

Wound Healing

Southern Africa

2026 Volume 19 No 1

Cutimed®
Healing for every body

Cutimed® Sorbact® Designed with Sorbact Technology that prevents and treats wound infection²

93%
of the wounds
were healed or
improved¹

The smart choice right from the start

Cutimed Sorbact with Sorbact Technology is suitable for early intervention^{3,4,5} and designed to prevent and treat wound infection by binding and inhibiting bacteria, so antimicrobial resistance is not expected.⁶

Smart technology, packed into the tiniest details. And it's those tiny details that can make a big impact for patients, carers and budget holders.



Discover the benefits,
visit **cutimed.co.za**

1 Kammerlander G et al. An investigation of Cutimed Sorbact as an antimicrobial alternative in wound management. Wounds UK. 2008;4(2):10-18.

2 Stanirowski PJ et al. Randomized controlled trial evaluating dialkylcarbamoyl chloride impregnated dressings for the prevention of surgical site infections in adult women undergoing cesarean section. Surg Infect (Larchmt). 2016;17(4):427-435.

3 Stanirowski PJ et al. Randomized controlled trial evaluating dialkylcarbamoyl chloride impregnated dressings for the prevention of surgical site infections in adult women undergoing cesarean section. Surg Infect (Larchmt). 2016;17:427-435.

4 Magro M. Reducing surgical site infections post-caesarean section. International Journal of Women's Health. 2023;15:1811-1819.

5 Bua N et al. Dialkylcarbamoyl chloride dressings in the prevention of surgical site infections after nonimplant vascular surgery. Ann Vasc Surg. 2017;44:387-392.

6 Husmark J et al. Antimicrobial effects of bacterial binding to a dialkylcarbamoyl chloride-coated wound dressing: an in vitro study. J Wound Care. 2022;31:560-570.

Frequent dressing changes add up to a lot of waste

There is another way...



Mepilex® Border Post-Op


Mölnlycke®



Please contact K2 Medical for more information. Tel+27 10 045 2500 | Email: info@k2medical.co.za | Web: k2medical.co.za

Wound Healing

Southern Africa

Website:

www.woundhealing.co.za

WHSA is distributed annually to the members of WHSA as well as other surgeons (general, plastic, vascular and orthopaedic), diabetologists, dermatologists, general practitioners, podiatrists, stoma and ostomy specialists and wound care specialists.

Endorsed by WHSA



**Official journal of the
Wound Healing Association of
Southern Africa (WHSA)**

WHSA contact details:

Tel: (086) 111 1725

Fax: (086) 685 8353

E-mail: info@whsa.org

www.whsa.org

Advertising enquiries:

Cheryl Stulting

E-mail: cheryl@medpharm.co.za

Office: 012 664 7460

Cell phone: 082 894 8119

Publisher:

Medpharm Publications



Ground Floor, Centurion Wine & Art Centre,
123 Amkor Road, Lyttelton Manor
PO Box 14804, Lyttelton, 0157
Tel: (012) 664-7460, Fax: (012) 664-6276
E-mail: info@medpharm.co.za
www.medpharm.co.za

Wound Healing Southern Africa 2026 Volume 19 Number 1

Contents

Editorial

- Advancing wound care research in Southern Africa: A vision for rigorous, ethical and collaborative science
GC Boersema 4

Original Research

- Management of fasciotomy wounds using tape-assisted closure
NS Maseko, M Daya 6
- Roles of those involved with wound care in Tshwane District's residential aged care facilities: findings from a stakeholder analysis
GC Boersema, Y Botma, M Mulder 12

Case Series

- Copper oxide-impregnated dressings in the management of complex diabetic foot wounds: a case series
B Davids 18
- Intermittent neuromuscular electrostimulation of the common peroneal nerve as an adjunct to standard care in complex and non-healing venous leg ulcers: a three-case series
L Naude, A Gordon-Davies 21

CPD Questionnaire 28

©2026 Opinions and statements of whatever nature are published under the authority of the submitting author, and the inclusion or exclusion of any medicine or procedure, do not necessarily reflect the views of the editor, WHSA or Medpharm Publications. While every effort is made to ensure accurate reproduction, the authors, advisors, publishers and their employees or agents shall not be responsible, or in any way liable for errors, omissions or inaccuracies in the publication, whether arising from negligence or otherwise or for any consequences arising therefrom. The publication of advertisements in this journal does not imply an endorsement by the publishers or its editorial board and does not guarantee any claims made for products by their manufacturers.

Wound Healing

Southern Africa

Editorial policy

Editorial Board

- *Editor-in-Chief*
Dr Christelle Boersema
- *Associate Editors*
Dr Febe Bruwer

South African Board Members

- *Plastic Surgeons*
Nick Kairinos
Alan Rogers (burns)
Maria Giaquinto-Cilliers
Gary dos Passos (burns)
- *General Surgeons*
Laura Redman (vascular)
Gregory Weir (vascular)
Nikki Allorto (burns)
- *Lymphoedema*
Suzi Davey
- *Wound Care Specialist*
Liezl Naude
Hiske Smart
- *Dermatology*
Willie Visser
- *Internal Medicine and Infectious Diseases*
Tabie Greyling
- *Podiatry*
David Armstrong
Lee Rogers
Bernhard Zipfel
Sean Pincus
- *Nutrition and Dietetics*
Ingrid Schloss

International

Keith Harding
David Armstrong
Lee Rogers
Hiske Smart
Alan Rogers (burns)

Publisher:

Medpharm Publications (Pty) Ltd
www.medpharm.co.za

Advertising enquiries

Cheryl Stulting
E-mail: cheryl@medpharm.co.za
Cellphone: 082 894 8119



WHSa seeks to publish articles related to wound healing and wound care. This may take the form of original research (clinical or laboratory work), review papers for continued professional development (CPD), case reports, product reviews and letters (scientific and editorial). The target readership is specialists allied to wound care, general practitioners and nursing and allied professions with an interest in the field.

All material submitted for publication must be submitted exclusively to WHSA. All articles will be sent for peer review. WHSA will not accept material submitted to, or published by, other journals or books unless permission by the other publishers is granted. Opinions expressed by authors are their own and not necessarily those of Medpharm Publications (Pty) Ltd, the editorial staff, or any member of the editorial advisory board. The publishers of WHSA accept no responsibility for statements made by contributors or claims made by advertisers nor does the publication of advertisements constitute or imply endorsement. The content of WHSA is protected by copyright.

Review process

All articles are peer reviewed by 2 or more referees. If an article is accepted for publication or if revisions to the paper are required or if the paper is not accepted, the corresponding author will be notified by e-mail or letter. The editor reserves the right to edit material accepted for publication. Submitted materials will not be returned to author unless specifically requested in writing. WHSA particularly seeks new, original work that would have impact on its readership – priority is given to this type of article. Proofs of articles are sent to authors to check clinical and statistical accuracy. Major changes to text or tables at this stage are not permitted. Each submission must be accompanied by a letter signed by all authors and stating that the work has not previously been published and will not be published elsewhere. Once it is published, the article and its illustrations become the property of the journal, unless rights are reserved before publication. The letter should identify the corresponding author (include the address, telephone number, fax number, and e-mail address). Please make clear that the final manuscript has been seen and approved by all authors and that the authors accept full responsibility for the design and conduct of the study, had access to the data, and controlled the decision to publish.

Editorial submissions

We prefer online submissions at www.woundhealing.co.za

Correspondence to the Editors

E-mail: eboergc@unisa.ac.za/christelledas@gmail.com
Postal address: PO Box 14804, Lyttelton, 0140

For a full version of the author guidelines, please visit
www.woundhealing.co.za

Best in class
absorption¹

Cutimed® Sorbion®

Handle any level of wound exudate with Sorbion Technology

The smart way to maintain moisture balance

Cutimed Sorbion is designed with Sorbion Technology – its superabsorbent polymers help to maintain moisture balance for any level of exudate², light or heavy, avoiding dehydration³ and maceration⁴. Smart technology, packed into the tiniest details. And it's those tiny details that make a big impact for patients, carers and budget holders.



Discover the benefits,
visit **cutimed.co.za**



1 Essity group – commissioned laboratory testing at SMTL: Evaluation of absorbency and fluid retention tested against 20 biggest competitors (based on EN 13726). 2024.

2 Essity group commissioned laboratory testing at SMTL: Evaluation of absorbency and fluid retention of different superabsorbent wound dressings (based on EN 13726). 2024

3 Cutting K. Made Easy - Cutimed Sorbion Sachet. Wounds International. 2016.

4 Cutting KF. Managing wound exudate using a super-absorbent polymer dressing: a 53-patient clinical evaluation. J Wound Care 2009;18(5):200-205.

Editorial

Advancing wound care research in Southern Africa: A vision for rigorous, ethical and collaborative science

Dr Christelle Boersema, Editor-in-Chief

Senior Lecturer, Department of Health Studies, UNISA



Every wound tells a story – a patient's healing journey is shaped not only by the injury itself, but also by the quality of healthcare, the decisions made by clinicians and, ultimately, the strength of the evidence that informs those decisions. Across Southern Africa, clinicians face increasingly complex wound care challenges within healthcare systems characterised by constrained resources and

diverse patient needs. However, too often, clinical decisions continue to rely on evidence generated in healthcare systems that differ substantially from our own. While international research provides an essential foundation, Southern Africa must generate evidence that reflects its unique patient populations, healthcare systems and resource constraints. Yet, despite this growing need, our regional evidence base remains comparatively limited. Without robust local evidence, services cannot be planned effectively, contextually relevant clinical guidelines cannot be developed, and opportunities to improve equitable access to high-quality wound care may be missed.

The Southern African regions have witnessed steady growth in wound care research and scholarship over the past two decades. Since the first volume's publication in 2008, *Wound Healing Southern Africa* has become an important platform for disseminating regional research in wound management. Under the editorial leadership of Prof. Nick Kairinos and Dr Maria Giaquinto-Cilliers, the journal achieved DHET accreditation in 2022—an important milestone in its development as a recognised scholarly publication. This achievement provides a strong foundation for the incoming editorial team namely Dr Christelle Boersema and Dr Febe Bruwer.

Our vision is to build on the success and legacy of the previous editors by strengthening the journal's scientific impact, attracting high-quality research submissions from across Southern Africa and progressing towards international indexing.

Our ambition is not simply to publish more research, but to publish research that matters and contributes to raising practice standards in wound management.

High-quality research is characterised by methodological excellence, ethical integrity, relevance to healthcare practice and the potential to

improve patient outcomes, strengthen health systems and advance professional knowledge. Whether a study is a case report, observational study, clinical trial, implementation study, qualitative investigation, mixed-methods study, a systematic or scoping review, each contributes uniquely to the evidence base when conducted with scientific rigour. As a multidisciplinary journal, *Wound Healing Southern Africa* welcomes this diversity of methodologies because addressing the complex challenges of prevention and management of wounds requires knowledge generation on different levels.

Scientific excellence, however, cannot be separated from ethical responsibility. Patients living with wounds frequently experience persistent pain, impaired mobility, psychological distress and diminished quality of life. Many are older adults or individuals living with chronic disease, making them particularly vulnerable participants in research. Their willingness to contribute to scientific advancement deserves the highest standards of ethical conduct. Ethical research extends well beyond obtaining approval from an accredited research ethics committee. It requires respect for participant autonomy, meaningful informed consent, careful risk minimisation, scientific integrity and transparent reporting throughout the research process. Equally important, research must be scientifically sound. Poorly designed studies that cannot meaningfully answer important clinical questions may waste scarce resources.

The value of research, however, is measured not only by its scientific quality but also by its ability to improve clinical practice. Evidence that remains confined to journal pages cannot improve patient outcomes. Research achieves its greatest value when it informs clinical decision-making, influences policy and is translated into routine practice. This requires collaborative and engaged research that brings together researchers, clinicians, policymakers, educators, industry partners, patients and communities to co-produce knowledge that is both scientifically robust and practically relevant.

As Editor-in-Chief, I believe that *Wound Healing Southern Africa* has a responsibility that extends beyond publishing manuscripts. The journal should serve as a catalyst for advancing wound care science, supporting emerging and established researchers, and fostering a culture of ethical and collaborative scholarship throughout the region. Together, let us generate research that reflects the realities of Southern Africa, addresses our healthcare priorities and ultimately improves the lives of people living with wounds. After all, every wound tells a story — and through rigorous, ethical and collaborative research, we have the opportunity to help shape the future of wound care in Southern Africa.

Introducing ALLEVYN[◇] COMPLETE CARE Foam Dressings

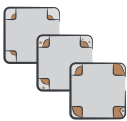
Smith+Nephew

ALLEVYN[◇]
COMPLETE CARE
Foam Dressing

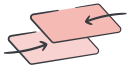
The new 5-layer foam dressing packed with technologies



The hyper-absorbent **ExuLOCK[◇] layer** locks away exudate to help minimize leakage¹⁻⁴



EXUMASK[◇] Technology uniquely shows exudate strikethrough only at the extremities of the dressing to indicate when to change,⁵⁻⁷ which has been proven to result in longer wear time/use than other foam dressings.^{8,9}



ShearDEFENSE[◇] Technology absorbs shear forces and reduces soft tissue strain*¹⁰



ComfortSTAY[◇] Technology is a gentle silicone adhesive that helps minimize pain and trauma at dressing changes.¹¹



HighFLEX[◇] Technology is a highly conformable, multi-way stretch technology¹²⁻¹³ to fit the contours of the body.^{4,14}



Dressing Specifications

S+N Code	Description	Size	Pad size	Border Width	Qty
66807695	ALLEVYN COMPLETE CARE Square XS	7.5 x 7.5cm	4.6 x 4.6cm	1.5cm	10
66807697	ALLEVYN COMPLETE CARE Square M	12.5 x 12.5cm	8.4 x 8.4cm	2cm	10
66807699	ALLEVYN COMPLETE CARE Square XL	17.5 x 17.5cm	13.5 x 13.5cm	2cm	10
66807705	ALLEVYN COMPLETE CARE HEEL	25 x 25cm	20 x 20cm	2.5cm	10
66807703	ALLEVYN COMPLETE CARE SACRUM S	17.3 x 17.5cm	8.4 x 12.4cm	2.5cm	10
66807704	ALLEVYN COMPLETE CARE SACRUM L	21.6 x 23.1cm	12.2 x 17cm	3cm	10

*NOMINAL VALUES.
* Dressing and pad size are taken from packaging artwork.
* Pad area and border width are taken from CAD product drawings.
* Sacrum sizes do not include the tail; the tail is designed to aid positioning and improve conformity to the sacral area.

For detailed product information, including indications for use, contraindications, warnings and precautions, please consult the product's Instructions for Use (IFU) prior to use. Products may not be available in all markets because product availability is subject to the regulatory and/or medical practices in individual markets. Please contact your Smith+Nephew representative or distributor if you have questions about the availability of Smith+Nephew products in your area.

*as demonstrated in vitro

References 1. Smith+Nephew 2025. Free swell Absorbency and Retention after Compression Testing of ALLEVYN COMPLETE CARE Dressing. Internal report: CSD.AWM.25.008. 2. Smith+Nephew 2025. Bacterial absorbance, sequestration & retention testing of ALLEVYN COMPLETE CARE. Internal report: CSD.AWM.25.019 V2. 3. Tiscar-González V, Menor-Rodríguez MJ, Rabadán-Sainz C, et al. Clinical and Economic Impact of Wound Care Using a Polyurethane Foam Multilayer Dressing. Adv Skin Wound Care. 2021;34(1):23-30. 4. Rossington A, Drysdale, K, and Winter R. Clinical performance and positive impact on patient wellbeing of ALLEVYN Life. Wounds UK. 2013;9(4):91-95. 5. Smith+Nephew 2025. Wound Models testing over 4 Days – Horizontal, Moderate Flow, Viscous SWF and Wound Models Testing over 7 Days, Horizontal, Moderate Flow of ALLEVYN COMPLETE CARE Dressing. Internal report: CSD.AWM.25.009 V2. 6. Tiscar-González V, Menor-Rodríguez MJ, Rabadán-Sainz C, et al. Clinical and Economic Impact of Wound Care Using a Polyurethane Foam Multilayer Dressing. Adv Skin Wound Care. 2021;34(1):23-30. 7. Simon D, Bielby A. A structured collaborative approach to appraise the clinical performance of a new product. Wounds UK. 2014;10(3):80 - 87. 8. Atkinson L, Allen D, Costa B. Poster presented at: European Wound Management Association (EWMA); May 1–3, 2024; London, UK. (NB: EM meta-analysis). 9. Costa B, Allen D. Poster presented at: European Wound Management Association (EWMA); May 3–5, 2023; Milan, Italy. 10. Smith+Nephew 2024. Comparison of Frictional Energy Absorber Effectiveness (FEAE) in two five-layer hydrocellular polyurethane foam dressings (HPFD) containing superabsorber and masking layers. Internal report: CSD.AWM.24.057 V2. 11. Smith+Nephew. Internal Report: EA/AWM/GENERAL/001/v2. 12. Smith+Nephew 2025. Conformability Testing of ALLEVYN COMPLETE CARE Dressing. Internal report: CSD.AWM.25.013. 13. Smith+Nephew 2025. Extensibility Testing of ALLEVYN COMPLETE CARE Dressing. Internal report: CSD.AWM.25.012. 14. Stephen-Haynes J, Bielby A, Searle R. The clinical performance of a silicone foam in an NHS community trust. Journal of Community Nursing. 2013;27(5):50 - 59.

Advanced Wound Management Smith & Nephew (Pty) Ltd, 30 The Boulevard, Westend Office Park, Westville, 3629. T +27 (0) 31 242 8111. F +27 (0) 31 242 8120.
www.smith-nephew.com *Trademark of Smith+Nephew
All Trademarks acknowledged ©2025 Smith & Nephew, Inc. | ALEE42-46544-1025

Management of fasciotomy wounds using tape-assisted closure

NS Maseko,  M Daya 

Department of Plastic and Reconstructive Surgery, School of Clinical Medicine, Inkosi Albert Luthuli Central Hospital, University of KwaZulu-Natal, South Africa

Corresponding author, email: daya@ukzn.ac.za<https://doi.org/10.36303/WHSA.3364>

Background: The ideal outcome of the fasciotomy wound is delayed direct primary closure. Direct skin closure produces the best aesthetic outcome. Split-thickness skin grafting is commonly performed to manage these wounds; however, the poor aesthetic outcomes and donor site morbidity are major drawbacks. We aimed to demonstrate a treatment method for fasciotomy wounds using tape-assisted closure (TAC) to produce delayed primary surgical wound closure.

Methods: In a prospective study from November 2023 to November 2024, consecutive patients referred to us by vascular surgery, with fasciotomy wounds involving both upper and lower limbs, were taped to stretch the bordering skin using a technique called TAC to enable delayed primary surgical wound repair. The skin was serially stretched on alternating days using Micropore™ tape (3M, Saint Paul, United States) until sufficient laxity was achieved, allowing tension-free closure.

Results: The TAC method was used to treat 11 male patients. The age range was 21–47 years. Delayed primary closure was achieved in eight patients, and one patient achieved direct closure with TAC alone. Two patients were withdrawn from the study due to ongoing treatment by primary physicians. The average time to surgical closure was 23 days. No major complications occurred due to TAC treatment. No cases of wound infection were recorded.

Conclusions: TAC is an effective method that may achieve secondary wound closure and facilitate the delayed primary closure of wounds post-fasciotomy. This method can be applied to other wound types and is a useful addition to a surgeon's armamentarium.

Keywords: fasciotomy, external tissue expansion

© Medpharm

Wound Healing Southern Africa 2026;19(1):6-11

Introduction

Fasciotomies are generally performed to save a limb from vascular compromise due to increased muscle compartment pressure by releasing the deep fascia to alleviate the raised pressure. Indications for a fasciotomy are either therapeutic or prophylactic. Moran et al.¹ found no significant difference between the two categories regarding outcomes. Once the limb is saved without loss of function, the ideal result of the fasciotomy wound is to achieve delayed direct primary closure. Direct skin closure has a lower infection risk, shorter wound care, and the best aesthetic outcome.²

The fasciotomy and vascular insult-associated tissue oedema, bulging muscles, and retracted skin edges of the wound delay wound edge approximation and suture closure. Since fasciotomy wounds are usually not associated with skin loss, managing the underlying oedema and retaining the skin's laxity are integral to achieving delayed primary closure. In some instances, timeous limb elevation alone can achieve successful delayed primary closure.³

Most fasciotomy wounds are closed secondarily using split-thickness skin grafts. Early grafting compared with ongoing wound care decreases patients' length of hospital stay.⁴ Skin grafting is a simple and effective technique; however, compared with delayed primary closure, it has disadvantages such as donor site morbidity, prolonged immobility, prolonged hospital stay, and aesthetic concerns, like colour mismatch and contour deformity. The skin graft may also lack sensation.³

The senior author of this study previously reported good outcomes in a clinical series utilising paper tape application for external tissue expansion for scar revision.⁵ This skin-stretching method, now termed tape-assisted tissue expansion (TATE), is practical and has non-invasive advantages. However, managing open wounds with tape application was not reported in their study.⁵

Here, we introduce the concept of TAC, in which tape is applied to open wounds to achieve wound closure. TAC is like TATE, with the key distinction being that TAC is applied to open wounds, whereas TATE is used to expand intact skin. This study aimed to demonstrate the use of TAC to treat fasciotomy wounds and achieve delayed primary surgical wound repair. Based on favourable outcomes reported with the TATE technique, it was hypothesised that TAC would be effective in managing fasciotomy wounds.

Patients and methods

We conducted a prospective observational study of patients with fasciotomy wounds treated with TAC at Inkosi Albert Luthuli Central Hospital, Durban, South Africa, from November 2023 to November 2024. All patients meeting the inclusion criteria were invited to participate in the study. The inclusion criteria were all patients referred to our unit with fasciotomy limb wounds. Exclusion criteria were unstable patients, wounds older than 48 hours, presence of skin or muscle necrosis,

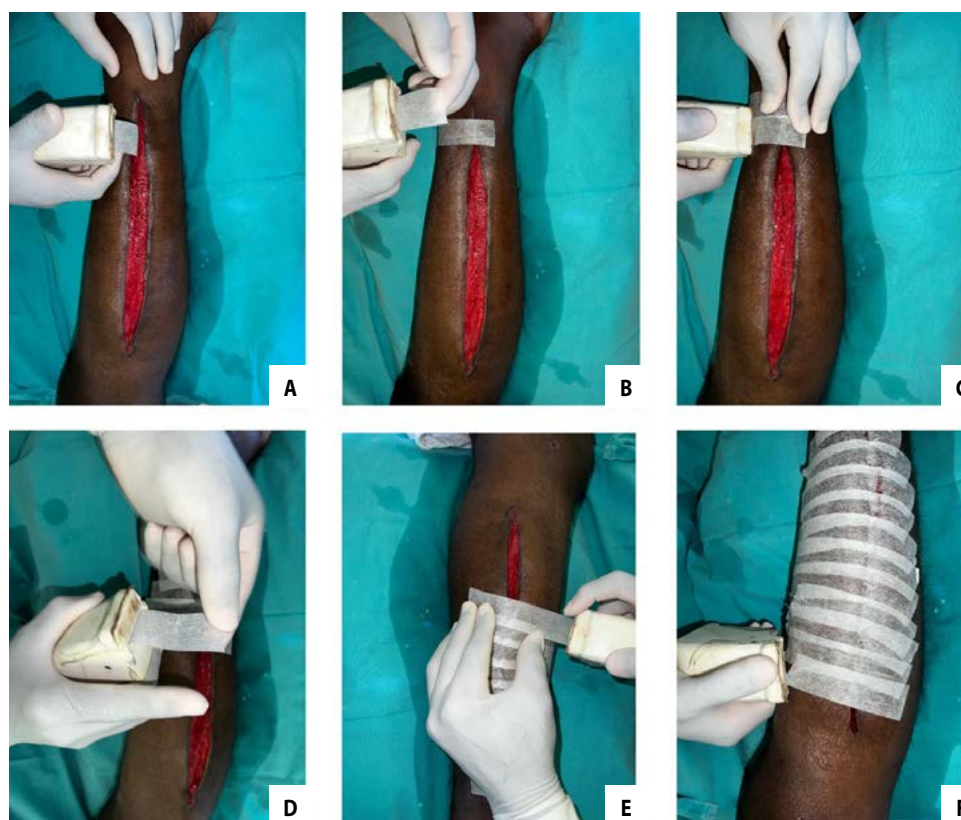


Figure 1: Stepwise application (images A–F) of the paper tape using a tape-assisted closure device

limb ischaemia, concomitant wound infection, and known peripheral vascular disease. Informed consent was obtained, and patients were offered the option of alternative treatment. Data collected and analysed included patient demographics, time to wound closure, wound location, number of taping sessions, complications, wound microbiology, and photographs of scars, which were assessed using the Scar Cosmesis Assessment and Rating (SCAR) scale.⁶

Description of taping procedure (Figure 1)

The wound and surrounding skin were cleaned with an antiseptic solution. We used SKIN-PREP™ (Smith & Nephew) protective wipes to wipe and prepare the adjacent, normal skin for tape application. Wound

edges were then brought together by pinching, using the index and thumb of the user's non-dominant free hand (the hand not holding the TAC device). The TAC device facilitates precise tape dispensing. The device incorporates an integrated cutting mechanism, and its ergonomic design enables controlled, single-operator application across the fasciotomy wound margins. With the adjacent skin fully stretched and the skin edges maximally migrated together, paper tape was applied across the wound to maintain this position (the tape was applied perpendicular to the wound's long axis). More lengths of tape were used serially, with some overlap, until the entire wound was covered. Gauze was then placed over the tape and secured with a crepe bandage to absorb excess fluid and exudate. This procedure was

Table 1: Summary of study participants (patients 9 and 11 were withdrawn from the study)

Patient	Age (years)	Sex	Comorbidities	Follow-up (months)	Fasciotomy site	Number of wounds
1	22	M	Nil	Lost	Forearm	1
2	47	M	HIV	12	Leg	2
3	37	M	Nil	8	Leg	2
4	31	M	Nil	Lost	Leg	2
5	36	M	Hpt, DM, IHD, CVA	13	Forearm	1
6	36	M	Nil	17	Leg	1
7	21	M	Nil	19	Forearm	1
8	43	M	Nil	Lost	Thigh	1
9	36	M	Nil	Withdrawn	Forearm	1
10	46	M	Nil	14	Leg	2
11	28	M	Nil	Withdrawn	Leg, thigh	4

CVA – cerebral vascular accident, DM – diabetes mellitus, HIV – human immunodeficiency virus, Hpt – hypertension, IHD – ischaemic heart disease, M – male

repeated daily or on alternate days until the wound was deemed ready for surgical closure. If patients had incision fasciotomies on either side of the limb, each wound was taped on a rotational basis on alternate days.

Scar assessment

Photographs of the resultant scars were taken during follow-up visits, which occurred 8–19 months post-closure. These photographs were sent to three independent plastic surgeons who rated each scar using the SCAR scale.⁶ The scale considers six variables: scar spread, erythema, dyspigmentation, track marks, hypertrophy/atrophy, and the assessor's own overall impression. The maximum score is 12, denoting the worst possible scar; a zero score represents the best possible scar.

Statistical analysis was performed by a statistician from the University of KwaZulu-Natal College of Health Sciences Biostatistics Department. To assess inter-rater reliability, an intraclass correlation coefficient (ICC) was calculated using IBM SPSS Statistics, version 31. The Spearman rank correlation coefficient was used to assess the relationship between the number of days to closure and the scar rating.

Results

A total of 11 patients (18 wounds) were included in the study (Table I). However, two patients were withdrawn in the early stages before achieving delayed surgical closure, due to unresolved vascular problems. The remaining nine patients, with a total of 13 wounds, were analysed.

All patients were male, with an age range of 21–47 years. The anatomic distribution was: forearm (four wounds), thigh (three wounds), and leg (11 wounds). Delayed primary closure was achieved in 12 wounds across eight patients. One patient (patient 5) with a single fasciotomy wound was allowed to heal without surgery; multiple uncontrolled comorbidities and surgery-related risks directed this treatment approach.

The average time to surgical closure for patients who achieved delayed primary closure was 23 days (range, 7–45 days). An average of nine taping sessions was needed to achieve closure (range, 4–16 sessions). No serious adverse effects were recorded during taping or after the surgery. Two patients (patients 2 and 10) had minor wound breakdown, which was allowed to heal spontaneously. None of the patients developed infection, and the commonly isolated wound contaminants on routine wound swabs were *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, and *Staphylococcus aureus*.

Six patients returned for follow-up. Three patients were lost to follow-up and could not be reached telephonically. The follow-up period was 8–19 months. Three independent plastic surgeons rated the final scars of those who returned for follow-up. A total of nine scars were assessed, with an average score of 5.5 (0 = best, 12 = worst) (Table II). To assess inter-rater agreement, an ICC was calculated using IBM SPSS Statistics. The average ICC was 0.603 ($p = 0.03$), indicating moderate agreement among the assessors regarding the average scar rating. However, the single ICC was 0.336 ($p = 0.03$), suggesting lower agreement when considering individual scar ratings. These findings indicate that while these assessors generally agree on overall scar outcomes, individuals differ in their perspectives on specific cases.

Table II: Summary of results

Patient	Wound number	Sex	Age	Site	Follow-up (months)	Days to closure	Number of taping sessions	Primary closure	Complications	SCAR average
1		M	22	Forearm	Lost	8	8	Yes	Nil	
2	1	M	47	Leg	12	26	11	Yes	Blisters, minor wound breakdown	6.3
	2			Leg		45	16	Yes		7.0
3	1	M	37	Leg	8	45	16	Yes	Nil	4.7
	2			Leg		31	11	Yes		5.7
4	1	M	31	Leg	Lost	15	5	Yes	Nil	
	2			Leg	Lost	15	6	Yes		
5		M	36	Forearm	13	90	*	No	Nil	7.0
6		M	36	Leg	17	19	5	Yes	Nil	4.2
7		M	21	Forearm	19	7	4	Yes	Nil	3.7
8		M	43	Thigh	Lost	16	8	Yes	Nil	
9		M	36	Forearm	Withdrawn					
10	1	M	46	Leg	14	37	16	Yes	Minor wound breakdown	7.3
	2			Leg		12	6	Yes		4.0
11		M	28	Thigh x 2, leg x 2	Withdrawn					5.54

M – male, SCAR – Scar Cosmesis Assessment and Rating



Figure 2: Medial leg fasciotomy (patient 2, wound 2) managed with tape-assisted closure

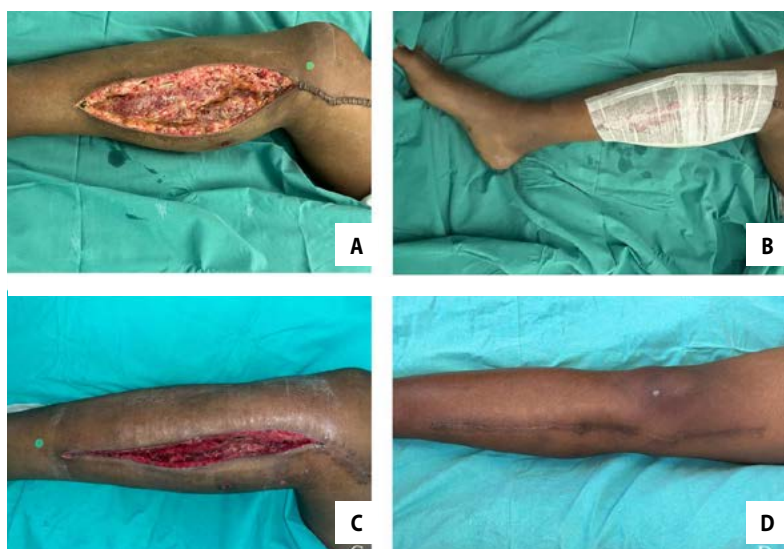


Figure 3: Sequential images (A–D) of a medial fasciotomy wound (patient 6) managed with tape-assisted closure



Figure 4: Sequential images (A–D) of a lateral fasciotomy wound (patient 11, wound 1) managed with tape-assisted closure

The Spearman rank correlation coefficient was used to assess the relationship between the number of days to closure and the scar rating. The correlation coefficient was 0.769 ($p = 0.015$), indicating a strong association between higher scores and longer time to closure.

Sequential images in Figure 2 demonstrate progressive improvement in the wound bed during the TAC process. A total of 16 taping sessions were required to achieve delayed primary closure. Figure 3 illustrates patient 6's wound at enrolment (A), the wound immediately following tape application (B), the progressive reduction in wound size (C), and the healed scar at the 17-month follow-up (D). A total of five taping sessions were required. Images A–C in Figure 4 show wound progression (patient 11, wound 1) during the TAC process. Delayed primary closure was achieved after 37 days. Image D shows the scar's appearance at the 15-month follow-up. Suboptimal scarring is evident and attributed to the prolonged closure time.

Discussion

External tissue expansion techniques are invaluable tools for managing open wounds. The literature contains various innovative solutions for delayed direct closure of the fasciotomy wound without a split-thickness skin graft.^{2,7–13} Examples include Steri-Strip™ (3M, St. Paul, United States) closure, rubber band-assisted external tissue expansion, the shoelace technique, the External Tissue Extender (Blomqvist), dermatotraction using a subcuticular suture, vacuum-assisted closure or negative pressure wound therapy (NPWT), and the cable tie technique.^{9,11,14–18}

Steri-Strip™ closure

This method is similar to our fasciotomy closure method. Steri-strips are placed perpendicular to the long axis of the wound and replaced daily until closure is achieved. Closure reportedly takes 5–8 days.¹⁴

Rubber band-assisted external tissue expansion

Reported by Kenny et al.,¹⁵ rubber bands are applied in a criss-cross pattern perpendicular to the long axis of the wound and secured by staples. This technique relies on the elastic recoil of the rubber band, and daily manipulation is not required. With this technique, 72% of patients were closed in seven days. However, NPWT was also used as an adjunct for large wounds.¹⁵

Shoelace technique

The shoelace technique is reasonably old. Closure is achieved by running a silicone vessel loop along the fasciotomy incision. This loop is fixed to the wound edge using staples. The loop is then tightened daily until the two wound edges lie opposite each other, after which delayed primary closure is performed. A mean closure time of 19 days was reported.¹¹

External Tissue Extender

This skin-stretching device, consisting of silicone tapes and plastic stoppers, approximates wound margins via dermatotraction. The silicone tapes are threaded through the skin at the wound edge using needles. Daily tightening is performed, and closure can be achieved in seven days with this technique.¹⁶

Dermatotraction using a subcuticular suture

A size 1 polydioxanone (PDS™, Neoxone®, Izmir, Turkey) subcutaneous suture is run continuously along the wound edges and tightened daily, until complete closure is achieved. Primary closure was achieved at an average of 25 days.¹⁷

Negative pressure wound therapy

NPWT is a valuable tool for managing fasciotomy wounds. It shortens the time to closure, whether by skin grafting or delayed primary closure. Yang et al.¹⁸ achieved definitive fasciotomy wound closure at an average of 6.7 days. NPWT's ability to reduce oedema enables delayed primary closure in these wound types. However, its use is limited by cost and the availability of consumables.

Cable tie technique

Several commercially available devices utilise cable ties to facilitate delayed primary wound closure. With this technique, cable ties are positioned along the wound edges, secured by staples, and tightened daily until closure is achieved.^{19,20} An average closure of 12 days is reported with this method.²⁰

Comparison of techniques

Of the techniques listed above, Steri-Strip™ closure most closely resembles our method. With this technique, 1.2 cm-wide steri-strips are applied perpendicular to the wound's long axis, leaving gaps between adjacent strips.¹⁴ In contrast, our method utilises 2.5 cm-wide tape applied with overlap, allowing for uniform tension distribution and functioning as a splint. The remaining techniques are invasive and may require application in an operating theatre.^{16,21} This aspect is a significant drawback, as theatre time is a valuable commodity at some health facilities in the country.

Classical tissue expansion with tissue expanders is contraindicated in open wounds. Most of these techniques stretch adjacent skin (external tissue expansion). External tissue expansion techniques, much like internal tissue expansion, use the skin's viscoelastic properties to produce stress relaxation and mechanical and biological creep. The endpoint of the tissue expansion process is to produce delayed direct wound closure.^{7,9,11,12,16,21,22}

In our study, all patients who underwent the taping process achieved healing without the need for a skin graft. The average time to delayed primary closure was 23 days, consistent with reports in the literature. Nonetheless, it still represents a relatively prolonged healing period. Despite this, avoiding a skin graft is a significant advantage. Moreover, the overall safety of the TAC technique was satisfactory; despite using non-sterile paper tape, no wound infections were observed. The scar aesthetics showed moderate outcomes, with a strong correlation between prolonged healing times and poorer scar aesthetics.

Delays in final wound closure were mainly due to limited theatre

availability; however, taping was continued while awaiting theatre access. This was a significant confounding factor in the study. Repeating the study in a different setting with better theatre access may be valuable. Delayed referrals also contributed to prolonged wound closure. By the time taping was initiated, significant oedema had already developed. Early and strict oedema management would likely help reduce the time to closure.

Our method of external tissue expansion is relatively easy to apply and can be taught to non-medical caregivers. This would facilitate outpatient management, potentially reducing hospital stays. The paper tape employed is inexpensive and readily available, making it a feasible option in resource-constrained environments. Micropore-type tape, originally designed for securing dressings, possesses properties that make it suitable for skin stretching, including hypoallergenicity, porosity, and adequate adhesiveness. To ease tape application, the senior author invented a tape-delivery device prototype, and further development is ongoing.

The SCAR scale, a validated photo-based scar assessment tool, was used to assess the resultant scars through photographs.⁶ Although the purpose was to obtain a more objective assessment of the outcome, there was moderate agreement among the three assessors, with even less agreement regarding individual cases. Given the subjectivity in rating individual scars, this was an expected finding. A comparison of the scale between taped wounds and those managed with other closure techniques was not conducted. A significant finding was the correlation between longer times to closure and poorer scar outcomes, likely due to prolonged inflammation. This relationship is demonstrated in Figure 4, which shows a 15-month follow-up scar with hyperpigmentation, hypertrophy, widening, and track marks.

The main limitations of this study include the small sample size and the non-comparative design. Future research should involve controlled, randomised trials comparing this method with other established techniques to better evaluate its efficacy and identify optimal indications. Long-term follow-up studies comparing outcomes between delayed primary closure and skin grafts are also warranted.

Conclusion

TAC is an effective method that may achieve secondary wound closure and facilitate delayed primary wound closure post-fasciotomy. This method can be applied to other wound types and is a useful addition to a surgeon's armamentarium.

Acknowledgements

The authors acknowledge the University of KwaZulu-Natal Plastic Surgery Team for assisting with data collection, and Mr Mahomva, Mr Ramdial, and Ms Ghoor for assisting with the scar ratings.

Conflict of interest

The authors declare no conflict of interest.

Funding source

The authors received no financial support for the research.

Ethical approval

Ethical approval was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (BREC/00005609/2023).

ORCID

NS Maseko  <https://orcid.org/0009-0005-2935-8684>M Daya  <https://orcid.org/0000-0002-1309-7126>

References

- Moran BJ, Quintana MT, Michael Scalea T, DuBose J, Feliciano DV. Two Urgency Categories, Same Outcome: No Difference After "Therapeutic" vs. "Prophylactic" Fasciotomy. *The American Surgeon*. 2023;89(4):614-20. <https://doi.org/10.1177/00031348211031860>.
- Jauregui JJ YS, Tsai J, Onuoha KO, Illical E, Paulino CB. Fasciotomy closure techniques. *J Orthop Surg (Hong Kong)* 2017. <https://doi.org/10.1177/2309499016684724>
- Bengezi O, Vo A. Elevation as a treatment for fasciotomy wound closure. *Can J Plast Surg*. 2013;21(3):192-4. <https://doi.org/10.1177/229255031302100303>.
- Weaver MJ, Owen TM, Morgan JH, Harris MB. Delayed primary closure of fasciotomy incisions in the lower leg: do we need to change our strategy? *J Orthop Trauma*. 2015;29(7):308-11. <https://doi.org/10.1097/BOT.0000000000000278>.
- Daya M, Nair V. Traction-assisted dermatogenesis by serial intermittent skin tape Application. *Plastic and Reconstructive Surgery*. 2008;122:1047-54. <https://doi.org/10.1097/PRS.0b013e3181858c68>.
- Kantor J. Reliability and photographic equivalency of the Scar Cosmesis Assessment and Rating (SCAR) Scale, an outcome measure for postoperative scars. *JAMA Dermatol*. 2017;153(1):55-60. <https://doi.org/10.1001/jamadermatol.2016.3757>.
- Barnes JW, Sherman G, Dubin J. Wound closure with acute dermatotraction. *J Surg Orthop Adv*. 2018;27(2):155-9. <https://doi.org/10.3113/JSOA.2018.0155>.
- Igoumenou VG, Kokkalis ZT, Mavrogenis AF. Fasciotomy wound management. In: Mauffrey C, Hak DJ, Martin IM, editors. *Compartment Syndrome: A Guide to Diagnosis and Management*. Cham (CH): Springer Copyright 2019, The Author(s). 2019. p. 83-95. https://doi.org/10.1007/978-3-030-22331-1_9.
- Johnson LS, Chaar M, Ball CG, et al. Management of extremity fasciotomy sites prospective randomized evaluation of two techniques. *Am J Surg*. 2018;216(4):736-9. <https://doi.org/10.1016/j.amjsurg.2018.07.033>.
- Kakagia D. How to close a limb fasciotomy wound: An overview of current techniques. *Int J Low Extrem Wounds*. 2015;14(3):268-76. <https://doi.org/10.1177/1534734614550310>.
- Kakagia D, Karadimas EJ, Drosos G, Ververidis A, Trypsiannis G, Verettas D. Wound closure of leg fasciotomy: comparison of vacuum-assisted closure versus shoelace technique. A randomised study. *Injury*. 2014;45(5):890-3. <https://doi.org/10.1016/j.injury.2012.02.002>.
- Krticka M, Ira D, Bilik A, Rotschein P, Svancara J. Fasciotomy closure using negative pressure wound therapy in lower leg compartment syndrome. *Bratisl Lek Listy*. 2016;117(12):710-4. https://doi.org/10.4149/BLL_2016_136.
- Lee JY, Jung H, Kwon H, Jung SN. Extended negative pressure wound therapy-assisted dermatotraction for the closure of large open fasciotomy wounds in necrotizing fasciitis patients. *World J Emerg Surg*. 2014;9:29. <https://doi.org/10.1186/1749-7922-9-29>.
- Harrah J, Gates R, Carl J, Harrah JD. A simpler, less expensive technique for delayed primary closure of fasciotomies. *The American Journal of Surgery*. 2000;180(1):55-7. [https://doi.org/10.1016/S0002-9610\(00\)00409-8](https://doi.org/10.1016/S0002-9610(00)00409-8).
- Kenny EM, Egro FM, Russavage JM, Spiess AM, Acartürk TO. Primary closure of wide fasciotomy and surgical wounds using rubber band-assisted external tissue expansion: A simple, safe, and cost-effective technique. *Ann Plast Surg*. 2018;81(3):344-52. <https://doi.org/10.1097/SAP.00000000000001506>.
- Karkos CD, Papoutsis I, Giagtzidis IT, et al. Management of postfasciotomy wounds and skin defects following complex vascular trauma to the extremities using the external tissue extender system. *Int J Low Extrem Wounds*. 2018;17(2):113-9. <https://doi.org/10.1177/1534734618765343>.
- Kılıçarslan K, Erdoğan Y, Karaman Y, Alkan H, Biçici V. Comparison of dermatotraction and negative pressure wound therapy for closure of cruris fasciotomy after 2023 Kahramanmaraş earthquake. *Jt Dis Relat Surg*. 2023;34(2):497-502. <https://doi.org/10.52312/jdrs.2023.1119>.
- Yang CC, Chang CS, Webb LX. Vacuum-assisted closure for fasciotomy wounds following compartment syndrome of the leg. *J Surg Orthop Adv*. 2006. <https://www.jsaonline.com/archive/2006/spring-2006/vacuum-assisted-closure-fasciotomy/>.
- Minakshi G, Ajinkya D, Kalyani A, et al. A prospective & retrospective, observational study comparing the efficacy of cable tie with secondary suturing in extremity necrotizing fasciitis. *Int J Acad Med Pharm*. 2025;7(4):569-73.
- Hsieh CH, Ho CY, Roan TL, Chang CW. Nylon cable ties-assisted delay primary closure of fasciotomy wound in patients of forearm compartment syndrome. *Formosan Journal of Surgery*. 2024;57(2):52-8. <https://doi.org/10.1097/F59.0000000000000086>.
- Yoo JJ, Fullerton N, Hui-Chou HG. Continuous external tissue expansion closure technique for management of forearm compartment syndrome releases and simple upper-extremity wounds. *J Hand Surg Am*. 2021;46(7):e30.e1-e9. <https://doi.org/10.1016/j.jhssa.2021.01.008>.
- Fowler JR, Kleiner MT, Das R, Gaughan JP, Rehman S. Assisted closure of fasciotomy wounds: A descriptive series and caution in patients with vascular injury. *Bone Joint Res*. 2012;1(3):31-5. <https://doi.org/10.1302/2046-3758.13.2000022>.



MEDIKA SA

WHERE
HEALING
HAPPENS



SCAN ME



SCAN ME

Contact Number:
+27 12 667 6243/4Customer support:
info@melcura.co.zaProudly manufactured
in South Africa

Roles of those involved with wound care in Tshwane District's residential aged care facilities: findings from a stakeholder analysis

GC Boersema,  Y Botma,  M Mulder 

School of Nursing, University of the Free State, South Africa

Corresponding author, email: eboergc@unisa.ac.za

<https://doi.org/10.36303/WHSA.4859>

Background: Older people are at an increased risk for wounds and require an evidence-based, interprofessional approach. This paper reports on a stakeholder analysis that aimed to identify the stakeholders important to implementing evidence-based wound care in residential aged care facilities (RACF) in the Tshwane District, based on their levels of involvement in wound care and organisational change processes, and to explore their roles.

Methods: A multimethod design was used. Quantitative data (a score rating importance) were collected through structured interviews with 14 nurse managers at 14 RACFs from lower-, middle-, and higher-income areas. An open-ended interview question explored stakeholder roles in wound care and organisational change processes. Qualitative data were analysed using both deductive and inductive approaches.

Results: Twenty-six stakeholder types were identified. The nurse manager was perceived as the most important stakeholder in establishing evidence-based wound care, followed by wound care practitioners, general practitioners, administrative managers, nursing staff, care workers, residents and their families, pharmaceutical company representatives, social workers, physiotherapists, occupational therapists, dietitians, and a few external organisations. Stakeholders contributed directly and indirectly to wound care, education, and change implementation.

Conclusion: The nurse manager emerged as a central coordinating figure in wound care and change processes within RACFs. However, resource constraints limited access to qualified wound care practitioners and other professionals needed for managing complex wounds in older people. Stakeholder engagement for establishing evidence-based wound care should be responsive to each RACF's unique staffing and organisational structures.

Keywords: stakeholder analysis, roles in wound care, organisational change, evidence-based practice, interprofessional, implementation, co-design

© Medpharm

Wound Healing Southern Africa 2026;19(1):12-17

Introduction

An interprofessional approach is important for managing wounds due to the complex interplay of factors influencing wound development and healing.^{1,2} Interprofessional care occurs when multiple healthcare workers from different professions, the patient, the family, and the community work together through an interdependent collaborative approach, share decision-making, and set common goals to deliver the highest quality of care.³⁻⁵ The increased risks for skin frailty and wounds among older people increase the need for optimal prevention and management practices, including an evidence-based interprofessional approach.⁶ For example, a bedridden older person in frail care is at a high risk for pressure injuries, requiring a nutritional specialist's support.

However, due to the fragmented healthcare system and persistent socio-economic inequities, access to a full interprofessional team is often limited.⁷ This is also true for older people residing in RACFs. Although the need for residential aged care is growing due to the ageing population, which is predicted to double by 2050, access is severely constrained in South Africa, with 394 government-subsidised facilities and 1 713 registered community-based care services.^{8,9} Furthermore, in South African RACFs, many barriers exist to translating new evidence into daily practice, including the complexity of the implementation process, an inadequate skills mix, and resource limitations.^{10,11}

The authors developed a framework to guide the implementation of an evidence-based and interprofessional approach to wound care in RACFs.¹² During the framework development process, a stakeholder analysis was conducted to identify the key stakeholders whose input was required to ensure the framework's relevance and applicability. This paper presents the findings of the stakeholder analysis. The specific objective of the stakeholder analysis, was to identify the key stakeholders (most important) involved in wound care and organisational change processes at RACFs in the Tshwane District, and to explore their roles. Because implementing evidence-based practice often requires changes to established clinical routines, identifying both stakeholders involved in wound care delivery and organisational change was essential. Insight into their roles provides a foundation for designing context-specific implementation strategies and reveals the nature of, and the gaps in, the interprofessional approach.

Methods

This section includes study design, population, sampling and recruitment strategies, methods of data collection and analysis, trustworthiness, and ethical considerations.

Study design

A multimethod design was used, integrating quantitative and qualitative data collected during a telephonic interview with each

participant. Quantitative data were collected by identifying stakeholders and scoring importance of each stakeholder based on their level of involvement. Qualitative data were generated by exploring the roles of each identified stakeholder. Data were collected between April and May 2021. The quantitative findings are provided in Supplementary file 1 (Table II), and the qualitative findings are reported in the results section.

Population

The population was nurse managers at RACFs in the Tshwane District, Gauteng. Residential aged care is limited in South Africa, but mostly present in urban areas, with more than a third in the Gauteng Province.^{9,13-15} The urban setting is expected to have more access to professionals than rural areas and was more suitable to identify the widest range of stakeholders involved with wound care in RACFs.

Sampling and recruitment

Purposive maximum variation sampling was used to select RACFs differing by governance type and geographical area. Governance types included welfare-funded facilities, faith-based organisations (FBO) and other non-governmental organisations (NGOs), and high-income retirement estates to capture variation in resources. Geographical location was also considered, as income levels vary across Tshwane, with generally higher-income areas in the east and lower-income areas in the central and western regions. Resource availability influences stakeholder involvement in wound care. For example, residents with medical aid coverage may access a broader multidisciplinary team. To ensure representation of stakeholders involved in managing different wound types, selected RACFs were required to provide both frail care and assisted living services.

The welfare-funded facilities, NGOs, and FBOs should have been registered as non-profit organisations. The sample was drawn from 17 Department of Social Development (DSD)-registered non-profit RACFs and 24 privately owned retirement estates identified through an online directory. A list of RACFs and their contact details was compiled from publicly available information by governance type (horizontal row in the matrix) and geographic area (vertical row). The researcher contacted the nurse manager at each identified facility, starting from the top of each governance type list, and moved to the next governance type list for the next interview, ensuring variability. During this first telephonic discussion, eligibility of the RACF and the nurse manager was confirmed, the study was explained, and the study information letter was emailed to the nurse manager to sign informed consent.

Nurse managers were eligible if they were registered nurses, currently in the nurse manager position at the RACF, and could converse in English. Where initial contacts were unavailable, additional participants were recruited from the same governance type list or through snowball sampling to achieve maximum variation. The sampling continued until data saturation was reached at the 12th interview; two more interviews were conducted to confirm data saturation.

Data collection

Data were collected through individual telephonic interviews guided by a semi-structured interview guide. The questions were informed by the Registered Nurses' Association of Ontario's definition of stakeholders, i.e. individuals, groups, or organisations directly or indirectly affected by, or able to directly or indirectly influence, a practice change.¹⁶ In

this study, practice change referred to changes within RACFs aimed at ensuring evidence-based wound care.

Accordingly, the interviews sought to identify the following five levels of involvement: directly involved with wound care, indirectly involved with wound care, should be involved for evidence-based wound care, involvement in decision-making for organisational change, and supporting organisational change. The interview guide was tested with a registered nurse involved with wound care at an RACF to confirm the clarity of the questions. The questions were clear, but an additional question was included: which stakeholder the nurse manager would prefer to involve to support effective change.

Each identified stakeholder type (e.g. registered nurse) was captured on a hardcopy sheet, and the level of importance was scored on a scale of 0 (not important) to 10 (most important) for each level of involvement. The participant was asked to elaborate on the perceived involvement and the role of each identified stakeholder. All interviews were audio-recorded with participants' consent. To protect confidentiality, each participant was assigned a unique code.

Data analysis

Quantitative data (the score between 0 and 10) were summed across all levels of involvement to generate a total score for each stakeholder type. A higher score indicates greater importance for involvement in evidence-based wound care and organisational change. For management of the qualitative data, audio recordings were transcribed verbatim by an experienced transcriber, then checked for accuracy and imported into ATLAS.ti version 9. The transcripts were analysed deductively using the level of involvement as the primary code. Thereafter, inductive analysis was used to identify roles. Similar roles were iteratively merged until a set of roles was established for each level of involvement per stakeholder. Where distinct roles could not be clearly defined, participant quotations were used to illustrate the nature and extent of involvement.

Trustworthiness

Credibility was enhanced through methodological and data triangulation, member-checking, and data saturation. Quantitative importance scores and qualitative narrative responses provided complementary perspectives. Sample size was determined by data saturation, with two additional interviews conducted thereafter. Transferability was supported through maximum variation sampling and thick descriptions of sampling and data. Dependability was maintained through transparent, traceable methods, as well as documentation and secure storage of audio-recordings, transcripts, and data files. Confirmability was achieved through member-checking with six participants. Authenticity was upheld through continuous critical reflection, with findings supported by verbatim quotations.

Ethical considerations

Ethical approval was obtained from the Health Sciences Research Ethics Committee (UFS-HSD2019/0600/2506-0001). All participants signed informed consent.

Results

The 14 participants' years of experience and the characteristics of their respective RACFs are presented in Table I. Seven participants were

Table 1: Participant and nursing home characteristics

Participant characteristics		RACF characteristics		
Participant code	Experience at the RACF	Governance type	Size of RACF and number of beds at frail care facility	Geographical area
MI01	6 years	Nursing home, NGO	Small - 40 beds	South-west, suburban
MI02	3 years	Nursing home, NGO	Medium - 80 beds	Central,* suburban
MI03	3.5 years	Nursing home, FBO	Small - 23 beds	Central-east, suburban
MI04	34 years	Nursing home, NGO	Small - 32 beds	Central; urban
LI01	4.4 months	Nursing home, welfare	Medium - 20 beds	Central-west, suburban
LI02	1.5 months	Nursing home, welfare, government-subsidised	Small - 32 beds	North-east, suburban
LI03	3 years	Nursing home, welfare	Medium - 80 beds	East, suburban
HI01	7 months	Retirement estate, private	Large - 32 beds	Far east, suburban
HI02	4 months	Retirement estate, private	Large - 10 beds	North, suburban
HI03	2.5 years	Retirement estate, private	Large - 20 beds	North, suburban
HI04	17 years	Retirement estate, private	Large - 30 beds	East, suburban
HI05	3 years	Retirement estate, private	Medium - 16 beds	East, suburban
HI06	17 years	Retirement estate, private	Large - 170 beds	Central-east, suburban
HI07	2 years	Retirement estate, private	Medium - 40	North, suburban

RACF size: small < 100 residents, medium 100–300 residents, large > 300 residents.

* Central denotes city.

HI – higher income, LI – lower income, MI – middle income, NGO – non-governmental organisation, RACF – residential aged care facility, FBP – faith-based organisation

employed at retirement estates in higher-income areas (HI01–07), four at NGO and FBO RACFs serving middle-income residents (MI01–04), and three at welfare-funded RACFs serving lower-income residents (LI01–03).

We identified 26 different stakeholders, of whom 21 were directly or indirectly involved with wound care and process change in the 14 RACFs. The other five stakeholders were those whom the nurse managers wished were more involved for an evidence-based approach to wound care, or to establish change, including a psychologist or psychiatrist, pastor, counsellor, the South African Nursing Council, and other RACFs. The roles of 21 identified stakeholders are reported in descending order of perceived importance.

Nurse manager

Across the 14 RACFs, the nurse manager is considered the most important for establishing evidence-based wound care through indirect involvement in supervision, guidance, care coordination, networking for support, ordering wound care products, and developing wound care protocols. The nurse manager also makes most decisions related to organisational change and supports change processes.

“So, it is very important to them [the nurses performing wound care] and they report directly to me.” (MI03)

“Also communicates with the wound care specialist if there is [sic] any financial problems or family problems, whatever, because the family should be involved in the progress of the wound ...” (HI01)

Wound care practitioner

The wound care practitioner, a professional nurse who operates an independent private practice and provides consultation services to residents at the RACF, was regarded as the second most important. In some RACFs, the wound care practitioner was solely responsible for

providing wound care, whereas in other facilities, their role was limited to providing guidance and recommendations. However, in many RACFs, their involvement comprised a combination of in-person consultations for wound bed preparation and advisory support to the RACF nursing staff. A further advantage of involving the wound care practitioner is their expertise in facilitating referrals to appropriate members of the multidisciplinary team. Additionally, the wound care practitioner was regarded as essential in promoting an evidence-based approach, supporting clinical decision-making, and driving organisational change.

“We have wound sisters. They are actually the people coming in, should the person, for instance, suffer from a wound that is more than superficial, for example, like a bedsore.” (MI02)

General practitioner

General practitioners were perceived as highly involved stakeholders in indirect wound care management across most RACFs. Their role primarily included holistic assessment of residents, prescribing wound treatment, conducting regular consultations at the RACF, and supporting referrals for specialised wound care services. Residents without medical aid were generally treated by government-employed practitioners, while those with medical aid consulted private practitioners. Although most participants preferred wound care practitioners for specialised wound management, general practitioners remained essential members of the interprofessional team, particularly for prescribing antibiotics and providing referral letters required for medical aid approval of private wound care services. Furthermore, participants highlighted that older residents often place greater trust in general practitioners than nurses, which should be considered for facilitating acceptance and implementing new wound care interventions.

“... if we have really a specific wound that we think needs special care, we will get the wound care specialist; we have a special wound care

specialist who works with us. So, I can refer her, and I can ask the doctor, if you have a good relationship with the doctor, then you can just ask her and ask her to write a script for the wound care specialist because she won't work unless she has a written reference from the doctor." (HI02)

Surgeons may be involved indirectly with postoperative wound care instructions. However, they do not typically consult residents at RACFs.

Administrative management

Participants primarily identified administrative managers as key decision-makers, underscoring their important role in supporting and facilitating change initiatives. Administrative management included general managers (typically one at each RACF responsible for overseeing overall operations), the RACF's board of trustees, and outsourced companies managing frail care services, where applicable and typically at retirement estates. The board of trustees and outsourced frail care company management generally provided final approval for major decisions. However, the general manager at the RACF is mostly involved in operational and financial decision-making, family-related matters, and implementing directives from the Department of Health (DoH) and the board of trustees. While nurse managers remained primarily responsible for clinical decisions because of their professional expertise, decision-making was commonly described as a collaborative process between the nurse manager and general manager.

"Well, it is a type of team effort between myself and the manager ... he would make a suggestion and then on our side we sort of incorporate it ... wherever it concerns the family and outside changes ... he handles that, when it is nursing-related, or resident-related directly, we, I usually handle it." (MI03)

Registered nurse

Registered nurses played a central role in direct wound care within 13 RACFs, often with the support of staff nurses, auxiliary nurses, and care workers. Their indirect role includes task delegation, supervision, reporting to nurse managers, and providing in-service training. Because of their central role in clinical care, registered nurses are essential for supporting change initiatives at the RACFs.

"... they don't have the final say, but they need to implement the change." (HI04)

However, some participants expressed concern that many registered nurses experience difficulties managing wound care independently due to limited updated training in the rapidly evolving field of wound care.

Staff nurses, auxiliary nurses, and care workers

The composition and roles of the front-line care teams varied across RACFs. Some RACFs did not employ staff nurses, while others did not employ auxiliary nurses. One participant reported that their RACF does not employ care workers. Staff nurses often performed wound care tasks similar to those of registered nurses.

"Then the staff nurse do [sic] not perform the wound care for the big wounds, for the large wounds. They would do them under the supervision of a professional nurse together with a professional nurse." (LI03)

Auxiliary nurses fulfilled supportive roles and provided wound care when delegated and supervised. However, not all nurse managers allow the auxiliary nurses to assist with wound care. Participants regarded the auxiliary nurses' and care workers' role in the early identification and reporting of skin changes as essential for prompt intervention and prevention of wound deterioration.

"So, the ordinary bruises and cuts, the auxiliary nurse will do, or the assistant nurse, very important because they bed wash the residents, they expose their bodies, so they immediately report any discolouring of skin, or a bruise, or when the skin is open, or you know, something like that." (MI01)

Care workers were primarily involved in wound prevention through assistance with daily activities rather than direct wound care. In some RACFs, carefully selected, trained, and supervised care workers managed minor wounds, such as skin tears, bruises, and blisters.

"Like I said, let's say for instance if there is a skin tear, they know what to do to treat the skin tear initially, because we've done the basics with all of them to tell them, this is what you look for, if you see anything that is red or it looks like a little blister, you need to report this. Like, the basic things they can handle, but they still report back to the sister on duty." (HI04)

Residents and their family

Among the assisted and independent living residents, the roles included the responsibility of reporting a wound and self-care. However, several challenges were reported, including reluctance to report wounds and not being aware of the importance of best-practice wound care. Residents providing wound care for themselves was not a role reported by the participants. Families were primarily involved through financial support and health promotion. Most participants viewed the family's involvement as essential, though one felt families should be informed rather than included in decision-making. Some participants mentioned that families were not involved enough.

"I work in an older people environment where they are reluctant to come forward if there is something wrong ... for example, I've got a lady that has breast cancer, and she waited until it was totally too late ... old people don't want people to know that there is something wrong, because they don't want to go to hospital, or they don't want to go to doctors or something like that." (HI03)

Representatives from pharmaceutical wound care product companies

Pharmaceutical companies supply wound care products and offer guidance through employed representatives with wound care and product knowledge, with one company providing staff training courses in wound care. Participants rated their importance variably, with some relying heavily on the representatives while others did not engage them. RACFs in the lower- and middle-income areas with residents who have limited access to wound care practitioners depended primarily on company representatives for advice and products.

"If she comes to assess a wound and give advice to us, then she usually, I usually do the dressing, and then she advises me, and then I go and teach my staff." (MI03)

Rehabilitation specialists

Rehabilitation specialists, including social workers, physiotherapists, occupational therapists, and dietitians, were identified for their indirect involvement and importance in an evidence-based approach to wound care. Social workers were valued across both low- and high-income settings for addressing psychological, financial, and family needs, as well as managing conflicts between residents, families, and nursing staff.

"... there is often a money problem, and there are often claims that the nurses did something wrong, or they are worried, and she can talk to them ... you know, sometimes the patient says she had no money, and they are very rich, so she [social worker] looks after all that ..." (H106)

Occupational therapists, physiotherapists, and dietitians were engaged in only a few RACFs and contributed in their respective roles to optimising functional status, mobilisation, circulation, and nutritional support for wound healing. Dietitians commonly contributed to menu planning at the RACFs.

Other organisations

The four participants who indicated the DSD and Department of Health as stakeholders regarded them as important. However, limited references to these bodies suggest minimal direct involvement in RACFs, consistent with findings on the DSD's lack of oversight in long-term care.⁹

Paramedics were at times involved when assisted or independent living residents sustained traumatic wounds, such as fall-related lacerations or head injuries, particularly in cases of uncontrolled bleeding associated with warfarin use. Laboratories supported wound care by processing wound swab samples. The public sector hospital wound care clinics and primary healthcare clinics were mentioned by one participant from a welfare RACF where many residents attended public healthcare services.

Discussion

This study identified and mapped stakeholders involved in RACFs, including those contributing directly or indirectly to wound care delivery, those essential for an evidence-based approach, and those with decision-making or change-support roles. By weighing stakeholders' importance according to their level of involvement, this study offers a nuanced picture of their relative importance in organisational change initiatives aimed at strengthening evidence-based wound care – an approach rarely employed in prior RACF wound care research. Engaging the most involved and influential stakeholders in co-design and implementation is essential for commitment, ownership, and sustainability.^{17,18} While co-design is gaining traction in research in residential aged care, the application to wound care intervention design in RACFs remains limited.¹⁹

Beyond identifying the most influential stakeholders, this study provides insight into how each stakeholder contributes to wound care, revealing both alignment with interprofessional practice principles and notable gaps. The nurse manager, general manager, wound care practitioner, nursing staff, and general practitioner were identified as the most important stakeholders, consistent with the literature positioning nursing leadership and medical practitioners as central to

clinical governance.²⁰ Collaborative decision-making was an established practice across RACFs, involving administrative managers, clinical staff, wound care practitioners, the patients, and their families, which aligns with an interprofessional approach.^{4,21} However, the findings lacked emphasis on the central position of the patient and their family. The study aligns with the literature, indicating that family members play a significant role in RACF care, emphasising the necessity to engage them in decision-making.²²

Knowledge gaps were identified across patients, families, and nursing staff, highlighting the need for targeted wound care education tailored to each group's level of responsibility. While the composition of front-line nursing staff varies across RACFs, each member holds an important responsibility in wound prevention and care. The complexity of managing various wound types, including acute, chronic, maintenance, and non-healable wounds, requires comprehensive training programmes developed for each level of staff based on their scope of practice. Furthermore, the involvement of experienced and qualified wound care practitioners and the multidisciplinary team is essential for an evidence-based approach.

Resource constraints restrict specialist involvement, particularly in limited medical aid access. Additionally, in South Africa, the lack of formal regulation of wound care training and the absence of recognition of wound care as a nursing speciality remain barriers to ensuring that wound care services are provided by practitioners with verified specialised expertise. The varying involvement of wound care practitioners, especially in complex wound management, was evident across the RACFs. Involvement of wound care practitioners was also important for access to advanced wound care dressings. RACFs located in lower-income areas engaged private wound care practitioners less frequently and placed greater value on the involvement of representatives from pharmaceutical and wound care product companies for providing access to expertise, education, and resources. However, reliance on industry, especially if limited to a single company, may contribute to a product-driven approach to care. The benefits and challenges of industry support in practice and research remain an ongoing debate in the literature.^{23,24}

Access to rehabilitation professionals, including dietitians, occupational therapists, and physiotherapists, was notably limited, particularly in lower- and middle-income RACFs, highlighting a critical gap in interprofessional wound prevention and management.²⁵ Social workers should be integral to all improvement initiatives, given their unique and existing role in addressing the psychological and financial needs of the resident and their family. A need was identified for enhanced emotional and psychosocial support for older people living with wounds, provided both by healthcare professionals, such as psychologists and social workers, and community stakeholders, including faith-based leaders.

Study limitations

As the study was purposively conducted in an urban setting to capture the broadest range of wound care stakeholders, rural contexts are likely to reflect fewer involved stakeholders. Therefore, a dedicated stakeholder analysis in rural RACFs is recommended to identify context-specific needs.

A limitation of this study is that the instrument used to rate stakeholder importance per level of involvement was not validated. The resulting scores reflect relative importance compared with other stakeholders, but lack standalone interpretive meaning. Qualitative findings

were reported to provide a more nuanced understanding of each stakeholder's role and significance. A further limitation is that the findings only reflect the perspectives of nurse managers. While nurse managers offer valuable insight into stakeholder involvement, input from other stakeholders may expand the identified stakeholder landscape or yield differing views on their relative importance.

Conclusion

This study offers valuable insight into the stakeholders involved in wound prevention and management, and decision-making at RACFs. The findings identify the key stakeholders who should be engaged in implementation initiatives to support the adoption of evidence-based wound care and highlight gaps that must be addressed to strengthen the interprofessional approach to wound care in RACFs. The nurse manager emerged as a central coordinating figure, with collaborative decision-making reflecting interprofessional practice across most RACFs. However, gaps were identified, particularly resource constraints, limiting access to qualified wound care practitioners and rehabilitation professionals needed to manage complex wounds in older and frail residents.

Future research should explore and evaluate innovative strategies to improve access to the expertise of these stakeholders and specialist healthcare professionals, particularly in resource-constrained settings. Future wound care governance frameworks must extend beyond clinical roles to encompass psychosocial and financial support, recognising wounds' profound impact on residents' quality of life. Stakeholder engagement should be context-specific, responsive to each RACF's unique staff composition, and inclusive of patients and families within a person-centred approach. This study provides a foundation for future research aimed at co-designing, implementing, and evaluating stakeholder-informed interventions to strengthen evidence-based and interprofessional wound care in RACFs.

Acknowledgements

The author extends her gratitude to all participants for their participation in this study.

Conflict of interest

The author declares no conflict of interest.

Funding source

Funding was received from the University of the Free State, Postgraduate School Doctoral Bursaries for PhD tuition fees, and the University of South Africa, Academic Qualification Improvement Programme, for research expenses related to data collection, analysis, and editing.

Ethical approval

Ethical approval was obtained from the University of the Free State, Health Sciences Research Ethics Committee (UFS-HSD2019/0600/2506-0001). All participants signed informed consent.

ORCID

GC Boersema  <https://orcid.org/0000-0001-5091-7333>

Y Botma  <https://orcid.org/0000-0003-1462-4079>

M Mulder  <https://orcid.org/0009-0006-1526-8263>

References

1. Heerschap C, Nicholas A, Whitehead M. Wound management: investigating the interprofessional decision-making process. *Int Wound J*. 2019;16(1):233-42. <https://doi.org/10.1111/iwj.13017>.

2. Johnston S, Parker CN, French S, Mitchell J, Theobald K. What interprofessional education teaching and learning approaches are being implemented in baccalaureate health professional curricula in wound care education? A scoping review. *Nurse Educ Pract*. 2024;79:104080. <https://doi.org/10.1016/j.nepr.2024.104080>.
3. Casimiro L, Hall P. Interprofessional education student pre-reading document [Internet]. Canadian Health Workforce Network; 2011. Available from: [https://www.hhr-rhs.ca/index.php?option=com_mtree&task=viewlink&link_id=75&lang=en\[S2.1\]\[S2.2\]](https://www.hhr-rhs.ca/index.php?option=com_mtree&task=viewlink&link_id=75&lang=en[S2.1][S2.2]).
4. Thistlethwaite JE, Musaeus P, Müller M. Editorial: opportunities and challenges of interprofessional collaboration and education. *Front Med (Lausanne)*. 2024;11:1392690. <https://doi.org/10.3389/fmed.2024.1392690>.
5. who.int [Internet]. Framework for action on interprofessional education & collaborative practice. Geneva: World Health Organization; 2010. Available from: [https://www.who.int/publications/i/item/framework-for-action-on-interprofessional-education-collaborative-practice\[S3.1\]](https://www.who.int/publications/i/item/framework-for-action-on-interprofessional-education-collaborative-practice[S3.1]).
6. Beeckman D, Campbell KE, Leblanc K, et al. Best practice recommendations for holistic strategies to promote and maintain skin integrity [Internet]. London: Wounds International; 2020. Available from: [http://hdl.handle.net/10072/403084\[S4.1\]](http://hdl.handle.net/10072/403084[S4.1]).
7. Gordon T, Booysen F, Mbonigaba J. Socio-economic inequalities in the multiple dimensions of access to healthcare: the case of South Africa. *BMC Public Health*. 2020;20(289). <https://doi.org/10.1186/s12889-020-8368-7>.
8. Moore E, Kelly G. Struggles over elder care in South Africa. *Dev South Afr*. 2024;41(6):1062-77. <https://doi.org/10.1080/0376835X.2024.2374823>.
9. Mahomed Y. Residential facilities for the elderly in South Africa 2021 [Internet]. Who Owns Whom (Pty) Ltd - African Business Information; 2021. Available from: [https://www.whoownswhom.co.za/store/residential-facilities-elderly-south-africa/\[S5.1\]](https://www.whoownswhom.co.za/store/residential-facilities-elderly-south-africa/[S5.1]).
10. Kilian M, Van der Merwe TR, du Toit SHJ. Evidence-based practice: implementing REIS findings in South African aged care facilities. *OTJR (Thorfare N J)*. 2024;44(1):106-16. <https://doi.org/10.1177/15394492231164948>.
11. Nicholson EC, van der Heever MM, Young C, van der Merwe AS. Barriers and facilitators to implementing staffing models in South African long-term care facilities: a qualitative study. *BMC Nurs*. 2025;24(1326). <https://doi.org/10.1186/s12912-025-03959-0>.
12. Boersema GC, Botma Y, Mulder M. Improving wound care in residential aged care facilities: development, validation and use of a novel knowledge translation framework. *Int J Older People Nurs*. 2025;20(5):e70044. <https://doi.org/10.1111/opn.70044>.
13. Ashwell A, Jacobs R, Docrat S, Schneider M. The impact of COVID-19 on long-term care facilities in South Africa with a specific focus on dementia care [Internet]. STRIDE South Africa; 2020. Available from: [https://ltccovid.org/wp-content/uploads/2021/02/COVID-19-Long-Term-Care-Situation-in-South-Africa-10-July-2020-1.p\[S6.1\].pdf](https://ltccovid.org/wp-content/uploads/2021/02/COVID-19-Long-Term-Care-Situation-in-South-Africa-10-July-2020-1.p[S6.1].pdf).
14. Moore E. Long-term care system profile: South Africa [Internet]. Global Observatory of Long-Term Care, Care Policy and Evaluation Centre, London School of Economics and Political Science; 2025. Available from: [https://goltc.org/system-profile/south-africa/\[S7.1\]](https://goltc.org/system-profile/south-africa/[S7.1]).
15. rentechdigital.com [Internet]. List of nursing homes in South Africa. Smartscribers; 2026. Available from: [https://rentechdigital.com/smartscriber/business-report-details/list-of-nursing-homes-in-south-africa\[S8.1\]](https://rentechdigital.com/smartscriber/business-report-details/list-of-nursing-homes-in-south-africa[S8.1]).
16. Registered Nurses Association of Ontario. Toolkit: implementation of best practice guidelines [Internet]. Toronto: Registered Nurses Association of Ontario; 2012. Available from: [chrome-extension://efaidnbmnnnibpcajpcgclefindmkaj/https://rnao.ca/sites/rnao-ca/files/RNAO_ToolKit_2012_rev4_FA.pdf\[S9.1\]](chrome-extension://efaidnbmnnnibpcajpcgclefindmkaj/https://rnao.ca/sites/rnao-ca/files/RNAO_ToolKit_2012_rev4_FA.pdf[S9.1]).
17. Dingelstad C, Hodyl N, Wyse R, et al. Co-production, co-creation and co-design in primary health care: a scoping review of design, implementation, impact and sustainability. *Health Expect*. 2025;28(5):e70447. <https://doi.org/10.1111/hex.70447>.
18. Holcomb J, Ferguson GM, Sun J, Walton GH, Highfield L. Stakeholder engagement in adoption, implementation, and sustainment of an evidence-based intervention to increase mammography adherence among low-income women. *J Cancer Educ*. 2022;37(5):1486-95. <https://doi.org/10.1007/s13187-021-01988-2>.
19. Westworth SE, Lu A, Long KM, Andrew NE. Evaluating co-design processes used in the development of healthcare interventions in residential aged care: a scoping review. *Public Health (Oxf)*. 2025;47(4):814-27. <https://doi.org/10.1093/pubmed/dfaf111>.
20. Nhongo D, Hendricks J, Bradshaw J, Bail K. Leadership and registered nurses (RNs) working after-hours in residential aged care facilities (RACFs): a structured literature review. *J Clin Nurs*. 2018;27(21-22):3872-81. <https://doi.org/10.1111/jocn.14565>.
21. Beckingsale L, Wilkinson T, Anakin M. Towards a conceptualisation of collaborative decision-making within interprofessional collaborative practice: a concept analysis using scoping review methodology. *BMC Med Educ*. 2026;26(743). <https://doi.org/10.1186/s12909-026-09085-y>.
22. Coe NB, Werner RM. Informal caregivers provide considerable front-line support in residential care facilities and nursing homes. *Health Aff (Millwood)*. 2022;41(1):105-11. <https://doi.org/10.1377/hlthaff.2021.01239>.
23. Martin PA. The challenge of institutionalised complicity: researching the pharmaceutical industry in the era of impact and engagement. *Social Health Illn*. 2022;44(Suppl 1):158-78. <https://doi.org/10.1111/1467-9566.13536>.
24. Shorney R. Working with industry for improved patient outcomes. *Br J Nurs*. 2014;23(Suppl 6):S14-20. <https://doi.org/10.12968/bjon.2014.23.Sup6.S14>.
25. Meulenbroeks I, Raban MZ, Seaman K, Westbrook J. Therapy-based allied health delivery in residential aged care, trends, factors, and outcomes: a systematic review. *BMC Geriatr*. 2022;22(712). <https://doi.org/10.1186/s12877-022-03386-9>.

Supplementary file available online

Copper oxide-impregnated dressings in the management of complex diabetic foot wounds: a case series

B Davids 

Cape Advanced Wound Care Centre, South Africa

Corresponding author, email: brindavids@gmail.com<https://doi.org/10.36303/WHSA.4132>

Background: Diabetic foot ulcers (DFU) result from peripheral neuropathy and arterial diseases. Among 537 million adults with diabetes globally, 19–34% develop DFUs.¹ DFUs have a 10% mortality rate within the first year after diagnosis.^{2,3}

Methods: A retrospective review was conducted of three patients with complex diabetic foot wounds managed at a specialist wound care centre in Cape Town, South Africa, between 2022 and 2023. These complex wounds would have been managed with negative pressure wound therapy (NPWT); however, due to financial constraints or limitations, its use was either prematurely discontinued or not authorised by the funding bodies. Copper oxide-impregnated dressings (COD) were applied immediately postoperatively (day 0), with dressing changes on days 3 and 7, followed by twice-weekly changes until complete wound closure.

Results: The wounds in the three cases demonstrated rapid granulation within 7–11 weeks. No recurrence of infection, hypersensitivity reactions, or local irritation was observed. The dressings were well tolerated, maintained antimicrobial activity for up to seven days, and required no pre-soaking before application.

Conclusion: CODs demonstrated favourable healing outcomes in complex diabetic foot wounds, even in resource-limited settings. This case series represents an early real-world clinical experience with CODs as a viable alternative when NPWT is unavailable or contraindicated.

Keywords: copper oxide-impregnated dressings, wound care, South Africa, wound closure strips, negative pressure wound therapy.

© Medpharm

Wound Healing Southern Africa 2026;19(1):18-20

Introduction

DFUs are a severe, complex complication of diabetes, characterised by high morbidity, frequent hospitalisation, and significant amputation risk. Armstrong et al.⁴ report that approximately 18.6 million people worldwide are affected by DFUs annually, with 80% of lower extremity amputations preceded by these ulcers. Its pathogenesis involves a critical triad: neuropathy, vascular insufficiency, and secondary infection.⁵

Copper-oxide dressings release cuprous ions that stimulate growth factors (e.g. vascular endothelial growth factor), collagen cross-linking, and antimicrobial activity.⁶ The CODs demonstrated potent, wide-spectrum biocidal activity, achieving a greater than 10 000-fold (4-logs) reduction in viable microbial titres for most tested microorganisms within three hours of exposure.⁷ This potent efficacy was maintained even after seven consecutive daily inoculations of high bacterial titres, showcasing the stability and prolonged antimicrobial protection provided by the cuprous oxide microparticles.⁷ COD products are



Figure 1: Wound status at initiation of copper oxide-impregnated dressings (week 1), progress (week 8), and complete epithelialisation (week 11)

approved by the Food and Drug Administration and European Union for acute and chronic wounds (including DFUs).⁸ In vitro and animal studies have shown that CODs markedly accelerate wound closure, upregulate pro-healing genes, and kill bacteria (often outperforming silver dressings).^{8,9} Melamed et al.¹⁰ reported that CODs used in chronic diabetic ulcers produced dramatic granulation and rapid size reduction.

In South Africa, access to NPWT is significantly limited due to restrictions imposed by medical aid funding and high costs, which results in many patients lacking access to advanced wound care as recommended by clinical guidelines. CODs were used as adjunctive treatment and not as a replacement for standard wound care principles. All patients remained on antibiotics as indicated, and all wounds were offloaded with specialised boots postoperatively.

Case 1

A 58-year-old man with type 2 diabetes and peripheral arterial disease presented with left fourth toe amputation. The patient had a history of femoral bypass and re-occlusion. The patient developed a deep infection in the third metatarsal space. Angiography revealed multilevel disease, and the patient underwent angioplasty followed by transmetatarsal amputation (TMA) on 18 April 2022. NPWT was applied for five days post-TMA and then stopped (per funder rules requiring a

30-day trial of conventional care). On postoperative day 5, CODs were applied to the TMA wounds. By week 8, the wound had decreased in size, and by week 11, complete epithelialisation was achieved (Figure 1).

Case 2

A 69-year-old woman with diabetes, chronic left foot pain, and toe gangrene presented in May 2022. She had long-standing peripheral arterial disease with a patent femoropopliteal bypass (which was later occluded). Initial toe debridement and intravenous antibiotics were administered; however, progressive gangrene and cellulitis persisted. On 17 August 2022, the patient underwent TMA. Postoperatively, the extensive cellulitis required continued antibiotic therapy. NPWT was not used after TMA (funder-allowed). Instead, CODs were applied on postoperative day 5. The dressings were changed on days 8 and 12, and then twice weekly. By week 3, the wound showed healthy granulation, and the infection had resolved. The wound completely re-epithelialised within seven weeks, with no further infection (Figure 2).

Case 3

A 70-year-old man with long-standing diabetes and peripheral vascular disease presented with a two-month history of non-healing left foot ulcers and sepsis. The patient had a history of coronary bypass surgery

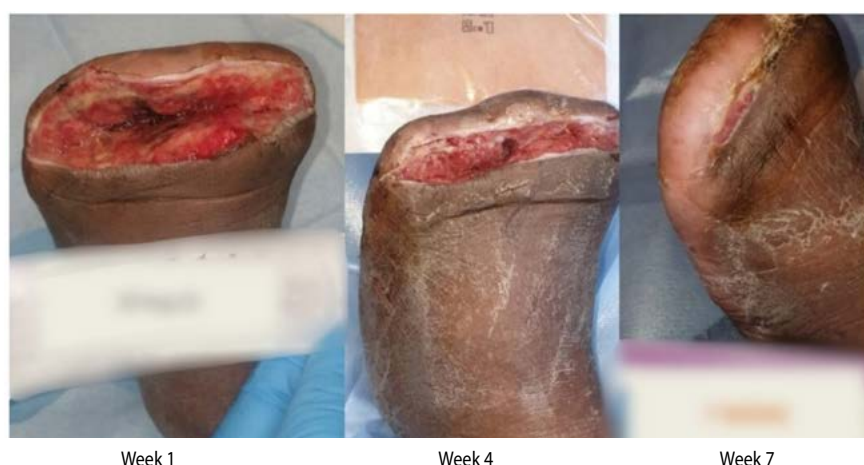


Figure 2: Wound progress with copper oxide-impregnated dressings; complete epithelialisation was achieved by week 7



Figure 3: Wound status post-transmetatarsal amputation at initiation of copper oxide-impregnated dressings (week 1), progress at week 8, and complete epithelialisation by week 11

and chronic renal insufficiency. Initial toe amputations and NPWT failed to control infection. In June 2022, he underwent a left forefoot ray amputation. NPWT was applied postoperatively, but a significant ischaemic slough developed. On 23 July 2022, the patient underwent TMA. NPWT was not continued because of funding constraints. CODs were applied on day 0, changed on days 4 and 7, and then changed twice weekly. Over the course of six weeks, the wound was filled with granulation tissue and subsequently epithelialised. By week 11 post-TMA, the progress was remarkable, with excellent contour (Figure 3).

Discussion

In this case series, CODs were used as an alternative advanced wound care modality. Copper dressings provide dual benefits by reducing wound bioburden while simultaneously supporting intrinsic wound repair mechanisms. Across all cases in this series, no wound deterioration or recurrent infection was observed. This finding is consistent with published evidence showing that copper ions possess broad-spectrum antimicrobial and anti-biofilm activity, which is critically important in chronic DFUs where the microbial burden impedes healing.^{6,7}

In addition to antimicrobial effects, copper promotes neovascularisation (angiogenesis, formation of new blood vessels), stimulates extracellular matrix deposition, and enhances cellular repair responses – all of which are typically impaired in diabetes. These biological mechanisms are described in both experimental and clinical wound healing literature.⁸ Despite early NPWT discontinuation due to funding constraints, the wounds in this series continued to progress toward closure with CODs.

From a clinical practice standpoint, the copper oxide dressings used in this series were easy to apply and manage. They adhered well to the wound bed, could be customised to the wound contour, did not require pre-moistening, and demonstrated a sustained effect, allowing for extended wear times. This reduced the frequency of dressing changes, decreased patient discomfort, and optimised nursing resource allocation. These observations are consistent with existing clinical evidence and published reports demonstrating promising handling characteristics and tolerability of copper dressings in chronic wounds.^{6,8,10} Importantly, wound improvement was achieved as part of a comprehensive multidisciplinary management strategy, including vascular optimisation, metabolic control, nutritional support, appropriate offloading, and regular debridement.

CODs represent a safe, economically responsible, and advanced wound care option in DFU management. Evidence from a recent randomised controlled trial confirms that copper dressings are non-inferior to NPWT in facilitating wound healing at approximately 15% of NPWT's cost, providing significant economic value to funders and health systems.⁹ Additional clinical data support their role in promoting granulation tissue formation (healthy vascular wound-healing tissue) and progressive closure in complex, hard-to-heal diabetic wounds, including those complicated by ischaemia and infection.^{6,8,10} Furthermore, copper dressings have shown encouraging outcomes in other chronic wound categories, such as venous leg ulcers and pressure injuries, with improved healing, reduced infection risk, and good tolerability.^{6,8,10}

Limitations

This case series is limited in several aspects. First, it is retrospective, and the case series did not include a control group, making causal

inferences regarding the role of copper dressings difficult to reach. Second, the three cases in this series are from one wound care centre, limiting generalisability. Third, wound size was not measured using validated measuring instruments at the various evaluation points. Fourth, the literature on CODs published on the subject is confined to a small sample, and independent replication is still required. This restricts interpretations of the findings to hypothesis-generating observations rather than evidence of treatment benefit.

Conclusion

CODs supported wound closure in three cases of complex diabetic foot wounds following TMA, in a context where NPWT was discontinued or inaccessible due to funding constraints. All three wounds achieved full epithelialisation within 7–11 weeks. The dressings were well tolerated with no adverse reactions observed. These findings support CODs as a clinically feasible option for complex diabetic foot wound management in resource-constrained settings in South Africa. However, the findings are limited to three cases and not generalisable. Controlled studies are needed to confirm these observations.

Conflict of interest

The author declares no conflict of interest.

Funding source

No funding was received for this work.

Ethical approval

Each of the three patients provided written informed consent for their cases and accompanying images to be published. Cases were managed as routine clinical patient care at a specialist wound care centre.

ORCID

B Davids  <https://orcid.org/0009-0009-3300-2110>

References

1. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017;376(24):2367–75. <https://doi.org/10.1056/NEJMra1615439>.
2. Hoffstad O, Mitra N, Walsh J, Margolis DJ. Diabetes, lower-extremity amputation, and death. *Diabetes Care*. 2015;38(10):1852–7. <https://doi.org/10.2337/dc15-0536>.
3. Meloni M, Izzo V, Giurato L, Lázaro-Martínez JL, Uccioli L. Prevalence, clinical aspects and outcomes in a large cohort of persons with diabetic foot disease: comparison between neuropathic and ischemic ulcers. *J Clin Med*. 2020;9(6):1780. <https://doi.org/10.3390/jcm9061780>.
4. Armstrong DG, Tan T-W, Boulton AJM, Bus SA. Diabetic foot ulcers: a review. *JAMA*. 2023;330(1):62–75. <https://doi.org/10.1001/jama.2023.10578>.
5. Raja JM, Maturana MA, Kayali S, Khouzam A, Efevbokhan N. Diabetic foot ulcer: a comprehensive review of pathophysiology and management modalities. *World J Clin Cases*. 2023;11(8):1684–93. <https://doi.org/10.12998/wjcc.v11.i8.1684>.
6. Melamed E, Rovitsky A, Roth T, Assa L, Borkow G. Stimulation of healing of non-infected stagnated diabetic wounds by copper oxide-impregnated wound dressings. *Medicina (Kaunas)*. 2021;57(10):1129. <https://doi.org/10.3390/medicina57101129>.
7. Borkow G, Roth T, Kalinkovich A. Wide spectrum potent antimicrobial efficacy of wound dressings impregnated with cuprous oxide microparticles. *Microbiol Res*. 2022;13(3):366–76. <https://doi.org/10.3390/microbiolres13030029>.
8. Borkow G, Melamed E. Copper, an abandoned player returning to the wound healing battle. In: Aghaei S, editor. *Recent advances in wound healing*. IntechOpen; 2022. <https://doi.org/10.5772/intechopen.96952>.
9. Melamed EA, Dabbah J, Roth T, Borkow G, Pinzur MS. Noninferiority of copper dressings compared to negative pressure wound therapy in diabetic foot - a RCT study. *Foot Ankle Orthop*. 2024;9(4):2473011424s00381. <https://doi.org/10.1177/2473011424s00381>.
10. Melamed E, Borkow G. Continuum of care in hard-to-heal wounds by copper dressings: a case series. *J Wound Care*. 2023;32(12):788–96. <https://doi.org/10.12968/jowc.2023.32.12.788>.

Intermittent neuromuscular electrostimulation of the common peroneal nerve as an adjunct to standard care in complex and non-healing venous leg ulcers: a three-case series

L Naude,¹  A Gordon-Davies²¹ Eloquent Advanced Wound Management Centre, South Africa² Sandton Wound & Stoma Clinic, South AfricaCorresponding author, email: liezl@eloquent.co.za<https://doi.org/10.36303/WHSA.4377>

Background: Chronic, complex or non-healing venous leg ulcers (VLUs) remain a significant clinical challenge, particularly when complicated by persistent oedema, impaired mobility, pain, venous hypertension and reduced calf-muscle pump function. Neuromuscular electrostimulation (NMES) of the common peroneal nerve has been proposed as an adjunctive intervention to augment calf-muscle pump activity and lower-limb circulation.

Objective: To describe the clinical experience of using intermittent wearable NMES as an adjunct to standard wound care in three patients with complex or non-healing VLUs.

Method: A descriptive three-case series was undertaken across two independent outpatient wound-care centres in South Africa during 2024–2025. Three patients with complex or non-healing VLUs were treated with a wearable intermittent NMES device (geko®) in addition to standard wound care. Standard care included compression therapy where clinically appropriate, wound-bed management and management of associated oedema and symptoms. NMES was applied over the common peroneal nerve according to clinical judgement and patient tolerance.

Results: All three patients had longstanding or complex lower-limb ulceration with clinical factors considered potentially detrimental to healing. Following introduction of NMES, clinicians observed improvements in wound-bed characteristics and, where assessed, oedema, pain, mobility and patient-reported wellbeing. The intervention was feasible to incorporate into outpatient wound-care practice and was generally well tolerated.

Conclusions: These three cases describe the potential role of intermittent common peroneal nerve NMES as an adjunct to comprehensive wound care in patients with complex or non-healing VLUs. The observations are descriptive and hypothesis-generating and cannot establish treatment efficacy or causality. Prospective controlled studies are warranted to further evaluate the role of NMES in this population.

Keywords: venous leg ulcer, neuromuscular electrostimulation, NMES, calf muscle pump, common peroneal nerve, compression therapy oedema, geko®, non-healing ulcer

© Medpharm

Wound Healing Southern Africa 2026;19(1):21-26

Introduction

Chronic and complex lower-limb wounds remain a significant clinical challenge and are frequently complicated by venous hypertension, lymphatic dysfunction, oedema, pain and reduced mobility. Impairment of the calf-muscle pump is an important contributor to venous congestion and oedema and may adversely affect the healing environment, particularly in patients with limited ambulation or longstanding venous disease.¹⁻⁴

Compression therapy remains the cornerstone of management for patients with confirmed venous leg ulcers (VLUs). Appropriate compression improves venous return, reduces oedema and supports the function of the calf-muscle pump.^{2,5,6} However, a proportion of patients demonstrate delayed or stalled healing despite appropriate compression and comprehensive wound management.

Neuromuscular electrostimulation (NMES) of the common peroneal nerve has been investigated as a means of activating the lower-leg musculature and supporting the calf-muscle pump. Experimental and clinical studies have demonstrated increases in venous, arterial and microvascular blood flow following peroneal-nerve stimulation.^{4,7,8}

Clinical studies evaluating NMES as an adjunct to standard wound care, including compression therapy, have reported encouraging findings in selected patients with VLUs.⁸⁻¹³ The recently published Canadian Consensus Statement for the Management of Venous Leg Ulcers recognises NMES as an adjunctive option when VLUs are not progressing with optimal therapy.²

More recently, Targett and Bain¹⁰ reported evidence from a systematic review supporting the potential effect of intermittent NMES of the common peroneal nerve on microvascular perfusion in chronic lower-limb ulcers. These findings provide further evidence for the use of NMES in wounds in which impaired perfusion and calf-muscle pump function may contribute to delayed healing.

The geko® device (Firstkind Ltd, UK) is a wearable NMES device designed to stimulate the common peroneal nerve below the knee without applying external compression. Stimulation produces intermittent contraction of the lower-leg musculature with the intention of augmenting venous return and lower-limb circulation.

Although published clinical studies provide an increasing evidence base, descriptions of real-world use in heterogeneous patients with complex wounds remain limited. This case series therefore describes



Figure 1: Application of the geko® device

the clinical experience of using intermittent common peroneal nerve NMES as an adjunct to comprehensive wound care in three patients with complex or non-healing VLUs managed in outpatient wound care settings in South Africa.

Case series

Clinical setting and treatment approach

Three patients with complex or non-healing VLUs were managed across two independent outpatient wound-care centres in South Africa. The patients were managed by wound-care practitioners with more than five years of experience in private clinical practice.

NMES was introduced pragmatically where wounds demonstrated limited progression despite ongoing standard care and/or where oedema, pain, reduced mobility or other clinical factors were considered potential barriers to healing.

The geko® device (Firstkind Ltd, UK) was applied below the knee over the anatomical course of the common peroneal nerve. Figure 1 illustrates the application of the geko® device. NMES was used as an adjunct to, and not as a replacement for, standard wound care.

Case 1 – 26 March 2024 Baseline images at first consultation



Case 1 – 19 April 2024 NMES device applied to the left leg DAY 0



Case 1 – Day 0 to Day 42 Summary



Figure 2: Clinical progression of Case 1

According to individual clinical requirements, standard management included compression therapy, wound cleansing and wound-bed preparation, appropriate debridement, advanced wound dressings, exudate management, peri-wound skin management, infection/inflammation management where clinically indicated and patient education and support.

Treatment duration and frequency were guided by clinical judgement, the patient's clinical condition and tolerance of the device.

The primary observations in this case series were changes in wound appearance, wound dimensions where measurable, wound-bed characteristics, exudate, oedema, inflammation, pain, functional status and patient experience.

Case 1 – Complex VLU with severe oedema and extensive ulceration

A 78-year-old man was assessed following hospitalisation for heart failure and presented with significant bilateral lower-limb oedema. The left lower limb demonstrated extensive, interconnected ulceration below the knee.

The ulcers were complex, with areas of undermining and necrotic tissue and multiple interconnected pockets. Full-thickness tissue loss extended deeply, with areas approaching fascia and bone. Pain was reported as 8/10, and exudate was described as 3+ purulent. Doppler assessment demonstrated biphasic flow bilaterally.

The clinical presentation was considered consistent with a complex venous ulceration pattern in the context of marked oedema and impaired lower-limb function.

Treatment of Case 1

Standard wound care was applied to both lower limbs using the same general wound-management approach. This included African-bandage compression with a tubular stocking, antimicrobial silver-containing dressings and super-absorbent dressings.

NMES using the geko® device was initiated on the left lower limb on 19 April 2024. The device was replaced daily. The contralateral limb continued to receive the same standard wound-care regimen but did not receive NMES.

The final documented geko® application occurred on 10 June 2024, approximately 52 days after initiation.

Because of the extensive interconnected nature of the ulceration, individual wound measurements were not considered reliable or clinically meaningful. Serial clinical assessment and photographic documentation were therefore used to evaluate progression.

Case 1- Clinical course and outcome

During the period of NMES use, the treated limb demonstrated progressive clinical improvement (Figure 2). The wound bed became healthier, with

increased granulation and epithelialisation. Exudate decreased, and the surrounding skin demonstrated improved integrity.

A reduction in lower-limb oedema was observed, with the treated left limb demonstrating a greater apparent reduction in oedema than the contralateral limb receiving the same standard wound care without NMES.

The patient also experienced reduction in pain and reported improvements in mobility and general wellbeing during the treatment period.

This case provides a within-patient clinical observation in which both limbs were exposed to comparable standard wound care while NMES was applied to one limb. However, because the treatment was not randomised or blinded and other clinical factors may have differed between limbs, the observation cannot establish that NMES alone was responsible for the difference.

Case 2 – Longstanding VLU with previous venous thrombotic disease

A 76-year-old woman presented with a longstanding VLU of more than five years' duration. The wound was associated with chronic lower-limb oedema and pain and had demonstrated limited progression despite ongoing wound management.

The patient's history included previous deep-vein thrombosis, providing an additional potential contributor to chronic venous dysfunction.

At the time NMES was introduced, the wound demonstrated significant exudate, described as 3+ purulent/offensive, with associated chronic inflammatory changes and oedema.

Treatment of Case 2

The patient continued with standard wound care, including compression therapy and advanced wound management appropriate to the wound characteristics.

Intermittent NMES using the geko® device was introduced as an adjunct with the intention of augmenting calf-muscle pump activity and supporting venous return.



Figure 3: Clinical progression of Case 2

Case 2- Clinical course and outcome

A reduction in pain was observed relatively early following introduction of NMES. This was followed by progressive improvement in the wound appearance and surrounding tissue (Figure 3).

Over the treatment period, the wound demonstrated improvement in the wound bed and a reduction in the clinical features associated with oedema and inflammation. The patient tolerated the device and was able to incorporate it into the wound-care regimen.

Given the longstanding nature of the ulcer and previous venous thrombotic history, the clinical course was considered consistent with a complex, slow-healing VLU in which impaired venous return and calf-muscle pump function were clinically relevant factors.

Case 3 – Chronic VLU in a patient with paraplegia

A 67-year-old man with paraplegia presented with chronic venous leg ulceration of more than seven years' duration. The patient had established chronic venous disease indicating clinical manifestations including venous disease, oedema, skin changes and active ulceration.

Multiple treatment modalities had previously been attempted, including surgery and skin grafting, without sustained wound closure. At baseline, the wound bed contained thick, fibrinous slough. Exudate was documented as 2+ haemopurulent. The surrounding skin was inflamed, and a new area of posterior skin breakdown was also noted. The patient had significant dependency oedema. His paraplegia represented an important impairment of voluntary lower-limb muscle-pump activity and was therefore considered particularly relevant to the rationale for NMES.

Treatment of Case 3

Baseline assessment occurred on Day 0 and the wound measured 3.0 cm x 1.0 cm. Standard wound management, including compression and advanced wound care, was continued. The geko® device was applied at the initial treatment visit to stimulate the common peroneal nerve.

Day 5 early clinical improvement was documented photographically. The wound demonstrated an improved appearance compared with the baseline, with a reduction in the apparent amount of fibrinous material and improvement in the wound bed and surrounding inflammatory changes. On Day 15, the wound measured 2.3 cm x 1.0 cm.

Clinical course and outcome

Compared with the baseline measurement of 3.0 x 1.0 cm, the recorded wound length had decreased by 0.7 cm, corresponding to a 23.3% reduction in recorded wound length.

Clinical assessment and photographic comparison demonstrated improved granulation tissue, healthier wound margins, reduced exudate, improvement in the surrounding skin, reduction in oedema and reduction in local inflammation. The clinical progression of Case 3 is shown in Figure 4.



Figure 4: Clinical progression of Case 3

The patient was able to apply the device with ease and tolerated its use. Importantly, the reduction is reported as a change in recorded wound length, rather than a percentage reduction in wound area, because only two linear dimensions were available and the width remained unchanged.

Summary of clinical observations

The clinical observations are summarised in Table I.

Across the three cases, the principal clinical observations following introduction of NMES were:

1. improvement in wound-bed quality;
2. progression towards granulation and epithelialisation;
3. reduction in wound dimensions where measurements were available;
4. reduction in exudate;
5. reduction in oedema;
6. improvement in surrounding skin and inflammation;
7. reduction in pain in patients reporting pain; and
8. feasibility of incorporating the device into outpatient wound care.

Discussion

This three-case series describes the use of intermittent common peroneal nerve NMES as an adjunct to standard care in patients with complex or non-healing VLUs. The cases were deliberately heterogeneous and included severe oedema, extensive ulceration, previous venous thrombotic disease, longstanding wounds and profound mobility impairment associated with paraplegia.

The findings are clinically relevant because the calf-muscle pump represents an important component of lower-limb venous return. Compression therapy remains the foundation of VLU management, but compression alone does not necessarily address all of the functional limitations affecting calf-muscle pump activity. Patients with reduced mobility, neurological impairment or longstanding oedema may have particularly limited ability to generate an effective muscle pump.

Common peroneal nerve NMES provides a mechanism for externally activating lower-leg musculature. The physiological evidence supporting this approach includes demonstrated increases in venous

Table 1: Summary of clinical observations

Clinical characteristic	Case 1	Case 2	Case 3
Age	78 years	76 years	67 years
Sex	Male	Female	Male
VLU duration	> 1 year	> 5 years	> 7 years
Major complicating factors	Age, heart failure history, severe bilateral oedema, extensive ulceration, pain, impaired mobility	Age, previous DVT, chronic oedema and pain, chronic venous disease	Paraplegia, dependency oedema, scar tissue
Wound complexity	Extensive interconnected ulceration	Chronic refractory ulcer	Chronic ulcer with fibrinous slough
Exudate	3+ purulent	3+ purulent	2+haemopurulent
Compression	Yes	Yes	Yes
Advanced wound management	Yes	Yes	Yes
NMES	Left leg	Left leg	Left leg
Main observed changes	Decrease in slough, granulation, reduced oedema, reduced pain, reduced exudate, reduced inflammation, improved mobility	Early pain reduction, progressive wound improvement with granulation and epithelial tissue, reduced inflammation	Reduced dimensions, improved granulation tissue, reduced exudate, reduced oedema, reduced inflammation
Device feasibility	Feasible, easy for family members to apply	Well tolerated	Ease for patient to apply himself

flow and velocity. Griffin et al.,⁷ for example, investigated blood flow in the deep veins of the lower limb during geko® stimulation, building on previous evidence of increased femoral venous flow.^{4,7,8}

The potential relevance of this mechanism extends beyond macroscopic venous flow. Das et al.⁸ demonstrated changes in wound-bed and peri-wound microcirculation during common peroneal nerve NMES in patients with VLUs. The 2026 systematic review by Targett and Bain¹⁰ further identified consistent increases in microvascular flux and pulsatility across chronic lower-limb ulcers, although the authors appropriately note the limited number of eligible studies and the need for further research.

The clinical observations in the present cases are therefore physiologically and clinically plausible. Improvement in oedema, wound-bed appearance and exudate may be compatible with improved venous and microvascular function.

The 2024 position paper by Stacey et al.¹ identified three broad clinical groups in which muscle-pump activation may be considered: patients unable to tolerate compression, those able to tolerate only suboptimal compression, and those whose ulcers remain slow or stalled despite optimal compression.

The present cases are particularly relevant to the latter group. All three patients had wounds that were considered clinically complex or slow to heal despite standard wound care. Case 1 provides a useful within-patient observation because the same general wound-care approach was used on both lower limbs while NMES was applied to the left limb. The apparent greater reduction in oedema on the treated side provides an interesting clinical signal, although it cannot be interpreted as a controlled treatment effect.

Case 2 illustrates another clinically important phenotype: a longstanding VLU associated with previous deep vein thrombosis (DVT), chronic oedema and pain. Venous disease following previous thrombosis may contribute to persistent venous hypertension and impaired calf-pump effectiveness. The early reduction in pain followed by progressive wound improvement is consistent with the broader clinical observations reported, although the present case cannot establish causality.

Case 3 is particularly relevant to the physiological rationale for NMES. A patient with paraplegia and a VLU of more than seven years' duration represents an extreme example of compromised voluntary calf-muscle pump activity. The observed reduction in wound length from 3.0 cm to 2.3 cm over 15 days, together with improvements in granulation, wound margins, exudate, oedema and inflammation, provides an informative real-world observation.

These observations are broadly consistent with the growing clinical literature. A 2023 within-patient controlled trial reported approximately a two-fold increase in healing rate when neuromuscular stimulation was added to multilayer compression.⁷ Similarly, the 2025 service evaluation by Murray et al.⁵ reported faster wound-margin advancement and a shorter mean time to closure with NMES plus compression compared with matched retrospective controls.

The 2017 observational evaluation by Harris et al.⁹ is also relevant because it described geko® use in patients with refractory VLUs that had failed to heal with standard treatment. In that series, the device was used as an adjunct to compression and wound care, and adherence to the treatment programme appeared important.

The 2025 Canadian Consensus Statement represents an important development in the clinical positioning of NMES.² The multidisciplinary panel specifically recommended adding muscle-pump activation using NMES of the common peroneal nerve when VLUs are not healing with optimal therapy or when optimal compression cannot be used.

The present case series therefore contributes a South African real-world clinical perspective to an evolving evidence base. It demonstrates how NMES can be integrated into routine outpatient wound management across heterogeneous patients rather than only within controlled research environments.

Clinical implications

Several practical observations emerge from these cases. First, NMES should be viewed as an adjunct rather than a replacement for standard VLU management. Compression and treatment of the underlying

venous pathology remain gold standard in VLU treatment. Second, patient selection may be particularly important. Patients with substantial oedema, reduced mobility, impaired calf-muscle pump activity or stalled wound progression may represent clinically relevant candidates for consideration of adjunctive NMES. Third, patient usability is important. In Cases 1 and 2, the device could be incorporated into routine care, and in Case 3 patient was able to apply the device with ease; in Case 1 the caregiver was also able to apply the device at home. Previous clinical evaluations have similarly highlighted the importance of patient or caregiver education and adherence.⁹ Fourth, objective wound measurement remains important. The Case 3 data demonstrate the value of documenting wound dimensions longitudinally. Where wound geometry permits, future cases should ideally document length, width and depth using a consistent measurement technique and calculate wound area where appropriate. Finally, we are in agreement with the Canadian consensus document on VLU management recommending that NMES should form part of a broader wound-care strategy addressing venous hypertension, compression, oedema, wound-bed preparation, infection or inflammation, nutrition, mobility and patient adherence.²

Limitations

This case series has several important limitations. First, it comprises only three patients, limiting generalisability. Second, there was no control group and no randomisation or blinding. Therefore, effectiveness cannot be established. Third, NMES was introduced alongside standard wound care, including compression and advanced wound management. Consequently, the individual contribution of NMES to observed wound improvement is limited to clinical observation. Fourth, the cases were clinically heterogeneous, with differences in age, functional status, wound duration, wound severity and comorbidities.

Fifth, not all wounds could be measured reliably. In Case 1, the interconnected and extensive nature of the ulceration prevented meaningful serial individual wound measurements, and clinical photography and descriptive assessment were therefore used. Sixth, the treatment duration and intensity were guided by clinical practice and patient tolerance rather than a predefined research protocol. Finally, the observations were made in routine clinical practice and therefore may be subject to observer bias and other confounding factors. These limitations mean that the findings should be regarded as descriptive and hypothesis-generating.

Conclusion

This three-case series describes the use of intermittent common peroneal nerve NMES using the geko® device as an adjunct to standard care in patients with complex and non-healing VLUs. Across the three cases, clinical improvement was observed in wound-bed characteristics, granulation tissue, exudate, oedema, inflammation, pain and, where measurable, wound dimensions. The cases included patients with severe oedema, longstanding venous disease, previous DVT, extensive ulceration and profound impairment of calf-muscle pump function associated with paraplegia. The findings are consistent with the proposed physiological rationale for common peroneal nerve NMES and with emerging evidence demonstrating effects on venous flow, microcirculation and VLU healing.

However, because NMES was used as part of a broader wound-care programme, these observations cannot establish causality. Larger prospective studies using standardised treatment protocols, objective wound measurements and appropriate control groups are required to determine the clinical effectiveness, optimal treatment dose and patient populations most likely to benefit from NMES.³⁻¹⁴

Conflict of interest

The authors declare no financial conflict of interest. The geko® device was used as part of clinical wound management, and the author received no financial remuneration from the manufacturer for the preparation of this publication.

Ethical approval

This report describes retrospective clinical observations from routine wound-care practice and does not represent a prospective interventional research study. Patients signed individual consent to treatment as per wound care practitioner practice policy. Written consent was obtained for the use of the clinical information and photographs.

ORCID

L Naude  <https://orcid.org/0009-0002-6414-5802>

References

1. Stacey MC, Sibbald RG, Evans R. Continuous muscle pump activation by neuromuscular electrical stimulation of the common peroneal nerve in the treatment of patients with venous leg ulcers: A position paper. *Int Wound J*. 2024;21(9):e70040. <https://doi.org/10.1111/iwj.70040>.
2. Stacey MC, Sibbald RG, Evans R, et al. Canadian Consensus Statement for the management of venous leg ulcers. *Int Wound J*. 2025;22(4):e70415. <https://doi.org/10.1111/iwj.70415>.
3. Ingess MV, Power AH. Two cases of transcutaneous electrical nerve stimulation of the common peroneal nerve successfully treating refractory, multifactorial leg oedema. *J Investig Med High Impact Case Rep*. 2014;20(24):2324709614559839. <https://doi.org/10.1177/2324709614559839>.
4. Tucker AT, Maass A, Bain DS, et al. Augmentation of venous, arterial and microvascular blood supply in the leg by isometric neuromuscular stimulation via the peroneal nerve. *Int J Angiol*. 2010;19(1):e31. <https://doi.org/10.1055/s-0031-1278361>.
5. Murray H, Duong R, Bain DS. Healing rate and time to closure of venous leg ulcers: A real-world service evaluation of neuromuscular electrostimulation as an adjunct to compression therapy. *Adv Skin Wound Care*. 2025;38(5):246-50. <https://doi.org/10.1097/ASW.0000000000000299>.
6. Owens L. Electrical stimulation therapy and electroceutical treatment for the management of venous leg ulcers. *Br J Community Nurs*. 2017;22(Suppl 3):S28-S36. <https://doi.org/10.12968/bjcn.2017.22.Sup3.S28>.
7. Griffin M, Bond D, Nicolaides A. Measurement of blood flow in the deep veins of the lower limb using the geko™ neuromuscular electro-stimulation device. *Int Angiol*. 2016;35(4):406-10. PMID: 26934561.
8. Das SK, Dhooonmoon L, Bain D, Chhabra S. Microcirculatory changes in venous leg ulcers using intermittent electrostimulation of common peroneal nerve. *J Wound Care*. 2021;30(2):151-5. <https://doi.org/10.12968/jowc.2021.30.2.151>.
9. Harris C, Loney A, Brooke J, et al. Refractory venous leg ulcers: Observational evaluation of innovative new technology. *Int Wound J*. 2017;14(6):1100-7. <https://doi.org/10.1111/iwj.12766>.
10. Targett MT, Bain DS. Neuromuscular electrostimulation and microvascular perfusion in chronic lower-limb ulcers: A systematic review. *Int Wound J*. 2026;23(8):e71004. <https://doi.org/10.1111/iwj.71004>.
11. Bull RH, Clements D, Collarte AJ, Harding KG. The impact of a new intervention for venous leg ulcers: A within-patient controlled trial. *Int Wound J*. 2023;20(6):2260-8. <https://doi.org/10.1111/iwj.14107>.
12. Jones NJ, Ivins N, Ebdon V, Hagelstein S, Harding KG. Neuromuscular electrostimulation on lower limb wounds. *Br J Nurs*. 2018;27(20):S16-S21. <https://doi.org/10.12968/bjcn.2018.27.Sup20.S16>.
13. Sibbald RG, Geng R, Slomovic J, Stacey M. The muscle pump activator device: From evidence to lived experiences. *Int Wound J*. 2024;21(8):e14949. <https://doi.org/10.1111/iwj.14949>.
14. Gagnier JJ, Kienle G, Altman DG, et al; CARE Group. The CARE guidelines: Consensus-based clinical case reporting guideline development. *J Clin Epidemiol*. 2014;67(1):46-51. <https://doi.org/10.1016/j.jclinepi.2013.08.003>.



WHEN WALKING ISN'T POSSIBLE, **ACTIVATE THE MUSCLE PUMP.**



Enhance blood flow. **Support** wound healing.

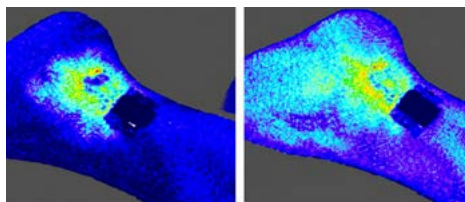
For patients with hard-to-heal lower-limb wounds, compromised circulation can compromise healing.

The geko[®] device uses neuromuscular electrostimulation (NMES) to non-invasively stimulate the common peroneal nerve, activating the calf and foot muscle pumps to enhance venous return and support arterial and microcirculatory blood flow without requiring active movement.

WHY **BLOOD FLOW** MATTERS

Microvascular Perfusion matters

geko[®] increases microcirculatory flux in the wound bed and peri-wound tissue, as demonstrated by laser speckle contrast imaging.



Baseline

geko[®]

CLINICAL EVIDENCE

	<i>Standard Care</i>	<i>Standard Care + geko[®]</i>
VLU healing rate	0.31 mm/week	0.56 mm/week
Time to closure	77 days	40 days

>2× THE RATE OF HEALING*

with geko[®] alongside standard wound care.
~50% shorter time to closure*

THE PHYSIOLOGY OF WALKING, **WITHOUT WALKING.**

geko[®] W
For wound therapy

geko[®] T
For hospital applications

DON'T JUST TREAT THE WOUND. SUPPORT THE CIRCULATION THAT HELPS IT HEAL.

Neuromuscular Electrostimulation (NMES): An adjunct to standard wound care. **Enhance blood flow.**



*Supporting evidence

CONTACT US



+27 12 845 0040



info@geko.health



www.geko.health



Life360 - geko[®] device

Wound Healing

Southern Africa

CPD Questionnaire: Wound Healing Vol 19 No 1

Please select only one answer for each question. For every five questions, one must achieve a minimum of four correct answers to obtain one CPD point. You can only obtain a maximum of three points for each CPD article.

Management of fasciotomy wounds using tape-assisted closure

1. What is the key distinction between tape-assisted closure (TAC) and tape-assisted tissue expansion (TATE)?

- a TAC is applied to open wounds, whereas TATE is used to expand intact skin
- b TAC uses sterile tape, whereas TATE uses non-sterile tape
- c TAC requires application in theatre, whereas TATE is done at the bedside
- d TAC is used only on the upper limb, whereas TATE is used only on the lower limb

2. In this prospective study, what was the average time to surgical closure for patients who achieved delayed primary closure?

- a 7 days
- b 12 days
- c 23 days
- d 45 days

3. What relationship was found between time to closure and scar outcome, as rated on the Scar Cosmesis Assessment and Rating (SCAR) scale?

- a No association was demonstrated between the two variables
- b Longer times to closure were strongly associated with higher (poorer) scar scores
- c Longer times to closure were associated with better scar scores
- d Scar scores correlated only with the patient's age, not with time to closure

Copper oxide-impregnated dressings in the management of complex diabetic foot wounds: a case series

4. Why was negative pressure wound therapy (NPWT) discontinued or not initiated in the three cases described?

- a All three patients developed hypersensitivity reactions to NPWT
- b NPWT was contraindicated because of peripheral arterial disease
- c NPWT was discontinued or not authorised because of funding constraints and funder rules
- d The patients declined NPWT because of pain during dressing changes

5. Within what time frame did the three wounds achieve complete epithelialisation?

- a 2 to 4 days
- b 7 to 11 weeks
- c 6 to 9 months
- d 12 to 18 months

6. Which of the following best summarises the limitations the author identifies for this case series?

- a It was a randomised controlled trial with an inadequate washout period
- b It was prospective but limited by loss to follow-up in more than half the cohort
- c It was a multicentre study limited only by short follow-up duration
- d It was retrospective, uncontrolled, included only three patients from a single-centre, and wound size was not measured with validated instruments

Roles of those involved with wound care in Tshwane District residential aged care facilities: findings from a stakeholder analysis

7. Which stakeholder was perceived by participants as the most important for establishing evidence-based wound care in residential aged care facilities?

- a The general practitioner
- b The nurse manager
- c The board of trustees
- d The resident's family

8. How many stakeholder types were identified in the analysis, and how many participants were interviewed?

- a 12 stakeholder types; 26 participants
- b 21 stakeholder types; 12 participants
- c 26 stakeholder types; 14 participants
- d 26 stakeholder types; 40 participants

9. What did the study find about facilities in lower- and middle-income areas, and what concern did the authors raise about it?

- a They employed more rehabilitation professionals, raising concerns about duplication of roles
- b They relied more heavily on wound care product company representatives for advice and products, which may contribute to a product-driven approach to care
- c They had greater access to private wound care practitioners, raising concerns about cost escalation
- d They excluded families from decision-making, raising concerns about consent

Intermittent neuromuscular electrostimulation of the common peroneal nerve as an adjunct to standard care in complex and non-healing venous leg ulcers: a three-case series

10. In this case series, what is the intended physiological rationale for applying intermittent neuromuscular electrostimulation (NMES) over the common peroneal nerve in patients with venous leg ulcers?

- a To activate the lower-leg musculature, thereby augmenting calf-muscle pump activity and supporting venous return and lower-limb circulation
- b To deliver graduated external compression to the lower limb
- c To provide local analgesia by blocking sensory nerve conduction at the ankle
- d To replace compression therapy as first-line management of venous hypertension

11. In Case 3 (a 67-year-old man with paraplegia), the wound measured 3.0 cm x 1.0 cm at baseline and 2.3 cm x 1.0 cm on Day 15. How did the authors report this change, and why?

- a As a 23.3% reduction in wound area, because both length and width had been recorded serially
- b As a 23.3% reduction in recorded wound length, because only two linear dimensions were available and the width remained unchanged
- c As complete epithelialisation, because the wound had closed by Day 15
- d As a reduction in wound volume, calculated from serial depth measurements

12. Which statement best describes the strength of the conclusions that can be drawn from this three-case series?

- a The findings confirm that NMES is more effective than compression therapy alone in complex venous leg ulcers
- b The within-patient comparison in Case 1 establishes a causal treatment effect, as both limbs received identical care
- c The findings are descriptive and hypothesis-generating only; the absence of a control group, randomisation or blinding, together with concurrent standard care, means causality cannot be established and prospective controlled studies are warranted
- d The findings justify substituting NMES for compression in patients whose ulcers have stalled despite optimal therapy

13. According to the Canadian Consensus Statement for the Management of Venous Leg Ulcers, as described in the article, in which circumstances did the multidisciplinary panel recommend adding muscle-pump activation using NMES of the common peroneal nerve?

- a In all patients with a confirmed venous leg ulcer, from the point of diagnosis, in place of compression therapy
- b Only in patients with an arterial component to their ulceration, as an alternative to revascularisation
- c When venous leg ulcers are not healing with optimal therapy, or when optimal compression cannot be used
- d Only once the wound bed is fully granulated, to accelerate the final stage of epithelialisation



VIND MED
MEDICAL SUPPLIES



**YOUR ONE STOP SHOP
IN WOUND CARE**



www.vindmed.co.za



Advancing Knowledge Enhancing Health



MEDICAL AND PHARMACEUTICAL JOURNAL PUBLISHING

Connecting Your Brand with the Future of Healthcare Innovation

Medpharm Publications has a publications list of more than fourteen titles comprising of over fifty journal editions. With all journals available digitally, we have a reach of more than 40 000 healthcare workers countrywide, and a global audience.

Contact Medpharm Publications today to advertise in one of our journals

www.medpharm.co.za | cheryl@medpharm.co.za