015, is a division of the Australian Diabetes Society (ADS) and is the peak national clinical and research body for foot health and disease in diabetes. Supported by an Operations Manager, DFA is led by a volunteer national steering committee comprised of a range of clinical and research expert members from disciplines including endocrinology, vascular surgery, infectious diseases, nursing, and podiatry. Members also bring a wealth of experience as representatives on various international, national, and state DFD groups, including the International Working Group on the Diabetic Foot and DFoot International.

DFA has four overarching objectives:

- Optimise national evidence-based and culturally responsive clinical practice for foot health in diabetes
- Stimulate national research in foot health in diabetes
- Reduce national diabetes-related lower limb amputation rates
- Empower Australia to become a leading nation in foot health in diabetes management

A foundational publication produced by DFA was the Australian DFD Strategy 2018-2022: The first step towards ending avoidable amputations within a generation strategy document.[7,8] To reduce the substantial national impacts of DFD on Australian, the 2018-2022 strategy clearly outlined 32 areas for action that if addressed would likely achieve 9 key goals and in turn improve care across 3 overarching priority areas: improve access to care, safe quality care, and research and development.

Since then, DFA has led many key initiatives addressing these areas for action to help reduce the impacts of DFD on Australians and Australia.

KEY INITIATIVES LED BY DFA

Publication of Australian evidence-based guidelines for the care of people at risk or with DFD[3]
Publication of National top research priorities for prevention and management of DFD[4]
Publication of Australian guidelines on footwear for people with diabetes[5]
Publication of Australian diabetic foot ulcer minimum data dictionary to standardise data collection[6]
Hosting the largest biennial national DFD conferences in the Southern Hemisphere
Hosting continual professional development activities for DFD stakeholders
Hosting the inaugural National Diabetes Feet Day held in November 2024
Providing ongoing support for other national public awareness campaigns
Providing ongoing national advocacy for DFD via submissions to government inquires
Providing ongoing national promotion and support for research projects

This new **Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes** has been developed by DFA to ensure Australia has a strong contemporary national strategy that reflects international best practice, considers latest impacts of DFD in Australia and helps position Australian communities to continually improve the foot health of people living with diabetes and reduce the impacts of DFD across the nation.

The Australian community involved in diabetes foot health

The Australian community involved in diabetes foot health is wide and diverse. DFA aims to work in collaboration with all key stakeholders in this community, including people with lived experience, their families and carers, health professionals, researchers, and industry.

People with lived experience

At the forefront of this community are people living with diabetes and their families and carers. Around one third of people living with diabetes have DFD. DFD is defined as disease of the foot in a person with diabetes that includes one or more of the following conditions: peripheral neuropathy, peripheral artery disease, infection, ulcer(s), Charcot neuro-osteoarthropathy, gangrene, or amputation.[9] Unfortunately, DFD is the leading cause of hospitalisations, amputations, disability burdens and healthcare costs in people living with diabetes in Australia.[10,11]

DFA is committed to working in partnership with and for people living with diabetes and DFD to help improve their foot health outcomes and in turn reduce the large health impacts caused by DFD on the nation. People living with diabetes have different personal strengths and coping strategies, and fostering a positive and collaborative relationship between people with lived experience and healthcare professionals empowers individuals to manage their diabetes and their foot health. This is particularly important if people develop DFD, as it can be especially challenging for a person to maintain their foot health when they may also be experiencing other diabetes complications.

DFA has a healthy track record of working with people living with diabetes across geographically diverse regions and with Aboriginal and Torres Strait Islander people as evidenced in the development of the recent Australian evidence-based clinical guidelines and the National top research priorities for people with or at risk of DFD.[3,4] Furthermore, DFA has committed to establish a national consumer advisory committee to ensure people with lived experience of DFD is at the core of everything DFA does and considers Diabetes Australia the key partner in advocating for people affected by diabetes.

Health Professionals

DFA is a division of the Australian Diabetes Society (ADS). The ADS is the peak national medical and scientific body for diabetes in Australia and is a member-based organisation consisting of endocrinologists, scientists, researchers, diabetes educators, allied health professionals and primary care practitioners. The ADS has four key strategic pillars: Advocacy, Clinical Guidelines/Standards, Education, and Research; and works in close collaboration with its affiliated partners, including Diabetes Australia and the Australian Diabetes Educators Association. It is committed to improving diabetes treatment and care, increase research funding, advocacy for health policies around diabetes and its prevention, and to support the person with diabetes to live well.[12]

Whilst DFA is the DFD division of ADS and has led the development of multiple national health professional projects in the field, it does this as part of a large multi-disciplinary community of peak national health professional organisations, such as the Australian and New Zealand Society for Vascular Surgery, Australian Orthotic Prosthetic Association, Australian Podiatry Association, Advanced Practicing Podiatrists – High Risk Foot Group (APP-HRF), National Association of Diabetes Centres (NADC), Pedorthic Association of Australia, South Australian Health and Medical Research Institute's (SAHMRI) Aboriginal and Torres Strait Islander Foot Complications Program and Wounds Australia; all of these organisations endorsed the Australian evidence-based DFD guidelines.

Other national health professional-led projects include the NADC national interdisciplinary High Risk Foot Service (iHRFS) accreditation program, Australian Diabetes Foot Registry, FootForward project, SAHMRI's Aboriginal and Torres Strait Islander Foot Complications Program and Wounds Australia's recent success in advocating for the new federally funded Chronic Wound Consumables Scheme.

Researchers

The Australian DFD research community is growing and becoming increasingly skilled, collaborative and productive, with a significant increase in research productivity shown over the past 10 years.[13] There has been some pockets of success in obtaining significant funding for DFD research, but much of this recent research productivity has been achieved in the context of disproportionately low research funding for the field. However, with appropriate research funding, Australia's research community is appropriately skilled, collaborative and ready to undertake large-scale research projects that align with wider DFD community priorities and make substantial impacts on improving the foot health of people living with diabetes and reducing the burdens of DFD on the nation.

Industry

Industry partners are vitally important to support innovation in health care, research translation, engagement, and education. Industry partners have been strong supporters of the DFA national conferences and other DFD community events, sponsor educational events and work with health professionals and researchers to enable best practice, culturally responsive and accessible care.

Progress towards goals of the last Australian DFD Strategy

In preparation for developing this new Australian strategy, the DFA steering committee initially met to rate by consensus the nation's progress in achieving the 9 key goals outlined in the first Australian DFD Strategy 2018-2022: The first step towards ending avoidable amputations within a generation document. This culminated in the DFA committee releasing a national report card on the first strategy by rating the achievement of the 9 key goals in the first strategy, identifying 2 goals rated as completed, 5 partially completed and 2 not completed (Figure 2).

Those key goals rated as completed included a new national accreditation system for iHRFS (Goal 4) and a new suite of Australian national evidence-based DFD guidelines (Goal 6). Those partially completed included new national screening pathways (Goal 1), funding new state-wide iHRFS based on the needs of people with DFD by some Australian State Governments (Goal 3), a new Australian DFD registry (Goal 5), identification of Australian top research priorities (Goal 7) and evidence of multiple national funding applications for clinical trials and other studies (Goal 8). Those not completed included no new government funding achieved for preventative services (Goal 2) or to make national DFD research funding proportionate to the national burden that DFD causes (Goal 9).

NATIONAL REPORT CARD

Figure 2 Australia's national report card toward achieving the 9 key goals of the Australian DFD strategy 2018-2022: The first step towards ending avoidable amputations within a generation

An important area not included in the inaugural strategy or considered in the report card was cultural responsiveness. Thus, it is unclear the level of cultural responsiveness of the initiatives implemented to address the areas for action. For its part, DFA is committed to continually learning and unlearning to develop and support culturally responsive evidence-based healthcare for DFD, and as such recognises and acknowledges the omission of cultural responsiveness in the inaugural strategy and national report card. However, cultural responsiveness was at the forefront of the DFA development of the 2021 Australian evidence-based DFD Guidelines, which privileges First Nations Voices, Knowledges and Cultures. DFA also recognises the amendment to embed cultural safety in the Health Practitioner Regulation National Law Act under the Australian Health Practitioner Registration Agency.[14,15] As part of these changes a new objective is to build the capacity of the Australian health workforce to provide culturally safe and respectful health services to Aboriginal and Torres Strait Islander people that are guided by principles of responsiveness and contributing to the elimination of racism in the provision of health services.[14,15] Furthermore, DFA acknowledges that First Nations Communities are diverse and implementation of recommendations in this strategy will require both flexibility and local community consultation and engagement.

The DFA national report card shows that there has been significant, but inconsistent, progress when assessed against the original 9 key goals. What must also be considered in preparing a new updated national strategy are contemporary trends of the impacts of DFD in Australia and around the world. Such trends help identify where further opportunities lie to improve the foot health of people living with diabetes here in Australia and help focus advocacy efforts for positive national change. Thus, in informing the development of this new strategy, the national strategy sub-committee reviewed the latest evidence on the impacts of DFD in Australia and around the world.

“

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SECTION 2

THE LATEST IMPACTS OF DIABETES-RELATED FOOT DISEASE

DFD is a large cause of the world's total disease burden

Globally, DFD is estimated to affect 199 million people and cause 1.8% of the total global disease burden.[10,16] This makes DFD the 13th largest cause of the global disease burden or world's health problems (Figure 3).[10,11,17] Indeed, the disease burden caused by DFD is similar in size to the dementia and breast cancer combined and is the largest cause of the diabetes disease burden.[10,11,17] Yet, unlike these conditions, the disease burden from DFD is made up mostly of its disability burden, rather than its mortality burden,[10,16] and this is driven by DFD being a leading cause of poor quality of life, hospitalisation, and amputation.[18,19] Its mortality burden though cannot be overlooked, considering 5-year mortality rates for people with DFD are higher than for those with most cancers.[20,21] Thus, DFD is now one of the largest causes of the global disability (11th), mortality (21st), and total disease burdens (13th).[10]

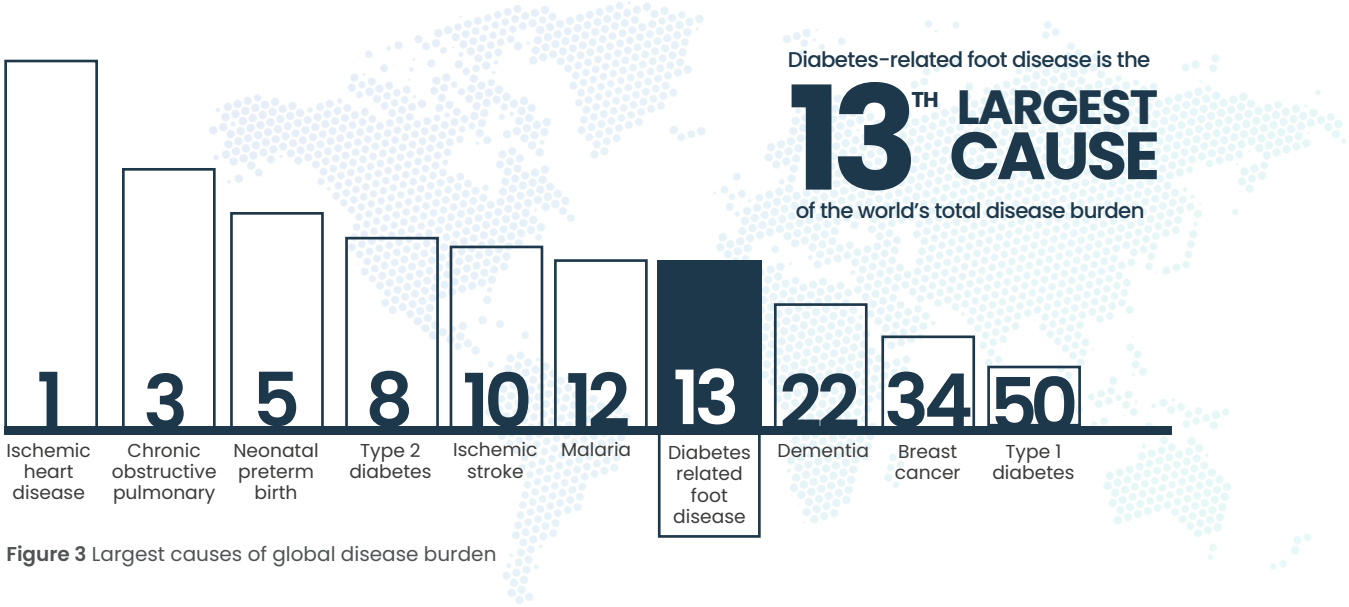

Figure 3 Largest causes of global disease burden

In Australia, DFD is currently estimated to affect 510,000 people and cause 47,100 hospitalisations, 6,300 amputations, 2,500 deaths and cost $2.7 billion each year (Figure 4). [21–27] This makes DFD the largest cause of hospitalisations, amputations and disability burdens in people with diabetes in Australia.[7,11,26,28,29] Indeed, hospitalisation rates for DFD (25 hospitalisations per 1,000 person-years with diabetes (25/1,000)) are much higher than that for heart failure (13/1,000), myocardial infarct (8/1,000) and stroke (6/1,000) in people living with diabetes.[18,24,26] Furthermore, Australians with DFD also have poorer mean quality of life (0.54; 0=death to 1=perfect health) than that for heart disease (0.77), cancers (0.75) and kidney disease (0.70).[19,28,30] Thus, DFD affects ~2% of all Australians and causes worse quality of life,[28] and higher chances of hospitalisation,[31] amputation and disability than much more well-known diseases in Australia.[24,26]

Each year in Australia it's estimated that

510,000	people are living with diabetes-related foot disease
47,100	hospitalisations are caused by diabetes-related foot disease
6,300	people will undergo an amputation because of diabetes-related foot disease
2,500	people will lose their life due to diabetes-related foot disease
2.7 billion	is spent in the Australian Health System for treating diabetes-related foot disease

Figure 4 Estimated people affected, hospitalisations, amputations, deaths and costs from DFD each year in Australia

DFD is a growing cause of the world's total disease burden

Globally, the total global disease burden caused by DFD has grown substantially this century, even after adjusting for changes in the age structure of populations over this time.[10,11,16] Indeed, DFD has had the 4th largest increase of the top-30 largest conditions causing the global disease burden with most other conditions actually reducing in size.[10,11,16] Promisingly though, global major amputation (above ankle) rates caused by DFD have decreased during this century,[10,18] but minor amputation (below ankle) rates have increased,[10,18] and DFD-related hospitalisation rates are concerningly very high.[18,24,26]

Australia has substantially reduced its major amputation rates caused by DFD this century, and has improved from having the 2nd highest (in 2007) to the 8th lowest (in 2021) national major amputation rates of 35 developed countries according to the Organisation for Economic Co-operation and Development (OECD).[32-37] Indeed, major amputation rates have now decreased in Australia to very low rates of 0.6 per 1,000 person-years with diabetes, and much lower than the median global rate (0.9/1,000).[18,24,26] This is a significant national achievement, although it is noted this reduction is not consistently reflected across the country with major amputation rates continuing to be much higher for geographically remote and Aboriginal and Torres Strait Islander populations.[38-40] Concerningly though, minor amputation rates in Australia have increased to 2.9 per 1000 persons-years with diabetes, and much higher than the median global rate (1.4/1,000).[18,24,26] Furthermore, DFD-related hospitalisation rates have also substantially increased to 24.8 per 1,000 person-years with diabetes, again much higher than the median global rate (16.6/1,000).[18,26] Unfortunately, this has been a major driver in Australia deteriorating from having the 3rd lowest (in 2007) to the 4th highest (in 2021) national diabetes-related hospitalisation rates in developed countries according to OECD rankings.[35,36]

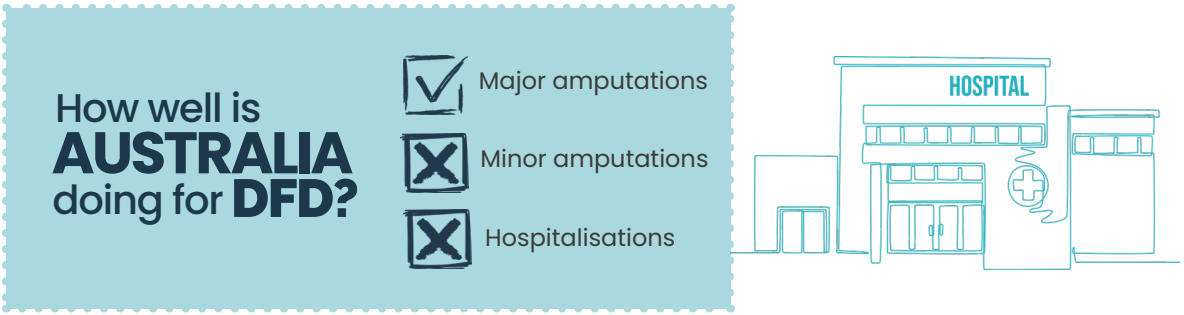

Figure 5 How well Australia is doing for DFD in 2025 compared to other developed countries

Finally, the demographics of those affected by DFD are also changing. Globally, the DFD demographic has been mostly middle-aged and male, but increasingly getting younger as people are diagnosed with diabetes younger and living longer.[11,16,18] In Australia, the most rapid increases in DFD burdens have also been reported in those of younger ages and males.[24,26,41,42] For example, over the last decade in Australia, annual increases have been most marked in younger age groups (<40 years vs >80 years) for amputation (7.9% vs 0.5%) and hospitalisation rates (6.0% vs 2.4%), and in males for amputation (3.3% vs 1.9%) and hospitalisation rates (5.3% vs 2.7%).[24,26]

Thus, the DFD burden is growing in Australia, driven mainly by hospitalisations and minor amputations, and more of this DFD burden is shifting to younger male populations and away from older aged populations.

Latest Australian DFD burden estimates

In Australia each year, latest estimates indicate that DFD affects 510,000 people and causes 47,100 hospital admissions (37,650 public, 9,450 private admissions), 6,300 amputations (5,250 minor, 1,050 major amputations), 2,500 deaths, and costs the Australian health system $2.7 Billion.[21-27] Table 1 displays these estimates for an average year for the whole nation and per 100,000 Australian residents. Therefore, cities or regions can apply these per 100,000 estimates to their residential populations to estimate their local DFD burdens. For example, a city with a population of ~450,000 residents would multiply the below per 100,000 estimates by 4.5 to provide realistic estimates for their city. Thus, using the figures in Table 1, we can estimate in a city with a population of ~450,000 residents, DFD will impact around 8,500 people, cause 783 hospital admissions, 105 amputations, 42 deaths and cost the health system around $44.8 Million in total direct costs to treat annually.

Table 1 Estimated burden caused by DFD on Australia and per 100,000 Australian residents each year (see Appendix 2 for detailed explanations of all estimates in this table)

Characteristic	Australia [a]	Per 100,000 [b]
Populations		
People with diabetes [c]	**1,500,000**	**5,556**
People with DFD [d]	**510,000**	**1,889**
People with active DFD [e]	**51,000**	**189**
People with diabetes-related amputations [f]	**25,000**	**94**
Hospitalisations		
People in a hospital bed because of DFD [g]	**471,000**	**1,744**
Public Hospital	376,500	1,394
Private Hospital	94,500	350
People newly admitted to hospital because of DFD [h]	**47,100**	**174**
Public Hospital	37,650	139
Private Hospital	9,450	35
Amputations		
People undergoing an amputation because of DFD [i]	**6,300**	**23.3**
Public Hospital	5,250	19.4
Private Hospital	1,050	3.9
People undergoing a minor amputation because of DFD [j]	**5,250**	**19.4**
Public Hospital	4,350	16.1
Private Hospital	900	3.3
People undergoing a major amputation because of DFD [k]	**1,050**	**3.9**
Public Hospital	900	3.3
Private Hospital	150	0.6
Mortality		
Deaths from DFD [l]	**2,500**	**9.3**
Costs		
Total direct costs because of DFD [m]	**$2.69 Billion**	**$9.96 Million**
Hospital costs because of DFD [n]	$1.09 Billion	$4.04 Million
Primary care and other recurrent health costs because of DFD [o]	$1.60 Billion	$5.92 Million

Latest Australian DFD burden that could be prevented with better care

A number of Australian cost-effectiveness analyses have consistently demonstrated that up to $2.7 billion can be saved over five years (~$10,000 per patient) for the Australia health system, if earlier access to guideline-based care is implemented for people with DFD across Australia.[27,43,44] These cost-savings are in addition to demonstrated health gains in quality of life and substantial reductions in the risk of hospitalisation and amputation for persons living with DFD.[27,43,44]

While the previous cost-effectiveness analyses relied on retrospective data and health economic modelling,[27,43,44] a recent Queensland Health report evaluated the cost-effectiveness of a real-world, state-wide, ~$5 million annual funding model that incentivised earlier access to interdisciplinary high risk foot services (iHRFS) care across Queensland compared to usual access.[45] Using real-world data, the report found significant improvements in quality of life, plus significant reductions in hospitalisations, amputations, and costs per patient, and importantly a return on investment of $8 for every $1 invested in earlier access to iHRFS.[45] Thus, Australian health economic evidence now clearly demonstrates from a health system perspective that investing in better care for people with DFD generates substantially reduced health costs for nations, considerably improved health gains for patients, and substantial returns on investments for governments.[27,43-45]

Table 2 uses this Australian health economic evidence to forecast the health gains and cost savings available if guideline-based care is systematically implemented across the nation for all Australians with DFD. These forecasts suggest that every year in Australia we could prevent 188,400 people from being in a hospital bed, 20,250 new hospital admissions, 2,840 amputation procedures, 1,125 deaths and $0.94 Billion dollars in costs by systematically implementing guideline-based care for people with DFD across Australia (or 698 hospital beds, 75 new hospital admissions, 10 amputations and $3.48 Million every year for each average region of per 100,000 Australian residents). This is the equivalent of freeing up an entire 500+ bed hospital in Australia each year and demonstrates why a nationwide strategy is urgently needed to improve health service delivery for people with DFD in Australia.

Table 2 Forecasted savings if guideline-based care for people living with DFD is systematically implemented across Australia and per 100,000 Australian residents (see Appendix 2 for detailed explanations of all estimates in this table)

Characteristic	Australia [a]	Per 100,000 [b]
Morbidity savings		
People prevented from being in a hospital bed [c]	**188,400**	**698**
People prevented from being admitted to hospital [d]	**20,250**	**75**
People prevented from undergoing an amputation [e]	**2,840**	**10.5**
Mortality savings		
People prevented from dying [f]	**1,125**	**4.2**
Cost savings		
Costs prevented to health system [g]	**$0.94 Billion**	**$3.48 Million**

Methodology

This **Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes** has been developed by the National strategy subcommittee of DFA. The subcommittee was commissioned by the DFA Steering Committee following a day long strategic planning day, and membership comprised experts from multiple health disciplines, including people with lived experience and Aboriginal and Torres Strait Islander people.

The subcommittee worked from a general methodological framework agreed to by the DFA Steering Committee. Firstly, the subcommittee were asked to review developments since the inaugural national strategy via the national report card and a contemporary analysis of the latest national impact of DFD. Secondly, the subcommittee were asked to align the new strategy with key principles and enablers developed by the steering committee and considered important to diabetes foot health. Thirdly, the subcommittee were then asked to propose, develop, discuss, and agree via consensus on overarching priority areas, key goals, potential areas for action and measures of progress to achieve those goals by 2030. The overarching priorities and accompanying key goals were largely maintained from the inaugural strategy with minor modifications. Finally, public consultation was undertaken where any members of the public were invited to provide feedback, all feedback was considered and where relevant addressed to develop this final version.

The framework for the Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes, including principles, enablers, and priorities is depicted in Figure 1. The framework aims to promote the person with diabetes as the central and most important part of the strategy, surrounded by the overarching priorities and all underpinned by the key principles and enablers.

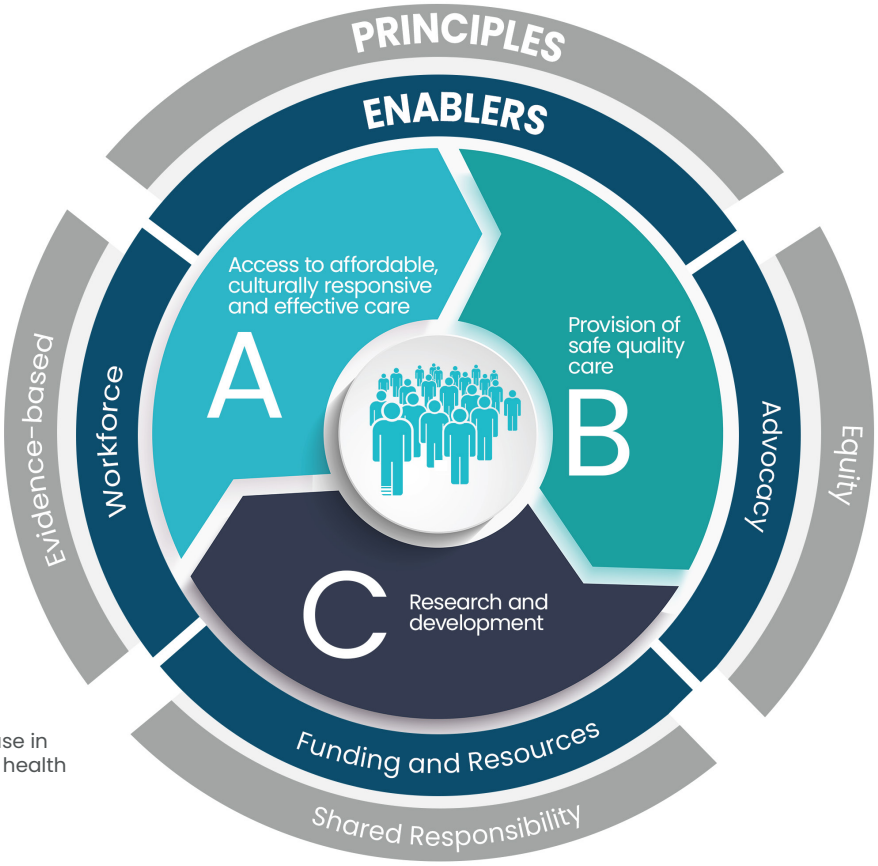

Figure 6
The framework for the Australian Strategy for Foot Health and Disease in Diabetes 2030: improving the foot health of people living with diabetes

Principles

Equity

Equity in healthcare ensures that all people have a fair opportunity to attain their full health potential and have fair access to the health services and resources they need.[46] Equity fosters a more inclusive and just healthcare system and is a important principle for people living with diabetes with, or at risk of DFD. In Australia there are significant challenges to ensuring equitable health care. For example, First Nations Peoples require access to culturally safe health care to best enable health and wellbeing. The current Australian mainstream healthcare model is often not culturally safe, denying Aboriginal and Torres Strait Islander people the opportunity to maintain or improve their health and quality of life.[47] The geographical scale of Australia also influences equity in access to health care for those in non-metropolitan areas, especially rural and remote areas.[48] Furthermore, Australia should also aim to promote equity in healthcare for our Western Pacific region, by collaborating with regional partners, sharing educational resources, promoting best practice, and helping develop innovative solutions to address local challenges in DFD care. Australia's strong healthcare system and expertise in DFD offer significant opportunities to support not only regions in our own country, but neighbouring countries through training programs, educational initiatives, and collaborative research. Thus, proactive and innovative approaches to equitable foot health care for people living with diabetes is needed across our communities, nation and region, especially due to the complex nature of DFD and the multidisciplinary care required.[49]

Shared responsibility

Shared responsibility recognises the need for the active participation of all parties involved with a person's health care. While health professionals, family/carers and community resources all play a key role in maintaining or improving foot health, the most important person is the person living with diabetes themselves. This has been particularly highlighted in diabetes foot health for decades, as maintaining foot health requires a person living with diabetes to constantly make lifestyle and self-care decisions to maintain their own health. Diabetes foot health is often an underappreciated but significant part of a persons' overall health, and education and support are key requirements for individuals and the community to understand its significance. Further developments are required to explore the efficacy of a range of potential initiatives to support shared responsibility and in turn to support a person living with, or at risk of DFD. This could include access to health education and information, support for interventions to optimise self-care behaviour, peer support programs and collaborative patient/ consumer involvement in health care design and improvement.

Evidence-based

Evidence-based approaches to health care involve integrating the best available evidence with clinical expertise and patient preferences to ensure that interventions and practices are both effective and relevant.[50] DFA strongly promotes this principle and has recently demonstrated it in the development of the suite of Australian evidence-based guidelines for those at risk of or with DFD. Although there have been significant advances in Australian DFD research, DFA acknowledges the continuing and disproportionate impacts of DFD on First Nations Peoples, and the urgent need for culturally responsive DFD research to be undertaken with and for Aboriginal and Torres Strait Islander people. Research evidence collected using and valuing Indigenous methodologies is essential to providing culturally responsive care and redressing severe disparities in DFD outcomes currently experienced by Aboriginal and Torres Strait Islander people.

Enablers

Advocacy

Advocacy involves actively supporting and promoting the rights, needs, and interests of patients and communities to ensure they receive equitable, evidence-based, and shared compassionate care.[51] The Australian DFD community is active and passionate with regards to advocacy and will continue to inform policy makers and resource holders about the nature of DFD, the impact it has on people and health systems, and to provide equitable, evidence-based, and practical policy advice to improve the foot health of people living with diabetes. In addition to these continued efforts, it is particularly important that advocacy efforts for people with DFD focus on Federal and State Government health policies to address current key deficiencies such as research funding, access to preventative care, access to all care in regional and rural communities, workforce shortages and implementation of culturally responsive care across Australia. Unfortunately, the ability for effective advocacy is limited, as DFD advocacy bodies are largely organised by volunteers with minimal resources. Thus, it is important that these bodies continue to be supported by the community and resourced by government to effectively advocate for the 510,000 people living with DFD.

Funding and resources

A crucial aspect of funding and resources is the proportionate distribution of available Australian healthcare resources to address the proportion of the overall Australian disease burden caused by a condition (such as DFD), while also addressing the disparities in different communities and regions.[52] As demonstrated in earlier sections, the current impact of DFD in Australia is significant and causes a substantial proportion of the Australian disease burden, yet current healthcare resourcing to address such a substantial disease burden is disproportionately low compared to other much more well-known conditions with much lower disease burdens. This disproportionality of funding and resourcing for DFD seems to be systematic across all health services, public health programs, and research and development and needs to be significantly increased across the board to equitably address the proportionate disease burden caused by DFD on Australians and Australia.

Workforce

An appropriate healthcare workforce is crucial for delivering culturally responsive, high-quality, and effective care for any condition. This involves ensuring the workforce is appropriately funded and resourced, well-trained, competent, and has the capacity to meet the diverse needs of people with the condition. People with diabetes or DFD need access to a workforce that can perform evidence-based screening, preventative footcare and management of DFD. Thus, people with DFD require a multi-disciplinary workforce, possibly more so than any other condition,[49] with multiple disciplines sharing their expertise to provide best DFD evidence-based care and outcomes. An appropriate evidence-based workforce for the care of people with DFD typically should include medical, surgical, nursing, and allied health disciplines working together with the person with DFD (and their family and carers). Appendix 1 provides a summary of the health professional disciplines who are likely to be involved in the care of a person with DFD dependent upon their individual DFD needs.

An optimal multi-disciplinary workforce requires ongoing training to keep up with advancements in technical and cultural knowledge. Education is fundamental for ensuring that health professionals are equipped with the knowledge, skills, and competencies necessary to provide high-quality care. This should encompass formal undergraduate and postgraduate training programs, continuing education, and professional development opportunities. A culturally safe workforce is also an integral enabler to improved diabetes foot health. The Indigenous Allied Health Australia's Diabetes Foot Care model (commissioned by the Aboriginal and Torres Strait Islander Diabetes-Related Foot Complications Program) provides a good example of a workforce model that encompasses an appropriate cultural, clinical, social and emotional wellbeing, and health promotion workforce.[53]

Currently there is a considerable DFD workforce shortage across Australia and particularly in geographically regional and remote areas. Thus, there is a need for the development of a specific national DFD workforce strategy to map current and future DFD workforce capacity, skillset, needs and geographical distribution, across a range of relevant health professional disciplines, to improve and support future workforce planning across the country. Subsequently, targeted initiatives to facilitate DFD workforce expansion and development such as incentivised regional and remote pathways and placements and DFD focused graduate programs, could be explored.

Table 3 outlines the estimated full-time equivalent health professional and interdisciplinary high risk foot service (iHRFS) workforce required to ensure access to evidence-based care for all people with or at-risk of DFD across Australia each year and is potentially a good starting point for the consideration and development of such a national DFD workforce strategy.

Table 3 Estimated full-time equivalent health professional and interdisciplinary high risk foot services (iHRFS) workforce required to ensure access to evidence-based care for people with or at-risk of diabetes-related foot ulcers across Australia each year (see Appendix 2 for explanation of citations in table)

Characteristic	Australia [a]	Per 100,000 [b]
LEVEL 1 CARE Screening for all people living with diabetes		
People with diagnosed diabetes[c]	**1,500,000**	**5,556**
Number of health professional consultations required to perform screening [d]	**1,500,000**	**5,556**
Number of FTE health professionals required to perform screening [e]	**313**	**1.2**
LEVEL 2 CARE Prevention for all people at-risk of DFU		
People at-risk of DFU [f]	**510,000**	**1,899**
Number of health professional consultations required to perform prevention [g]	**2,040,000**	**7,556**
Number of FTE health professionals required to perform prevention [h]	**425**	**1.6**
LEVEL 3a CARE Care for all people with active DFD (inc DFU) in ambulatory settings		
People living with active DFD [i]	**51,000**	**289**
Number of iHRFS consultations required to perform ambulatory care [j]	**2,650,000**	**9,815**
Number of FTE iHRFS required to perform ambulatory care [k]	**550**	**2.0**
LEVEL 3i CARE Care for all people with active DFD (inc DFU) in inpatient hospital settings		
People in a hospital bed because of DFD [l]	**471,000**	**1,744**
Number of iHRFS consultations required to perform inpatient care [m]	**471,000**	**1,744**
Number of iHRFS required to perform inpatient care [n]	**64.5**	**0.2**

PRIORITY A

ACCESS TO AFFORDABLE, CULTURALLY RESPONSIVE AND EFFECTIVE CARE

GOAL 1

All people living with diabetes need access to culturally responsive evidence-based annual screening to determine their risk of diabetes-related foot ulcers and inform their risk-based footcare

Foot health screening to identify risk

Effective preventative care can greatly reduce the risk of diabetes-related foot ulcers (DFU).[54] Australian and International evidence-based guidelines strongly recommend all people living with diabetes receive an annual evidence-based foot screening by an appropriately trained health professional, to identify if they are at-risk of developing a DFU [55,56]. This includes at a minimum, screening for the presence of peripheral neuropathy and peripheral artery disease (PAD).[55,56] Foot screening informs an individual's needs for ongoing footcare and education that will most effectively reduce their risk of developing a DFU.[55,56]

More than 1.5 million people in Australia are estimated to be living with diabetes.[25,57] According to a recent 2023 clinic-based study of 1,084 people living with diabetes from 25 NADC accredited diabetes services, 68% of people reported having a foot screening in the past year.[58] This potentially suggests a modest improvement from the only previous estimates of 50% from an older population-based study,[59] although this improvement is still unclear as these estimates are from different study populations. The nature and extent of foot screening is also highly variable with large gaps found between screening practices in clinical practice and those recommended in guidelines.[60] However, in comparable countries, the establishment of national diabetes foot screening tools and programs have been shown to increase national screening rates to be inclusive of the vast majority of populations living with diabetes, whilst also importantly providing robust DFD prevalence data to inform both health policy and research priorities.[61] We suggest establishing similar national diabetes foot screening tools and programs in Australia would likewise substantially increase national foot screening rates, provide DFD prevalence data, improve access to effective preventive care for people living with diabetes and help direct national strategies to combat DFD.

Culturally responsive evidence-based foot health screening

Access to a culturally responsive evidenced-based national foot screening program that is integrated with established community and hospital-based DFD care is a key initiative that will help support the health and wellbeing of people living with diabetes. The 2021 Australian evidence-based guidelines for the prevention and management of DFD ('the Australian Guidelines') highlight the need for careful consideration of strategies to improve footcare delivery for First Nations Peoples and for any people living in geographically remote areas – populations found to be more likely to experience the most severe outcomes of DFD and urgently require better access to culturally responsive care.[38,40,62] Recognising the considerations of the Australian Guidelines, the diversity and geographical scale of Australia, the limited workforce capacity in rural and remote areas,[63] and a colonial history that continues to drive health inequities for Aboriginal and Torres Strait Islander Peoples, such national foot screening programs require an evidence-based, contextually relevant and culturally responsive screening tool, and effective mechanisms to support and monitor implementation of such a tool.

Integral to effective and culturally responsive foot screening programs are fit for purpose foot screening tools that support equity of access to culturally responsive footcare and the differing needs of people living with diabetes in all geographical locations, including rural and remote settings. Commensurate with this, we firstly propose a culturally responsive foot screening and referral tool is developed using a First Nations-led co-design process ensuring First Nations leadership; a culturally grounded approach; respect; benefit to First Nations Communities; inclusive partnerships; and evidence-based decision-making.[64] We recommend this development is underpinned by latest evidence-based Australian Guidelines[55] and informed by existing tools, such as the FootForward screening tools. To support widespread implementation of this screening tool we also recommend development of a co-designed culturally responsive training package for health professionals to accompany the screening tool.

Implementation of culturally responsive evidence-based foot health screening

To adequately provide the evidence-based foot screening recommended by the Australian Guidelines for the 1.5 million Australians living with diabetes,[25,57] we estimate the equivalent of 313 full time equivalent (FTE) health professionals are required in Australia, or 1.2 FTE per 100,000 Australian residents (see Table 3). Through implementation of a national culturally responsive foot screening program to determine the risk-based footcare needs of individuals living with diabetes we anticipate a more patient-centred approach to subsequent footcare provision can be achieved. For people with restricted care access, for example those living in rural and remote areas where care provision may not be available locally and for Aboriginal and Torres Strait Islander people for whom culturally responsive care may not be readily available, opportunistic or more frequent screenings may also be indicated.[65] Currently, diabetes foot screenings are being reimbursed under a range of general Medicare Benefits Schedule (MBS) items, while access to further assessment and treatment (e.g., with allied health professionals such as podiatrists) is allocated by the primary health provider rather that directed by the DFU risk status of the patient. We suggest creating a new MBS Item specifically for foot screening using the co-designed foot screening tool, to systematically identify those people at-risk of (or with) DFU as early as possible. Referral and access to services appropriate to the risk status of an individual can then be effectively facilitated (see Goals 2 and 3). This will not only improve future footcare for people living with diabetes, but it will also enable robust monitoring of diabetes foot screening rates across the country. We suggest that such newly created specific MBS item should be available for use by a range of appropriately trained health professionals. Any increased investment needed for the introduction of such a new foot screening MBS item would be modest, as it would likely involve a cost shift from a range of general MBS items currently being used to a specific MBS item for this purpose.

We recommend the criteria to receive reimbursement for such a new diabetes foot screening MBS item should include performing the aforementioned foot screening assessment using the co-designed foot screening tool, plus providing culturally responsive education on their identified level of DFU risk to the person living with diabetes and referring them to appropriate evidence-based services when needed. This requires people living with diabetes and primary care clinicians to be educated on the need to undertake this process and of the appropriate evidence-based services available to them. In addition, in accordance with recommendations made in the Australian guidelines for further objective vascular assessment in people living with diabetes and suspected PAD,[66,67] for these individuals we also recommend reimbursements be made available to appropriately qualified health professionals (e.g. podiatrists), for recommended additional existing vascular assessment MBS Items (e.g. items 11610, Ankle-Brachial Index, Doppler ultrasound, Toe pressure measurement).

All people living with diabetes need access to culturally responsive evidence-based annual screening to determine their risk of diabetes-related foot ulcers and inform their risk-based footcare

GOAL 1

progress since inaugural strategy

- Implementation of the FootForward Program, providing patient and health professional education on understanding foot risk, foot-health guides, and resources
- Publication of DFA Australian evidence-based guidelines for DFD informing evidence-based foot risk stratification tools and referral pathways

potential areas for action

- Further develop and refine co-designed, culturally responsive, evidence-based foot screening and referral tools (and associated training packages) for people living with diabetes and their primary care health professionals, beginning with First Nations Peoples
- Establish a new specific MBS Item number for annual diabetes foot screening in line with Australian evidence-based guideline recommendations
- Make existing vascular assessment MBS items available to other appropriately qualified non-medical health professionals
- Implement public awareness campaigns to encourage people living with diabetes and primary care clinicians to initiate annual diabetes foot screening

potential measures of progress

- Proportion of people living with diabetes receiving annual diabetes foot screening per diagnosed diabetes population
- Proportion of people living with diabetes at-risk of developing, or with, DFU receiving referrals to appropriate evidence-based culturally responsive footcare services
- Consumer and health provider evaluation of foot screening tool and health professional training packages

PRIORITY A

ACCESS TO AFFORDABLE, CULTURALLY RESPONSIVE AND EFFECTIVE CARE

GOAL 2

All people at risk of diabetes-related foot ulcers need access to recommended culturally responsive evidence-based preventative footcare from trained health professionals

Culturally responsive evidence-based preventative footcare

All people living with diabetes that have peripheral neuropathy or PAD are at risk of developing diabetes-related foot ulcers (DFU).[55,65,68] Australian and International guidelines recommend these people at a minimum are at low risk of DFU and need evidence-based footcare consultations every 6-12 months with trained health professionals to prevent future DFU (i.e. 1-2 consultations per year).[55,65,68] The guidelines further recommend if these people also have foot deformities (including limited joint mobility, abundant callus or pre-ulcerative lesions, that further increase plantar pressures under their feet) their level of risk increases to being at moderate risk of DFU and they need more frequent evidence-based footcare consultations every 3-6 months (i.e. 2-4 per year).[55,65,68] Finally, guidelines recommend if people also have a history of DFU, amputations or end-stage renal disease their level of risk increases again to being at high risk of DFU and they again need more frequent evidence-based footcare consultations every 1-3 months (i.e. 4-12 each year).[55,65,68]

The culturally responsive and evidence-based footcare recommended to be delivered at each of these consultations is dependent on an individual's level of risk for DFU.[55,65,68] According to the guidelines, at a minimum, the components of this footcare should include: i) professional re-examinations for risk factors and DFU, ii) professional treatment of any pre-ulcerative foot lesions, callus and ingrown nails, and iii) education of patients on their risk level for developing DFU (low, moderate or high), the foot self-care they should enact (including daily inspections and wearing appropriate footwear) and how to seek urgent care for a DFU.[55,65,68] In those at moderate or high risk levels, this care should also include considerations to provide medical grade footwear, foot orthoses and/or digital flexor tenotomy surgery treatments to reduce high plantar pressure underneath the foot and in turn the risk of DFU [55,65,68]. However, in those with a history of DFU, these treatments become more important and are instead strongly recommended for health professionals to enact rather than just to consider.[55,65,68] Due to worse DFU outcomes for First Nations Peoples and non-Indigenous Australians living in rural and remote areas, access to culturally responsive preventative care commensurate with risk level for DFU for these populations should be prioritised. Therefore as for Goal 1, where there may be limited or inconsistent access to culturally responsive preventative care, opportunistic care access should be supported.[65] It should be noted that since the previous 2011 Australian DFD guidelines and previous 2018 Australian DFD Strategy,[7,8,69] these footcare recommendations have only become more specific and more strongly recommended based on additional research confirming the importance of this evidence-based footcare.[55,65,68]

Unfortunately, many components of this recommended evidence-based footcare are still not reimbursed via the MBS, Pharmaceutical Benefits Scheme (PBS) or other national funding schemes, such as the National Diabetes Services Scheme (NDSS), National Disability Insurance Scheme (NDIS), Department of Veteran Affairs (DVA), and private health insurance (PHI) schemes.[34,55,65,68] This is despite these components having been recommended for over ten years in all relevant guidelines and again in the latest Australian and International guidelines.[34,55,65,68,70] Examples of the footcare components not funded include medical grade footwear, which is now even more strongly recommended for people at high risk of DFU, based on several high-quality randomised controlled trials (RCTs) demonstrating significant reductions in the likelihood of developing DFU.[5,34,55,65,68,70] Furthermore, the number of evidence-based footcare consultations required to adequately examine and treat pre-ulcerative lesions at the frequency recommended to prevent DFU are still not reimbursed.[34,55,65,68] Depending on their level of risk, people at risk of DFU need between 1-12 footcare consultations per year as part of evidence-based footcare, to adhere to the recommendations made in latest Australian and International guidelines.[55,65,68,69] Such consultations are often provided by podiatrists, although other appropriately trained health professionals can provide them as well.[55,65,68,69]

However, such consultations still remain capped within the maximum number of five allied health professional consultations for non-Indigenous Australians (with an additional five visits available to First Nations Peoples) permitted per year for people with chronic conditions in the MBS.[34,55,65,68] This results in evidence-based footcare consultations for people at risk of DFU having to compete with other MBS allied health care requirements, be funded under other disparate national funding schemes or be funded by the patient themselves, all of which typically results in inadequate access to evidence-based footcare for people living with diabetes at risk of DFU. [34,55,65,68]

This lack of Australian Government reimbursement is striking, considering these evidence-based footcare treatments have been consistently recommended by Australian and International guidelines and are supported by robust high level evidence.[55,65,68,69] This failure to reimburse evidence-based footcare recommendations to prevent DFU has translated into a distinct lack of access to quality evidence-based footcare treatments for people at risk of developing DFU, the inevitable development or recurrence of DFU, and perhaps not surprisingly very high rates of hospitalisation in those with DFU in Australia, with hospitalisation for DFU now being the leading cause of Australia's comparatively very high national diabetes-related hospitalisation rates.[18,24,26]

Facilitating culturally responsive evidence-based preventative footcare

We strongly call on the Australian Government to urgently rectify this obvious gap in care for people at risk of DFU by reimbursing all evidence-based care recommended in Australian evidence-based guidelines for people living with diabetes via MBS, PBS or similar national publicly-funded schemes (such as the NDSS, NDIS, and DVA). This would mean that access for all people living with diabetes to all the evidence-based footcare that they need is provided in accordance with Australian evidence-based guidelines for people with diabetes. Furthermore, for people at risk of or with DFU, multiple Australian cost-effectiveness studies have found that such access not only reduces incidence rates of DFU, hospitalisations and amputations, but is also cost-saving to the patient and the health system even after investing in this extra recommended evidence-based footcare.[27,43-45] To adequately provide the evidence-based footcare recommended in the Australian guidelines for the 510,000 Australians estimated to be at risk of DFU, we estimate the equivalent of 425 FTE health professionals are required in Australia, or 1.6 FTE per 100,000 Australian residents (see Table 3).

With the majority of appropriately trained foot health professionals that are able to provide this evidence-based footcare practicing in the private or not-for-profit sector (e.g. 80% of registered podiatrists practice privately[71]), reimbursements from MBS, PBS or other similar national schemes (such as NDSS, NDIS, DVA, and PHI) is vital in the care of people at risk of developing DFU. To ensure increased access to evidence-based care and prevent uncontrolled reimbursement claims, we recommend that only people with confirmed risk factors for developing DFU be eligible for reimbursement (see criteria recommended for new MBS item for diabetes-related foot screening in Goal 1). Furthermore, we recommend that only health professionals who can demonstrate to be appropriately trained in evidence-based footcare to prevent DFU are eligible for reimbursement of any new MBS, PBS or similar national publicly-funded scheme items in this area (see further Goal 4). Similar DFU reimbursement systems have been in place in Germany and Belgium for over ten years, and this has led to health professionals consciously choosing to either treat people at risk of DFU in accordance with evidence-based guideline recommendations, or refer to others that do.[72] In addition, for First Nations Peoples and geographically remote people, we again also recommend that access to translation services and options to conduct evidence-based footcare in shared medical appointments or in conjunction with the telehealth services be supported to increase the accessibility and cultural responsiveness of services. Finally, further reimbursements could be tied to demonstrated improved DFU clinical performance and outcomes achieved by health professionals (see further Goal 5).

GOAL 2

All people at risk of diabetes-related foot ulcers need access to recommended culturally responsive evidence-based preventative footcare from trained health professionals

progress since inaugural strategy

- Publication of DFA Australian evidence-based guidelines for prevention of DFU
- Otherwise, limited progress has been made since the last strategy

potential areas for action

- Establish MBS, PBS or similar national publicly-funded scheme item numbers (such as NDSS, NDIS and DVA) to reimburse footcare consultations for all people at risk of DFU in line with Australian evidence-based guideline recommendations
- Establish MBS, PBS or similar national publicly-funded scheme item numbers to reimburse medical grade footwear and foot orthoses for all people at high risk of DFU in line with Australian evidence-based guideline recommendations
- Implement public awareness campaigns to encourage people living with diabetes and primary care clinicians to initiate preventative diabetes footcare, including preventative footwear

potential measures of progress

- Increased proportion of additional MBS, PBS or similar national publicly-funded scheme item number reimbursements for footcare consultations per estimated population at risk of DFU
- Increased proportion of additional MBS, PBS or similar national publicly-funded scheme item number reimbursements for medical grade footwear and foot orthoses per estimated population at risk of DFU

PRIORITY A

ACCESS TO AFFORDABLE, CULTURALLY RESPONSIVE AND EFFECTIVE CARE

GOAL 3

All people with active diabetes-related foot disease need access to clinically safe and culturally responsive evidence-based healthcare from interdisciplinary High Risk Foot Services

Interdisciplinary High Risk Foot Services in Australia

Australian and International guidelines recognise that optimal care for people with active DFD requires a breadth of clinical skills possessed by no single healthcare discipline.[49,55,56,73,74] Active DFD includes ulceration, infection, ischaemia or active Charcot neuro-osteoarthropathy of the foot in a person with diabetes.[9] People with active DFD need access to regular evidence-based care that requires clinical skills in the assessment and management of metabolic, vascular, neurological, orthopaedic, biomechanical, ulcer and infection aspects of DFD.[49,56,67,73-84] For this, collaborative patient-centred care should be provided by a range of clinicians with these different skills working together in specialised interdisciplinary High Risk Foot Services (iHRFS). Implementation of iHRFS have been found to significantly improve clinical and financial outcomes including hospitalisation and amputation.[27,43,56,74,85] Thus, it is vital that all Australians with active DFD have access to evidence-based healthcare from iHRFS in order to achieve optimal health outcomes.[49,56,67,73-84]

The exact number of iHRFS in Australia is currently unknown and heterogeneity in the availability, composition and function of iHRFS in Australia has previously been described.[86] However, since the release of the previous DFA strategy, there has been significant progress in defining the personnel, equipment, processes and procedures needed for an iHRFS in the Australian context with the release of the NADC iHRFS standards and accreditation program which outline the characteristics of a Core and a Centre of Excellence level iHRFS (see Goal 4).[87] Thus far, 17 iHRFS have been awarded accreditation as Centres of Excellence and 19 others accredited at Core level. Based on this information and canvassing DFD health professional networks in Australia we estimate there are currently approximately 70 iHRFS (including both accredited and non-accredited services) in Australia. Furthermore, most iHRFS in Australia are located in state funded ambulatory health care facilities such as hospital outpatient clinics or community health centres. However, to provide evidence-based interdisciplinary specialist care to the estimated 51,000 people with active DFD each day in Australia, we estimate the equivalent of 550 ambulatory iHRFS are required, or 2 ambulatory iHRFS per 100,000 people (see Table 3). In addition, we estimate the equivalent of 64.5 inpatient iHRFS are required in Australia, or 0.2 inpatient iHRFS per 100,000 people, to adequately care for the estimated 1,290 Australian inpatients in hospital each night with active DFD (Table 3). Thus, we suggest Australia has less than 15% of the iHRFS needed to adequately provide evidence-based care to all Australians with active DFD. Although this is an increase from the previous strategy estimate of having less than 10% of iHRFS needed, iHRFS availability needs to increase significantly and rapidly in Australia.

Improved outcomes, including reduced hospitalisation and amputations, have been achieved in Australian regions which have invested in improved access to iHRFS for people with active DFD.[29,85,88] NSW has invested in at least one iHRFS clinic per local health district and has achieved lower amputation rates in rural and regional areas than most other states.[88] In Queensland, investment in increased numbers of iHRFS across the state including in regional centres, has been associated with a 40% reduction in DFD hospitalisations, 45% reduction in major amputations and a 37.5% reduction in minor amputations.[85] Furthermore, data from the UK National Diabetic Foot Audit has demonstrated more rapid access to specialist care in iHRFS clinics is associated with higher likelihood of being alive and ulcer free at 12 and 24 weeks after DFU onset.[89]

In addition, Australian data has shown that a patient's location (distance from an iHRFS clinic) is a determinant of DFU healing outcomes, with a greater distance from an iHRFS clinic being associated with slower DFU healing and higher risk of amputation.[48,90,91] There can be challenges in recruiting an appropriately skilled workforce to staff iHRFS clinics in some regions, and greater efforts and access to training, upskilling opportunities and connection to established iHRFS will be important to help resolve these issues (see Goal 4). The marked increase in iHRFS required to meet current clinical needs will require substantial initial investment from State and Federal governments. However, as per aforementioned findings from Australian cost-effectiveness analyses studies,[27,43-45] even after accounting for initial investments to ensure access to evidence-based care for all Australians who need it, savings in the order of $940 million per year (or $3.5 million per 100,000 Australian residents each year)can be achieved (see Table 2). These cost savings, along with the significant improvements in patient outcomes, provide compelling justification for governments to facilitate the establishment of many more iHRFS.[27,43-45] This could be done through innovative incentives for public or conjoint public/private health services to establish iHRFS to cover staff, facilities and consumables.

Facilitating care for people with active DFD across Australia

Providing timely access to iHRFS care is highly challenging in geographical areas of Australia with vast distances between health services and smaller populations. Telehealth should be facilitated and reimbursed between health professionals in rural and remote areas, with iHRFS in regional or metropolitan hubs. Several randomised controlled trials (RCT) of telehealth iHRFS models (consisting of initial iHRFS in-person assessment plus follow-up telehealth care by the iHRFS) compared with standard iHRFS in-person care in different European countries have consistently demonstrated similar outcomes for healing and amputation rates in those with DFU, but with potentially cost-savings for the telehealth iHRFS models.[92-94] A telehealth program for DFU and leg ulcer management was also associated with reduced diabetes-related amputations in Western Australia[95] and have now been funded with similar anecdotal improved outcomes in Queensland, NSW and South Australia.[96,97] There has also been recent telehealth acceptability and feasibility data from SA and for First Nations Peoples.[98]

To help support the expansion of innovative and evidence-based iHRFS delivery of care via telehealth of people with active DFD, this recommendation could be incorporated into existing telehealth MBS item numbers. To increase the number of ambulatory, inpatient and telehealth services provided by iHRFS in Australia, there is also a need to train many more multi-disciplinary health professionals to deliver the required iHRFS specialised care in both state-funded public facilities (for example public hospitals or community health care facilities) and MBS-reimbursed private facilities (for example private hospitals or large GP clinics) (see Goal 4).

Ongoing impacts of colonisation and persisting racism have contributed to First Nations Peoples experiencing a 3 to 6 fold increase in DFD rates compared with non-Indigenous Australians.[40,99,100] Access to evidence-based, culturally appropriate footcare services for Aboriginal and Torres Strait Islander people is essential to improving foot health and reducing the impacts of DFD.[101] Innovative models of care that are First Nations-led, address Community identified priorities, incorporate Indigenous knowledges and build trust between Community, Aboriginal Community Controlled Health Organisations (ACCHOs) and mainstream health providers (e.g. iHRFS)[101] need to be much more widely available. There are small scale examples both in Australia and internationally of initiatives to decolonise health care systems and provide culturally safe services to First Nations Peoples with diabetes and/or DFD.[101-103] Such services demonstrate that using First Nations-led service delivery models co-designed with and for First Nations Peoples and involving culturally capable health professionals and service delivery methods (e.g., clinical yarning and shared medical appointments) increases uptake of services and may in turn improve footcare management and DFD outcomes. Co-design of services for the management of active DFD must privilege First Nations health knowledges and priorities, re-position power to First Nations Peoples and be adequately supported through designated funding for and commitment to authentic First Nations-led co-design process and culturally safe and on Country care delivery.[64]

Since the first DFA strategy, the federally funded Aboriginal and Torres Strait Islander Foot Complications Program coordinated by the South Australia Health and Medical Research Institute (SAHMRI) was established. The program's aim was to improve foot health and reduce amputation rates for Aboriginal and Torres Strait Islander people living with diabetes in South Australia, the Top End of the Northern Territory and Central Australia, the Kimberley region in Western Australia and Far North Queensland.[104] The initial planning phase of the program investigated and reported on the determinants, burden and impact of DFD, as well as mapped available DFD services, and identified gaps in the system. Each region then developed an implementation plan to improve access to iHRFS care, optimise continuity of care, develop new service models, and enhance the existing workforce capacity and capability. This program has had a strong focus on community engagement and empowering people living with diabetes and those with or at risk of developing DFD to maintain healthy feet, recognise foot health risks early and navigate the health system to access early and appropriate care. A formal evaluation of the program has not yet been published, but anecdotally it has been a success, and such successful initiatives will require ongoing financial support.[104]

Similar to prevention (see Goal 2), there is a lack of reimbursement via MBS, PBS and national schemes (such as NDSS, NDIS, DVA and PHI) for many Australian guideline recommended evidence-based care components necessary to treat people with active DFD.[34] For example, the frequent (weekly or fortnightly) podiatry consultations required to adequately treat active DFD and the provision of necessary pressure offloading devices are not reimbursed via MBS or PBS.[55,56,76,78,80,81] In terms of optimal DFD outcomes, necessary offloading devices (such as non-removable moonboots) to heal active DFU have amongst the highest level of evidence and strength of recommendation of all Australian diabetes-related guideline recommendations.[55,56] Additional barriers to access such necessary offloading devices include geographical inequity of access, workforce constraints and suboptimal awareness and education regarding the importance of these evidence-based interventions.

Australia's healthcare system includes both public sector and private health organisations with complex funding sources including Australian federal, state and territory governments, private sector service providers, not for profit organisations and individuals.[105] Most iHRFS in Australia are located in public hospitals. Further work should be undertaken to understand the barriers and facilitators to establishing iHRFS in the private healthcare setting, such as innovative funding models and MBS incentives. Without reimbursement for Australian guideline recommended evidence-based care[34] it is unlikely that many iHRFS will be established in the private sector and thus people with active DFD will nearly always need to seek care in the public health system.

However, there has been progress made in funding of wound care consumables for the management of DFUs since the previous Australian DFD Strategy with the 2023 announcement of the Australian Government funded Chronic Wound Consumables Scheme. This scheme will provide people living with diabetes aged 65 years and over and Aboriginal and Torres Strait Islander people aged 50 years and over access to subsidised wound consumables.[106] This funding investment should greatly improve access to affordable wound care management for many Australian's >65 years living with DFUs. However further funding is still required to ensure equitable access to wound consumables for all people living with DFUs, especially considering as outlined in Section 2 that demographic trends indicate many people with DFD are being diagnosed much younger (<65 years) and those of youngest ages (<40 years) are experiencing the poorest DFD outcomes.[11,18,24,26]

Finally, more work must be undertaken to better empower and inform communities of people living with diabetes regarding the evidence-based care they should expect to receive for management of active DFD. Since the first DFA strategy, there have been new patient and health professional focused educational resources developed by the NDSS Foot Smart program, the DFA Toolkit and associated educational materials, the DFA Foot Passport, the National Foot Forward program and also a number of resources developed in collaboration with community from the SAHMRI Aboriginal and Torres Strait Islander Foot Complications Program. These resources should continue to be disseminated as widely as possible via social media, patient organisations, peak national health professional organisations and governments. Furthermore, we strongly recommend there should be national public awareness campaigns and patient-friendly tools to encourage people with active DFD to seek early access to evidence-based care. Wounds Australia has recently been awarded a $2 million federal government grant to deliver a national education and awareness campaign on chronic wound prevention and treatment,[107] which will go some way to helping to raise awareness of this problem in general, but much more needs to be done to raise awareness of the fact that people with DFU urgently need evidence-based iHRFS care.

GOAL 3

All people with active diabetes-related foot disease need access to clinically safe and culturally responsive evidence-based healthcare from interdisciplinary High Risk Foot Services

progress since inaugural strategy

- Gradual increase in numbers of iHRFS across Australia mainly via state government funding
- Improved funding and resources for iHRFS for Aboriginal and Torres Strait Islander people via the SAHMRI Aboriginal and Torres Strait Islander Foot Complications Program
- Australian Chronic Wound Consumables Scheme funding now available, but not all people with active DFD are eligible
- DFA, Foot Forward, DA, NDSS developed patient friendly tools for people with DFD
- Wounds Australia recently awarded funding for national education and awareness chronic wounds campaign
- No progress in coordinated national funding of iHRFS, including telehealth models

potential areas for action

- Establish innovative incentives and funding model agreements to significantly increase the number of iHRFS in the public and private sector, including via telehealth
- Establish an MBS, PBS or similar national publicly-funded scheme item numbers (such as NDSS, NDIS and DVA) to reimburse offloading devices for all people with active DFD in line with Australian evidence-based guideline recommendations
- Consider tying ongoing reimbursement of iHRFS for active DFD care to improvements in regional clinical process indicators and outcomes
- Implement national public awareness campaigns and patient-friendly tools to encourage people with active DFD to seek early access to evidence-based care

potential measures of progress

- Increased number and proportion of iHRFS available across Australia and in each health service region
- Increased proportion of people with active DFD treated in iHRFS
- Increased proportion of people with active DFD receiving appropriate offloading devices
- Increased proportion of people with DFU receiving appropriate wound dressings
- Increased proportion of people with active DFD receiving telehealth consultations with iHRFS
- Perform cost-effectiveness analyses of increased investments in evidence-based iHRFS compared to usual care for people with active DFD to determine and report on patient outcomes, costs and returns of investments in additional iHRFS across Australia

GOAL 4

All people living with diabetes-related foot disease should have access to interdisciplinary High Risk Foot Services that meet evidence-based standards

Accreditation of iHRFS

Considerable recent progress has been made in developing Australian standards for iHRFS and a robust national accreditation process for iHRFS has been established. The NADC formed a collaborative interdisciplinary Foot Network Working Party in 2017, which had broad representation across relevant health professions and 12 peak national health professional organisations. The working party developed and launched Australian iHRFS Standards in 2018, and reviewed and updated them in 2021.[108] The standards outline detailed service indicators for Core and Centre of Excellence iHRFS levels across 8 standard areas including interdisciplinary approach, governance, evidence-based management, access criteria, continuity of care, equipment, wound care, and quality improvement. In conjunction with the standards, the NADC implemented a world leading iHRFS Accreditation program in 2019.[109] To date, 17 services have been awarded Centre of Excellence status, 19 services awarded Core status, and 15 of those services have now completed reaccreditation (4 yearly assessment cycle). Nearly all accredited iHRFS are located in metropolitan or large regional cities. However, a dramatic increase in the number of appropriately skilled, well-organised and accredited iHRFS is still required to ensure all people with active DFD across Australia have access to the quality iHRFS footcare they require to achieve optimal health outcomes (see also Section 2 and Goal 3).

To build upon the considerable success of this leading iHRFS accreditation program, further development of the program could consider aspects such as the cultural responsiveness of the program, the potential reach and flexibility of the program to health services in diverse geographical areas and diverse populations, and the potential barriers to proceeding through the iHRFS accreditation process. For example, provision of evidence-based, culturally appropriate iHRFS care for Aboriginal and Torres Strait Islander people is essential to improving outcomes and reducing the impacts of DFD.[101] There are examples both in Australia and internationally of initiatives to decolonise health care systems and provide culturally safe services to First Nations Peoples with DFD, incorporating models of care co-designed with and for First Nations Peoples, and involving culturally capable health professionals and service delivery methods such as clinical yarning and shared medical appointments.[101-103] The current NADC iHRFS core standards do already emphasise the need for iHRFS to provide culturally appropriate care (standard 4, indicator 6). However future versions of the standards provide opportunities to expand this standard, by including collaboration with Aboriginal and Torres Strait Islander people and organisations, using First Nations-led approaches that reflect the immense diversity of First Nations Communities priorities, and supporting First Nations Community-led approaches to development of DFD service delivery. Such work would require appropriate investment in time and resources.

For rural and remote regions of Australia, flexibility is likely required for accreditation to be considered for the many iHRFS-type services provided in these regions. These services may not be able to comply with current core iHRFS standards because of the lack of available core iHRFS health professionals and treatment modalities in rural and remote regions. However, evidence is expanding regarding telehealth models of care for people living with DFD,[92,94] with an increasing number of iHRFS telehealth programs being developed around Australia.[96,97] An area of potential future development of the iHRFS standards and accreditation program would be to add specific service indicators for a third Telehealth iHRFS level, with specific evidence-based service indicators to ensure safe and effective use of telehealth for interdisciplinary DFD management. This may have further spin-off benefits in terms of developing national recommendations for markers of quality telehealth care provided across all levels of iHRFS and potentially improve and widen options to access best practice care via in-person and telehealth for all people with DFD across Australia.

Other options for the further development of the accreditation program could be mandatory regulation of iHRFS standards (eg via systems such as the National Safety and Quality Health Service Standards).[110] This could drive further engagement and provision of additional resourcing to help provide support for iHRFS to successfully meet Australian iHRFS standards and achieve accreditation. Now that Australian iHRFS standards, accreditation, data collection and benchmarking process are well-established, further development could include activities such as peer-review or in-person iHRFS auditing. In Germany, accredited iHRFS visit each other at least six monthly for peer-review auditing.[72] This generates unique learning opportunities, strengthens networks, and avoids the need for a separate arbitrary external auditing body. However, substantial funding and resources would be required to progress with peer-review or in-person auditing iHRFS accreditation in Australia.

Health professional education and training

For all health professionals involved in supporting people living with diabetes to be appropriately trained, specific culturally responsive and evidence-based education modules for optimising diabetes foot health need to be developed, endorsed and readily available at minimal cost. These modules should address the skills required across the entire spectrum of foot health in diabetes (encompassing primary, secondary and tertiary care), align with Australian DFD guideline recommendations and be relevant for multiple health professional disciplines. This is particularly important where there is limited access to culturally responsive health services and a limited health workforce, as often seen in rural and regional Australia. Fortunately, considerable progress has already been made in the development of education packages from peak national organisations (such as DFA, ADS, NADC, DA and others) in providing an increasing volume of available educational resources on DFD for health professionals. To pick one example, the FootForward program has produced three freely available, evidence-based, educational modules regarding diabetes foot screening, PAD and peripheral neuropathy, with associated continuous professional development recognition. Furthermore, similar DFD training packages for Aboriginal and Torres Strait Islander Health Workers are also available through the FootForward program website.

Whilst there is an increased volume of existing training and education modules available, further work needs to be undertaken to evaluate these modules to see if they are effective and for which health professions they appeal. For example, ensuring culturally responsive education and training packages are available is crucial for uptake and training for certain health professionals such as Aboriginal and Torres Strait Islander Health Workers, who may find it challenging to engage with available education modules, or remote area nurses may not find current resources useful for their practical day-to-day clinical experiences. Most of these existing modules and resources though are targeted at GPs and primary care health professional level. Therefore, there is still much scope for the development of advanced DFD education modules targeted at early and mid-career health professionals across diverse disciplines, to support their development towards becoming more knowledgeable and skilled particularly in the area of active DFD care. This would in turn start to build health professional interest and capacity towards the optimal multi-disciplinary DFD workforce to ensure access to optimal care for all people with DFD across Australia as outlined in Table 3.

Health professional credentialling

For practitioners working in iHRFS settings, there are some health professional discipline specific training and regulatory processes in place to try and ensure delivery of safe, quality care. For example, specialists such as vascular surgeons, endocrinologists and infectious disease physicians all complete advanced post-graduate training programs with curricula which may include the management of DFD. Specialist medical organisations also provide additional educational opportunities for doctors in training, such as the DFD education session comprising part of the 2-day ADS Practical Skills Course for 1st year endocrinology advanced trainees. Whereas university undergraduate podiatry programs also typically include dedicated units on DFD management of varying length and emphasis. However, there are no specific post-graduate qualifications or credentialling focused on DFD in any discipline, although podiatrists can pursue further qualifications in advanced prescribing, nurse practitioners can specialise in advanced wound care and a high quality of DFD footcare can be developed through supported experience and practice in hierarchical iHRFS teams.

Whilst additional certification, credentialling or accreditation of individual health professionals to ensure competency of practice in preventative and active DFD management was recommended in the first strategy and explored by some peak health professional bodies, this approach has not gained significant traction either in Australia or internationally at this stage. However, there could be better scope and appetite for a voluntary certification, credentialling or accreditation process for DFD health professionals at screening and prevention levels (e.g. in primary care with general medical practitioners, primary health care nurses, Aboriginal Health Practitioners or podiatrists), and active DFD management levels (e.g. in secondary and tertiary care, such as with iHRFS podiatrists, endocrinologists, vascular surgeons or nurse practitioners). This could have synergies with and potentially sit alongside the existing iHRFS accreditation process. Rather than mandating a set of core competencies or certification, the voluntary health professional credentialling/accreditation process could be a personal achievement, identifying an individual as providing excellent quality DFD screening, prevention and/ or care or lead to certain reimbursements and deserved consideration.

Reimbursement

A possible long-term strategy for iHRFS accreditation is to align qualifications with reimbursement (see Goals 1-3). In Germany and Belgium, for example, only accredited iHRFS are eligible to receive public or private reimbursement when treating people with active DFD, which has been essential for the longevity of iHRFS.[72] Furthermore, if individual health professional credentialling/accreditation at each level of DFD care was progressed, this could also potentially be tied in future to eligibility for re-imbursement of specific MBS items, such as bedside vascular assessment, offloading device or wound dressings MBS items, which may increase the attractiveness to health professionals for such a quality improvement credentialing process.

GOAL 4

All people living with diabetes-related foot disease should have access to interdisciplinary High Risk Foot Services that meet evidence-based standards

progress since inaugural strategy

- Australian iHRFS standards and accreditation process have been established by the NADC
- A public register of accredited iHRFS has been established & available on the NADC iHRFS accreditation website
- iHRFS benchmarking is now available via participation in standardised national DFD data collection and benchmarking process via the Australian Diabetes Foot Registry (see Goal 5)
- Multiple health professional education and training modules in DFD management developed by multiple national peak bodies across Australia

potential areas for action

- Consider mechanisms to support more services completing the iHRFS accreditation process
- Consider introduction of new iHRFS standards and accreditation processes for remote iHRFS, telehealth iHRFS and services providing care to First Nations people
- Raise awareness of existing evidence-based education and training modules for healthcare professionals working with people with, or at-risk of, DFD
- Develop new education and training modules aimed at health professionals working with people with active DFD
- Develop further undergraduate, postgraduate and advanced trainee DFD training options
- Develop a sustainable process for reviewing and endorsing iHRFS accreditation standards and DFD training and educational modules, to ensure they align with latest evidence-based guidelines and are accessible to all stakeholders
- Develop a new voluntary credentialling program for individual health professional to recognise their knowledge, experience and competency for 3 different levels of DFD care: screening, prevention and management of active DFD
- Align DFD reimbursement strategies with credentialling for individual health professional's and accreditation for iHRFS

potential measures of progress

- Increased number or proportion of iHRFS accredited
- Broadened iHRFS accreditation program to include diverse iHRFS services for diverse populations of Australia
- Increased number of education and training modules that are accessible, relevant, evidence-based and improve the foot health of people with diabetes.
- Establishment of a voluntary credentialling/accreditation program for individual health professionals

PRIORITY B

PROVISION OF SAFE QUALITY CARE

GOAL 5

All health service regions should report their diabetes-related foot disease outcomes annually and contribute standardised data to a registry that enables benchmarking and collaboration

The value of standardised data collection

Data collection, audit and benchmarking are integral to optimisation of healthcare delivery.[110-112] Understanding the characteristics of people who develop DFD and the nature of disease can inform service development and resource allocation. Further, monitoring process and outcomes enables identification of areas for quality improvement at both a service and public health level.[110-112] The International DFD guidelines recommends "auditing of all aspects of services to identify and address problems and ensure that local practice meets accepted standards of care".[56] Following on from these International guidelines, the Australian DFD guidelines noted gaps in data availability across several footcare domains, impeding local capacity to comprehensively evaluate clinical management and outcomes.[113] Through a broader lens, a key goal of the current Australian National Diabetes Strategy 2021-2030 is to improve access of diabetes-relevant datasets, linkage across healthcare settings and to foster new knowledge from aggregate analysis.[114] Given the power of data to effect positive change it is crucial that data registries purposefully include priority populations, such as people living in geographically remote areas, and explore mechanisms to support inclusion of primary care outcomes. Furthermore, it is important that Aboriginal and Torres Strait Islander people and Communities are empowered by supporting the development of First Nations governed datasets that align with their self-determined goals for DFD while ensuring Indigenous data sovereignty, which is a national priority.[115]

The inaugural strategy identified the need for improved and cohesive data collection practices by services managing DFD.[8] A major success of the intervening years has been the increasing integration of data collection in clinical care, particularly in iHRFS. In large part this cultural shift was driven by the introduction of the NADC Australian iHRFS Standards in 2018, and in particular the need to meet the service indicators in Standard 8 that are dedicated to data collection and quality improvement.[108] Combining data-driven outcome monitoring with accreditation was also recommended by the inaugural strategy based on the success of European service models.[8,72] In seeking accreditation by the NADC, several Australian iHRFS requested centralised guidance and infrastructure be made available to alleviate the local burden of developing and implementing data collection. A minimum dataset was derived by interdisciplinary expert consultation and based on the DFA Australian Diabetic Foot Ulcer Minimum Dataset Dictionary.[6] Imperative to the widespread uptake of this standardised minimum dataset was the supported and somewhat flexible implementation of a commonly used, accessible and free electronic data collection platform.[116] The periodic aggregation of data collected from this platform now feeds the Australian Diabetes Foot Registry (ADFR). Since 2022 ADFR annual site reports have provided comparative site and national statistics for benchmarking and quality improvement.[117] The ADFR has since been growing exponentially and has attracted numerous invited presentations at key national and international conferences further strengthening iHRFS collaboration across the country. Additionally, the Queensland High Risk Foot Form (QHRFF) database has been active for over 15 years across Queensland. The QHRFF is now one of the largest DFD datasets in the world and has been widely used in national and international studies.[90,91] Considering the ADFR and QHRFF, Australia has become an international leader in DFD data collection and this strength should be maximised to ensure all health service regions have the means to report and compare their DFD outcomes.

Ensuring the right data is collected in the right way

Another noteworthy development over this period was the establishment of patient-reported outcome measures (PROMs), including quality of life, within diabetes and DFD datasets. The Australian Commission on Safety and Quality in Healthcare recommends use of PROMs to bring lived experience to the forefront of care.[118,119] While value-based healthcare is universally desirable, the adoption of PROMs by iHRFS should certainly be prioritised, as has been exemplified by implementation of the Leading Better Value Care program in New South Wales since 2017.[120] Moving forward, the appropriateness of generic PROMs for people living with DFD, and their usability, validity and reliability in this clinical context, should be assessed. Incorporating or linking PROMs with existing Australian DFD datasets will enable more comprehensive evaluation of outcomes important to the person with DFD which may not be simply measured by ulcer healing, hospitalisation and/or amputation rates.[121]

National outcome reporting relating to care of people living with DFD, has historically been reliant on general health databases that are not specifically focused on DFD, such as standard Australian hospital admissions datasets. Whilst resulting epidemiological data is powerful in identifying DFD care priority areas, such as showing growth and variations in incidence or outcomes of diabetes and DFD,[10,11,18,122] explaining these variations between services or regions typically require availability of more nuanced data. Resourcing and processes of hospital admission data collection and analysis for DFD is relatively well established.[18,26] However, there is still a need to standardise hospital coding definitions and reporting standards nationally, if not globally, for DFD hospitalisations as has previously been performed for diabetes-related amputations. This is ever more important considering DFD has emerged as the leading cause of diabetes-related hospitalisation both nationally and globally.[18,26] In this context, hospitalisation avoidance has become a major focus of iHRFS and community care, and with that monitoring non-admitted care and primary care outcomes is equally important to provide potential data-driven explanations of variations between services and regions across Australia. To conceptualise integrated DFD data reporting systems needs in Australia, Table 4 outlines the general DFD outcomes of interest needed, along with the datasets available to inform those outcomes, and recommended actions to deliver reporting of those outcomes for each aspect of the Australian healthcare system.

Table 4 DFD outcomes of interest, datasets available and recommended actions for data reporting systems in Australia

Healthcare system	Outcomes of interest	Datasets available	Recommended actions
Tertiary	Hospital admitted care process and clinical outcomes	Australian hospital admission datasets	National consensus standards on the definitions for identifying and reporting DFD hospitalisations
Secondary	Non-admitted care process and clinical outcomes	Australian Diabetes Foot Registry and Queensland High Risk Foot Form (QHRFF) Database	Increasing contribution of iHRFS to existing datasets / registries
Primary	Primary care process and clinical outcomes	Medicare Benefits Schedule (MBS), Pharmaceutical Benefits Scheme (PBS),and National Diabetes Services Scheme (NDSS) datasets	Insufficient and fragmented; need to be incentivised for DFD data collection (see Goals 1 to 3)
Primary, secondary and tertiary	Patient-reported outcome measures (PROMs)	Health Outcomes and Patient Experience platform in NSW and QHRFF in QLD	National consensus on PROMs for DFD, and standardised collection across states / territories
Aboriginal Community Controlled Health Organisations	Primary care and patient -reported outcomes for First Nations Peoples	MBS, PBS and NDSS; not otherwise standardised	Support First Nations Communities and Organisations to explore priorities and processes for data collection

The above table highlights the first challenge in addressing areas for action from the inaugural strategy, namely the siloing of data within different parts of the healthcare system. Australia is yet to realise a unified medical record system that caters to the needs of all states and territories, healthcare settings, health professionals, and patients across the whole system. As a result, standardising collection of DFD specific data are typically confined to state,[123,124] region[41], healthcare setting[125], or indeed service. Positively, the Australian Commission on Safety and Quality in Healthcare has published a revised framework to guide development of "future-focused" national clinical quality registries.[126] Beyond the logistics of implementing national data collection, reaching unanimous agreement on the dataset/s itself, can be challenging. Services also struggle with the time-demand of data collection when it is independent of routine clinical workflow, despite there being acknowledged ultimate benefits of this data reporting. Thus, the ADFR will need to remain adaptable and evolve in response to health professional feedback, changes in national metadata standards and the introduction of electronic medical records. Also, the ADFR relies on the voluntary involvement of services and with that confidential service-level data, and therefore transparency of publicly available reports is currently limited. Thus, overcoming many of these data reporting challenges relies on sufficient project funding in concert with the national digitalisation of healthcare.

There are surprisingly few international models of coordinated nationwide and comprehensive data collection on the management of DFD. The ideal data reporting system would collect and report the outcomes of entire diabetes and DFD populations to identify regional differences, such as ulcer healing, hospitalisation and amputation rates, while minimising ascertainment bias.[127] If differences persist after adjustment for known risk factors (e.g. age, sex, ethnicity) there may be important variations in care (e.g. access to services, adherence to quality care standards), however such in-depth analysis requires sufficient data granularity. The United Kingdom has arguably led the world in this space with the establishment of the National Health Service Digital National Diabetes Footcare Audit (NDFA) across England and Wales.[128] The NDFA exemplifies the power of digitalisation and government partnership,[129] and use of enhanced knowledge to drive quality improvement.[130]

In summary, the current standing of Australia's data-driven efforts to improve outcomes for people living with DFD, and at the very least the readiness of health professionals and services to conduct audits and monitor outcomes, has been demonstrated in Australia. Recent developments, including the implementation of ADFR and PROMs by services, has further proven the feasibility of national standardised data collection. The following potential areas for action for improved DFD reporting in Australia strives for equitability and excellence in diabetes footcare delivery across the country, and will see Australia further recognised internationally for innovation and leadership in this field.

All health service regions should report their diabetes-related foot disease outcomes annually and contribute standardised data to a registry that enables benchmarking and collaboration

GOAL 5

progress since inaugural strategy

- Establishment of the ADFR to report non-admitted DFD care process and clinical outcomes
- Some reporting of Australian DFD-related hospitalisation and amputation rates

potential areas for action

- National alignment of datasets relating to DFD, with a particular focus on non-admitted care and PROMs
- Continue to integrate data collection and audit with iHRFS accreditation, and explore option of mandating minimum data contribution to the national registry (ADFR)
- Continued development of site-level reporting processes for iHRFS, including benchmarking, and prioritising use of DFD data to inform quality improvement
- Acquire funding to realise the full potential of the national registry, including access to data analytics and establishment of strategic linkages with other national datasets
- Establish national consensus standards on the definitions and codes for identifying and reporting DFD hospitalisations and amputations
- Promote and support culturally responsive First Nations-led approaches to development of datasets to address priorities of Aboriginal and Torres Strait Islander people
- Promote and support collaborative and positive use of data for priority populations for example geographically remote populations.

potential measures of progress

- Number of national peak bodies endorsing nationally standardised DFD data collection standards, including achieving consensus on process, clinical and patient-reported outcomes across all healthcare settings
- Increased proportion of data collection capture with respect to diverse target populations
- Introduction of dedicated MBS item codes for diabetes foot screening, with requirement for data collection on risk classification, identified DFD and referring practices (with specific consideration of primary care)
- Introduction of nationally standardised PROMs for DFD to enable benchmarking
- Increased number or proportion of services that successfully integrate data collection in clinical workflows via electronic medical records
- Increased funding received towards formalising a national clinical quality registry and supporting site and national-level reporting of outcomes specifically relating to DFD

GOAL 6

Australian national diabetes-related foot disease guidelines should continually reflect the most up-to-date evidence to guide best practice standards for healthcare provision across Australia

Current Australian DFD guidelines

Evidence-based guidelines are the cornerstone of clinical care for all health professionals. The inaugural Australian DFD strategy recommended a key goal was the urgent updating of the previous 2011 Australian evidence-based DFD guideline.[131] In 2021, a suite of new Australian evidence-based DFD guidelines were developed and launched.[8] Prior to the development of these new Australian guidelines, DFA concluded that the substantial funding required (estimated to be >$1 million) to develop new guidelines de novo ('from scratch') was not likely feasible to obtain for the DFD field.[55] Therefore, DFA decided the new 2021 Australian guidelines would be developed using the ADAPTE and Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approaches; both methodological approaches recommended by the National Health and Medical Research Council (NHMRC) for adapting international guidelines to the Australian context.[132] An expert guidelines development group systematically identified that the 2019 International Working Group of the Diabetic Foot (IWGDF) Guidelines were the only appropriate guideline source able to adapted as part of these approaches.[133-139] As such, the suite of 6 IWGDF ("International") guidelines were systemically assessed by 30 Australian multi-disciplinary clinical, research and consumer DFD experts from 7 disciplines across 6 parallel expert panels over a two year process using the ADAPTE and GRADE approaches. At the conclusion of this process, of the original 100 IWGDF guideline recommendations across the 6 guidelines, 71 recommendations were adopted, 27 adapted and two excluded for the new Australian guidelines.[3,65,67,75-78] This approach enabled careful and systematic considerations of the evidence in the Australian context, and included consumer and Aboriginal and Torres Strait Islander Peoples representatives input at all steps of the development. Furthermore, to maximise uptake and usability, complementary quick reference pathways, webinars, and interactive digital pathways and tools were also produced.[140] In total this recommended systematic process successfully adapted Australian guidelines from appropriate international source guidelines, yet involved the substantial in-kind contributions of 30 experts over a two year period.

In May 2023, an updated iteration of the IWGDF guidelines were released. This comprises 111 new or revised recommendations across the six original IWGDF guidelines comprising prevention, classification, wound healing, peripheral artery disease, infection and offloading.[68,80-84,141] Additionally, 26 new recommendations were also developed in a seventh IWGDF guideline, the inaugural guideline for the management of active Charcot neuro-osteoarthropathy.[79] Whilst at face value, the recommendations from IWGDF guidelines in 2019 and 2023 appear reasonably similar, key differences in the methodologies and recommendations exist. These include but are not limited to: 1) a systematic review (2023) instead of critical review (2019) for the classification guideline; 2) an entirely new systematic review limited to randomised controlled trials (2023) for the wound healing guideline; 3) addition of multiple new important outcomes across all guidelines following input from people with lived experience of DFD; and 4) use of a more thorough GRADE methodological approach throughout all guidelines.

Challenges in updating national DFD guidelines

While the ADAPTE methodology offers greater efficiency compared to de novo guideline development, as outlined above the process is still resource intensive given the breadth and interdisciplinary nature of the DFD field. It was estimated the 2023 IWGDF guidelines would have cost AU$3.2 million should the voluntary work of international experts have been reimbursed.[142] In comparison, the 2021 Australian guidelines engaged 30 (inter)national experts over approximately two years, with in-kind hours having an estimated value of $100,000, in addition to the $150,000 in grants for baseline expenses and production of implementation toolkits. A further consideration is diversion of time, which may otherwise have been invested in other projects to advance DFD care and research in Australia.

New guidelines are released every four years by the IWGDF to coincide with the International Symposium of the Diabetic Foot, the top international DFD conference. Thus, there is a risk that Australian guidelines adapted from this source may become outdated not long after their release. Whilst an obvious solution may be to simply endorse each iteration of the IWGDF guidelines soon after their release, there are benefits to having Australian guidelines. These include: 1) contextualisation to the Australian healthcare system and our vast geography; 2) involvement of Australians with lived experience of DFD; 3) involvement of and considerations with and for Aboriginal and Torres Strait Islander people; 4) greater awareness and potentially usage by primary care practitioners; and 5) endorsement by 10 national peak bodies across at least seven different medical, nursing and allied health professions significantly increasing the awareness and uptake of the guidelines. Further, other topics particularly relevant to the Australian context may be missed if guidelines are constrained to the IWGDF chapters, such as inpatient DFD management and geographical remote service delivery via telehealth.

Despite the cost, up-to-date and robust national evidence-based guidelines for DFD should always be maintained in Australia to promote best practice standards for the care of people with DFD across Australia. However, without appropriate ongoing funding for the four yearly adaptation of the new iterations of the IWGDF guidelines, reliance on in-kind work by dozens of experts over two years, is unlikely to be sustainable. An alternative to periodic adaptation may be investment in living guideline methodologies for DFD, for which the NHMRC has made arrangements,[143] and there is a significant precedent in Australia for diabetes guidelines in particular.[144,145] However, this does not negate the need for regular maintenance. Therefore, DFA, ADS and other peak national health professional bodies representing disciplines involved in DFD management across Australia have a key role in advocating for the ongoing availability of contemporary Australian evidence-based DFD guidelines, and a concerted and agreed approach to ensuring their longevity is needed.

Australian national diabetes-related foot disease guidelines should continually reflect the most up-to-date evidence to guide best practice standards for healthcare provision across Australia

GOAL 6

progress since inaugural strategy

- Launch and publication of the suite of 2021 Australian evidence-based guidelines for the prevention and management of diabetes-related foot

potential areas for action

- Explore feasibility of Australian evidence-based DFD living guidelines, including scoping of resources required for regular maintenance
- Convene (and expand) the collaboration of the 10 peak national health professional bodies that endorsed the current Australian DFD guidelines
- Urgently develop, adapt or adopt an Australian evidence-based guideline for diagnosis and management of active Charcot neuro-osteoarthropathy
- Evaluate clinical uptake and use of guidelines (from evidence to practice) to inform implementation success of the 2021 Australian evidence-based DFD guidelines
- Establish consumer and Aboriginal and Torres Strait Islander Peoples consultation groups to ensure all Australian DFD guideline development/maintenance are people-centric and applicable to geographical remote and Aboriginal and Torres Strait Islander Peoples
- Advocate for research funding to develop an understanding of the needs and priorities of Aboriginal and Torres Strait Islander Peoples living with DFD to inform future iterations of the guidelines

potential measures of progress

- Development and funding of the ongoing methodology for Australian DFD living guidelines
- Launch of new iterations of Australian evidence-based DFD guidelines
- Time to launch of an inaugural Australian evidence-based active Charcot neuro-osteoarthropathy guideline

GOAL 7

Research investment for diabetes-related foot disease should be proportional to its impact on Australians

The disproportionality of DFD research investment with DFD impact

High quality research into diabetes and diabetes-related complications is critical to improving outcomes for all Australian people living with diabetes. However, funding investment for diabetes research in Australia is inadequate, declining by 35% over the past ten years, despite a 32% increase in the number of people living with diabetes over the same time period.[146] The funding shortfall for DFD research is even more critical with an enormous gap between the relatively large impact that DFD collectively causes on the Australian population and the relatively small amount of research and development funding DFD receives to address its large national impact.[4,10] For example, it has been reported that DFD causes around 2% of the global disease burden (or 2% of the world's health problems) yet receives <0.01% of global health research funding.[4,10] Such research investments shortfall for DFD is persistent around the world, having also been reported in Australia, the UK and US.[4,147]

Funding for health research is finite, and each individual has a reasonable claim on resources proportional to their own 'disease burden'.[52] However, factors like how the burden is measured, which members of the population carry the weight of the disease burden, political considerations and the impact that prior allocation (or misallocation) of funding has on the future burden of disease should also be considered.

Considering these factors, this goal strongly promotes proportionality for DFD research funding, relative to the total disease burden it causes and that of other common diseases in the Australian context. This is on the basis that firstly, DFD causes a heavy burden on the nation and globe whichever widely used metric is applied, including prevalence, incidence, disability, premature mortality, health costs and total disease burden using the formal disability-adjusted life-years (DALYs) metric.[10] Second, in Australia the burden of DFD is disproportionately borne by First Nations Australians and by non-Indigenous Australians living in underprivileged or remote communities,[40,103] further making the case for a more equitable distribution of resources. Third, the overall prevalence of diabetes, and its complications is increasing in the Australian community, and there has been limited funding for diabetes research and critically limited for DFD research over the past 10-20 years (see Figure 7).[4,7,146]

Addressing the disproportionality of DFD research investment

The DFA National Strategy subcommittee has objectively quantified this mismatch in Australian research investment to disease impact for DFD compared to other conditions. This was performed by summing the research funding achieved from successful applications in recent reported years to the main (Category 1) Australian Government health research funding bodies, the NHMRC (2014 -23) and Medical Research Future Fund (MRFF; 2017-23) and categorised the funding according to the primary disease or condition the application targeted or addressed.[148] The total amount of NHMRC research funding achieved for each disease or condition was then compared to the total global disease burden (i.e. total global DALYs) the disease or condition causes, and this is depicted in Figure 7.[10,149] For most conditions there is a log-linear relationship between the Australian Government health research funding successfully achieved and the total global disease burden it causes, with the obvious exception of DFD. Figure 7 demonstrates that DFD has received only ~1% of the 'proportionate' Australian government research funding it should receive relative to the total global disease burden it causes, when compared with funding allocated for cardiovascular disease, cancer, mental health, dementia, asthma, injury and arthritis and osteoporosis. DFD is also consistently underfunded relative to other diabetes complications such as diabetes-related kidney and eye disease.[7,8,147]

Based on this data, DFD needs at least an additional $30-50 million per year over the next ten years from the main Australian Government health research funding bodies alone to achieve proportionality in research funding for disease burden, as per more well-known conditions with lower global burdens of disease. Even if this could be attained, it would not account for historical underfunding over the past decades, nor would it account for projected increased prevalence of diabetes and DFD complications over the next decade. Setting a clear national research agenda (Goal 8) and the establishment of a national DFD research network (Goal 9) are also important next steps that will help to improve the quality and competitiveness of DFD grant applications submitted to NHMRC, MRFF and other funding agencies in future. However, rectifying this substantial disproportionate underfunding of research for DFD is urgently required to 'level the playing field' and enable these important next steps for DFD research. Whilst a small number of successful applications for individual trials or outstanding investigators have been recently achieved, and would be welcome in the future, these will be too small in number and funding to organically address the research funding gap without a concerted rectification.

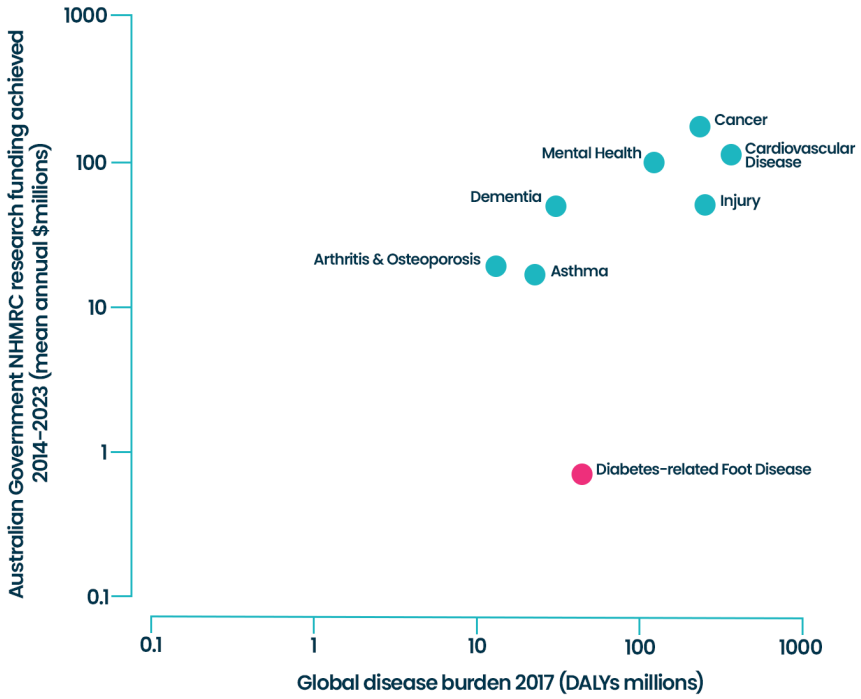

Figure 7 Australian Government NHMRC annual research funding relative to total global disease burden for DFD compared with cardiovascular disease, cancer, mental health, dementia, asthma, injury and arthritis and osteoporosis.

Notes:
Conditions: Former Australian Government National Health Priorities as listed in NHMRC Research Funding statistics (https://www.nhmrc.gov.au/funding/outcomes-and-data-research/research-funding-statistics-and-data) and diabetes complications as listed in Global Burden of Disease Study data.[10,16]
Global disease burden (DALYs): Total disability-adjusted life-years (DALYs) for each condition as listed in Global Burden of Disease Study 2017 data.[10,16]
National funding ($s): Mean annual national research funding achieved from NHMRC between 2014-2023 for each condition as listed in NHMRC Outcomes of funding rounds (2014 - 2023) (https://www.nhmrc.gov.au/funding/data-research/outcomes)

To achieve the scale required to achieve proportional research funding, a MRFF Mission should be promoted and enacted for DFD research. These large programs of work bring together key researchers, health professionals, services, industry and consumers to tackle big health challenges. A number have already been funded for common priority conditions or technologies including cardiovascular health, brain cancer, traumatic brain injury, genomics and stem cell therapies. A 'Foot Health and Disease in Diabetes Mission' would make transformative improvements in foot health in diabetes for all Australians through reducing the number of Australians of all ages affected by DFD, improving outcomes for people with DFD and improving long-term recovery and survivorship.

GOAL 7

Research investment for diabetes-related foot disease should be proportional to its impact on Australians

progress since inaugural strategy

- Limited progress made since last strategy

potential areas for action

- Lobby for an Australian Government MRFF mission to tackle DFD (MRFF: Foot Health & Disease in Diabetes Mission)
- Support, endorse and promote DFD funding applications across all calls for competitive research funding via:
  - Peer review from subject matter experts
  - Providing formal endorsement from DFA
  - Leveraging research priority settings (Goal 8)
  - Applications led by national DFD Research Network (Goal 9)

potential measures of progress

- Announcement of a MRFF: Foot Health & Disease in Diabetes Mission or similar national DFD research program
- Increased number of successful researcher fellowships, clinical trials and cohort studies for DFD research funded via NHMRC, MRFF and other Category 1 research funding body rounds.
- Increase in proportionate research funding relative to other relevant medical conditions using rolling 10-year average

GOAL 8

An Australian foot health and disease in diabetes research framework responsive to local and national priorities should be developed

Developing a national research framework for DFD: stakeholder engagement and priority setting

Experts and other stakeholders are well aware of many evidence gaps in the prevention and management of DFD. The purpose of developing an Australian foot health and disease in diabetes research framework is to provide a structure and focus for Australian DFD researchers and research funders to identify and address the most relevant evidence gaps that will deliver the "biggest bang for buck" for Australia DFD research whilst targeting the reduction of the large disease burden caused by DFD and being responsive to new local and national priorities

Since the inaugural strategy, progress has been made towards identifying DFD research priorities in both Australia and Europe.[4,150] Using a three round Delphi study open to the entire Australian DFD community, 210 stakeholders participated in a research prioritisation exercise.[4] Participants were mostly health professionals (58%) and consumers (34%), half of whom had lived experience of DFD. However, representation from researchers (4%) and industry (4%), including First Nations people (1%) was low.[4] There were striking differences between health professionals and consumers in their different research prioritisation findings. Consumers prioritised prevention, identification and management of peripheral neuropathy and peripheral artery disease as the cause of ulcers. [4] By contrast, health professionals prioritised management efficacy, cost-effectiveness and implementation science research for various interventions for people living with active DFD.[4] Findings from a similar Swedish study reinforced these DFD research prioritisation differences observed between consumer and health professional found in the Australian study.[150] The consumers in the Swedish study (n=51; 50%), comprised mainly those with Type 1 diabetes, of whom only 5 had a lived experience with DFD. In this group, prevention of diabetes as well as self-care, screening and education for peripheral neuropathy and peripheral artery disease were again prioritised. Like their Australian counterparts, health professionals generally prioritised management interventions for wound healing, infection and vascular insufficiency in those with active DFD.[150]

Rather than identifying any one research priority as being the most important, these findings emphasise that priority setting exercises are likely to be framed by the experiences of the study participants. In this context, consumers living with diabetes, but without a history of DFD will likely have had a very different journey to those with active DFD. Presumably this might also mean that their priorities are likely to be different. Similarly, priority setting among health professional stakeholders is also likely to be framed by clinical specialty and the health sector in which they work. For example, a vascular surgeon working in a tertiary hospital in a capital city is likely to have different priorities to a community podiatrist working in a remote Indigenous community. Additional limitations of the existing literature on research prioritisation for DFD is that healthcare and research funders have not been consulted in the Australian context, and almost nothing is known about priorities for First Nation Peoples, their families and Communities.[4]

Key elements of an Australian foot health and disease in diabetes research framework

This goal proposes to develop a research framework that provides a structure that enables flexibility to respond to new local and national priorities as they arise. The ideal approach will acknowledge the diverse lived experiences of consumers as well as the clinical expertise of different health professionals and the needs of Australian healthcare and research funders. An Australian foot health and disease in diabetes research framework should should at least cover the domains of prevention, primary care, secondary care and tertiary care. Similar approaches have been taken for other conditions important in the Australian context (e.g. Rheumatic Heart Disease).

Articulating these domains will emphasise consumer voices along the continuum of the DFD journey. Primordial prevention will acknowledge the need to understand social determinant factors which contribute to the onset of DFD, including those which underpin social and economic disadvantage. Primary care efforts for those with peripheral neuropathy and peripheral arterial disease could reflect the priorities presented by the consumers in the two research priority publications discussed above. Given the high rates of recurrence, priority setting should also focus on secondary prevention efforts. Additional efforts should be made to understand priorities amongst consumers, presenting to secondary and tertiary care with active DFD who suffer the most severe consequences of DFD such as hospitalisation, amputation and death.

Any research prioritisation exercise conducted in consumers and/or health professionals should be mapped onto the general priority and expectation needs of existing healthcare and research funders as well as align with this new Strategy and the 'evidence gaps' reported in the Australian and International DFD guidelines at the end of each guideline. Finally, in a time when access to funding to support research is limited, it is important that industry partners are given the opportunity to align their priorities within the research framework. Once the building blocks for research prioritisation are in place within each of the domains, a core set of research questions should be developed for each domain. Where there is a clear consensus on the top 3 research questions within each of the domains, possible study designs should be explored including developing consensus on study design, sample size, meaningful endpoints, and research fund applications.

For a research framework to be useful to the Australian research community, it should be widely disseminated and used to inform and strengthen applications for funding. In particular, any call for proportionate funding (Goal 7) or work within the DFD research network (Goal 9) should acknowledge and align with this DFD research framework document. In addition, to encourage uptake, from wider stakeholders, the research framework should be sent to various peak national bodies for endorsement and then published.

GOAL 8

An Australian foot health and disease in diabetes research framework responsive to local and national priorities should be developed

progress since inaugural strategy

- Initial national research priorities study of Australian DFD stakeholders published

potential areas for action

- Develop an Australian foot health and disease in diabetes research framework
- Understand Aboriginal and Torres Strait Islander people's research priorities
- Align the research framework within the DFA and IWGDF strategy and guideline documents

potential measures of progress

- An Australian foot health and disease in diabetes research framework developed
- Number of stakeholder endorsements of a published Australian foot health and disease in diabetes research framework
- Number of research priority exercises undertaken to determine domain priorities within the Australian foot health and disease in diabetes research framework
- Number and value of successfully funded projects that align with the Australian foot health and disease in diabetes research framework
- Number of future national guideline recommendations based on new Australian research that aligned with the Australian foot health and disease in diabetes research framework

GOAL 9

An Australian foot health and disease in diabetes research network should be established

Steps towards an Australian foot health and disease in diabetes research network

A thriving and sustainable Australian DFD research community is central to achieving improved outcomes for people living with DFD and a reduction in the large national disease burden caused by DFD. A recent bibliometric study of Australian DFD research outputs and funding sources from 1970 to 2023 revealed that although there was a steady increase in publications, most Australian DFD published research received no dedicated funding and predominantly investigated aetiology, existing treatments and health service delivery.[13] There was a dearth of well-resourced clinical trials, research with and for First Nations Peoples and studies into DFD prevention.[13] Thus, the Australian DFD research community appears to be a productive and resilient community considering this large recent increase in publications despite minimal funding. However, to conduct research that has potential to greatly improve the lives of people living with, or at risk of DFD, a marked increase in funding, research training and research activity will be required across Australia.

An Australian foot health and disease in diabetes research network needs to be established, to attract Australian and international investigator-initiated and industry-initiated research projects and funding. Such a network's objectives and activities should be based on developed national research priorities (Goal 8). The research network could encourage and coordinate active involvement with all interested key consumer, health professional, researcher and industry stakeholder groups. With demonstration that a research network has the capacity and skills to undertake high impact and culturally responsive research, large research funding bids that bridge the enormous gap between the impact of DFD and the research investment in DFD are also more likely to be successful (Goal 7).

In October 2023, a meeting of stakeholders and interested parties was held prior to the 2023 DFA National DFD conference to introduce the idea of a DFD focused research network to the Australian community of DFD researchers and health professionals. The aim of the meeting was to commence discussion on a national approach to DFD research in Australia, to collaboratively introduce concepts of research organisational models,[151] funding structures and professional networks, and as well as to gauge the level of support for a DFD focused research network from the Australian DFD research and health professional community. Stakeholders shared a vision of a DFA research network that valued excellence, collaboration, inclusion, listening to community, partnering with consumers, innovation, and empowerment. Nearly 90% of respondents were interested in participating in a future Australian DFD research network workshop. Therefore, DFA is intending to undertake further such national research network development activities to progress the development of an Australian foot health and disease in diabetes research network.

The important first steps in progressing towards an Australian research network must be focused on building research skills, knowledge and capacity, and fostering greater collaboration across Australia and internationally. The DFD research community should have the skills and knowledge to engage in high quality, rigorous, appropriately powered and resourced, multisite observational studies and clinical trials. There should be the capacity to support implementation of First Nations-led research that addresses self-determined needs and priorities of First Nations Communities. Therefore, the early activities of the research network must focus on development, education, training and building a diverse research community that can collaborate and engage effectively. It is also critical that there is a strong future focus on engagement and collaboration with people living with diabetes and DFD, those living in rural and remote areas, health professionals involved in DFD management outside of iHRFS, and First Nations Communities to support research that is informed by lived experience and that addresses the needs and priorities of populations who are disproportionately affected by DFD.

There is also an urgent need to decolonise research in Australia and for DFD research to be undertaken with and for First Nations Peoples to inform clinical guidelines and care.[103,152,153] Self-determined First Nations-led co-designed DFD research underpinned by Indigenous methodologies that challenge the worldviews that have historically informed use of unethical research methods and discriminatory research designs is essential to engaging First Nations Communities and identifying their national priorities for First Nations DFD research.[1,154,155] This includes engagement with and empowerment of First Nations organisations, including health services providers and peak bodies, First Nations Communities and researchers to value and promote Indigenous research methodologies and research outcomes and support development of robust processes, Indigenous data governance and sovereignty. A national research network simultaneously investing in high quality mainstream academic research through RCTs, First Nations-led research privileging Indigenous methodologies, and research integrating these knowledge systems will potentially create the greatest benefits and quickest national and global impact.

Next generation researchers

A research network also provides unique opportunities to nurture the next generation of DFD researchers. The best opportunity for early career researchers is to be made part of large, high-quality, studies. Ideally, when setting up studies, roles should be created for early career researchers to do the 'footwork' in these studies. Furthermore, DFD research should be supportive of increasing capacity of First Nations researchers and First Nations health organisations to undertake DFD research with Aboriginal and Torres Strait Islander Communities. Additionally, it is critical to provide support to DFD discovery science researchers and PhD students, building capacity and sustainability in this important research area. DFD researchers and universities considering DFD research should be encouraged to align PhD student's topics with national DFD research priorities (goal 8) and research network activities once established. A culturally responsive mentoring system should be created for researchers and preferably within the research network. To further stimulate the next generation of DFD researchers, a "National DFD Early Career Researcher Award" should be created. This should be promoted and awarded at a DFA National DFD Conference and may provide the recipient with (for example) dedicated mentoring-support for two years, a small travel grant to visit international researchers and related forums, and an allocated keynote presentation at the next national conference to present their findings.

Research skills development and training

Research on DFD has many intricacies that are specific to the multi-disciplinary nature of the DFD field, and it requires education and training to understand and appreciate these intricacies.[156,157] Training modules should be developed, aiming to improve the knowledge and skills for novice and early career researchers in the field of DFD research. Training modules should also be provided to increase knowledge and understanding of Indigenous methodologies and working with First Nations Communities to support self-determined research and culturally responsive research practice. Module content may also include critical assessment of the history and salient DFD publications; designing research studies; data capture and analysis and minimum reporting standards.[156,157]

Cooperation

Finally, this goal is a call to all Australian DFD researchers, health professionals and consumers to maximise communication, cooperation and collaboration around multi-centre studies and funding application plans. Furthermore, it is incumbent upon all non-Indigenous DFD researchers to give up space for First Nations-led research, and emerging and established First Nations researcher leaders, and develop knowledge and capabilities to promote wider understanding and acknowledgement of the central and valuable role of Indigenous research methodologies and research outcomes for addressing DFD. Research is a highly competitive world and, by its history and its nature, rather hierarchical. Like DFD clinical services, interdisciplinary cooperation rather than competition is the primary strategy for long-term success to improve the clinical and research outcomes of people with DFD and in turn reduce the comparatively high national disease burden caused by DFD.

GOAL 9

An Australian foot health and disease in diabetes research network should be established

progress since inaugural strategy

- Australian DFD Research Network stakeholder engagement activities commenced

potential areas for action

- Establish an Australian foot health and disease research network
- Initiate research programs including RCTs, observational studies and discovery science within the research network that align with national research priorities (Goal 8)
- Support First Nations-led research programs within the research network
- Promote results from Australian DFD research to health professionals, consumers, communities, industry and funding bodies
- Establish a "National DFD Early Career Researcher Award", including a specific award for First Nations researchers
- Establish DFD research training modules for novice researchers

potential measures of progress

- Increased number and amount of funding provided to DFD studies and projects within the Australian DFD Research Network and Australian institutions, including specific funding for First Nations-led research projects
- Increased number of researchers and PhD students undertaking DFD research that aligns with national research priorities
- Number of accredited iHRFS participating in the research network
- Number of consumers participating in research within the research network
- Number of publications, theses and conference presentations resulting from the research network and Australian institutions
- Increased proportion of funds for DFD research projects from the total national health and diabetes research funding available

ABBREVIATIONS

ADS	Australian Diabetes Society
ADFR	Australian Diabetes Foot Registry
APP-HRF	Advanced Practicing Podiatrits - High Risk Foot Group
DALY	Disability Adjusted Life Years
DFA	Diabetes Feet Australia
DFD	Diabetes-related Foot Disease
DFU	Diabetes-related Foot Ulcer
DVA	Department of Veteran Affairs
FTE	Full Time Equivalent
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
iHRFS	Interdisciplinary high risk foot services
IWGDF	International Working Group on the Diabetic Foot
MBS	Medicare Benefits Schedule
MRFF	Medical Research Future Fund
NADC	National Association of Diabetes Centres
NDFA	National Diabetes Footcare Audit
NDSS	National Diabetes Services Scheme
NDIS	National Disability Insurance Scheme
NHMRC	National Health and Medical Research Council
OECD	Organisation of Economic Co-operation and Development
PAD	Peripheral Artery Disease
PBS	Pharmaceutical Benefits Scheme
PHI	Private health insurance
PROMS	Patient-reported outcome measures
QHRFF	Queensland High Risk Foot Form
RCT	Randomised Control Trial
SAHMRI	South Australian Health & Medical Research Institute

Appendix 1: Health professional disciplines who may be involved in the care of a person with DFD

The list below provides an indication of the types of health professional disciplines that may be part of the health workforce working with people with diabetes to maintain or improve their foot health. The list is in alphabetical order, likely incomplete, with certain circumstances potentially requiring input from other disciplines not listed as well.[49,108]

Disciplines
Aboriginal and Torres Strait Islander Health Practitioner
Allied Health Assistant / Assistant in Nursing
Cardiologist
Chronic Pain Specialist
Credentialled Diabetes Educator
Dermatologist
Diabetes Nurse Practitioner
Endocrinologist/Diabetologist/Physician
Exercise Physiologist
Family/carers
General Practitioner
Geriatrician
Infectious Diseases Specialist
Nephrologist
Neurologist
Orthopaedic Surgeon
Orthotist and/or Pedorthist
Other support services (e.g. NDSS information and support service)
Physiotherapist
Plastic Surgeon
Podiatric Surgeon
Podiatrist
Psychiatrist
Psychologist
Radiologist
Rehabilitation Specialist
Social worker/Counsellor
Vascular Surgeon
Wound Care Nurse

Table 1 Estimated burden caused by DFD on Australia and per 100,000 residents each year

Characteristic	Australia [a]	Per 100,000 [b]
Populations		
People with diabetes [c]	**1,500,000**	**5,556**
People with DFD [d]	**510,000**	**1,889**
People with active DFD [e]	**51,000**	**189**
People with diabetes-related amputations [f]	**25,000**	**94**
Hospitalisations		
People in a hospital bed because of DFD [g]	**471,000**	**1,744**
Public Hospital	376,500	1,394
Private Hospital	94,500	350
People newly admitted to hospital because of DFD [h]	**47,100**	**174**
Public Hospital	37,650	139
Private Hospital	9,450	35
Amputations		
People undergoing an amputation because of DFD [i]	**6,300**	**23.3**
Public Hospital	5,250	19.4
Private Hospital	1,050	3.9
People undergoing a minor amputation because of DFD [j]	**5,250**	**19.4**
Public Hospital	4,350	16.1
Private Hospital	900	3.3
People undergoing a major amputation because of DFD [k]	**1,050**	**3.9**
Public Hospital	900	3.3
Private Hospital	150	0.6
Mortality		
Deaths from DFD [l]	**2,500**	**9.3**
Costs		
Total direct costs because of DFD [m]	**$2.69 Billion**	**$9.96 Million**
Hospital costs because of DFD [n]	$1.09 Billion	$4.04 Million
Primary care and other recurrent health costs because of DFD [o]	$1.60 Billion	$5.92 Million

DFD = Diabetes-related foot disease; [a] Estimated burden for the 27,000,000 resident population of Australia in 2024[158]; [b] Estimated burden for every 100,000 resident population of Australia in 2024 (i.e. 100,000 / 27,000,000); [c] Number of Australians with diagnosed diabetes in 2023[25]; [d] Prevalence with DFD (~34%)[11,29] x number of Australians with diagnosed diabetes in 2023[25]; [e] Prevalence of those with active DFD[9](~3.4%: 3.2% ulcer (+/-infection)[10,11,29] + 0.1% active Charcot neuro-osteoarthropathy[10,79]+ 0.1% gangrene[36,79,82,159]) x number of Australians with diagnosed diabetes in 2023[25]; [f] Prevalence of those with a previous diabetes-related amputation (~1.7%)[11,29] x number of Australians with diagnosed diabetes in 2023[25]; [g] Incidence of overnight hospital admissions per year for DFD (31.4 per 1,000 person-years with diabetes, i.e. 25.1 public hospital admissions + 6.3 private hospital admissions)[26] x number of per 1,000 Australians with diagnosed diabetes in 2023 (i.e. 1,500,000 / 1,000)[25] x 10 day median length of hospital stay for a DFD hospital admission[18,31,85]; [h] Incidence of overnight hospital admissions per year for DFD (31.4 per 1,000 person-years with diabetes)[26] x number of Australians with diagnosed diabetes in 2023[25]; [i] Incidence of overnight hospital admissions per year for diabetes-related amputation (4.2 per 1,000 person-years with diabetes)[18,24,26] x number of Australians with diagnosed diabetes in 2023[25] (including 3.5 for minor amputations [j] and 0.7 major amputations[k] per 1,000 person-years with diabetes)[18,24,26]; [j] Incidence of overnight hospital admissions per year for minor diabetes-related amputation (i.e. 3.5 per 1,000 person-years with diabetes, i.e. 2.9 public hospital admissions + 0.6 private hospital admissions)[18,24,26] x number of Australians with diagnosed diabetes in 2023[18,24,26]; [k] Incidence of overnight hospital admissions per year for major diabetes-related amputation (i.e. 0.7 per 1,000 person-years with diabetes, i.e. 0.6 public hospital admissions + 0.1 private hospital admissions)[18,24,26] x number of Australians with diagnosed diabetes in 2023[25]; [l] Incidence of excess all-cause deaths in people with active DFD compared to those with diabetes without active DFD (49.3 excess all-cause deaths per 1,000 person-years with diabetes)[21] x number of Australians with active DFD[e] (51,000 / 1,000); [m] Total direct healthcare costs incurred by DFD to the Australian Health System in 2023 ($AU2.69 billion = $1.09 billion in hospital costs[n] x 2.51 for primary care and other recurrent health costs, i.e. total health care costs = 40% hospital costs + 60% primary care and other recurrent costs)[22]; [n] Total hospital costs ($AU1.09 billion in 2023, i.e. $939 million in 2020 = ($729 million hospitalisation costs = $15,477 per Australian hospitalisation for DFD[23,27] x 47,100 hospitalisations per year) + ($160.3 million minor amputation costs = $30,530 per Australian minor amputation[23,27] x 5,250 minor amputations) + ($49.7 million major amputation costs = $47,327 per Australian major amputation[23,27] x 1,050 major amputations)); [o] Total primary care and other recurrent health costs make up 60% of total direct healthcare costs in Australia (i.e. $AU1.60 billion in 2023).[22]

Table 2 Forecasted savings if guideline-based care for people living with DFD is systematically implemented across Australia and per 100,000 Australian residents each year

Characteristic	Australia [a]	Per 100,000 [b]
Morbidity savings		
People prevented from being in a hospital bed [c]	**188,400**	**698**
People prevented from being admitted to hospital [d]	**20,250**	**75**
People prevented from undergoing an amputation [e]	**2,840**	**10.5**
Mortality savings		
People prevented from dying [f]	**1,125**	**4.2**
Cost savings		
Costs prevented to health system [g]	**$0.94 Billion**	**$3.48 Million**

DFD = Diabetes-related foot disease; [a] Estimated savings for the 27,000,000 resident population of Australia in 2024[158], [b] Estimated savings for every 100,000 resident population of Australia in 2017 (i.e. 100,000 / 27,000,000); [c] People in a hospital bed because of DFD in Table 1 x percentage reduction demonstrated in people in a hospital bed because of DFD after systematic implementation of evidence-based care (~40%)[85]; [d] People newly admitted to hospital overnight because of DFD in Table 1 x percentage reduction demonstrated in people newly admitted to hospital overnight because of DFD after systematic implementation of evidence-based care (~43%)[85]; [e] People undergoing a diabetes-related amputation in Table 1 x percentage reduction demonstrated in people undergoing diabetes-related amputations after systematic implementation of evidence-based care (~45%)[85,160,161], [f] People dying from DFD in Table 1 x percentage reduction demonstrated in people dying from DFD after systematic implementation of evidence-based care (~45%)[21,162]; [g] Estimated costs to all health systems from DFD in Table 1 x percentage reduction demonstrated in estimated costs to all health systems from DFD after systematic implementation of evidence-based care (~35%)[27,43-45]; [h] Estimated costs to hospitals from DFD in Table 1 x percentage reduction demonstrated in estimated costs to hospitals from DFD after systematic implementation of evidence-based care (~35%)[27,43,45].

Table 3 Estimated full-time equivalent health professional and interdisciplinary high risk foot services (iHRFS) required to ensure access to systematic evidence-based care for people with, or at-risk of, diabetes-related foot ulcers across Australia each year

Characteristic	Australia [a]	Per 100,000 [b]
LEVEL 1 CARE Screening for all people living with diabetes		
People with diagnosed diabetes[c]	1,500,000	5,556
Number of health professional consultations required to perform screening [d]	1,500,000	5,556
Number of FTE health professionals required to perform screening [e]	313	1.2
LEVEL 2 CARE Prevention of all people at-risk of DFU		
People at-risk of DFU [f]	510,000	1,899
Number of health professional consultations required to perform prevention [g]	2,040,000	7,556
Number of FTE health professionals required to perform prevention [h]	425	1.6
LEVEL 3a CARE Care for all people with active DFD (inc DFU) in ambulatory settings		
People living with active DFD [i]	51,000	289
Number of iHRFS consultations required to perform ambulatory care [j]	2,650,000	9,815
Number of FTE iHRFS required to perform ambulatory care [k]	550	2.0
LEVEL 3i CARE Care for all people with active DFD (inc DFU) in inpatient hospital settings		
People in a hospital bed because of DFD [l]	471,000	1,744
Number of iHRFS consultations required to perform inpatient care [m]	471,000	1,744
Number of iHRFS required to perform inpatient care [n]	64.5	0.2

DFD = Diabetes-related foot disease; DFU = diabetes-related foot ulcer; FTE = full-time equivalent; iHRFS = interdisciplinary high rsik foot services. [a] Estimated population needing care and workforce required to adequately care for that population using the 27,000,000 resident population of Australia in 2024 [158]; [b] Estimated population needing care and workforce required to adequately care for that population for every 100,000 resident population of Australia in 2024 (i.e. 100,000 / 27,000,000); [c] Number of Australians with diagnosed diabetes in 2023 [25]; [d] Number of people living with diabetes x number of consultations required to adequately perform foot screening per year for each person (one screening consultation per year is required [55]); [e] Number of consultations required to adequately perform DFU screening per year / 4,800 x foot screening consultations able to be performed by one full time equivalent (FTE) health professional performing a DFU screening role only (20 x DFU screening consultations per day (assumed one screening takes 20 minutes) x 240 available working days per year); [f] Prevalence of those at-risk of DFU (~34%) [11,29] x number of Australians with diagnosed diabetes in 2023 [25]; [g] Number of people at-risk of DFU x average number of consultations required to adequately perform DFU prevention per year for each person (average of 4 consultations per year assumed as numbers of consultations required range from 2 per year for those at low risk to 12 per year for those at high risk of DFU [55]); [h] Number of consultations required to adequately perform DFD prevention per year / 4,800 x foot prevention consultations able to be performed by one FTE health professional performing a DFU prevention role only (20 x DFU prevention consultations per day (assumed one prevention consultation takes 20 minutes) x 240 available working days per year); [i] Prevalence of those with active DFD (~3.4%: 3.2% ulcer (+/-infection)[10,11,29] + 0.1% active Charcot neuro-osteoarthropathy[10,79] + 0.1% gangrene[36,84,163]) x number of Australians with diagnosed diabetes in 2023 [25]; [j] Number of people with active DFD x number of iHRFS consultations required to adequately perform active DFD care per year for each person (average of 52 iHRFS consultations assumed as a person with DFD requires weekly care [55]); [k] Number of iHRFS consultations required to adequately perform active DFD care per year / 4,800 x iHRFS care consultations able to be performed by one FTE iHRFS (involving 2+ health professionals) performing an active DFD care role only (20 x DFD care consultations per day (assumed one care consultation takes 20 minutes) x 240 available working days per year); [l] Incidence of overnight hospital admissions per year for DFD (31.4 per 1,000 person-years with diabetes)[26] x number of Australians with diagnosed diabetes in 2023[25] x 10 day median length of hospital say for a DFD hospital admission[18,31,85]; [m] Number of inpatients in hospital each day for DFD x number of iHRFS consultations required to adequately perform DFD care for each inpatient (average of one iHRFS consultations assumed as an inpatient with DFD requires daily review [163]); [n] Number of iHRFS consultations required to adequately perform DFD care per year / 7,300 x iHRFS care consultations able to be performed by one FTE iHRFS (involving 2+ health professionals) performing a DFD care role only (20 x DFD care consultations per day (assumed one care consultation takes 20 minutes) x 365 available working days per year).

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