



Enhancing diabetes management in rural and remote areas through academic–clinical partnership: an innovative workshop model for primary healthcare professionals

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ABSTRACT

Background. Diabetes has a greater impact on people living in rural and remote Australia because of limited access to specialist diabetes services and ongoing workforce shortages. Primary healthcare professionals in these regions play a central role in diabetes care, but they often lack targeted training and professional support. **Innovation.** This project introduced a co-designed, face-to-face workshop model to build clinical skills, strengthen confidence in culturally responsive communication and foster professional networks among rural healthcare workers. Developed through an academic–clinical partnership with health organisations for Aboriginal and Torres Strait Islander peoples, the workshops used evidence-based teaching methods to improve professional development tailored to the realities of rural primary healthcare needs. **Methods.** Two full-day workshops took place in Queensland and New South Wales in 2024. A pretest–posttest survey design was used to evaluate the workshops, assessing changes in clinical confidence and professional engagement. Of 120 participants, 73 completed post-workshop surveys, and 48 provided matched pre- and post-workshop data. **Impact.** Participants reported substantial increases in clinical confidence, particularly in using diabetes technologies (+72.4%) and understanding recent advances (+66.5%). Notably, 96.3% reported enhanced professional connections, with 87.0% intending to maintain them post-workshop. High levels of participants’ satisfaction and partner support highlight the model’s potential for broader implementation. **Conclusion.** This innovative workshop model addresses critical gaps in diabetes care training for rural health professionals by integrating clinical education, culturally responsive communication skills and opportunities for peer support. It offers a sustainable approach to rural health workforce development that aligns with national rural health priorities, and supports quality improvement in primary health care.

Keywords: continuing professional development, co-design, culturally responsive communication, diabetes education, Indigenous health, primary health care, professional networking, rural health, workforce development.

Introduction

Diabetes disproportionately affects rural and remote populations, largely due to health workforce shortages and limited access to specialist diabetes services, such as endocrinology or tertiary diabetes teams (Wilson *et al.* 2009; Skinner *et al.* 2013). Primary healthcare professionals are at the frontline of diabetes care in these regions, yet they often lack the training or professional support to manage diabetes (Rushforth *et al.* 2016). This paper describes a partnership that delivered targeted, face-to-face workshops to support primary healthcare professionals in managing diabetes, such as nurses, Aboriginal Health Workers and other allied health professionals. This partnership model integrates clinical education, confidence in culturally responsive communication and professional

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networking, demonstrating a practical approach to quality improvement (QI) in the rural primary healthcare workforce.

Context: primary healthcare challenges in rural and remote diabetes management

Diabetes is a chronic condition that poses significant health challenges, particularly in rural and remote areas (Dugani *et al.* 2021). As of June 2024, approximately 1.5 million Australians have diabetes, with >300 new diagnoses daily (Diabetes Australia 2024). The prevalence of diabetes increases with remoteness, with people in remote areas 1.3 times more likely to have diabetes than those in major cities (Australian Institute of Health and Welfare 2024a). Most concerning, the diabetes hospitalisation rate is 2.6 times higher among those in rural and remote areas compared with major cities (Australian Institute of Health and Welfare 2024b), highlighting significant health inequities in Australia.

Shortages in the primary healthcare workforce, especially among professionals managing chronic conditions such as diabetes, worsen these challenges. In 2019, there were 458 full-time equivalent medical practitioners per 100,000 people in major cities, compared with only 264 in remote areas (Australian Institute of Health and Welfare 2024a). This statistic reflects system-level workforce distribution rather than the workshop participant group, and highlights broader challenges in ensuring access to diabetes care. In rural settings, diabetes care is commonly delivered by multidisciplinary primary healthcare teams that include nurses, Aboriginal Health Workers, pharmacists and dietitians, particularly where access to medical practitioners is limited. This shortage of a skilled workforce negatively impacts the quality of care available to rural and remote populations, including people living with diabetes.

Policy frameworks, including the Australian National Diabetes Strategy (2021–2030; Australian Government Department of Health and Aged Care 2021), and the National Strategic Framework for Rural and Remote Health (Australian Government Department of Health and Aged Care 2020), emphasise strengthening primary healthcare workforce capacity in rural and remote settings. However, existing approaches to upskilling primary healthcare professionals tend to be either generic or lacking in rural contextualisation (Department of Health and Aged Care 2025; National Diabetes Service Scheme 2025). This partnership-based workshop responds directly to these challenges by offering practical, locally accessible professional training for health professionals.

Review of literature on similar cases

Diabetes education has long been shown to improve health outcomes when tailored to real-world practice (Chatterjee *et al.* 2018; Gucciardi *et al.* 2020). Evidence suggests

face-to-face education for clinicians remains the optimal method for complex skill development and fostering professional relationships in rural primary healthcare settings compared with virtual education (Schoen *et al.* 2016; Bidner *et al.* 2022). This preference often reflects challenges in rural areas, such as unreliable internet and limited technology infrastructure.

Literature showed that educational interventions in rural healthcare settings were most effective when they incorporated principles of adult learning theory and place-based education (Sharrock and Lockyer 2008; Taylor and Hamdy 2013). These theoretical frameworks emphasise the importance of practical, context-specific training, which is delivered in locations close to their communities. However, there remains a lack of published Australian models of care that combine these approaches in rural diabetes care training, particularly those co-designed with multidisciplinary clinical stakeholders rather than solely medical practitioners.

Practice innovation: the workshop model

What sets this workshop model apart is its co-design approach, which actively involves rural clinicians, health organisations for Aboriginal and Torres Strait Islander peoples and academic partners from the outset. This collaborative process ensured that the workshop curriculum was not only evidence-based, but also tailored to the unique clinical realities, cultural contexts, and resource constraints of rural and remote communities. Unlike many conventional professional development programs, the workshops integrated hands-on skills training, culturally responsive communication strategies and opportunities for peer networking, delivered in accessible, face-to-face formats.

A further innovation of the workshop model was the embedding of continuous feedback loops. Participants and partner organisations provided real-time input during and after the workshops, allowing for rapid adaptation of content and delivery. This approach mirrors quality improvement models used in rural diabetes care, which emphasise local feedback and ongoing refinement. The model also leveraged existing clinical–academic partnerships to optimise resource use and sustainability, drawing on shared facilities, expertise and funding streams.

Workshop design and delivery

Two full-day face-to-face workshops were delivered in rural New South Wales and Queensland in March and August 2024, respectively. The workshops were open to all Australian registered health professionals working in rural or remote areas, and participants were recruited through academic and clinical partner networks, including conferences, email lists and social media. Locations were selected to maximise accessibility for rural healthcare professionals. These workshops were co-designed by university academics, clinicians, clinical

partners and health organisations for Aboriginal and Torres Strait Islander peoples to ensure the content reflected the realities of rural practice, incorporated culturally grounded perspectives and fostered professional peer networking.

The co-design process involved representatives from the Collaborative Commissioning: Care Partnership – Diabetes program partners (<https://www.ruralhealthpro.org/s/diabetes>), Rural Doctor Network, Western Primary Health Network, Western NSW Local Health District and Far West Local Health District, Aboriginal Health and Medical Research Council, Institute for Urban Indigenous Health, and diabetes educators and evaluation experts from the University of Technology Sydney. The Care Partnership – Diabetes partner organisations include frontline Aboriginal Health Workers and community-based clinicians, two of whom participated directly in the co-design process. Their contributions provided practical insights into rural service realities and community needs, ensuring that the identified learning priorities reflected the perspectives of those delivering care on the ground. Across multiple planning meetings, partners collectively identified priority learning needs based on local service gaps and challenges reported by rural clinicians. These needs included strengthening clinicians' confidence in providing insulin injection instruction, interpreting haemoglobin A1C results and performing point-of-care testing, demonstrating blood glucose monitoring techniques, recognising acute diabetes complications, such as hypoglycaemia, and supporting culturally responsive communication.

The agenda and content of the workshop were jointly designed by all partners. Aboriginal and Torres Strait Islander partners provided leadership in developing and delivering the cultural empathy communication session, and contributed examples of culturally appropriate language, interactions and storytelling. Clinical partners contributed locally relevant case studies that reflected common presentations in rural and remote settings, including missed diabetic ketoacidosis and blood glucose monitoring techniques. Academic partners ensured alignment with adult learning principles by incorporating hands-on practice stations, case-based discussions and demonstration–practice–reflection sequences. Academic partners with evaluation expertise helped design the online surveys, ensuring they were practical for rural settings, aligned with the workshop objectives and allowed for iterative refinement based on participant feedback. In addition, co-design shaped the delivery methods, including the use of rotating small-group skill stations, mixed-discipline seating to support interprofessional interaction and facilitated case-based discussions to consolidate clinical reasoning. All facilitators, including academics, Aboriginal health educators and clinical staff, completed preparatory briefings and rehearsals, and used standardised facilitator guides to ensure consistent delivery across both workshops.

The workshop model was designed as a structured, context-responsive approach that can be replicated for diabetes education and adapted for other chronic conditions. The

workshops followed a standardised and locally tailored structure comprising four core components: brief clinical updates grounded in current practice challenges; rotating hands-on skills stations; case study based discussions addressing acute presentations frequently encountered in rural and remote settings; and a cultural empathy and communication session led by Aboriginal and Torres Strait Islander educators. What distinguishes this workshop model is the integration of rural practice needs, culturally informed communication and interprofessional learning within a single, co-designed format. Each component followed a consistent instructional sequence of short evidence updates, facilitated demonstration, supervised practice and reflective debriefing, with a facilitator-to-participant ratio of approximately 1:10 to optimise skills coaching. The detailed agenda for the workshops, including session titles, timing and delivery format, is available in Supplementary File 1. Implementation followed a defined series of steps, including identifying local needs with partner organisations, establishing a co-design group, refining learning objectives, developing facilitator guides, preparing facilitators through rehearsals and delivering the workshop using rotating small-group formats supported by real-time feedback mechanisms.

Although the curriculum presented in this study was diabetes-specific, the educational model is readily adaptable to other chronic conditions, such as cardiovascular disease and chronic respiratory illness. The co-design methodology, hands-on skills stations, case-based learning structure and intentional peer-connection activities could be tailored by substituting condition-specific clinical content and competencies while maintaining the overarching pedagogical framework. The interprofessional learning design, including mixed-discipline grouping throughout the workshop to encourage relationship-building, is similarly transferable and could strengthen professional networks in other continuing professional development programs.

Workshop evaluation

The workshops were evaluated to inform future professional development initiatives and support ongoing quality improvement in primary health care. Participation in the evaluation of these workshops was voluntary. This evaluation used a pretest–posttest design with the convenience sampling approach, and used online surveys to collect data administered via Qualtrics (<https://www.qualtrics.com/>). All surveys underwent pilot testing with four healthcare professionals in February 2024 to assess content appropriateness, language clarity and completion time.

This evaluation received ethics approval from the University of Technology Sydney Human Research Ethics Committee (approval number: ETH24-9037). All participants provided informed consent before participating in the study.

Survey administration and timing

The pre-workshop evaluation survey was available for 1 week before the workshop, and closed at the start of the workshop day, whereas the post-workshop evaluation survey was completed either immediately after the workshop or within 14 days via an online link. In addition to these formal evaluation surveys, participants were invited to provide informal feedback to support workshop refinement.

Between-workshop refinements

Following the first workshop, participant feedback informed several refinements to the second workshop. These refinements included allocating additional time to diabetes technology demonstrations, adjusting the sequencing of content to support learning progression and revising facilitation prompts for the case discussions. To ensure consistency across locations, these adjustments focused on how the workshop was delivered rather than on what content was taught. The curriculum content remained unchanged, and refinements focused on timing, sequencing and facilitation to improve instructional flow.

Measures

Survey items assessed self-reported confidence in diabetes education and management rather than observed clinical behaviours. One item assessed confidence in health communication with Aboriginal and Torres Strait Islander peoples, which reflected self-reported awareness rather than cultural safety. The surveys also included three pre-workshop and three post-workshop questions examining participants' perceived professional connection, including their sense of connection with other rural primary healthcare professionals involved in diabetes care, interest in forming professional relationships and intention to maintain any connections established during the workshop. These items were co-designed with program partners, and informed by literature emphasising the importance of collegial relationships for wellbeing and performance in rural health settings (Tran *et al.* 2018; Gu *et al.* 2022).

Data collection and analysis

Quantitative survey data were analysed descriptively. Changes in self-reported confidence and professional connection were summarised using proportions and percentage changes between pre- and post-workshop responses. Subgroup analyses by profession or workshop location were not conducted due to small sample sizes, and because such analyses were outside the scope of the pre-specified, ethics-approved study aims.

Qualitative data were obtained through optional free-text response items embedded in both the pre- and post-workshop surveys. These items invited participants to comment on their learning needs, their experience of the workshop, factors that supported or hindered their participation and any reflections on networking. Free-text responses were analysed inductively

using a descriptive qualitative approach. One author (WP) conducted line-by-line coding, and preliminary codes were synthesised into themes. Two additional authors reviewed the coding and theme structure, and disagreements were resolved through discussion until consensus was achieved.

Participant characteristics

Of 120 participants, 73 completed questionnaires (response rate 60.8%), with 48 completing both pre- and post-workshop questionnaires. Participants were primarily registered nurses/midwives (50.7%), Aboriginal and Torres Strait Islander Health Professionals (9.6%) and pharmacists (9.6%). The remaining participants included dietitians (6.8%), podiatrists (6.8%), credentialed diabetes educators (5.5%), an accredited exercise physiologist (1.4%), a clinical coordinator (1.4%) and project managers (2.7%). Health professional type data were missing for four participants.

Self-reported evaluation outcomes

Substantial improvements were observed in participants' self-reported clinical confidence, particularly in using diabetes technologies (72.4% increase) and understanding recent advances in diabetes technologies (66.5% increase; Table 1). Additionally, 96.3% of participants reported enhanced professional connections following the workshop, with 87.0% indicating an intention to maintain these connections. Clinical partners also reported strong support for further collaboration, with 94.7% indicating willingness to participate in future workshops. The evaluation did not include any objective assessment of behaviour change. Accordingly, all outcome findings reflect self-reported perceptions and intentions rather than verified changes in clinical practice.

Qualitative reflections on intended application and networking

Some participants used the optional free-text survey items to describe how they anticipated applying workshop content in their future practice, such as discussing advanced diabetes technologies with patients or using culturally responsive communication strategies. In addition, clinical partners who attended the workshops noted that the workshops stimulated discussions about ongoing mentorship and the development of local peer support networks. These qualitative findings reflect participants' and partners' perceptions, intentions, and early discussions rather than observed behaviour change or evaluated outcomes.

Impact and lessons for rural primary health care

An innovative model for quality improvement in primary health care

The workshop model brings together clinical skill-building, culturally responsive communication skills and opportunities

Table 1. The comparisons of confidence pre- and post-workshop for different topics.

	Pre-workshop % (n = 48)	Post-workshop % (n = 48)	% Change
I am confident in administering insulin injections as part of diabetes education, including demonstrating correct techniques	53.3	80.0	26.7
I am confident in explaining HbA1c results	73.3	93.3	20.0
I am confident in discussing HbA1c targets across various diabetes management approaches	46.7	93.3	46.6 ^A
I am confident in performing HbA1c testing using point-of-care methods	40.0	86.7	46.7 ^A
I am confident in blood glucose monitoring, including demonstrating proper techniques	73.3	93.3	20.0
I am confident in setting blood glucose targets according to the latest clinical guidelines	46.7	93.3	46.6 ^A
I am confident in assisting clients in preventing or managing hypoglycaemia	66.7	93.3	26.6
I am confident in assisting clients in preventing or managing hyperglycaemia	46.7	93.3	46.6 ^A
I am confident in assisting clients in preventing or managing diabetic ketoacidosis	40.0	80.0	40.0
I am aware of my cultural competence when working with people from diverse cultural backgrounds e.g. Aboriginal and Torres Strait Islander culture	73.3	93.3	20.0
I am confident in facilitating diabetes group sessions	26.7	86.7	60.0 ^A
I am confident in describing the latest advancements in diabetes technologies, including insulin pump therapies and continuous glucose monitoring systems	27.3	93.8	66.5 ^A
I am confident in demonstrating the use of at least one insulin pump and continuous glucose monitoring device	18.2	90.6	72.4 ^A
I am confident in outlining common barriers and opportunities for people with diabetes to use various technologies to support their self-management	33.3	93.8	60.5 ^A
I am confident in demonstrating the use of the 'teach-back' method to enhance a client's understanding and self-management of diabetes	57.6	100	42.4 ^A
I am confident in explaining the role of strengths-based communication in diabetes education and support	45.5	96.9	51.4 ^A
I am confident in performing the basic foot assessment and screening for diabetes-related complications	45.5	100	54.5 ^A

Abbreviations: HbA1c, haemoglobin A1C.

^AIndicating a statistically significant result ($P < 0.05$).

for professional connection through a co-design approach. Unlike standardised or virtual-only training, this approach recognises the value of learning that is grounded in local context and professional relationships in rural health settings.

A key feature of this model is its adaptability: the core principles – co-design, contextualisation, hands-on learning and network-building – can be readily transferred to other clinical topics or professional groups facing similar rural workforce challenges. For example, the model could be applied to upskilling rural clinicians in chronic disease management, mental health care or maternal and child health, with content tailored to local needs and resources. This replicability is supported by the model's reliance on existing partnerships and infrastructure, making it feasible for rural health services with limited resources. Participants' feedback highlighted perceived opportunities for peer support and collaboration, suggesting potential avenues for ongoing learning and support.

Future directions for this model include formal evaluation of the model's long-term impact on clinical practice, patient outcomes and workforce retention, as well as adaptation for virtual or hybrid delivery to reach even more remote

communities. By documenting both the process and outcome evaluation results, this model offers a practical template for other rural health services seeking to address workforce development and health equity through innovative, partnership-driven approaches.

Building clinical competence

Quantitative evaluations of the workshops showed significant increases in participant confidence across core diabetes management competencies, particularly with advanced technology use. Qualitative feedback suggested that participants intended to use workshop content in their practice; for example, troubleshooting continuous glucose monitoring devices. Several participants indicated that the hands-on, case-based learning strengthened their confidence to address real-world challenges and described intentions to apply these skills in their future practice. These findings reflect self-reported confidence and anticipated application rather than objectively measured changes in behaviour or patient care. These evaluation outcomes align with previous studies emphasising the importance of practical, skills-based training in healthcare education (Crockett 2014; Rushforth *et al.* 2016).

Strengthening professional networks

The workshops were perceived by participants as addressing professional isolation, which is a known barrier to rural health workforce retention and quality care (Russel *et al.* 2021). The high percentage of participants indicating their likelihood to stay in touch with other healthcare professionals met in the workshops (80% in March and 90.6% in August) suggests that these workshops serve as valuable platforms for building professional networks. Please note, perceived improvements in professional connections reflect participants' self-reported experience during and immediately after the workshop, and do not provide evidence of longer-term network sustainability.

In optional free-text survey responses, several participants described interest in strengthening peer support and regular case discussion with other rural health professionals, including potential use of digital communication tools. Clinical partners similarly reported that these connections were perceived as potentially supportive of collaborative problem-solving and knowledge-sharing within their organisations. The importance of perceived professional connection is well documented in rural workforce literature, where strong collegial relationships are associated with improved job satisfaction, confidence in managing conditions, collaborative problem-solving and reduced professional isolation. Within this context, sustained primary healthcare professional relationships are understood as a key enabling factor for workforce resilience and quality improvement in rural primary healthcare settings (Fagnan *et al.* 2021; Malatzky *et al.* 2024).

Enhancing culturally responsive communication

These workshops included content on culturally responsive communication, and 73.3% of respondents reported increased confidence in interacting with people from diverse cultural backgrounds, including Aboriginal and Torres Strait Islander communities. Feedback from Aboriginal and Torres Strait Islander health professionals indicated that the co-design process and use of culturally grounded examples supported participant engagement with the communication concepts introduced. These findings reflect participants' perceived confidence and do not constitute evidence of cultural safety outcomes, which were not assessed in this evaluation.

Given that Aboriginal and Torres Strait Islander peoples are three times more likely to develop diabetes, with 40% of Aboriginal and Torres Strait Islander adults affected in remote central Australia (Australian Institute of Health and Welfare 2024b), the importance of culturally appropriate care cannot be overstated. The workshops' partnership with health organisations for Aboriginal and Torres Strait Islander peoples was perceived to reinforce these principles during workshop delivery, though participant feedback suggested areas for further development, such as expanding content on culturally responsive diabetes self-management strategies. These findings highlight the value of including culturally

responsive communication skills in professional development programs, particularly for healthcare professionals working in rural and remote communities.

This focus on culturally responsive communication was strengthened by Aboriginal and Torres Strait Islander peoples' involvement across leadership, research and workshop attendance roles. Health organisations for Aboriginal and Torres Strait Islander peoples provided leadership in the co-design and delivery of the workshops, and Aboriginal and Torres Strait Islander health educators supported curriculum development and facilitation. Aboriginal and Torres Strait Islander researchers contributed to the evaluation design and interpretation of findings, whereas Aboriginal and Torres Strait Islander health professionals participated as workshop attendees and were represented within the evaluation cohort. This multi-level involvement strengthened the cultural relevance and contextual appropriateness of the workshop model, and informed interpretation of its outcomes.

Implications for health policy, practice and quality improvement

This workshop model aligns with the SQUIRE 2.0 guidelines for reporting quality improvement initiatives, emphasising iterative design, stakeholder engagement and measurable outcomes (Ogrinc *et al.* 2015). It also serves as a practical QI initiative that directly addresses the need for structured, team-based QI capacity in rural primary health care, a gap identified in previous research (Fagnan *et al.* 2021). By focusing on training delivery and opportunities for professional connection, the model aligns with the principles of continuous quality improvement, which uses iterative cycles of learning and intervention to drive change in practice (Salman 2005; Pullyblank *et al.* 2024). Also, its multifaceted approach, targeting clinicians and the health system through partnership, is consistent with evidence on effective QI interventions for diabetes in rural settings (Ricci-Cabello *et al.* 2013).

From a policy perspective, this partnership model operationalises key goals of the National Strategic Framework for Rural and Remote Health (Department of Health, Disability and Ageing 2020), particularly those related to developing a sustainable workforce, fostering collaborative partnerships and supporting innovative, locally relevant solutions. This model could directly inform the Australian Government's Rural Health Workforce Support Activity by demonstrating how blended funding models can sustain partnership-driven training (Department of Health, Disability and Ageing 2025). For instance, the workshop costs were integrated into existing Primary Health Network commissioning agreements, enhancing scalability. Additionally, this model provides a tangible example of the place-based education and training strategies central to the Australian Government rural health workforce policy, offering a cost-effective approach to building workforce quality and sustainability (Stewart, 2023; Malatzky *et al.* 2024; Department of Health, Disability and Ageing 2025).

Where feasible, the team will seek to partner with local health services and Primary Health Networks to access de-identified patient outcome data (e.g. hemoglobin A1C levels, hospitalisation rates) and workforce retention statistics. This mixed-methods approach, informed by recent recommendations for evaluating the sustainability of evidence-based interventions in health care, will provide a comprehensive understanding of both the determinants and outcomes of long-term change of this workshop model.

Conclusion

The workshops improved self-reported confidence in diabetes management skills and professional networking among healthcare professionals in rural and remote areas. This innovative, partnership workshop model addresses key barriers in rural diabetes care by integrating clinical education, workforce development and culturally responsive communication skills. As a practical quality improvement initiative, this co-designed model provides a replicable framework for building local capacity and fostering the professional networks essential for continuous learning in primary health care. Its alignment with national rural health strategies demonstrates a sustainable, place-based approach that can inform future policy and commissioning for workforce development. Ultimately, the lessons from this initiative offer a valuable template for policymakers, health services and clinicians seeking to strengthen the rural workforce, implement effective QI in practice, and advance health equity for underserved communities across Australia.

Supplementary material

Supplementary material can be accessed from the article page online.

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Ethical statement. This evaluation study used an online survey approach and received ethics approval from the University of Technology Sydney Human Research Ethics Committee (ETH24-9037). All participants provided informed consent before participating in the study.

Data availability. The data used and analysed in this evaluation study are not shared publicly for privacy and ethical reasons. The data may be available from the corresponding author upon reasonable request.

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