


ORIGINAL RESEARCH **OPEN ACCESS**

Healing Steps on Country—Exploring Care Pathways for Aboriginal People in the Kimberley With Diabetes-Related Foot Disease

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Received: 24 August 2025 | **Revised:** 15 March 2026 | **Accepted:** 20 March 2026

Keywords: aboriginal health | Australia | diabetes-related foot disease

ABSTRACT

Objective: This project aimed to document the experiences of Aboriginal people living in the Kimberley region who have experienced diabetes-related foot disease (DFD) so that service delivery can be optimised.

Setting: The Kimberley region, Western Australia.

Participants: Aboriginal People in the Kimberley with DFD.

Design: A mixed methods study design was used, incorporating quantitative analysis of primary and outpatient care presentations and hospitalisation data collected from in-depth medical record reviews ($n = 35$) and semi-structured interviews with participants ($n = 28$).

Results: This study highlighted that DFD in the Kimberley has a significant impact on individuals and communities. While primary and outpatient services play a key role in DFD care, there is an opportunity to strengthen preventive foot care services. Participants valued flexibility and autonomy in managing their care, especially with the support of Aboriginal Community Controlled Health Services (ACCHS). Recommendations to improve DFD care are provided, incorporating the perspectives of patients and of the health professionals who participated in the data interpretation workshop. These include facilitating patient self-care, expanding high-quality foot care within ACCHS, strengthening support for hospitalised patients, and advocating for upstream service improvements.

Conclusion: Addressing geographical and systemic barriers through improved patient education, better access to primary care resources, and increased patient choice may enhance autonomy and long-term DFD outcomes.

1 | Introduction

Diabetes-related foot disease (DFD) presents a major public health challenge in Australia, contributing to substantial morbidity, mortality and healthcare burden [1, 2]. DFD is Australia's leading cause of amputation, has mortality rates worse than most cancers and requires more frequent consultations, referrals, and

hospitalisations than heart disease and cancer [1, 3–5]. Globally, DFD accounts for 2% of the total disease burden, ranking 13th among over 250 leading conditions [6].

Aboriginal people experience considerably higher rates of DFD than non-Indigenous Australians [2, 7] and in Western Australia are up to 38 times more likely to undergo an amputation than their

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Key Points

- What is already known on this subject?
 - Aboriginal people experience considerably higher rates of DFD than non-Indigenous Australians, and in Western Australia are up to 38 times more likely to undergo an amputation than their non-Indigenous counterparts.
 - Despite the high rate of DFD in the Kimberley, there is limited research documenting care pathways or patient experience, highlighting a critical gap this study addresses to support improved outcomes.
- What does this story add?
 - This study provides the first in-depth account of Aboriginal people's experiences living with DFD in the Kimberley, highlighting the significant impact on individuals, families, and communities.
 - Participants valued flexibility and autonomy in managing their DFD care, especially with the support of Aboriginal Community Controlled Health Services (ACCHS).
 - Practical, community-informed recommendations are described to strengthen DFD care in rural and remote settings, including enhanced support for self-management, improved local access to foot care, and better coordination across health services.

non-Indigenous counterparts [8]. In remote regions, rural and remote living conditions contribute additional risk factors, leading to higher disease rates and more complications [2, 9]. Recent research in Queensland, Australia, noted that among patients admitted with DFD, Aboriginal patients had higher rates of inter-hospital transfer and amputation than non-Indigenous patients [9]. Moreover, only 9.3% of patients from the most remote regions were able to complete treatment locally, highlighting the greater impact of DFD treatment on patients living in rural and remote locations that has been described globally [9, 10].

The high background rate of End-Stage Kidney Disease (ESKD) in Aboriginal people living in remote Australia, including the Kimberley, is also associated with a markedly increased ulceration and amputation risk [11, 12]. People with ESKD require frequent screening for DFD as per international and local DFD guidelines [4, 12, 13].

Effective management of DFD requires a collaborative approach, integrating multidisciplinary expertise across primary, secondary and tertiary care settings [4]. In rural and remote regions, where access to specialist services is limited, primary care plays a critical role in early detection and intervention [4]. Timely diagnosis and management of DFD are essential, as delays significantly increase morbidity, mortality and risk of amputation [14].

Despite the high rate of DFD in the Kimberley region, there is limited research documenting patient care pathways and patient experiences, highlighting an evidence gap. We aimed to document the journey and experience of Aboriginal people living in

the Kimberley region who have experienced DFD so that service delivery can be optimised. To achieve this, we measured disease presentations with DFD and, for consenting participants, conducted in-depth case reviews and semi-structured interviews.

2 | Methods

2.1 | Design

A mixed methods study design was used, incorporating quantitative analysis of primary and outpatient care presentations and hospitalisation data collected from in-depth primary care medical record review and semi-structured interviews. This approach recognises the importance both of providing measurable indicators of impact that can be monitored over time and of providing participants with the opportunity to add their voices, providing depth and meaning to the quantitative results.

The project concept originated from within a Kimberley-based Aboriginal Community Controlled Health Service (ACCHS) and was designed using feedback from local Aboriginal health leaders and community members. The research process was governed by local Aboriginal leadership and informed by principles of Indigenous Data Sovereignty to improve relevance for Aboriginal communities.

2.2 | Setting

The Kimberley region is the northernmost region of Western Australia and extends over 420000km², encompassing more than 200 small remote Aboriginal communities [15, 16]. Aboriginal people represent 41.1% of the total population of the Kimberley region [16]. Where the term Aboriginal is used in preference to Aboriginal and Torres Strait Islander, it is used in recognition that Aboriginal people are the original inhabitants of Western Australia. No disrespect is intended to Torres Strait Islander people and communities.

This study was conducted at five ACCHS across four regional towns and multiple remote Aboriginal communities in the Kimberley region. ACCHS deliver holistic, comprehensive and culturally appropriate primary health care with a multidisciplinary team of Aboriginal Health Workers and Practitioners (AHW and AHP), nurses and General Practitioners (GPs) [17]. Podiatry services are delivered via outreach or telehealth. An electronic medical record system (MMEx) has been used by all participating ACCHS since 2010. There are five hospitals in the region, one with High Dependency Unit capability [18]. Vascular surgery is accessed via telehealth or transfer outside of the region (2200km by plane from Broome to Perth). In 2021, a hospital-based podiatrist position and multidisciplinary foot service was established in Broome, improving regional capacity to manage DFD.

2.3 | Participants

All Aboriginal people presenting to a participating ACCHS with DFD between 1.10.2018 and 18.09.2024 over 18 years of age at the time of presentation were considered eligible for this study.

DFD was defined as any ulceration, infection, ischaemia or neuro-arthropathy in an individual with diabetes [19]. Diabetes was defined as either having a diabetes care plan in their electronic medical record or (as per national guidelines) having had a HbA1c equal to or greater than 6.5% [20]. Participants with both type I and type II diabetes were considered eligible.

Eligible individuals were identified via a newly developed automated DFD attendance report (see Section 2.4). Convenience sampling was used, with patients contacted in partnership with their primary health provider with study information. Local healthcare providers were also invited to identify and refer eligible patients not identified via MMEx report. Purposive sampling was used to ensure geographical representation: recruitment continued until a minimum of four patients from each participating service was included. Participants gave individual informed consent (written and/or verbal) for file review and interview to be conducted by the research team.

2.4 | Data Collection

2.4.1 | Quantitative

An automated 'DFD attendance report' in MMEx was developed to identify relevant presentations to primary care. Presentations were included if the consult note title included any of the following keywords: 'diabet*' + 'foot', 'diabet*' + 'ulcer', 'charcot', 'amputation' OR 'ulcer, foot' OR 'ulcer, toe', 'gangrene' or 'foot infection'. Patient identifiers, date of birth, Aboriginal and/or Torres Strait Islander status, diabetes care plan status and highest HbA1c were included in the report. The report was developed with clinical input, piloted, refined, and later assessed for completeness by comparison to file review among consenting participants.

File review was completed for consenting participants to identify and describe relevant primary care and outpatient presentations, which were defined as preventive (foot care provided in the absence of active DFD; e.g., foot check) or acute foot care (foot care provided for active DFD). For each presentation, the following variables were recorded: patient identification number, date of consultation, reason for presentation, designation of staff attending (if more than one, all were recorded), whether telehealth was used (if so, type of telehealth) and participant destination (if hospital, mode of transport).

At first documented review with a podiatrist in the primary care setting, the presence of peripheral arterial disease, loss of protective sensation, foot deformity, previous ulcer and/or amputation and ESKD was recorded. This information was used by the research team to calculate the individuals' risk of developing a foot ulcer, as defined by the 2021 evidence-based Australian guidelines for diabetes-related foot disease guideline [4].

All available hospital discharge summaries were identified and described. Hospital admissions were included if the primary diagnosis was DFD or sepsis of unknown origin, with DFD recorded as the most likely source. Admissions where a foot ulcer was managed incidentally during an admission for unrelated

conditions (e.g., pneumonia and cardiac events) were excluded. For each admission, the following variables were recorded: patient identification number, date of hospital admission, inpatient facility (if more than one, all were recorded), discharge date, discharge type (i.e., facilitated or discharge against medical advice (DAMA)), inpatient procedure(s) performed and total days in hospital (in the Kimberley region and outside of the Kimberley). Length of stay was inclusive of day of admission to first inpatient facility and day of discharge from last inpatient facility. Major lower limb amputation was defined as surgical removal of the limb proximal to the ankle joint (i.e., below or above knee amputation). Minor lower limb amputation was defined as amputation distal to the ankle (e.g., toe(s) or midfoot). Time under observation was defined as the number of days between the first documented presentation or admission with DFD and last eligible presentation or discharge before the census date.

For each participant it was recorded whether they had chronic kidney disease (CKD), defined by the presence of a CKD care plan or diagnostic eGFR and ACR results [21]. For patients with CKD, it was recorded if the participant was undergoing haemodialysis or had previously received a renal transplant.

2.4.2 | Qualitative

Participants were offered the opportunity to receive their file review results via a 'Foot Journey Map' (Appendix 1), a one-page, visual summary of the individuals' results including locations and dates of care received and details of their DFD. They were then asked to provide feedback on DFD care and the project via a short, semi-structured interview. Interview questions (Appendix 2) were drafted by the research team based on preliminary quantitative research findings. Interviewers were Aboriginal people and/or were experienced Kimberley health professionals. Recording was by written transcription or voice recording, depending on participant preference. Participants were invited to bring a support person to their interview or offered the presence of an Aboriginal Health Worker (AHW).

Local health professionals, including AHW, senior clinicians and clinic managers ($n = 12$), were invited to a data interpretation workshop in December 2024.

2.5 | Data Analysis

Data were compiled in Microsoft Excel 2021 (Microsoft), then imported into Stata 14 (StataCorp). Normally distributed data were presented as means with standard deviations, and non-normally distributed data as medians with interquartile ranges.

Interviews were transcribed into and organised in a textual database in Microsoft Word 2021 (Microsoft) according to the interview guide. Qualitative data were first coded for each question asked (Appendix 2) with input from five members of the research team, using an inductive approach. Thematic analysis was then undertaken at the data interpretation workshop where the initially generated codes were explored referencing direct quotations from patient participants. This process generated recommendations for future action (Table 3) and refined the coding framework used to

organise results into broad themes. Themes and recommendation statements were given back to attendees for review prior to final analysis. Any discrepancies were discussed between the five coding members of the research team until consensus was achieved. Priority quotations were identified collaboratively.

2.6 | Ethics

This project received ethics approval from the Western Australian Aboriginal Health Ethics Committee (HREC reference:1296) and was supported by the Kimberley Aboriginal Health Planning Forum Research Subcommittee (KAHPF reference: 2023-015). This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

2.6.1 | Positionality

The research team, inclusive of Aboriginal people, works closely with Kimberley Aboriginal communities, with many directly involved in DFD care. The team included GPs, public health physicians, podiatrists and health promotion officers. The team has longstanding professional and personal ties to the region and acknowledges that these relationships shape perspectives and understanding of DFD patient pathways. To minimise bias and centre participants' voices, the team employed reflexive practices throughout data collection and analysis.

3 | Results

3.1 | Participant Characteristics

The DFD attendance report identified 173 eligible patients with an additional 12 identified by local health practitioners (Figure 1).

Thirty-five patients were able to be contacted and consented to file review. Participants came from 13 different communities from across the Kimberley region. The median age of participants was 58 years (IQR 50.6–64.1) and 18 (51%) were female. The median time under observation was 10.2 years (IQR 7–12.4 years). All participants had type 2 diabetes and 88.6% (31/35) had CKD. Six patients were receiving haemodialysis and three had a functioning kidney transplant.

The mean age at the first diagnosis of DFD was 47 years old (SD: 10.3 years), while the youngest age of first DFD diagnosis was 13.4 years. The median age for both first admission to hospital and first surgical procedure was 51 years. The average age at admission for major lower limb amputation was 50 years ($n = 6$, IQR 43.1–50 years). At initial primary care podiatry review 28.6% (10/35) were classified as low risk, 14.3% (5/35) as moderate risk and 57.1% (20/35) as high risk of developing foot ulceration.

3.2 | Care Characteristics

3.2.1 | Outpatient Care

A total of 3303 eligible primary care and outpatient presentations were identified, with a median of 57 presentations per participant (IQR 27–102) (Table 1). Participants were most often seen by a nurse, with AHW involvement in 8.6% (116/3303) of presentations (Table 2). Ten percent (332/3303) of presentations were at Kimberley Renal Services Renal Health Centres, where foot care was provided at the time of routine haemodialysis. Telehealth was used in 10.7% (356/3303) of presentations. Of these, 37.1% (132/356) used asynchronous telehealth (i.e., image uploads for ongoing management), 24.7% (88/356) involved provider-to-provider photo sharing for clinical advice, 23.3% (83/356) used provider-to-provider telephone advice,

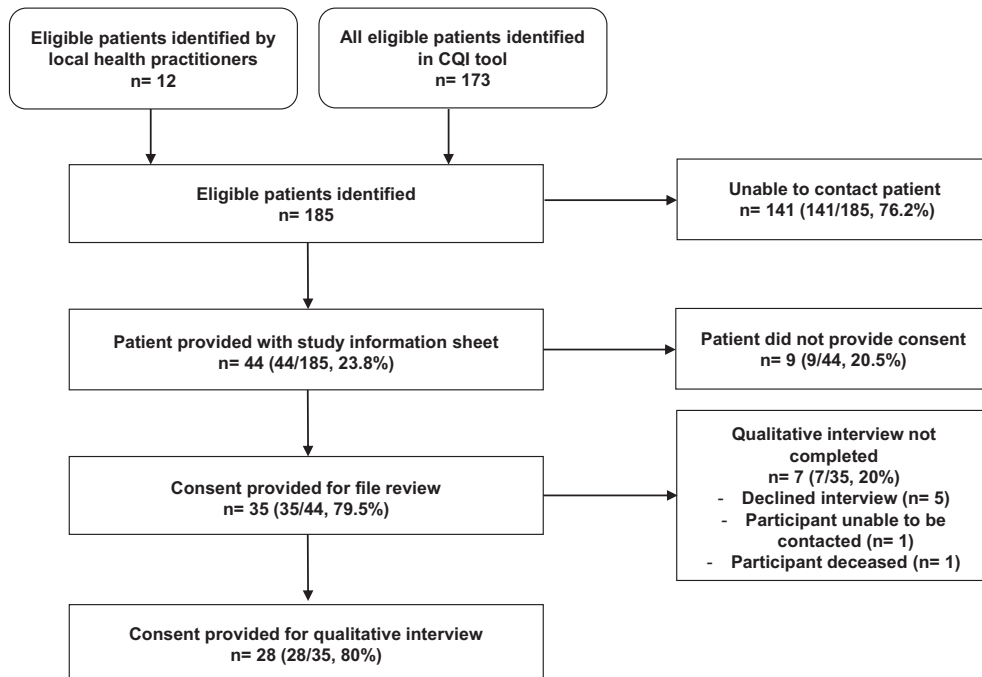


FIGURE 1 | Patient recruitment process.

TABLE 1 | Total presentations and hospitalisations per participant ($n = 35$).

	Frequency (%)
<i>Number of outpatient presentations</i>	
0–50	16 (45.7%)
51–100	10 (28.6%)
101–150	3 (8.6%)
151–200	1 (2.9%)
201–250	2 (5.7%)
251–300	1 (2.9%)
301–350	1 (2.9%)
> 350	1 (2.9%)
<i>Number of hospitalisations</i>	
0	4 (11.4%)
1–5	17 (48.6%)
6–10	6 (17.1%)
11–15	1 (2.9%)
16–20	5 (14.3%)
21–25	1 (2.9%)
26–30	0 (0%)
31+	1 (2.9%)
<i>Amputation/procedure</i>	
None	12 (34.3%)
Procedure without amputation*	5 (14.3%)
Minor lower limb amputation	12 (34.3%)
Major lower limb amputation	6 (17.1%)
Total	35 (100%)

*Debridement or vascular interventions.

11.8% (42/356) involved videoconferencing and 3.1% (11/356) did not document a specific mode of telehealth. A total of 100 (100/3303, 3.0%) primary care and/or outpatient presentations resulted in hospital admission. Of these, 30 (30/100) were evacuated from their community by air, and 70 (70/100) by road.

Ten participants (10/35, 28.6%) had received preventive foot care as an outpatient before their first documented presentation with DFD.

3.2.2 | Inpatient Care

Most (31/35, 88.6%) participants had at least one admission during the observation period. Overall, participants ($n = 35$) had a median of 46 days in hospital (IQR 6–99) and four admissions

TABLE 2 | Characteristics of primary care and outpatient presentations ($n = 3303$).

	Frequency (%)
<i>Type of care provided</i>	
Acute foot care	2997 (90.7%)
Preventive foot care	306 (9.3%)
<i>Use of telehealth</i>	
Telehealth not used	2947 (89.2%)
Telehealth used	356 (10.8%)
<i>Practitioner type providing care</i>	
Nurse	1617 (49%)
Podiatrist	636 (19.2%)
GP and Nurse	550 (16.6%)
GP and AHW/P	163 (4.9%)
GP or GP registrar	131 (4%)
AHW/P	116 (3.5%)
Non-GP specialist medical practitioner	46 (1.4%)
GP and podiatrist	22 (0.7%)
Three or more practitioners	20 (0.6%)
Nurse and AHW/P	2 (0.1%)
<i>Presentation outcome</i>	
Discharged	3196 (96.8%)
Admitted to hospital	100 (3%)
Admitted overnight awaiting evacuation	7 (0.2%)
<i>Total</i>	<i>3303 (100%)</i>

(IQR 1–10). The median admission duration was 6 days (IQR 4–21). Twenty-one patients (21/35, 67.7%) were transferred outside of the Kimberley region at least once.

File reviews identified 246 hospital admissions and 2478 admitted days. Of these, 1471 days (1471/2478, 59.4%) were spent in Kimberley regional hospitals, 969 (969/2478, 39.1%) days in Western Australian (WA) and Northern Territory (NT) tertiary hospitals, and 38 days (38/2478, 1.5%) in regional, secondary hospitals outside of the Kimberley (i.e., other WA regions or NT). Seventy (70/246, 28.6%) admissions involved patient transfer between two or more inpatient facilities. The highest level of admission was most frequently to a regional hospital ward/HDU, (180/246, 73.2%), followed by tertiary hospital ward (62/246, 25.2%), and tertiary hospital ICU/HDU (4/246, 1.6%). Discharge against medical advice occurred in 15.5% of admissions (38/246), with no significant difference between regional and tertiary hospitals. The 28-day readmission rate, inclusive of both planned and unplanned readmissions, was 17.9% (44/246).

TABLE 3 | Recommendations arising from stakeholder consultation.

Recommendations
<ul style="list-style-type: none"> • Support opportunities for Diabetes Foot Disease (DFD) self-care for Aboriginal people: <ul style="list-style-type: none"> ◦ Empower patients with the interest and capacity to manage their own care ◦ Enhance existing medical record systems and provider prompts to support self-care ◦ Identify and evaluate existing self-care programmes and resources for DFD for their potential to be used with Aboriginal communities, including: <ul style="list-style-type: none"> • Patient education for wound care • Telehealth and digital tool to support patient self-care and connection with provider • Ensure consistent availability of wound care supplies and appropriate medical equipment in rural and remote areas • Expand the delivery of high-quality foot care within the Aboriginal Community Controlled Health Service (ACCHS) sector: <ul style="list-style-type: none"> ◦ Evaluate provider confidence and competence to deliver DFD care ◦ Provide targeted training opportunities to strengthen service capacity ◦ Orient new staff to local diabetes-related foot disease services and referral pathways ◦ Inform patients of all available foot care services, enabling them to access appropriate care when and where they need it ◦ Identify and evaluate DFD health promotion materials, developing new educational resources in local Aboriginal languages as needed <ul style="list-style-type: none"> • Co-design any materials or event with local Aboriginal people, particularly those with lived experience of DFD and diabetes. ◦ Develop an Aboriginal Health Worker/Practitioners role to deliver culturally safe and community driven foot care, supported by the podiatrist and other primary care staff ◦ Evaluate the effectiveness and acceptability of new DFD service models in the Kimberley, including the AHW-led approaches and telehealth-facilitated multidisciplinary team meetings • Support patients requiring hospital admission: <ul style="list-style-type: none"> ◦ Facilitate the involvement of appropriate support persons for Aboriginal people during hospital admissions for DFD ◦ Review and improve discharge planning processes and care coordination in collaboration with Aboriginal communities ◦ Advocate for improved access to Aboriginal Liaison Officers • Advocate for upstream improvements and services required to prevent DFD: <ul style="list-style-type: none"> ◦ Improved environmental health conditions that contribute to DFD, including housing and sanitation ◦ Increased podiatry services that are integrated with rural and remote primary care settings (including ACCHS) as part of a multidisciplinary workforce ◦ Sustainably funded ongoing DFD education initiatives for both healthcare providers and Aboriginal community members ◦ Improved access, affordability, and availability of culturally appropriate footwear for Aboriginal people, particularly in remote communities

3.3 | DFD Attendance Report Results

Compared to manual file review, the automated DFD attendance report captured only 9.8% (217/2214) of eligible presentations. Of the 35 participants whose files were reviewed, 12 would not have been identified by the report, including a participant with 530 presentations for DFD care.

3.4 | Qualitative Results

Twenty-eight participants consented to a qualitative semi-structured interview (50% female, median age 57 years (IQR 50–64)). The following themes emerged during analysis:

3.4.1 | Feet First: Navigating the Impact on Lives and Communities

Participants consistently identified foot health as key to overall health and social and emotional wellbeing for themselves, their families, and their community:

Gotta look after your feet. Feet are the main ones, they're all you've got. Next you have to crawl on your knees.

[ID 5]

Participants shared the impact DFD has had on their lives, including their ability to stay independent, maintain employment and participate in valued activities, particularly outdoor cultural activities such as hunting and camping: 'I can only walk a little... I used to go everywhere, now I can't go anywhere' [ID 14]. Others explicitly described the negative impact on social and emotional wellbeing including concern about the future and for their family. One participant shared 'I get frightened of my body. I have a child, I don't want them to see me like this'. [ID 18].

Despite these challenges, many participants demonstrated incredible strength and resilience. One participant shared, 'I just don't want to sit there and give up. Say f*** life, you know. Some days I feel like that. But I think, nah. I got my grandchildren you know' [ID 31].

3.4.2 | Support Needed for Hospital Admissions: ‘Go With Them. That’s Important’

Participants shared a variety of experiences about their hospital care. Positive experiences related to the presence of support persons and Aboriginal Liaison Officers (ALO) who were valued for their clinical, social–emotional and cultural support. Most patients, however, reported not being seen by an ALO during their inpatient stay and did not understand why this wasn’t offered. Presence of a support person(s) was noted as important to those transferred out of the region for care:

Our boy went with [my wife, who had been admitted with DFD], we went every day, she can see us with our smiles. You know when people go to [tertiary hospital] ... they need company or carer with them. Go with them. That’s important.

[ID 22]

During qualitative analysis, local health practitioners recommended increasing ALO access during inpatient care and ensuring patients could travel with a support person.

Hospital environments sometimes felt foreign and ‘sterile’. Negative experiences were often associated with the perception of poor communication regarding care, feeling uninformed and not in control of decision making. In some cases, this left patients’ feeling that amputations had happened without their consent:

They cut it without my permission...I was asking them, why did [they] cut it up here? They could have cut it down there [below knee].

[ID 8]

I didn’t understand they had to take my toe, no one knew what was going on... found out after it was because of infection.

[ID 3]

Several participants expressed concerns about the lack of information, support and dressing resources provided at discharge after hospital admission (‘I was on my own’ [ID 10]). Issues with communication and coordination between services were also raised, with one participant noting, ‘we need more working together, you know with everyone, all the other services, not duplicating but working together’ [ID 31].

3.4.3 | Footcare in Community Highly Valued

Participants spoke positively about the DFD care provided by their local ACCHS, it being ‘very professional’ [ID 29], ‘properly safe’ and ‘the best care’ [ID 12]. Participants particularly appreciated assistance with transport, integration of bush medicines and support from trusted staff, especially AHW and AHPs.

When you see those health workers, they are all local people. Aboriginal People. Yeh, I think its

[culturally] safe. We always yarn and have a laugh and joke about things. It makes me feel proud to see our people there.

[ID 31]

Podiatry services were also highly valued. Several participants spoke positively about their relationships with podiatrists and described their important role in patient and clinician education: ‘When I went [to the nearest hospital], I went for something else, and [podiatrist]... checked on my feet and everything. She was really helpful and telling the doctors what dressing to use on my feet and everything. Yeah, she’s brilliant.’ [ID 24] Participants also appreciated the assistance they received in accessing appropriate footwear. Participants reported extended wait times, up to several months, for outpatient podiatry services, particularly those in remote communities. Many expressed a desire for more frequent visits and reviews.

Telehealth services were seen as an acceptable method to enhance service delivery and reduce the burden of travel. One participant shared that telehealth was more acceptable if a trusted health professional was present during the consultation.

3.4.4 | Autonomy and Flexibility Identified as Benefits of Self-Care: ‘I have to start looking after my foot myself’

Several participants were interested in having more opportunity to care for their own wounds, valuing the autonomy and flexibility this might give them:

When we come here, so we don’t have to be hanging around. We like to grab our stuff and like to do it at home. That’s how I have been treating my leg, at home.

[ID 8]

Yeah, I tell em’ let me take [dressings] home and do it because I got slack coming in and out of [local ACCHS] ... couple of days in home and do em’, and then I’ll come again and let them check it and see if we right.

[ID 21]

The kids know what to do. I do it myself. Show me the dressings, I’ll take it home.

[ID 2]

You need a 4-wheel drive if it rains to get out of there. I’m not going to walk out in the rain. So I am going to look after my foot, I have to start looking after my foot myself, that’s the only way I can do it there.

[ID 35]

During qualitative analysis, local health practitioners agreed that empowering patients with choices in their dressing plans and providers was important. As one local ACCHS-employed GP observed, 'I think often the experience for our patients is that it's assumed that they can't and lots of our patients are actually really happy to, want to learn, and want to be able to take care of themselves, especially when it comes to dressings... we [ACCHS] are probably the best placed services to provide that level of time, care and education' [ID 36].

Both participants and health professionals identified barriers to effective self-care, particularly varied home environments and the inconsistency in dressing types in remote locations, particularly as patients frequently travelled across healthcare settings. 'I order something, they don't have it. It doesn't come' noted a participant [ID 2].

3.4.5 | 'Prevention Is Better Than a Cure'

Participants expressed a strong desire to raise awareness and build knowledge about DFD within their local communities. When asked what advice they would give to others for foot health, wearing shoes was the most frequently raised recommendation. Equitable access to appropriate footwear was consistently highlighted as essential for prevention by both participants and workshop attendees.

Further to this, multiple participants emphasised the importance of early prevention, screening, and timely healthcare presentation, with one saying, 'Prevention is better than a cure' [ID 12]. Participants also placed value on the need to optimise diabetes control and maintain a healthy diet to improve DFD and overall health.

A key theme arising from interviews was the demand for more culturally appropriate resources, including educational materials in native Aboriginal languages and events delivered by local Aboriginal people, including people with lived experience of DFD and diabetes. A patient described the importance of optimising delivery: 'I reckon and it's how you explain it to Aboriginal mob. They will say yes for everything, even though they don't understand. So I reckon they should do more... so they can understand more' [ID 4].

3.4.6 | Unique Environmental Impacts in the Kimberley: 'Tyres Got Flat Here'

Participants identified the impact of both home and outdoor environments on managing DFD in the Kimberley region. Participants frequently identified the presence of hazards in their environment such as sharp rocks, glass, hot roads/tarmac and needles which increased the risk of injury and complicated foot health management.

Both participant interviews and healthcare worker workshops highlighted how housing and limited access to appropriate equipment affected DFD care. Two participants reported a lack of post-amputation support services, leaving them without necessary assessments, equipment and home modifications for their remote locations. Following an amputation, a patient described

how the wheelchair provided on discharge, was not suited to their needs: '... they should have checked the wheelchair and made sure it was alright for the place [remote community]... We keep getting flats [flat tyres]. Need to check everything in hospital before you go. Tyres got flat here [remote community]... need BMX tyres, bit softer' [ID 22]. Later in the interview, the patient expressed how it would be helpful for health care/support providers to visit remote communities to improve identification of housing modification and equipment requirements, '...we just want someone to come inside the house, write it in the book, what you need and all that' [ID 22].

4 | Discussion

This study documents the healthcare journey of Aboriginal people in the Kimberley region with DFD, aligning with and expanding on existing literature [5, 7, 8, 22–24]. The findings provide new insights about how DFD is being managed within a network of ACCHS, highlight the healthcare priorities for patients with lived experience of DFD, and recommend further actions to improve outcomes in line with recent evidence on the potential benefits of self-care for DFD [25].

We described over 3000 presentations in 35 individuals, highlighting the important role of comprehensive, multidisciplinary primary care in foot care provision in rural and remote Australia. Participants valued the foot care they received within the ACCHS sector, especially when received from an AHW, consistent with existing literature documenting the important role of AHWs in providing wound care [24]. One tenth (332/3303) of DFD-related primary and outpatient care was provided to patients receiving haemodialysis at a Kimberley Renal Health Centre, who are at increased risk of major amputation, prolonged hospital stay and mortality [26]. Integrating podiatry services into haemodialysis units has been shown to improve clinical outcomes and patient satisfaction and our findings suggest that this has been successfully implemented in the Kimberley region [27, 28]. Telehealth was only used in 10% (356/3303) of primary and outpatient DFD presentations but was acceptable to patients as in other studies [29, 30] and could be expanded to address demand.

Up to 85% of diabetes-related amputations are preventable with early detection and intervention. As such, achieving greater preventive care coverage, including through the ACCHS sector, is essential to improving long-term outcomes [31]. Most participants in this study were high risk for developing foot ulcers, with at least one preventive foot assessment recommended annually [4]. Although early prevention was reported as valuable by participants, less than a third (10/35) had a documented preventive care attendance before their first DFD complication, and less than 10% (306/3303) of foot care attendances identified in this study were for preventive care. Noting this disconnect, and that a lack of effective preventive care delivery contributes to late-stage presentation and higher amputation rates, [1, 23] recommendations to strengthen preventive foot care within the ACCHS sector are included in Table 3.

Study participants valued the autonomy and flexibility of managing their care, especially with the knowledge that support was available from their local ACCHS when needed. Involving

patients or informal caregivers in wound care interventions can improve clinical outcomes and quality of life for patients with DFD [25]. Additionally, national DFD guidelines support foot self-care (e.g., foot inspection and emollient use) and foot self-management (e.g., foot skin temperature and telehealth), particularly in remote regions such as the Kimberley [4]. Western Australian Standards also explicitly recommend that patient and carers receive education to support safe and sterile wound management if wound care from a trained professional is not available [32]. The results of this study and stakeholder consultation support future work to empower Aboriginal people to practice self-care for DFD. Appropriate consideration must be given to the resources required to develop an effective model of self-care for DFD with evaluation for cultural and clinical safety needed, and with reference to other models of care in use in Australia [33–35].

The substantial inpatient and outpatient burden associated with DFD is known to affect social–emotional wellbeing [36]. In this study, time spent in hospital was significant. Most participants (21/35, 60%) required care outside the Kimberley at least once, often for extended periods, and participants reported feelings of isolation and alienation. Such time away from country disrupts cultural and social connections, negatively impacting health and wellbeing [37]. The rate of ‘discharge against medical advice’ was relatively high in this study (15.5% vs. 3.8% overall reported rates for Aboriginal patients in WA) as were hospital readmission rates (17.9% vs. 8.3% in other DFD-specific Australian studies) [38, 39]. These results, with the added context of the negative inpatient experiences described by our participants, affirm the importance of strategies to support patients admitted with DFD. Options include improved access to ALOs and support persons and/or early supported discharge to reduce hospital length of stay, noting that consistent funding and support for such strategies is needed to enhance cultural safety and improve hospitalisation outcomes and experiences for Aboriginal patients [40]. Lack of information, supplies and suitable equipment at discharge were also raised as concerns. Strategies that reduce healthcare-related burdens (Table 3) are needed to mitigate the impacts of hospitalisation on patients and their families.

This study has several limitations. The data were collected from ACCHS primary health care records and as such, care delivered by outpatient hospital systems or other providers is likely underestimated. Recruitment may have been biased towards patients actively presenting to services, which may have skewed the participant group towards those with more severe DFD or, alternatively, those best engaged with their providers. Only presentations that included a clinical aspect of foot care were included in this study. Consultations provided by Credentialed Diabetes Educators and Dieticians were not recorded by the research team, despite these services being available in the region. We acknowledge the contribution these services make to health promotion and education and that this dataset may underrepresent the true volume and diversity of DFD care provided.

No demographic or health outcome data were collected on participants who declined to participate, limiting our ability to assess representativeness. Whilst the data used is comprehensive and rich, generalisability is limited due to the small sample size and regional focus.

Despite our attempt to automate a DFD attendance report, our report captured only 9.8% of file-reviewed presentations and can't be usefully used to monitor trends over time. This emphasises known existing challenges in accurately capturing and coding data from primary care medical record sources with recognised implications for workforce and resource planning [41].

Responses from participants and from health professionals who participated in the data interpretation workshop included several recommendations to improve outcomes and experiences for Aboriginal people experiencing DFD (Table 3). Addressing these challenges will require a combination of enhanced primary care strategies and improved system-wide coordination. By focusing on early intervention and strengthening community-based care, it may be possible to reduce the burden of DFD and improve long-term outcomes for Aboriginal people.

5 | Conclusion

This study comprehensively documented healthcare pathways and experiences among Aboriginal people living with DFD in the Kimberley region. Our findings demonstrate the significant impacts of DFD on individuals and communities. Primary care and outpatient services play an important role in DFD care in the region; however, there remains an opportunity to enhance preventative foot care. Participants valued autonomy and flexibility in managing their care, particularly with the support of their local ACCHS. Resources for primary care, developed by and with Aboriginal people, may further facilitate patient autonomy and improve health outcomes. Recommendations to improve prevention, care experiences, and management for Aboriginal people with DFD are provided in Table 3, incorporating the perspectives of both patients and providers. Further research is needed to address this important health issue. Priority should be given to Aboriginal-led health initiatives, investigating effective strategies to improve prevention and reduce hospitalisation rates for Aboriginal people.

Author Contributions

Emma Griffiths: methodology, investigation, formal analysis, data curation, writing – review and editing, supervision. **Ellen Stapleton:** conceptualization, methodology, formal analysis, data curation, writing – review and editing. **Courtney Fairfull:** conceptualization, methodology. **Sophie Moustaka:** conceptualization, methodology, data curation, investigation, writing – original draft, writing – review and editing, visualization, project administration, formal analysis. **Ala Mckay:** conceptualization, methodology, investigation, formal analysis, writing – review and editing, data curation. **Chantelle Carr:** investigation, formal analysis, writing – review and editing, data curation. **Sarah Tomlinson:** methodology, investigation, formal analysis, data curation, writing – review and editing. **Jodie Millroy:** methodology, investigation, formal analysis, data curation, writing – review and editing.

Acknowledgements

We sincerely thank all study participants for generously sharing their time, knowledge, and energy in support of this project. We also gratefully acknowledge all Aboriginal Community Controlled Health Services that partnered in and facilitated this project: Broome Regional

Aboriginal Medical Service, Derby Aboriginal Medical Services, Yura Yungi Medical Service, Ord Valley Aboriginal Health Service and Kimberley Aboriginal Medical Services. We extend our appreciation to all individuals who participated in our data interpretation workshop, with special thanks to Felicity Stewart, Isaac Torres, Alicia Schifferle, Michele Harvey and Laura Buckingham for their contribution to participant recruitment, interview facilitation and/or manuscript review. The authors confirm that no generative artificial intelligence tools were used in the writing or preparation of this manuscript.

Disclosure

The authors have nothing to report.

Ethics Statement

This project received ethics approval from the Western Australian Aboriginal Health Ethics Committee (HREC reference: 1296) and was supported by the Kimberley Aboriginal Health Planning Forum Research Subcommittee (KAHPF reference: 2023-015). This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Conflicts of Interest

E.S., C.C. and S.T. were employed by local podiatry services (Kimberley Aboriginal Medical Services, Boab Health Services And WACHS: High Risk Foot Clinic) during the study period and provided clinical and/or support care to the participants. E.G. was employed by Kimberley Renal Services and provided renal care to participants.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Appendix 1

Foot Journey Map Template:



Exploring care pathways for Aboriginal People in the Kimberley with diabetes-related foot problems

Name: _____

Ulcer Map	Treatment Map	Treatment Summary
		<p>Number of clinic appointments:</p> <p>Total number of days in hospital:</p> <p>Number of days in a Kimberley hospital:</p> <p>Number of days in hospital outside of the Kimberley:</p> <p>Number of surgeries:</p>



Exploring care pathways for Aboriginal People in the Kimberley with diabetes-related foot problems

Part 1: Introduction

Research team member name/s:

Interview date:

Patient's recording preference: Voice recorder OR Pen and paper

Information to share with patient prior to interview:

Introduce yourself and your role in the Kimberley

Offer to invite a support person to the yarn (optional): family member, clinic staff etc

Inform the patient that they can stop the interview at any time and this will not affect their health care

Reassure the patient that all information is strictly confidential and will not be shared by the research team in any form that can identify them

[if patient selects voice recording] Offer to send the patient a copy of their research yarn transcript

[if patient select pen and paper] Let the patient know that you may need to pause to write information down. Let the patient know they are welcome to look at your notes during or after the interview if they would like to.

Inform the patient: If we discuss anything during the interview which you find upsetting, please let me know and we can stop the interview and offer to connect you with social and emotional wellbeing support at your local clinic

Inform the patient: If you need any help with your foot sick or general health problems, please let me know, and we can connect you with support at your local clinic

Part 2: Questions

1. Is the summary an accurate (true) description of your journey? did we miss anything?

2. When you had sick foot, how was the care you received at clinic/s?

