Evidence-based practice regarding lower leg ulcers: a mapping review

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Background: Treating lower leg ulcers is a multifaceted problem and requires a comprehensive approach. Appropriate care requires both skill and knowledge in the application of evidence-based care. New evidence regarding wound care and the management of lower leg ulcers is emerging continuously, yet care seems to lack standardisation, and guidelines are not implemented.

Method: A systematic process was followed to address the research question that focused on the characteristics, assessment methods, and treatment options of evidence-based practices for people with lower leg ulcers in all healthcare settings. An electronic search of seven different databases was conducted for publications from 2011 to 2020. Studies were assessed for relevance and 44 of 668 publications were included. Data were charted literatim and checked for accuracy.

Conclusion: Data charted from the reports were organised into themes, categories and subcategories, and aided in identifying links and concepts regarding history taking, assessment, treatment, wound assessment, referral criteria, outcome measures, health dialogue, and product options as the first step in the development of a care pathway for lower leg ulcers. A mapping review of existing evidence aided in building an actionable knowledge base.

Keywords: mapping review, lower leg ulcer, evidence-based, concept map

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Introduction

The field of wound care research is rapidly expanding, with new studies and evidence emerging daily. As such, researchers and practitioners need to stay up to date with the latest research findings and insights. This is where mapping reviews come in: a mapping review is a methodological approach that aims to map and synthesise existing knowledge, identify research gaps, and highlight areas for future research. An array of literature, guidelines, reviews, and protocols related to the care of lower leg ulcers are available. Despite this, results from a situational analysis of the quality of care in facilities attending to patients with lower leg ulcers in Gauteng indicated that these guidelines are not being utilised.[1] The correct diagnosis and treatment of lower leg ulcers are vital to ensure the best possible outcome for the patient.[2]

Mapping reviews are particularly useful when exploring complex, multidisciplinary topics with a broad range of existing evidence. Similar to systematic reviews, mapping reviews use rigorous and transparent methods to identify and analyse research. However, unlike systematic reviews, which aim to answer a specific research question, mapping reviews provide a broader overview of available literature, allowing researchers to develop a comprehensive understanding of the field.

The purpose of this mapping review was to explore the current state of research in a particular area, highlighting trends, gaps in knowledge, and potential areas for future research. By taking a broad perspective, this mapping review aims to provide a comprehensive overview of existing research, identifying key themes as well as areas where further investigation is needed. The authors followed established guidelines for conducting scoping reviews, including a comprehensive search strategy, transparent inclusion criteria, and a rigorous analysis of the included studies.[3]

Ultimately, the goal of this mapping review is to provide a valuable resource for researchers, practitioners, and policymakers working in the field. By synthesising existing evidence and providing an overview of the current state of research, this review aims to guide future research and improve outcomes for patients and communities. A mapping review can be utilised to identify links in literature and aid in identifying concepts and the flow of information through publications to qualitatively synthesise the data collected, resulting in an actionable knowledge base.[4]

Methodological framework

The mapping process is reiterative as each step builds upon the previous one.[3] This process started with a review question and ended with a concept map. The review question considered was: "What would the characteristics, assessment methods, and treatment options, according to evidence-based practices, for people with lower leg ulcers in all healthcare settings be?" This mapping review aimed to identify available evidence, select appropriate literature, perform a relevance

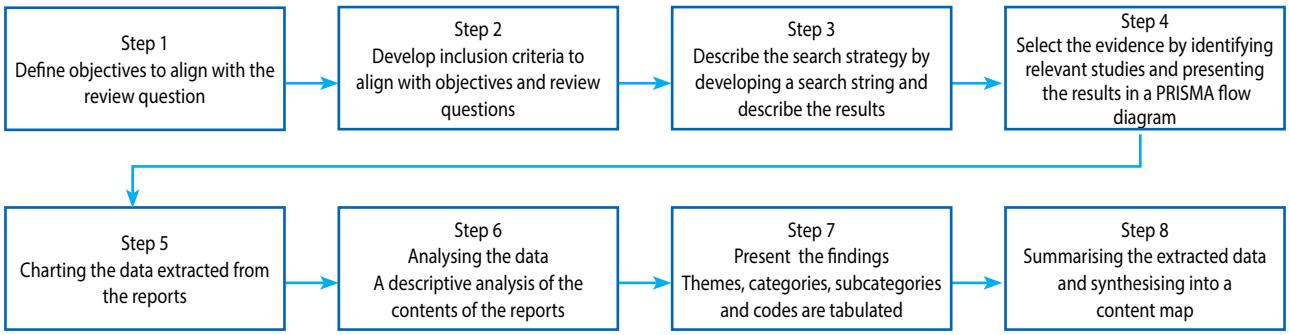

Figure 1: Mapping review framework as adapted from Peters et al.[3]

assessment, categorise the data for multiple clinical practice guidelines, extract data from these studies and synthesise the data into a data map.[5] Figure 1 outlines the mapping review steps followed in this study.

The population, context, and concept (PPC) mnemonic was used to create a search string as it is designed to include a wider search base and search for qualitative, quantitative, and mixed-method research.[6] Table I delineates the application of the PCC mnemonic.

Table I: Application of the PCC mnemonic

Mnemonic PCC	Application
Population	Persons with lower leg ulcers (LLU)
Concept	Evidence-based, Consensus documents, Guidelines, Algorithms
Context	Healthcare settings

Inclusion and exclusion criteria

Deciding on inclusion and exclusion criteria required careful consideration of the review question and the aim of the review. The following inclusion criteria were applied:

- Literature in any language if an English translation is available.
- Guidelines, reviews, consensus documents, best practice statements, or original studies accessible through the university database.
- Literature focusing on chronic lower leg ulcers.
- Publications from 2011 onward (from the initial search it was evident that most of the guidelines were published from 2011 onward).

Burns or acute wounds not located on the lower leg or that are specific to a geographical area (i.e. Buruli ulcer) were excluded. Grey literature or literature that could not be accessed through the university database was excluded.

Search strategy

The Boolean search string was developed using synonyms for the PCC application to ensure a comprehensive but focused search of the databases. Table II shows the keywords of the search string.

Data sources

A comprehensive literature search was done with the assistance of a skilled librarian using the following electronic databases: Academic Search Ultimate, Africa-Wide Information, CINAHL with Full Text, Health Source: Consumer Edition, Health Source: Nursing/Academic Edition, MEDLINE, and SCOPUS. These are all widely known expert sources of gold standard, peer-reviewed information, including systematic reviews (completed to extremely high objective standards), randomised controlled trials (RCTs), and other reputable data sources. Studies from 2011 were included when most guidelines were published up to 2020 (when the search was conducted). The keywords included are listed in Table II. Automatic system deduplication was applied to remove duplicate studies.

Selecting the evidence

The literature search yielded 668 records. A total of 201 duplicates were removed. An additional 328 of the remaining 467 records were excluded due to irrelevance. Of the 139 reports, 12 could not be retrieved despite numerous efforts. A further 83 of the 127 reports were excluded due to irrelevance ($n = 71$) and 12 reports were excluded as English translations were not available. Figure 2 is the PRISMA flow diagram depicting the results of the search.

Charting the data

Data were charted under the following themes: assessment, history, wound assessment, wound classification, referral criteria, treatment options, interprofessional team, outcome measures, health dialogue, and products. One author charted the data literatim with page numbers in an Excel worksheet and the other two authors checked the charted data for correctness.

Findings

A total of 44 reports were included in the review comprising 23 guidelines, 19 review articles and two observational studies. The countries from which the reports originated are depicted in Figure 3.

Table II: Keywords identified to form part of the search string according to PCC

Population	"Lower leg ulcer*" OR "venous ulcer*" OR "varicose ulcer*" OR "foot ulcer*" OR "stasis ulcer*" OR "venous hypertension ulcer*" OR "arterial ulcer*" OR "diabetic foot ulcer*" OR "Martorell's ulcer" OR "vasculitis" OR "Pyoderma gangrenosum" OR "cellulitis or malignancy" OR "Neuropathic ulcer*" OR "Ischemic ulcer*" OR "Cancerous wound*" OR "Trophic ulcer*" OR "Calciphylaxis" OR "Marjolin ulcer*" OR "leg wound" OR "wound OR sore" OR "lesion" OR "injury"
Concept	"Care pathway" OR "Algorithm" OR "clinical pathway" OR "care pathway" OR "flow diagram" OR "Guideline" OR "best practice" OR "evidence-based care" OR "EBP"

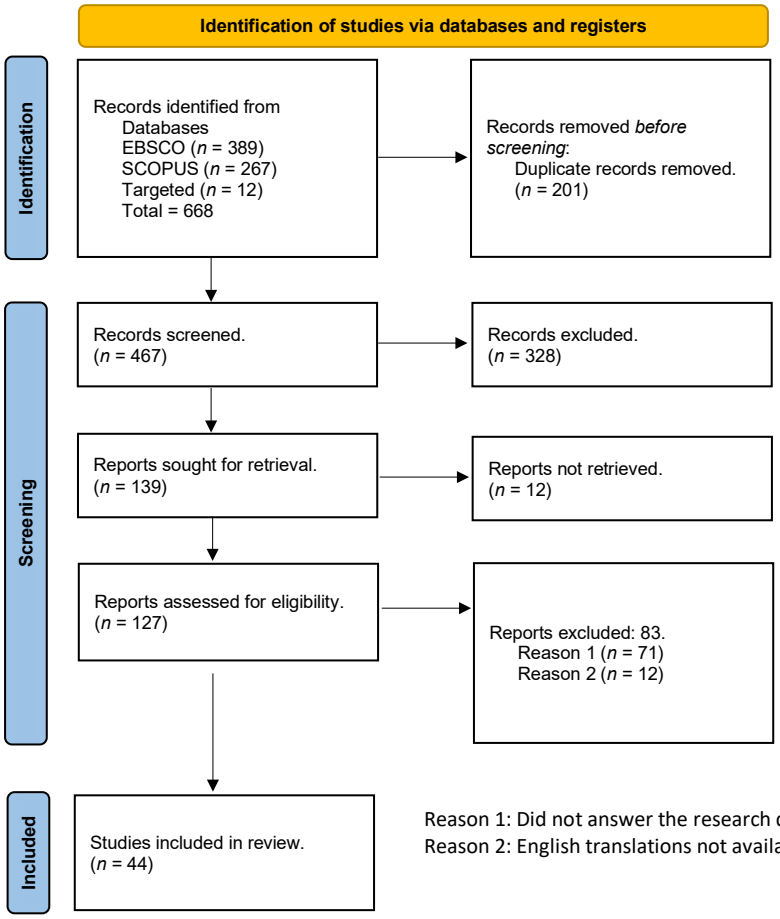

Figure 2: PRISMA flow diagram (adopted from Peters et al 2020).

Figure 3: Demographic distribution of included literature as outlined on a world map

Most of the literature originated from first-world countries like the United States of America (USA), Canada, and the United Kingdom (UK) (*n* = 36). From the included reports, only 13% (*n* = 8) originated from countries that are classified as low- to middle-income countries by the World Bank.[7] Delivering evidence-based care poses several impediments and is often similar across different health systems.[8] Within resource-poor settings, the extent and mechanisms through which these barriers affect quality improvement interventions may be different.[8]

The data were further tabulated literatim under categories and subcategories identified within the themes and specific to the various aetiologies identified. Tabulating the data aided in identifying key features within the main themes as well as identifying gaps within the literature. Table III is a summary of the evidence-based statements identified under the main theme, categories and subcategories. The data analysis resulted in the synthesis of a concept map.

Under the themes identified, evidence-based statements were recognised. Themes supported by strong evidence included comprehensive history taking to identify underlying diseases and risk factors, as well as performing a physical assessment.[9,17,18] The physical assessment included an Ankle-brachial pressure index (ABPI) as a minimum requirement to exclude arterial involvement and guide treatment options.[9,17,18,26]

Furthermore, wound assessment is vital in aiding the differential diagnosis. Treatment options include wound bed preparation and treatment of the underlying cause by utilising compression if indicated. Skill and training in both the choice of bandage and the application thereof are paramount.[18,26] Additionally, incorporating referral criteria in the treatment plan is vital to integrate an interprofessional approach.

Finally, considering patient preference, quality of life, and activities of daily living could contribute to adherence to the treatment plan. Health dialogue is vital to not only help reduce risk but also promote healing and aid in better concordance with the mutually agreed upon treatment plan.[10,17,19,23,34,48,51]

Gaps identified

The initial search for data already posed a challenge because limited data could be accessed for some of the aetiologies. Furthermore, several gaps within the collected data were also identified. Table IV outlines some of the gaps identified within the charted data.

Seemingly limited data were available on the treatment of atypical wounds. Furthermore, investigations outlined in the reports required to make a differential diagnosis, like ABPI and toe pressure, are mentioned but not described and there seems to be a lack of consistency in the interpretation of the readings. The delineation of some of the concepts within the reports is unclear. Certain aspects of assessment, diagnosis, and treatment are mentioned but not outlined and there is a definite lack of clear description of treatment options and the application thereof, as well as the impact of the treatment. Similarly, quality of life aspects are mentioned but not discussed.

Concept map

The findings culminated in a concept map as illustrated in Figure 4.

One of the key challenges in mapping data is ensuring that the product thereof (i.e. the concept map) accurately represents the data collected.[52] This can be achieved through a process of methodologically

Table III: Summary of evidence-based statements

Theme: assessment		
Categories & subcategories	**Evidence-based statement**	**Evidence**
History/risk factors	Comprehensive health assessment that includes risk assessment and identifies comorbidities	(9–24)
Ankle-brachial pressure index (ABPI)	ABPI assessment is vital to establish the level of concomitant arterial disease	(9, 10, 17–21, 23, 25)
Interpretation of the ABPI	The normal range is 0.8–1.3	(13, 17, 18)
	ABPI < 0.5 (indicates clinically relevant ischaemia from arterial disease) ABPI >1.3 (indicates possible arterial disease with non-compressible vessels) Underlying issues can result in false high readings like diabetes, smoking, hypertension, and advanced age	(13, 18, 26, 27) (18, 26)
Toe pressure	Assessment required to rule out distal ischaemia in diabetic patients	(17, 26, 28)
Leg and foot assessment	Assessment for associated signs and symptoms on the leg aids differential diagnosis	(13, 18, 25–27, 29–31)
Loss of protective function (LOPS)	Sensory testing is essential in the neuropathic foot	(13, 27)
Pain assessment	Pain assessment is vital to guide differential diagnosis	(17, 20, 22, 26, 32, 33)
Theme: treatment		
Categories		**Evidence**
Compression	The most effective level of compression is 40 mmHg at the ankle[6] Multilayer compression is more effective than single-layer Multilayer is compression more effective for immobile patients	(9, 17, 18, 21–23)
	Full compression can be applied if ABPI is 0.8–1.3 Modified or short stretch compression for 0.6–0.8 (under the supervision of a vascular surgeon) Compression can be modified for ABPI between 0.5 and 0.8	(9, 10, 21, 22)
	If the ABPI is < 0.5 (indicating clinically relevant ischaemia from arterial disease) or > 1.3 (indicating possible arterial disease with non-compressible vessels) compression should not be applied	(26)
	Patients with concomitant heart failure should be monitored With infection, compression should be adjusted according to patient tolerance Modified compression can also be utilised for very painful ulcers, i.e. Pyoderma Gangrenosum (PG)	(17, 18) (32)
Theme: referral criteria		
Referral criteria: ABPI	ABPI < 0.5 warrants urgent referral ABPI < 0.6 with symptoms (intermittent claudication, rest pain, and comorbidities) needs a referral ABPI 0.6–0.7 asymptomatic with comorbidities needs a referral ABPI within the normal range of 0.8–1.3 with symptoms (intermittent claudication, rest pain) ABPI outside the 0.80–1.3 range or < 0.6 or > 1.3 refer to a vascular surgeon Toe pressure < 45 mmHg, refer to a vascular surgeon	(18, 21, 22 26, 34) (26, 27)
Referral criteria	Wound failed to reduce in size by 20–30% at 4–6 weeks, despite best practice Fixed ankle or reduced range of motion foot deformity Unmanaged pain	(9, 18, 23, 26, 31, 35)
	Wound present for 3 months or longer requires a referral for a biopsy, atypical wounds require a biopsy	(24, 32, 35–38)
	Surgical intervention for either treatment, debridement, or grafting	(9, 17, 18, 39)
	Increased ischaemic pain is an indication for surgical intervention	(26, 40)
	Wound infection in the neuropathic foot warrants referral	(41, 42)
Theme: wound assessment		
Wound bed assessment	The wound bed should be assessed according to location, type of tissue on the wound bed, wound edges, surrounding skin area, surrounding tissue, signs of infection, and dimensions should be recorded	(9, 18, 23, 26, 35, 43, 44)
Theme: outcome measure		
Time to healing	A wound that has failed to reduce in size by 20–30% at 4–6 weeks or if the wound has stalled or not changed in 2 weeks	(18, 20–23)
	Outcomes could also be measured by a reduction in oedema, reduction in pain, and reduction in wound symptoms like high exudate level and odour as well as improved quality of life and activities of daily living	(17, 18)
Infection	Early recognition and treatment of infection is vital to prevent unfavourable outcomes Infection diagnosis should be based on clinical signs and supported with investigations, i.e. quantitative swab/biopsy and haematological infection markers A quantitative swab is only indicated with clinical signs of infection, but a tissue biopsy seems to have a much higher efficacy in identifying causative pathogens	(17, 20, 21, 22, 23, 27, 41, 45) (23, 28, 46, 47)
Theme: health dialogue		
Risk reduction	Patient education on lifestyle changes that include smoking cessation, weight management, nutrition, exercise, foot care, skin care, and concordance with medical treatment is vital to achieve optimal outcomes	(10, 17, 19, 23, 27, 34, 39, 48, 49)
Theme: products		
Dressings	Consideration of the characteristic of the wound bed when utilising a topical application is only second to identifying and treating the underlying cause	(21, 50)

Table IV: Gaps identified within the charted data

Concept	Evidence not found
Atypical wounds	Limited data on the treatment of gout ulcers Limited data on wound bed preparation of atypical wounds
Infection	Lack of clear description of both signs and symptoms of infection in some of the reports as well as treatment thereof
Risk assessment	Although several reports indicate risk factors for ulcer formation, the risk for delayed healing is not clearly defined
Biometric assessment	Obesity is indicated as a risk factor in several reports, but information on what is regarded as obesity is lacking as well as biometric indicators and the relationship between obesity and lower leg ulcer risk
Investigations	Lack of specific application/instruction/rationale Although investigations are indicated, clear descriptions are lacking ABPI: range and interpretation are outlined but instructions on how to perform an ABPI were not indicated Toe pressure: indicated in several reports but without a description of how to perform the procedure Thermometry is mentioned but without indication of how to measure temperature on the foot Laboratory investigations are listed but the correlation between abnormal values and lower leg ulcer development is not outlined
Interprofessional	Lack of specific reference to team collaboration and types of disciplines outlined (reference to the skill and competence of the clinician is indicated in one report)
Hosiery	Although indicated, the correct type and pressure are not indicated
Quality of life	Not considered in all the reports
Mental health	Limited information on addressing psychosocial issues
Outcomes measures	Not specifically outlined in all the reports
Photography	Photography is indicated as a method of record-keeping, but guidance on photography that delivers comparable photos is not outlined
Products	Lack of description of correct indications or applications of products

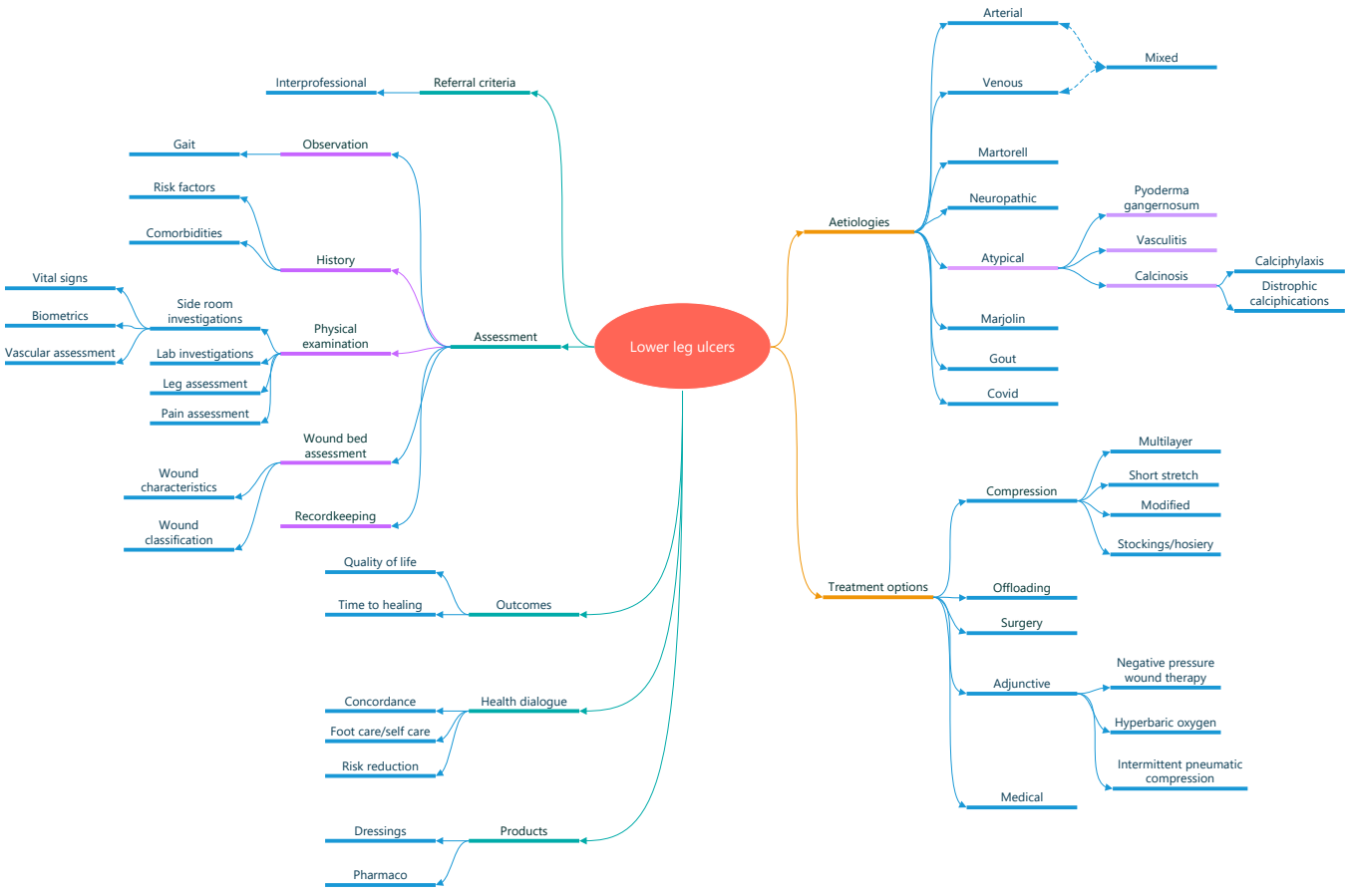

Figure 4: Concept map

charting the data literatim, as described previously. Another key consideration in mapping is the purpose of the map. The purpose of this concept map was to map and organise a large body of evidence. The charted typical characteristics of each type of wound assist in distinguishing between the aetiologies. The main themes, categories and subcategories of assessment, referral, outcomes, health dialogue, products, and treatment options relate to each aetiology. Furthermore, the importance of the assessment and correct interpretation of an ABPI for all patients with lower leg ulcers was highlighted as it directs the diagnosis, health dialogue, and treatment options, including referral.

Limitations of the mapping review

The exclusion of literature that was not available in English could be a limitation, although every effort was made to procure translations. Furthermore, the broad nature of the search could have contributed to some reports being missed, which was addressed by utilising Boolean operators, modifiers, and several different databases as well as the skills of a librarian. The lack of critical appraisal could have been a limitation but aided in identifying gaps in the literature.[53]

Future research

Future research could focus on utilising the concept map in the development of an algorithm or care pathway in the application of evidence-based care in the diagnosis and treatment of lower leg ulcers with different aetiologies. The large body of evidence could be amalgamated into a guideline that describes evidence-based care and the application thereof.

Conclusion

A large body of evidence on lower leg ulcers was mapped following the methodological framework of scoping reviews by Peters et al.[3] The concepts identified were categorised under themes, categories and subcategories as shown in the map (Figure 4). A comprehensive history and ABPI are essential to not only make a differential diagnosis but also to guide further investigations and treatment options. An inaccurate differentiation and diagnosis may harm the patient physically, psychologically, and financially. Compression therapy remains the gold standard in treating lower leg ulcers once arterial involvement is excluded, but the application thereof requires skill and knowledge. Omitting the "how" from evidence-based guidelines may contribute to the low uptake of guidelines in clinical practice.

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Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Before commencement of the study ethical approval was obtained from the following ethical review board: Health Sciences Research Ethics Committee, University of the Free State: No. UFS-HSD2020/0703/2909.

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