

RESEARCH

Priority topics for chronic wound research in Australia: a consensus study

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Abstract

Aim To achieve consensus on priorities for chronic wound research in Australia.

Methods A three-round modified online Delphi survey using RAND/UCLA methods was undertaken to seek consensus from a random sample of Australian multidisciplinary expert chronic wound practitioners and researchers. Participants rated their agreement/disagreement on a nine-point Likert scale for each potential research topic. Customised software calculated median scale scores and 30–70% inter-percentile range for each item.

Results A sample of 20 practitioners and researchers were invited and 12 agreed to participate. After three rounds, 102 topics achieved consensus as national priorities, including 26 items on diabetes-related foot ulcers, 25 on pressure injuries, 17 on mixed chronic wounds, and 16 on venous leg ulcers. The highest rated topics included pain management, compression therapy to prevent venous leg ulcers, pressure injury management for heels and wheelchair users, and compression therapy adherence.

Conclusion This study found that while diabetes-related foot ulcers and pressure injury topics had the greatest number of consensus national priority topics for chronic wound research in Australia, pain management, compression therapy for venous leg ulcers and pressure injury management were the highest rated priorities. These findings could be used to target funding for national grant schemes.

Keywords chronic wounds, consensus study, research priorities

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Introduction

The health and economic burden of chronic or hard-to-heal wounds is an underestimated public health issue in Australia and around the world, incurring estimated annual health care costs in Australia of \$5.14 billion in 2019.¹ Chronic wounds are defined as any wounds which “do not progress through a normal, orderly, and timely sequence of repair”.^{2(p159)}

There is limited up-to-date data on the prevalence and costs associated with chronic wounds in Australia, as many are cared for in community homes or primary health care settings rather than tertiary settings, thus data collection on a national scale is complex. A systematic review on chronic wound prevalence, incidence and parameters in Australia reported significant gaps and limitations in the available

evidence³; while an Australian survey of 2505 persons from hospital, aged care facilities, general practices and community care provider settings estimated costs of AUD \$692,144 to \$1,621,768 to treat the 3096 wounds found, for wound care consumables and nursing time alone.⁴ A 2017 systematic review reported costs of USD \$1000/year for those with chronic ulcers, to USD \$30,000 per care episode for the health system.⁵

The health and economic burden from chronic wounds is likely to escalate significantly in the future, unless several key issues and barriers are overcome.⁶ Frequently encountered chronic wound types such as pressure injuries (PIs), leg ulcers, diabetes-related foot ulcers (DFUs) and malignant wounds are typically related to underlying chronic disease and increasing age and thus are likely to increase in significance with ageing populations.⁷ Living with a chronic wound is also associated with poor health-related quality of life, pain, loss of mobility, hospitalisation, amputation, and reduced social function and/or productivity.⁸

The importance of research into strategies to prevent and heal chronic wounds is imperative. There are numerous evidence-based guidelines for treatment of different chronic wound types, yet these guidelines highlight there are still evidence gaps and high-quality research is needed.^{9–11}

Agreement on priority areas for research is essential for allocation of limited available research funds. In Australia, there have been broad national medical research priorities identified, such as consumer-driven research and primary care research,¹² along with some national research priorities within a specific wound type, such as PIs¹³ and DFUs¹⁴. A few studies in the United Kingdom have identified priorities for wound research in general,^{15,16} however there has been no such national research priorities developed to our knowledge for overall chronic wound research priorities in Australia.

Engaging in chronic wound research is recognised as challenging due to ethical issues regarding research with vulnerable populations, lack of research support for administration and clinical staff, and inadequate funding.¹⁷ Recognising these challenges and the significant health and economic burden of chronic wound care in Australia, the Australian Health Research Alliance (AHRA) with government support established the Wound Care Initiative to help address some of these challenges.⁴ The AHRA Wound Care Initiative was divided into four streams, i) investigating the cost of wound care, ii) developing best practice framework and standards, iii) developing a training and education registry and iv) building a research program. One of the research program's activities was achieving consensus on wound research priorities in Australia in three areas: chronic wounds; acute wounds; and fundamental science wound research. This study aimed to achieve consensus on priority topics for chronic wound research in Australia to inform the assignment of research resources to the areas of greatest value and need.

Methods

Design

This study was designed as a three-round modified online Delphi survey. The authors initially performed a scoping review to identify existing research on chronic wounds in Australia¹⁸ that synthesised original research studies on chronic wounds published in Australia. In addition, the review scoped international systematic reviews, guidelines and consensus documents on chronic wounds, providing a broader international perspective of research conducted to date. The findings of this review facilitated identification of gaps in the research and the creation of a preliminary list of research topics which formed the basis for the development of the modified online Delphi survey for this study.¹⁸

Participants and setting

A sample of multidisciplinary expert chronic wound practitioners and researchers from Australia were the participants of this study. A pool of potential eligible participants from across Australia (n=96) was initially identified by the authors, the project reference group, and by identifying published Australian wound researchers. From this pool of eligible participants, an online randomisation program¹⁹ was used to identify a stratified random sample of 20 potential eligible participants. The sample was stratified by areas of expertise, such as chronic wound types and areas of research or practice. It has been reported that the ideal number of participants for a three-round Delphi survey using the Research and Development/University of California at Los Angeles (RAND/UCLA) appropriateness method is seven to fifteen participants.²⁰ The RAND appropriateness method is a group decision-making technique where a panel of experts participates in a structured process to achieve consensus on a particular topic.²⁰

Potential recruits were sent an email invitation to participate, including a Participant Information Sheet with information on the goals and participation requirements. If the potential participant agreed to participate, they were asked to opt-in and confirm their consent to participate and that they understood the requirements, this enabled the surveys to open for the consenting participants to complete. Participation was voluntary, and participants had the right to withdraw at any time without consequence.

Procedure

The consensus process selected for this project was a Delphi voting process, via an online application of the RAND Appropriateness Method.²⁰ The RAND method is a nominal group voting methodology published by RAND/UCLA that was designed to be used by a panel of experts to reach agreement on topics.²⁰ Validity and reliability of this consensus method have been previously reported,²⁰ including when used by wound experts.^{21,22}

The Delphi voting process occurred via a customised online platform, *Delphiguide*. The platform incorporated a user-

friendly interface to enable participants to view and interact with the items over three rounds of consensus building. A process of three consensus rounds has previously been reported as a feasible process length with respect to reaching agreement while maintaining expert engagement.^{13,22}

All chronic wound research topics identified in the scoping review were listed as preliminary item topics in the Delphi survey, each topic was accompanied by a summary of the amount and level of evidence available on the topic as identified in the scoping review. Due to the large number of topic items generated from the scoping review ($n=258$),¹⁸ the first voting round (Round One) involved a simple yes/no vote to determine whether each item should be included as a potential research priority in the following rounds. If 60% or more of the participants voted yes to include an item, it was retained for the subsequent consensus round.²³ Participants were also offered the opportunity to nominate additional topic items to be included in the following survey rounds.

The items retained or added after the first round were included in the following voting round (Round Two) where participants were asked to rate their level of agreement/disagreement on a nine-point Likert scale for each item (one=complete disagreement to nine=complete agreement). The customised software automatically calculated a median Likert scale score for each item, along with a 30–70% inter-percentile range (IPR) and the percentage of participants with responses in the 'agree' tertile. Furthermore, the IPR adjustment for symmetry (IPRAS), defined as a linear function of the distance of the IPR centre-point from the Likert scale centre-point, was also calculated.²⁴ An IPRAS value higher than or equal to the IPR indicated agreement was reached on the item (consensus).²⁰ The participants were also invited to provide a written justification for the way they cast each vote to outline their reasoning in open-ended responses. At the end of Round Two, a disagreement index was calculated to provide a quantitative evaluation indicating whether consensus on dis/agreement was reached. The disagreement index is the ratio of IPR and IPRAS, where the lower the disagreement index value, the greater the agreement on the item.^{20,25} Items which obtained consensus on disagreement (meaning consensus was achieved that the item was not a priority) were removed from the priority list, items which obtained consensus on agreement were retained, and items which did not achieve consensus were included in the final round (Round Three) of voting. The same procedure from Round Two was applied in Round Three to determine whether an item should be included in or excluded from the final list of items. Individual participants' responses and comments were anonymised to other participants and investigators at all stages. Finally, the list of research topics identified as important, those that obtained consensus on agreement as described above, were ordered in a priority list based on their median Likert scale score and IPR. If the median score was the same, then they were ordered by IPR, and if the IPR was the same, then by IPRAS, then by percent

agreement. There was no statistical testing of differences between the items in the final list of priorities.

Analysis

The research team undertook an analysis of the responses after each round and identified core themes in the experts' open-ended responses. The written reasoning statements were synthesised to identify arguments and rationales for agreement, neutral to or in disagreement with the nominal research priorities. The synthesised data from the written reasoning statements in each category (agree/neutral/disagree) were developed into summary statements which provided participants an overview of the context around the voting for each round. Summary statements were fed back to the participants after round one and two during the next consensus voting round as a written representation of the current perspectives of the consensus voting group to inform their next round of voting.^{13,22}

Results

A stratified random sample of 20 experts were invited to participate, including four experts in DFU, four in PI, four in leg ulcers, and eight general chronic wound experts. Of the 20 invited, 12 (60%) of the experts consented to participate, including three DFU, three PI, two leg ulcer, and four general chronic wound experts. The participants included eight nurse specialists/nurse practitioners, one medical specialist, and three podiatrists. They were based in all states and territories of Australia with the exception of the Northern Territory and had extensive experience ranging from 15 to over 30 years. Seven of these were also academic researchers, most with combined clinical and academic roles. All participants had published wound research.

In round one, 258 topic items were included based on the scoping review, including 62 items on DFUs, 55 on VLUs, 52 on PIs, 51 on mixed chronic wound types, 25 on mixed types of leg/foot ulcers, four on malignant wounds, two on arterial leg ulcers (ALUs) and six items on other wound types (see Supplementary Table 1). Following the Round One voting, agreement was reached to retain 131 items in Round Two, including 26 on DFUs, 25 on PIs, 18 on VLUs, 18 on mixed chronic wounds, 12 on mixed leg/foot ulcers, three on malignant wounds, one on ALUs and two on other wound types.

Of the 131 remaining items in Round Two, 100 items obtained consensus for inclusion as priority items, 26 items obtained consensus for exclusion, while five items did not achieve consensus and were submitted for the final Round Three voting (Table 1). In Round Three, consensus was obtained to include two of these five items as research priorities, resulting in a final list of 102 prioritised topic items, including 26 items on DFUs, 25 on PIs, 17 on mixed chronic wounds, 16 on VLUs, 12 on mixed leg/foot ulcers, three on malignant wounds, one on ALUs, and two on other wound types.

These 102 prioritised topic items were then ranked based on their median and IPR scores of agreements as priority items (Table 2). Based on these scores, the highest rated priority items for chronic wound research in Australia were pain management, compression therapy to prevent VLU, management of heel PIs and PIs in wheelchair users, topical analgesia for lower limb ulcers and adherence to compression therapy. Further details and priorities are shown in Table 2.

Discussion

This study aimed to identify research priorities for chronic wound management in Australia. The Delphi process highlighted numerous priorities, reflecting the complex issues involved in managing hard-to-heal wounds and the paucity of robust evidence to inform many chronic wound management decisions. The greatest number of included priorities focused on DFUs and PIs, wound types known for their substantial health and economic burden on the national population and health care system. The highest rated items also included chronic wounds as a combined group, such as pain management, along with compression therapy for VLUs. This suggests that there are urgent areas of need in community health care settings in addition to hospital settings.

While some studies have reported research priorities for specific chronic wound types such as DFU or VLUs, and two studies reported general wound research priorities, there is scant published information on overarching research priorities for chronic wounds.¹⁵ A 2017 study involving health professionals in the UK focused on complex wounds, defined as wounds “healing by secondary intention with additional features such as exudate or infection”.^{15(p2)} They reported their top five rated priorities on areas requiring research evidence to reduce uncertainty in practice were patient involvement, classification of PIs, evaluating assessment tools, skill mix in community settings and education needed to manage complex wounds.¹⁵ Similarly, our study identified health service management and models among the top ten rated priorities, with self-treatment and patient engagement ranking in the top 20. However topics such as PI classification or grading and assessment tool outcomes were excluded from the priority list, possibly due to the extensive information available on this topic in recent clinical practice guidelines.¹¹ A study from Ireland identified patient and carer views on wound research priorities overall,¹⁶ reporting their top priorities as support groups and educational resources, the impact of wounds, pain management, exudate management and continuity of care.¹⁶ Our study highlighted pain management as a primary concern alongside health service management, models of care and quality of life all ranking within the top 20 priorities.

The highest rated priority in this Delphi survey was pain management for people with chronic wounds in general. Related items such as pain assessment, impact of chronic wounds and wound-related quality of life were also high priorities. This is consistent with the unanimous findings of

an expert consensus meeting on chronic wound treatment in the United States, which noted the complex issues associated with wound pain.²⁶ A recent systematic review of topical pain management of chronic wounds also highlighted the paucity of research on strategies to address chronic wound pain.²⁷ Studies have reported a link between pain and poor wound healing,^{28,29} indicating further research in this area is urgently needed.

Other significant priorities identified for chronic wounds overall were models of care, management of wound infection, self-management, patient engagement and wound management in persons with dementia. Finding effective, resource efficient, and acceptable models of care which meet the needs of community-living older adults with chronic wounds and comorbid conditions remains an ongoing challenge and merits urgent investigation.

The highest priorities specifically in PI research were the management and prevention of heel PIs, PIs in wheelchair users and self-management to prevent PIs. This finding is consistent with a previous Australian consensus study conducted in 2018.³⁰ The heels remain one of the most common locations for a PI and when they occur, heel PIs are usually more serious PIs.^{31,32} While some research has been undertaken since the 2018 consensus study, it is concerning to note this area continues to be a high priority. There appears to have been minimal research funding allocated to this priority area, despite its identification in a government-funded study in 2018 and despite the fact that PIs remain a high priority.^{33,34} Heel PIs pose distinct prevention and management challenges as evidenced by the most recent international systematic review of 13 studies.³¹ The vulnerability stems from the absence of significant protective subcutaneous tissue as well as lack of fascia or muscle within the heel making it vulnerable to pressure and friction forces.³⁵ These injuries, when coupled with underlying conditions can lead to severe complications including the need for amputation.³⁶

The highest priorities for DFU research were in the areas of assessing risk factors for poor outcomes, pain assessment, self-management and cognition assessment. A 2021 Australian national consensus study on top research priorities for DFU included consumers, clinicians and researchers as participants and prioritised similar items, such as evaluation of multi-disciplinary high risk foot services, pain management associated with peripheral neuropathy and effectiveness of education for foot self-care.¹⁴ However, the previous national study did not find risk factors for poor DFU outcomes or cognition assessment were priorities, unlike our study. Two other 2022 consensus studies on top research priorities for DFU in the UK and Sweden also identified priorities from both people with diabetes and health professionals, reporting prevention of DFUs and complications, risk assessment and factors associated with healing in the UK,³⁷ and organisation of diabetes care, early screening, and risk factors for DFUs or delayed healing in Sweden.³⁸ Cognition in individuals

Table 1. Results for potential wound research areas in the consensus process

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
Venous leg ulcers (VLU)						
Compression therapy for prevention	90%; 8.5 (8.0-9.0)	7.60; 3.50	Retain			
Adherence to compression therapy	70%; 8.5 (6.4-9.0)	6.40; 2.70	Retain			
Management of complexities in VLUs	80%; 8.0 (8.0-9.0)	7.60; 3.50	Retain			
Adherence to preventive strategies	90%; 8.0 (8.0-8.3)	7.08; 3.15	Retain			
Cost of care of VLUs	100%; 8.0 (7.7-8.3)	6.85; 3.00	Retain			
Education interventions to prevent recurrence	90%; 8.0 (7.7-8.3)	6.85; 3.00	Retain			
Risk factors for developing a first-time VLU	90%; 8.0 (7.7-8.3)	6.85; 3.00	Retain			
Self-management of VLUs	89%; 8.0 (7.4-8.6)	6.85; 3.00	Retain			
Risk factors for delayed healing	90%; 8.0 (7.7-8.3)	6.63; 2.85	Retain			
Topical analgesia	80%; 8.0 (7.7-8.0)	6.63; 2.85	Retain			
Vascular assessment in primary health care	70%; 8.0 (6.4-9.0)	6.40; 2.70	Retain			
Risk Assessment Tools for delayed healing	70%; 8.0 (6.7-8.0)	5.88; 2.35	Retain			
Debridement methods	80%; 7.5 (7.0-8.0)	6.10; 2.50	Retain			
Pain assessment	60%; 7.5 (4.7-9.0)	5.13; 1.85	Retain			
Dressing types for healing VLUs	60%; 7.0 (5.1-8.0)	4.68; 1.55	Retain			
Assessing quality of life	50%; 7.0 (5.0-8.0)	4.68; 1.55	Reconsider	42.86%; 6.0 (3.0-7.2)	2.50; 0.10	Excluded
Wound bed care	50%; 7.0 (5.0-8.0)	4.6; 1.5	Retain			
Protease-modulating matrix treatment	40%; 6.0 (4.7-7.3)	3.85; 1.0	Reconsider	42.86%; 6.0 (2.8-7.0)	2.50; 0.1	Excluded
Pressure injuries						
Management of heel PIs	90%; 8.5 (7.7-9.0)	7.39; 3.35	Retain			

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
Pls in wheelchair users	90%; 8.5 (7.7-9.0)	7.38;3.35	Retain			
Self-management to prevent Pls	90%; 8 (8.0-9.0)	7.60; 3.50	Retain			
Prevention of heel Pls	90%; 8 (7.7-9.0)	7.38; 3.35	Retain			
Management of medical device Pls	80%; 8 (7.7-9.0)	7.38; 3.35	Retain			
Assessment of heel Pls	80%; 8 (8.0-8.3)	7.08; 3.15	Retain			
Cost analyses on PI management and prevention	90%; 8 (7.7-8.0)	6.63; 2.85	Retain			
PI specific QoL tool	90%; 8 (7.7-8.0)	6.63; 2.85	Retain			
IAD and risk of PI	80%; 8 (7.7-8.0)	6.63; 2.85	Retain			
Prevention of Pls in neonates	80%; 8 (7.0-8.0)	6.1; 2.5	Retain			
Support surfaces	70%; 8 (6.4-8.3)	5.88; 2.35	Retain			
Epidermal hydration or non-blanchable erythema and PI risk	80%; 7.5 (7.0-8.0)	6.10; 2.50	Retain			
Patient education	80%; 7.5 (7.0-8.0)	6.10; 2.50	Retain			
Malnutrition as a risk factor for Pls	70%; 7.5 (6.4-8.0)	5.65; 2.20	Retain			
Dressings for PI management	70%; 7.5 (6.4-8.0)	5.65; 2.20	Retain			
Nutrition interventions	89%; 7 (7.0-8.6)	6.55; 2.8	Retain			
Operating table support surfaces, surgical-related Pls	80%; 7 (7.0-8.3)	6.33 ;2.65	Retain			
Health care factors, demographics and risk of Pls	80%; 7 (7.0-8.0)	6.10; 2.50	Retain			
Surgery and risk of Pls	70%; 7 (6.7-8.0)	5.88; 2.35	Retain			
Flaps for ischial PI reconstruction	70%; 7 (6.7-7.3)	5.35; 2.0	Retain			
Medical devices and risk of Pls	70%; 7 (6.4-7.0)	4.9; 1.7	Retain			
Position / Repositioning for prevention of Pls	60%; 7 (6.0-8.0)	5.35; 2.0	Retain			
Physical activity /position as risk factors for Pls	60%; 7 (6.0-7.3)	4.83; 1.65	Retain			

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
PI documentation and reporting	60%; 7 (4.4-8.3)	4.38; 1.35	Retain			
Mobile Apps for PI identification	50%; 6 (5.0-7.3)	4.08; 1.15	Reconsider	57.14%; 7 (4.4-7.2)	3.55; 0.8	Retain
Diabetes-related foot ulcers (DFUs)						
Risk factors for delayed healing or increased DFU severity	88.89%; 8 (8.0-9.0)	7.60; 3.50	Retain			
Health professionals' EB prevention practices	80%; 8 (7.7-9.0)	7.38; 3.35	Retain			
Risk factors for DFU infection	88.89%; 8 (8.0-8.6)	7.30; 3.30	Retain			
Validation of prognostic models/markers for ulceration or amputation	77.78%; 8 (8.0-8.6)	7.30; 3.30	Retain			
Characteristics of persons with DFUs	88.89%; 8 (8.0-8.0)	6.85; 3.00	Retain			
Pain assessment	77.78%; 8 (7.0-9.0)	6.85; 3.00	Retain			
Self-management	80%; 8 (7.7-8.0)	6.63; 2.85	Retain			
Cognition assessment	100%; 8 (7.0-8.6)	6.55; 2.8	Retain			
Identifying DF osteomyelitis	100%; 8 (7.4-8.0)	6.40; 2.70	Retain			
Risk factors for foot ulcers and amputation in adults on dialysis	88.89%; 8 (7.4-8.0)	6.40; 2.70	Retain			
Imaging assessment methods	88.89%; 8 (7.0-8.0)	6.1; 2.5	Retain			
Debridement	80%; 8 (7.0-8.0)	6.1; 2.5	Retain			
Pain management	70%; 8 (6.7-9.0)	6.63; 2.85	Retain			
Foot or skin temperature monitoring	70%; 8 (6.4-8.3)	5.88; 2.35	Retain			
Multi-faceted complex interventions for prevention	60%; 8 (5.7-9.0)	5.88; 2.35	Retain			
Off-loading methods to prevent DFU	60%; 8 (4.4-8.3)	4.38; 1.35	Retain			
Combined interventions to manage DFUs	70%; 7.5 (6.4-9.0)	6.4; 2.7	Retain			
Management of infection	70%; 7.5 (6.7-8.0)	5.88; 2.35	Retain			
Offloading devices & footwear	60%; 7.5 (6.0-8.0)	5.35; 2.0	Retain			

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
Psychosocial interventions	60%; 7.5 (5.0-8.0)	4.6; 1.5	Retain			
Implementing EBP	60%; 7.5 (5.0-8.0)	4.6; 1.5	Retain			
Classification or Scoring systems	77.78%; 7 (7.0-7.6)	5.8; 2.3	Retain			
Assessment tools	66.67%; 7 (6.4-8.6)	6.1; 2.5	Retain			
Risk factors for DFU occurrence	66.67%; 7 (6.4-8.0)	5.65; 2.20	Retain			
Dressings for healing	70%; 7 (6.4-7.3)	5.13; 1.85	Retain			
Surgical offloading procedures	50%; 6 (4.7-7.0)	3.63; 0.85	Reconsider	75%; 7.5 (7.0-8.0)	6.10; 2.5	Retain
Leg or foot ulcers in general						
Topical analgesia	90%; 8.5 (7.0-9.0)	6.85; 3.0	Retain			
Health service management	89%; 8 (8.0-9.0)	7.6; 3.5	Retain			
Risk factors for infection in chronic leg ulcers	100%; 8 (8.0-8.3)	7.08; 3.15	Retain			
Topical antimicrobial treatments	100%; 8 (7.0-9.0)	6.85; 3.0	Retain			
Assessing infection	100%; 8 (7.7-8.3)	6.85; 3.0	Retain			
Impact of medications on healing	100%; 8 (7.7-8.0)	6.63; 2.85	Retain			
Facilitating EB management	80%; 8 (7.0-8.3)	6.33; 2.65	Retain			
Prevalence of foot ulcers	90%; 8 (7.0-8.0)	6.10; 2.50	Retain			
Risk factors for development of foot ulcers	90%; 8 (7.0-8.0)	6.10; 2.50	Retain			
Impact of symptom clusters	90%; 7.5 (7.0-8.3)	6.33; 2.65	Retain			
Autologous stem cell therapy	80%; 7 (7.0-8.3)	6.33; 2.65	Retain			
Biomarkers for assessing risk of ulceration / recurrence	70%; 7 (6.4-8.0)	5.65; 2.20	Retain			
Chronic wounds in general						
Pain management	77.78%; 9 (8.4-9.0)	7.9; 3.7	Retain			
Pain assessment	88.89%; 8 (8.0-9.0)	7.6; 3.5	Retain			
Models of care for chronic wounds	77.78%; 8 (8.0-9.0)	7.6; 3.5	Retain			

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
Self-treatment of chronic wounds	100%; 8 (8.0-8.6)	7.3; 3.3	Retain			
Patient engagement	100%; 8 (8.0-8.6)	7.3; 3.3	Retain			
Impact of chronic wounds	88.89%; 8 (8.0-8.6)	7.3; 3.3	Retain			
Management of wound infection	88.89%; 8 (8.0-8.6)	7.3; 3.3	Retain			
Quality of life or experience of living with chronic wounds	77.78%; 8 (8.0-8.6)	7.3; 3.3	Retain			
Management of wounds in adults with dementia	88.89%; 8 (7.4-9.0)	7.15; 3.2	Retain			
Digital wound management systems	77.78%; 8 (7.4-9.0)	7.15; 3.2	Retain			
Prevalence of wounds	77.78%; 8 (8.0-8.0)	6.85; 3.0	Retain			
Wound cleansing solutions	77.78%; 8 (8.0-8.0)	6.85; 3.0	Retain			
Management of exudate	77.78%; 8 (8.0-8.0)	6.85; 3.0	Retain			
Topical antimicrobials	88.89%; 8 (7.0-8.6)	6.55; 2.8	Retain			
Nutrition	100%; 7 (7.0-8.0)	6.1; 2.5	Retain			
Assessment of wound infection and/or biofilms	88.89%; 8 (7.0-8.0)	6.1; 2.5	Retain			
Reliability of tools to predict healing	66.67%; 8 (6.2-8.0)	5.5; 2.1	Retain			
Wound assessment	66.67%; 8 (4.0-8.0)	3.85; 1.0	Reconsider	28.75%; 6 (5.8-6.4)	4.0; 1.10	Exclude
Malignant / fungating wounds						
Topical agents and dressings for fungating wounds	100%; 8 (8.0-9.0)	7.6; 3.5	Retain			
Assessment of living with malignant wounds/ QoL	100%; 8 (8.0-8.0)	6.85; 3.0	Retain			
Management of symptoms	88.89%; 8 (7.4-8.6)	6.85; 3.9	Retain			
Arterial leg ulcers						
Dressings and topical agents	77.78%; 8 (7.0-8.0)	6.1; 2.50	Retain			

Chronic wound research areas	Consensus Round Two			Consensus Round Three		
	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome	Agreement* (%); Median agreement (IPR**)	IPRAS***; RAND disagreement index	Round outcome
Other types of chronic wounds						
Characteristics of non-diabetes related foot ulcers	88.89%; 8 (7.0-8.0)	6.10; 2.50	Retain			
Treatments for ulcers related to tophaceous gout	77.78%; 8 (7.0-8.0)	6.10; 2.50	Retain			

** 30-70% inter-percentile range (IPR), *** IPR adjustment for symmetry (IPRAS) – a linear function of distance of IPR centre-point from centre-point of the Likert scale

with DFU is a controversial topic, with uncertainty in the literature relating to whether cognitive changes in people with diabetes are worsened by the presence of a DFU. A case-control study conducted by Natovich et al³⁹ found that individuals with a DFU exhibited significantly lower cognitive scores compared to those with diabetes and no foot ulceration. In contrast, a prospective study by Kloos et al⁴⁰ showed no association between cognitive function and recurrence of DFU. The reductions in cognitive scores and executive function is expected to affect the implementation of optimal management strategies, including self-care and participation in integrated foot care programs aligned with current international guidelines.⁴¹ Hence the identification of this topic as a research priority is justified.

Despite the impact of VLU on health services and health-related quality of life, research priorities specifically addressing VLUs remain limited. A US study⁴² highlighted the need for advanced wound dressings, venous surgery and antibiotics as the top VLU priorities alongside implementation of general high-quality evidence. In contrast, our study highlighted compression therapy for prevention, adherence to compression therapy, managing complexities in VLU care, and adherence to preventive strategies as the top priorities for VLUs. The assessment and management of pain was also found a significant aspect of VLU care due to its impact on quality of life.^{43,44} The conclusions from a systematic review⁴³ indicated an insufficient understanding of wound pain which may explain reporting from clinicians that they infrequently discuss its management and reports from patients of inadequate addressing of their wound pain.⁴⁵ Self-care emerged as a priority area for VLUs, in particular for managing compression therapy. This issue is recognised internationally, Chitambira⁴⁶ highlighted the low compliance rates to compression therapy from patients' perspectives, underscoring the challenges healthcare professionals face in ensuring adherence. In addition, a recent Best Practice Statement by Wounds UK⁴⁷ addresses the challenges and barriers associated with self-care and adherence to therapies such as compression.

Other chronic wound types mentioned are found less frequently and most did not rate highly, perhaps as the items on rarer types of leg or foot ulcers are partially addressed in the combination of all chronic wounds or leg ulcer item categories. However, it is worth noting that three of the four items on malignant fungating wounds (on assessing quality of life, symptoms and topical management) were rated highly. There was minimal research found on this topic in the supporting scoping review and a recent 2024 review has highlighted this lack of studies, identifying only 10 comparative studies or trials on this topic.⁴⁸

Overall, a comparison of results from our study with other previously identified research priorities in Australia found firstly: our study rated management of heel PIs, management of wheelchair PIs, and self-management to prevent PIs as the highest PI priorities, in comparison to previously identified

Table 2. The top 50 highest rated items on priority areas for chronic wound research in Australia (starting from the highest)

Item	Percent Agreement (%) [*]	Median score	IPR** Agg Agreement (%) [*] percentilPR	IPRAS***
Pain management for chronic wounds	78%	9.0	8.4–9.0	7.9
Compression therapy to prevent VLU	90%	8.5	8.0–9.0	7.6
Management of heel PIs	90%	8.5	7.7–9.0	7.4
Management of PIs in wheelchair users	90%	8.5	7.7–9.0	7.4
Topical analgesia for lower limb ulcers	90%	8.5	7.0–9.0	6.9
Adherence to compression therapy	70%	8.5	6.4–9.0	6.4
Topical agents and dressings for fungating wounds	100%	8.0	8.0–9.0	7.6
Self-management to prevent PIs	90%	8.0	8.0–9.0	7.6
Risk factors for delayed healing of DFUs	89%	8.0	8.0–9.0	7.6
Health service management for leg ulcers	89%	8.0	8.0–9.0	7.6
Pain assessment for chronic wounds	89%	8.0	8.0–9.0	7.6
Management of complexities in VLU care	80%	8.0	8.0–9.0	7.6
Models of care for chronic wounds	78%	8.0	8.0–9.0	7.6
Self-treatment of chronic wounds	100%	8.0	8.0–8.6	7.3
Patient engagement	100%	8.0	8.0–8.6	7.3
Risk factors for DFU infection	89%	8.0	8.0–8.6	7.3
Impact of chronic wounds	89%	8.0	8.0–8.6	7.3
Management of wound infection in chronic wounds	89%	8.0	8.0–8.6	7.3
Prognostic models/markers for DFUs or amputation	78%	8.0	8.0–8.6	7.3
Quality of life living with chronic wounds	78%	8.0	8.0–8.6	7.3
Risk factors for infection in chronic leg ulcers	100%	8.0	8.0–8.3	7.1
Adherence to preventive strategies for VLUs	90%	8.0	8.0–8.3	7.1
Assessment of heel PIs	80%	8.0	8.0–8.3	7.1
Assessment of QoL for persons with malignant wounds	100%	8.0	8.0–8.0	6.9
Characteristics of persons with DFUs	89%	8.0	8.0–8.0	6.9
Prevalence of chronic wounds	78%	8.0	8.0–8.0	6.9
Wound cleansing solutions	78%	8.0	8.0–8.0	6.9
Management of wound exudate	78%	8.0	8.0–8.0	6.9
Prevention of heel PIs	90%	8.0	7.7–9.0	7.4
Management of medical device-related PIs	80%	8.0	7.7–9.0	7.4
Health professionals' EBP for prevention of DFUs	80%	8.0	7.7–9.0	7.4
Cost of care of VLUs	100%	8.0	7.7–8.3	6.9
Assessing infection in leg ulcers	100%	8.0	7.7–8.3	6.9
Risk factors for developing a first-time VLU	90%	8.0	7.7–8.3	6.9
Education interventions to prevent VLUs	90%	8.0	7.7–8.3	6.9
Impact of medications on healing of leg ulcers	100%	8.0	7.7–8.0	6.6
Risk factors for delayed healing of VLUs	90%	8.0	7.7–8.0	6.6
PI specific QoL tool	90%	8.0	7.7–8.0	6.6
Cost effectiveness of PI management and prevention	90%	8.0	7.7–8.0	6.6
Topical analgesia for VLUs	80%	8.0	7.7–8.0	6.6
IAD and risk of PI	80%	8.0	7.7–8.0	6.6
Self-management of DFUs	80%	8.0	7.7–8.0	6.6
Management of wounds in adults with dementia	89%	8.0	7.4–9.0	7.2
Digital wound management systems	78%	8.0	7.4–9.0	7.2
Self-management of VLUs	89%	8.0	7.4–8.6	6.9
Management of symptoms from fungating wounds	89%	8.0	7.4–8.6	6.9
Identifying diabetes-related foot osteomyelitis	100%	8.0	7.4–8.0	6.4
Risk factors for foot ulcers in adults on dialysis	89%	8.0	7.4–8.0	6.4
Topical antimicrobial treatments	100%	8.0	7.0–8.6	6.6
Facilitating evidence-based management for leg ulcers	80%	8.0	7.0–8.3	6.3

^{*}Percentage of participants with responses in the agree tertile; ^{**}Interpercentile range; ^{***}Interpercentile range adjusted for symmetry
 VLU: venous leg ulcer; PI: pressure injury; DFU: diabetes-related foot ulcer; IAD: incontinence-associated dermatitis; QoL: quality of life; EBP: evidence-based practice; IPR: inter-percentile range; IPRAS: IPR adjustment for symmetry

highest ranked priorities of strategies to assess skin and tissues, consensus on outcome measures for PI healing and recurrence, and heel pressure and shear management.³⁰ Secondly, our study rated risk factors for delayed DFU healing, risk factors for DFU infection, and DFU prognostic models or markers as the highest DFU research priorities; while previously identified highest DFU research priorities were evaluation of multidisciplinary high-risk foot services, treatment options for neuropathy pain, and education programs for prevention of DFD.¹⁴

This study has several limitations. These included a 60% response rate from the experts in the area and limiting the number of survey rounds to three due to time and resource constraints during the Covid-19 pandemic, thus a formal ranking survey round was unable to be conducted. The voting process revealed that over half the items had similar median scores (although differences in IPR), thus overall, indicating that a significant number of items were perceived as equally important. Survey participants were limited to clinicians and researchers, thus future surveys involving consumers are recommended. Additionally, potential conflicts of interest may have arisen as participants were wound researchers with a vested interest in prioritising their own areas of expertise for funding. Authors of this paper were not excluded from selection as participants in the survey. A strength of the study was following a structured validated RAND process to obtain consensus.

Conclusions

The complexity of managing chronic wounds is highlighted by the extensive range of research priorities encompassing prevention and management of chronic wounds in Australia. This Delphi study conducted across Australia, identified pain management, VLU compression therapy and PI management as the highest rated priority topics. Whereas DFU and PI care topics comprised the greatest number of the 102 research priorities agreed upon by the experts for the prevention and management of chronic wounds in Australia.

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Conflict of interest

CP owns shares in a company that manufactures amniotic membrane allografts for wound applications.

Ethics statement

Ethical approval was obtained from the Queensland University of Technology Human Research Ethics Committee, Approval No. 4539.

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Author contribution

KF, EH, UB, PT, PAL, MB-J, SMT, KC contributed to study design; KF, EH, UB contributed to data collection and analyses; KF, EH, UB, CP, JO'B contributed to data synthesis and manuscript preparation; all authors contributed feedback on the manuscript. All authors read and approved the final manuscript.

Supplementary data can be found at woundpracticeandresearch.com

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