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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.

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Editorial submissions

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Editorial

Every time I write the editorial, we seem to have something exciting happening in our country. Last time, we had just won the rugby world cup…again! This time, for the first time in over 30 years, we appear to have a very different government about to be formulated after our recent elections. We are all hoping that the proposed government of national unity will bring positive changes to our ailing economy. Our economy has deteriorated to levels that have recently necessitated budget cuts in our healthcare sector that have never been seen before, with posts being frozen for all forms of healthcare professionals. This has put enormous strain on those that remain in the system. Let's hope that the makeup of the new government results in positive changes for the healthcare sector and the country as a whole.

Regarding our application for the journal to appear on scholarly search engines, it is so far indexed on Google Scholar, Sabinet, African Journals Online (AJOL), Academy of Science of South Africa (ASSAf) and the Department of Higher Education and Training (DHET). Our application is currently being reviewed by SCOPUS and the Directory of Open Access Journals (DOAJ). As usual, I'll keep you posted regarding any further developments.

I'm pleased to see that our wound care practitioners in the field of nursing are finding the time to undertake original research. One of these is an original research article on perspectives on wound care in nursing homes in the South African context. Another, published in this issue, is on the role of topical oxygen therapy as an adjunct in treating non-healing wounds. Chronic, non-healing wounds are something we are all familiar with and often have difficulty in treating and information on any adjunctive therapy, such as topical oxygen therapy, is always welcome.

Our podiatry colleagues have been submitting more and more articles to WHSA, which I'm very pleased about, given that the field of wound care is multidisciplinary. In this issue, they publish an article on diabetic foot complications and their management at primary healthcare clinics in Johannesburg. I believe they already have another article lined up for our next issue!

In keeping with the spirit of being a multidisciplinary journal, we also have an interesting article published by one of our burn surgeons from KwaZulu-Natal. This original research article focuses on superficial partial thickness burns and donor sites and considers the benefits of extended wear of Cutimed Sorbact®. These research findings have resulted in this becoming standard practice for the management of these types of wounds at many of the hospitals.

I think this may be the first issue with only original research articles and no case reports. While we welcome interesting and unusual case reports, having more original research articles strengthens the impact of the journal and is something we should strive for. Keep them coming!

I hope you enjoy reading this issue.

Nick Kairinos

Editor: Wound Healing SA

Superficial partial burns and donor sites are unique wounds: case series of extended wear Cutimed® Sorbact®

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Background: Superficial partial burns and donor site wounds are unique and do not behave like other wounds, warranting a unique approach. A dressing with an antimicrobial effect to prevent infection and minimise trauma at the wound by extending wear time promotes spontaneous healing by epithelialisation. The properties of Cutimed® Sorbact® achieve this goal in its temporary skin-like substitute action. This audit aims to illustrate that our management of superficial partial burns and donor sites is successful.

Methods: A prospective audit was done from January to June 2019 at the Harry Gwala Regional Hospital, where Cutimed® Sorbact® was used at the burn surgeon's discretion. Sorbact® was typically chosen for acute superficial partial-thickness burns at presentation and donor sites.

Results: A total of 27 patients were included. There were 14 superficial partial-thickness burns (nine children and five adults) treated with a mean wear time of 14 days to healing, with two patients having a wear time of 17 and 22 days, respectively. There were 13 donor sites treated (eight children and five adults), with 12 cases healed by day 17 and one complication of depth conversion.

Conclusion: Frequent removal of the primary Cutimed® Sorbact® dressing in the epithelialising wound causes trauma to the wound, leading to delayed healing despite the absence of infection. Leaving the primary Cutimed® Sorbact® in situ while monitoring for complications leads to successful outcomes. This has been adopted as standard management in our service for superficial partial burns and donor sites.

Keywords: superficial partial burns, donor site wounds, Cutimed® Sorbact®

Wound Healing Southern Africa 2024;17(1):4-10

Introduction

Despite their vast differences in pathophysiology, burn wounds heal following the three phases of wound healing, i.e. inflammation, proliferation, and remodelling.[1] The superficial partial-thickness burn heals spontaneously by epithelialisation through keratinocyte migration from viable skin appendages in the dermis. Deep partial-thickness and full-thickness wounds should not be left to heal spontaneously and require skin grafting due to the destruction of all or most basal epithelial cell islands in the skin appendages.[1] The donor site is akin to a superficial partial-thickness burn with healing by re-epithelialisation.

Several decades ago, there was a paradigm shift to moist wound healing, which transitioned wound care to using closed rather than open dressings. The moist environment promotes the growth and migration of new cells and is the usual approach to wounds. Chronic wounds are more complex, and the balance of moisture and biofilm formation should be addressed.[2] Many concepts in chronic wound healing are carried over to burn wounds. Superficial partial burns and donor sites are different, and in the era of modern wound care, the use of temporary skin substitutes or dressings that behave like temporary skin substitutes can provide a cost-effective solution, since a single application can be applied.

This audit aims to illustrate that our management approach to superficial partial burns and donor sites with Cutimed® Sorbact® is successful. The dressing can be left in situ much longer than originally thought, leading to epithelialisation of the wound with a temporary skin-like substitute action. This is resource-sparing in an environment where cost and labour are limited.

Setting

The Pietermaritzburg Burn Service (PBS) consists of Greys Hospital (six paediatric and six adult burn beds) and Harry Gwala Regional Hospital (24 burn beds). Greys Hospital is the tertiary surgical service for western KwaZulu-Natal, comprising 3 million inhabitants, taking referrals via the Vula Medical Referral application (Mafami Pty Ltd). Harry Gwala Regional Hospital also receives referrals, but two-thirds of patients present directly to the hospital's Emergency Department (ED). Patients are assessed by the ED, which refers to the PBS, and decisions for further management are made by the PBS team.

Methods

A prospective audit was done from January to June 2019 at the Harry Gwala Regional Hospital, where Cutimed® Sorbact® was used at the burn surgeon's discretion. Sorbact® was typically chosen for scald burns assessed to be superficial partial-thickness at presentation or donor sites at the time of operation where the size of the burn injury or donor site was less than 10% of the total body surface area (TBSA). Less than 10% was chosen due to the physiological factors

potentially complicating larger surface area wounds (for example, fluid resuscitation complications or systemic infection, such as pneumonia).

Wound care may have been for an inpatient or outpatient, depending on social circumstances. Data was collected for three dressing changes on three components: whether the Cutimed® Sorbact® was wet or dry, whether it was removed or not at each dressing, and whether the wound was healed or not. The outcome was described for any continued wound care longer than three dressing changes. Demographic data, burn size, and mechanism were also recorded. This forms part of the PBS burns electronic registry, and the data is exported to Excel spreadsheets (Microsoft Corporation) for analysis. Patients were grouped into single Cutimed® Sorbact® use or non-single Cutimed® Sorbact® use and donor site group after data collection for ease of describing results. Simple descriptive statistics were used.

Ethics

Ethical approval is granted for the registry from the University of KwaZulu-Natal Biomedical Ethics and Research Committee, BCA 106/14.

Sorbact® protocol

Wounds are washed under procedural analgesia, or general anaesthetic in the case of donor site harvesting for a skin graft, with chlorhexidine soap (4% chlorhexidine gluconate B-Braun Bioscrub, South Africa) and water, with the removal of all blisters and debris. Haemostasis is achieved with a topical adrenaline solution of 1 : 1 000 sprayed onto the wound with a bulb syringe in the case of a donor site. The Cutimed® Sorbact® swab is placed, with a second buffer Cutimed® Sorbact® swab in the case of donor sites, and gauze, secured with Hypafix® (BSN Medical GmbH, Germany), or bandage, or Elastomesh® (BSN Medical GmbH, Germany).

Review is done on days 4–6 depending on practicality (for example, clinic day). The first wound review comprises the removal of the outer fixation and gauze. Inspection of the primary Cutimed® Sorbact® is done. If dry and adherent, new gauze is placed and fixed, and again reviewed in 4–6 days. If the Cutimed® Sorbact® is wet, it is removed, the wound is washed with chlorhexidine soap (4% chlorhexidine gluconate B-Braun Bioscrub, South Africa) and water, and a new Cutimed® Sorbact® swab applied, and the wound again reviewed in 4–6 days. This process is repeated until healing, usually between 14 and 21 days.

When the wound is believed to be epithelialised, removal is attempted. If it peels off easily with little resistance, removal continues. The wound is likely deeper if not epithelialised at this stage; the Cutimed® Sorbact® dressing is changed every 3–4 days, and skin grafting is planned. This protocol is presented as a flow diagram in Figure 1.

Results

A total of 27 patients were included. Results are presented in Table I. Demographics and injury details are presented in Table II. Dressing review details and outcomes are described below.

Superficial partial-thickness group

This group consisted of 14 patients. Six children under five years, four male children and a mean age of 27 months (range 10–48 months), three children under 12 years, two males and a mean age of six years (7–8 years), and five adults, three men and a mean age of 36 years (19–60 years). The mean TBSA was 5% (3–9%), with three facial burns, five torso burns, and nine limb burns (three patients had wounds in more than one area). Scald was the mechanism of burn in all cases except one, which was flash burn. Patients were divided into two groups, single Cutimed® Sorbact® to healing and non-single Cutimed® Sorbact® to healing.

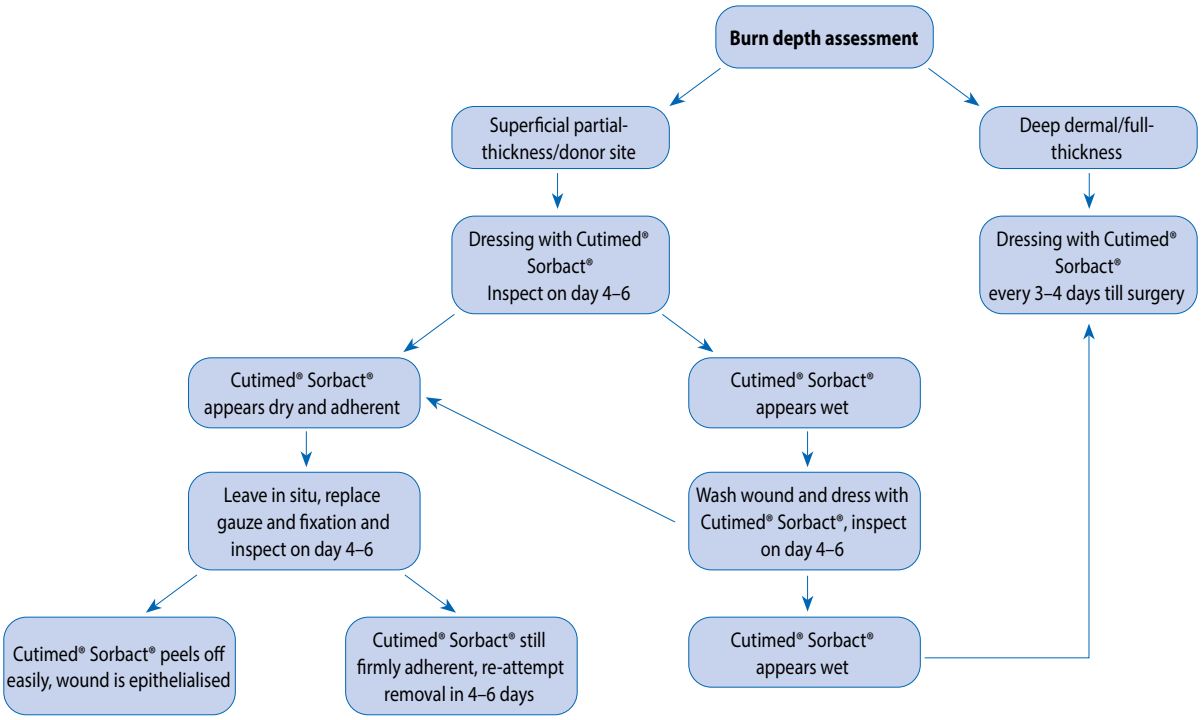

Figure 1

Table I: Demographics and injury details

Patient number	Adult (age in years)	Child > 5 years (age in years)	Child < 5 years (age in months)	Gender	Mechanism	% TBSA
Single Sorbact® group						
1	24			M	Scald	3
2	43			M	Scald	5
3		7		F	Scald	7
4			10	F	Scald	4
5			24	M	Scald	4
6		8		M	Scald	9
7			19	M	Scald	7
8	19			M	Flash	4
9	32			F	Scald	3
Non-single Sorbact® group						
10		6		M	Scald	8
11	60			F	Scald	4
12			38	F	Scald	5
13			22	M	Scald	6
14			48	M	Scald	5
Donor site group						
1	52			F	N/A	3
2	33			M	N/A	4
3	29			M	N/A	2
4			34	M	N/A	3
5			18	M	N/A	4
6			22	F	N/A	5
7			27	M	N/A	2
8			31	F	N/A	1
9			14	M	N/A	2
10			34	M	N/A	4
11			28	M	N/A	7
12	22			M	N/A	8
13	47			F	N/A	3

F – female, M – male, N/A – not applicable, TBSA – total body surface area

Single Cutimed® Sorbact® group

Nine patients did not have Cutimed® Sorbact® removed at the initial dressing review. Five patients had Cutimed® Sorbact® removed at the second review, and wounds were healed on day 13 in four cases and day 14 in one case. Cutimed® Sorbact® was removed at the third review, and healing was found in four cases on days 10, 14, 17, and 19, respectively. Cutimed® Sorbact® wear time had a mean of 14 days, ranging from 10 to 19 days, with no adverse effects.

Non-single Cutimed® Sorbact® group

Five patients had Cutimed® Sorbact® removed as the initial dressing according to the protocol because the dressing was wet. Two patients had Cutimed® Sorbact® changes every three days due to wetness; these wounds were declared deeper wounds and grafted on day 21 postinjury. On the second review, three patients were found to have dry Cutimed® Sorbact®, which was not removed according to the protocol until healing on days 14, 17, and 22, respectively.

Donor site group

The donor site group consisted of 13 patients, five adults, three men and a mean age of 37 years (22–52 years), and eight children under five years, six males and a mean age of 26 months (14–34 months). All donor sites were on the legs, with a mean TBSA donor site of 3.7% (1–8%). Donor sites were inspected on days 5, 10, and 17 postharvesting in 12/13 cases, with dry Cutimed® Sorbact® at first and second dressing and removal on day 17. A single Sorbact® dressing was used with a wear time of 17 days till healing in those 12 cases. One adult donor site was complicated by depth conversion. The wound was wet on initial inspection; Cutimed® Sorbact® was replaced and changed again on days 7, 11, 15, and 19, and the donor site was grafted on day 23.

Discussion

The PBS manages a high burden of injury in a resource-limited setting. Versatile and cost-effective dressings are in high demand. The PBS started using Cutimed® Sorbact® (Abigo Medical AB, Askersund,

Table II: Dressing review details and outcomes

Patient number	First review: day postburn	Sorbact® wet or dry?	Sorbact® removed?	Second review: day postburn	Sorbact® wet or dry?	Sorbact® removed?	Wound healed?	Third review: day postburn	Sorbact® wet or dry?	Sorbact® removed?	Wound healed?	Days to healing	Outcome if not healed by third review
Single Sorbact® group													
1	5	D	N	12	D	N	N	19	D	Y	Y	19	
2	6	D	N	13	D	Y	Y					13	
3	3	D	N	7	D	N	N	10	D	Y	Y	10	
4	6	D	N	13	D	Y	Y					13	
5	5	D	N	13	D	Y	Y					14	
6	3	D	N	10	D	N	N	14	D	Y	Y	14	
7	7	D	N	14	D	Y	Y					14	
8	6	D	N	13	D	Y	Y					13	
9	4	D	N	7	D	N	N	17	D	Y	Y	17	
Non-single Sorbact® group													
10	4	W	Y	7	D	N	N	14	D	Y	Y	14	
11	7	W	Y	10	W	Y	N	13	W	Y	N		Sorbact® every 3 days, depth conversion, granulation tissue grafted on day 21 postinjury
12	6	W	Y	9	W	Y	N	12	W	Y	N		Sorbact® every 3 days, depth conversion, granulation tissue grafted on day 21 postinjury
13	5	W	Y	8	D	N	N	15	D	N	N	22	Reviewed on day 22 postinjury, Sorbact® was dry and was removed, wound healed
14	4	W	Y	7	W	Y	N	10	D	N	N	17	Reviewed on day 17 postinjury, Sorbact® was dry and was removed, wound healed
Donor site group													
1	5	D	N	10	D	N	N	17	D	Y	Y	17	
2	5	D	N	10	D	N	N	17	D	Y	Y	17	
3	5	D	N	10	D	N	N	17	D	Y	Y	17	
4	5	D	N	10	D	N	N	17	D	Y	Y	17	
5	5	D	N	10	D	N	N	17	D	Y	Y	17	
6	5	D	N	10	D	N	N	17	D	Y	Y	17	
7	5	D	N	10	D	N	N	17	D	Y	Y	17	
8	5	D	N	10	D	N	N	17	D	Y	Y	17	
9	5	D	N	10	D	N	N	17	D	Y	Y	17	
10	5	D	N	10	D	N	N	17	D	Y	Y	17	
11	5	D	N	10	D	N	N	17	D	Y	Y	17	
12	5	D	N	10	D	N	N	17	D	Y	Y	17	
13	4	W	Y	7	W	Y	N	11	W	Y	N		Donor conversion, grafted on day 23 after initial harvest

D – dry, N – no, W – wet, Y – yes

Sweden) in 2016 due to its bacterial binding properties with an antimicrobial effect alongside its versatile nature. Adhering to product guidelines, dressings with Cutimed® Sorbact® were done twice a week, and the dressing was removed on each occasion. However, we noticed firm adherence to the wound bed in the case of superficial partial wounds and donor sites, and that removal was traumatic, leading to bleeding and removal of the newly formed epithelium.

Contrarily, this was not the case in wet, older wounds, like granulation tissue or skin grafts. We subsequently changed our wound management practice in the case of adherence of the Cutimed® Sorbact® to the wound bed where the wound was assessed as superficial partial thickness or a donor site. The Cutimed® Sorbact® was left in situ for 2–3 weeks until the wound appeared epithelialised beneath the dressing and peeled off easily.

Figure 2: Premature removal of Cutimed® Sorbact® with removal of epithelial cells and bleeding

Figure 3: Dry adherent appearance of Sorbact® over the donor site

Figure 4: Complete epithelialisation of a superficial partial-thickness burn after easy removal of Cutimed® Sorbact®

We believe that superficial partial burn and donor site wounds are unique and do not behave like other acute or chronic wounds, warranting a unique approach. Choosing a dressing with an antimicrobial effect to prevent infection and minimise trauma at the wound-dressing interface by an extended wear time promotes spontaneous healing of these wounds by epithelialisation. The properties of Cutimed® Sorbact® appear to achieve this goal.

In this patient group, complete healing by re-epithelialisation occurred on days 10–22 postinjury in the superficial partial-thickness group and day 17 in the donor site group with the extended wear time of the Cutimed® Sorbact® dressing, which has previously not been described. The time to healing is consistent with other authors.[3,4] These results demonstrate that Cutimed® Sorbact® can be left on the wound for much longer than originally thought by the manufacturer, with healing by epithelialisation of superficial partial-thickness burns and donor sites.

Three patients had depth conversion complications and required grafting. In these cases, where the Cutimed® Sorbact® appeared wet, it was changed every three days, as we do with other burn wounds (acute full-thickness burns or granulation tissue). These three patients illustrated standard complications of depth conversion, regardless of dressing type, and we believe the type of dressing used is unrelated.

It was our experience prior to this audit that led to the change in approach. Where Cutimed® Sorbact® was removed from a wound that it was adherent to, a layer of epithelial cells was seen on the removed Cutimed® Sorbact® with bleeding at the wound bed, illustrated in Figure 2. Repeated dressing changes appeared to delay final healing by epithelisation of the wound, despite no local signs of infection or systematic factors that could contribute to delayed healing. This led to our practice of leaving the Cutimed® Sorbact® in place until it peeled off easily, revealing a completely epithelialised wound. Figure 3 illustrates the appearance of the dry, adherent Cutimed® Sorbact® left in situ. Figure 4 illustrates the completely epithelialised superficial partial-thickness wound when the Cutimed® Sorbact® is removed easily without trauma, typically on days 14–22 in our series.

Reviews and meta-analyses typically report heterogeneity in the time to wound healing of donor sites and dressing comparison in published studies. Initial studies reviewed and published before 2003 on the use of moist wound-healing dressings in the management of split-thickness skin grafting donor sites concluded that moist wound-healing products are advantageous over non-moist products, specifically relating to healing, pain/comfort, and infection rates.[5] The comparator was typically fine mesh gauze or tulle-gras compared to hydrocolloids or polyurethane films, which were considered moist wound-healing.

In a more recent review published in 2018 of 35 publications, a vast array of modern products was used for donor sites. Some reported the superiority of moist wound-healing regarding pain and healing time. Others had no convincing evidence to support the superiority of moist dressings compared to dry dressings in donor site wound healing. One also needs to consider the secondary dressing as it influences the process of healing, which is not entirely dependent on the primary dressing.

Our approach differs from the usual frequently changed moist dressings and is similar to the temporary skin substitute approach with a single application removed only on healing. Other authors have described a dry-dressing approach with spontaneous separation of the dressing from the wound bed, reporting the dressing removal time as the mean healing time in days.[4] This aligns with our approach.

We would like to clarify that this extended wear Cutimed® Sorbact® approach until spontaneous separation occurs, applies strictly to acute superficial partial-thickness burns and donor sites. We believe these wounds are unique and unlike other wounds in general, as well as other full-thickness or chronic burn wounds where the Cutimed® Sorbact® would be changed every three days. The bacterial binding properties of Cutimed® Sorbact® are advantageous in preventing infection in acute superficial partial-thickness burns and donor sites, and likely contribute to the success of this approach.

Conclusion

The frequent removal of the primary Cutimed® Sorbact® dressing in the epithelialising wound (superficial partial-thickness burns and donor sites) causes trauma at the wound-dressing interface and can lead to delayed healing despite the absence of infection. Instead, leaving the primary Sorbact® layer in situ, with a protocol to monitor for complications, led to successful outcomes in our cohort. This practice

Cutimed® Sorbact®

Effectively prevents and treats wound infection[1,2]

93 % of wounds were healed or improved[1]

- Sorbact® Technology dressings reduce the bioburden in wounds[3]
- Effective against the Top 5 WHO (World Health Organisation) pathogens, as shown in vitro.[4]
- Can be used during the entire wound healing process.[2]

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Cutimed®
Your Power to Heal

has been adopted as standard management in our service, including large surface area burn injuries and large surface area donor sites.

Conflict of interest

The author declares no conflict of interest.

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Ethical approval

Ethical approval was obtained from the University of KwaZulu-Natal Biomedical Ethics and Research Committee Approval, BCA 106/14.

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Diabetic foot complications and their management at primary healthcare clinics in Johannesburg

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Background: Primary healthcare (PHC) in South Africa is predominantly nurse-driven, focusing on illness prevention and treatment of acute and chronic disorders. However, data on diabetic foot complications at PHC clinics is limited, and the role of podiatrists in prevention is underutilised. Diabetic foot complications, particularly ulcers, are a significant cause of amputations, with early identification and treatment crucial for prevention.

Methods: This cross-sectional retrospective study involved 536 diabetic patients with foot complications from three Johannesburg PHC centres. Descriptive statistics were used to analyse patient data.

Results: The study reveals a high prevalence of diabetic foot complications in PHC clinics, emphasising the need for community foot health promotion and podiatrist involvement. Early intervention is crucial, especially in patients with longer diabetes duration. Inadequate management and screening of foot-related complaints by nurses are observed. Lack of guidelines and well-defined referral pathways contribute to inadequate diabetic foot management.

Conclusion: The study reveals significant challenges in managing diabetic foot complications in South Africa's PHC system, emphasising the need for reform, early intervention, and the inclusion of podiatrists to provide holistic care and prevent amputations. The study concludes that podiatrists should be an integral part of PHC teams to improve diabetic foot care.

Keywords: diabetic foot, primary healthcare, South Africa, diabetic foot complication, diabetic foot risk management, diabetic foot risk factors

Wound Healing Southern Africa 2024;17(1):11-15

Introduction

Primary healthcare (PHC) in South Africa is largely nurse-driven, focusing on illness prevention, disease prevention, and treatment of acute and chronic disorders.[1] The health department manages various health services, including primary, secondary, and tertiary healthcare centres.[2] PHC is ideal for early identification of diabetic foot complications, but data on diabetic foot complications at PHC clinics is scarce.[3]

Podiatrists diagnose, treat, and manage lower limb and foot diseases, and their role in preventing complications like ulceration and amputation is underutilised.[4] Despite the need for podiatrists in PHC, they are not included in relevant strategies to drive inclusion, as seen in their exclusion from the draft document of Human Resources for Health 2030.[5]

Diabetic foot complications and their current management

Diabetes causes half of all amputations, mostly due to infected diabetic foot ulcers.[6] Early treatment and identification of risk factors can improve prevention and treatment outcomes.[7] Clinicians can reduce lower-extremity amputation risk through comprehensive history and foot examination.

Offloading is a technique used to reduce pressure at the ulcer site to speed up healing and reduce complications. It is crucial in foot ulcer treatment as it helps prevent damage to soft tissue voids, often leading to unnoticed damage in diabetic sensory neuropathy patients.

Additionally, diabetes often gives rise to diabetic foot infections (DFIs), a prevalent and expensive complication. Infections affecting the soft tissues and bones in DFIs commonly result in the development of sepsis and/or the necessity for amputation. However, 25% of patients do not recover. Early supplementary treatment can improve results, and routine treatment is often limited to four weeks.[8]

The ever-increasing number of diabetic-related amputations in South Africa may indicate a lack of access to early care for diabetic patients with foot complications. Despite this, the current framework is silent on foot health, prevention, and management of foot pathologies across all levels of care, particularly at the PHC level.

Methodology

In this cross-sectional retrospective design study, the researcher used quantitative methods. This approach allows a complete overview of the research problem. This study was cross-sectional, as the researcher was not choosing participants based on a selected outcome but rather a selected locality. The study was quantitative as the data was expressed using statistics and numbers. By using quantitative methods, the researcher was able to attain the aim of the study, which was to investigate, identify, and describe the incidence of diabetic foot complications and their management at PHC centres in Johannesburg.

This study was retrospective as the outcome of interest had already occurred and used data from medical records. This study was conducted

at three PHC centres in Johannesburg Region F. The researcher used the non-probability sampling method to choose the three clinics as the PHC centres for the study. Only diabetic patients were part of the sample. This method allowed the researcher to choose participants that fit a particular inclusion and exclusion criteria aligned with the study's aims.

Study population

The study involved diabetic patients with foot complications from three Johannesburg PHC centres. The study used 536 files and a self-constructed data collection tool. The tool was piloted at another clinic and discussed with the statistician for improvements to increase validity and reliability.

Data analysis

Descriptive statistical methods were used for this study.[9] The collected data was assessed by a statistician. Count, average, and quartile functions were used to analyse the data statistically.

Results

This study aimed to investigate the various aspects of diabetes management and foot health across three clinics at PHC. The analysis focused on age distribution, gender representation, duration of diabetes, diabetic foot risk factors, reported foot pathologies, and the utilisation of referral pathways for management. It is noteworthy that the cases of diabetic foot complications predominantly presented among male patients (59%) compared to female patients (41%). Given this discrepancy, more research should be undertaken to shed light on the possible contributing factors and devise appropriate strategies to address the unique challenges faced by males and females during treatment for diabetic foot ulcers.

The study encompassed a wide age range with participants from young adults to the elderly, indicating a diverse patient population (Figure 1). Most patients across all three clinics had diabetes for less than 20 years, with the highest percentage falling within the 0–9-year range (Table I). There were a limited number of cases with diabetes durations exceeding 40 years, highlighting the need for long-term management strategies.

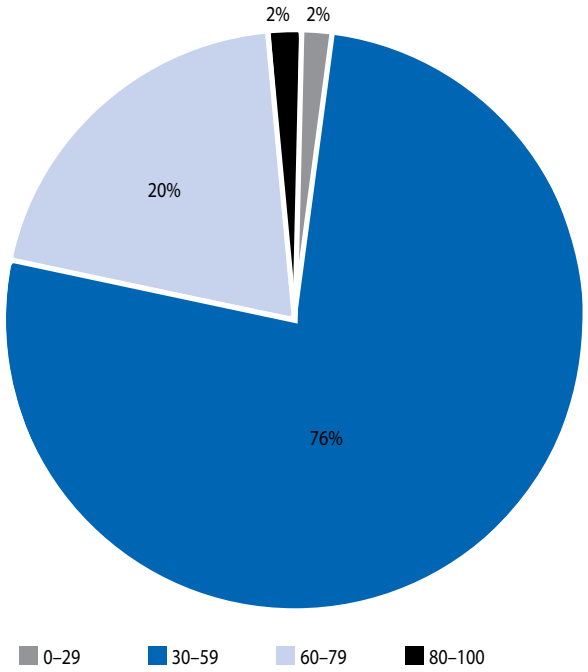

Figure 1: Overall age spread

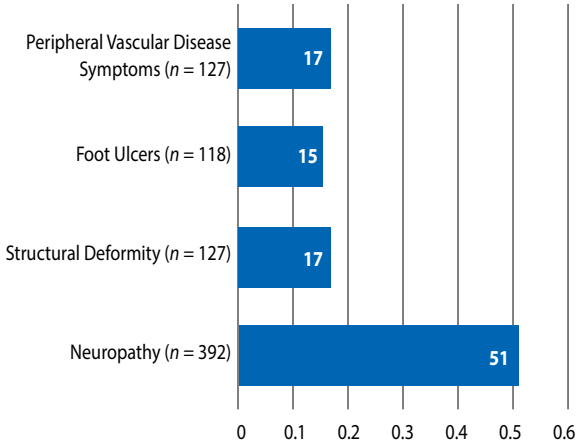

Figure 2: Recorded diabetic risk factors across all three clinics

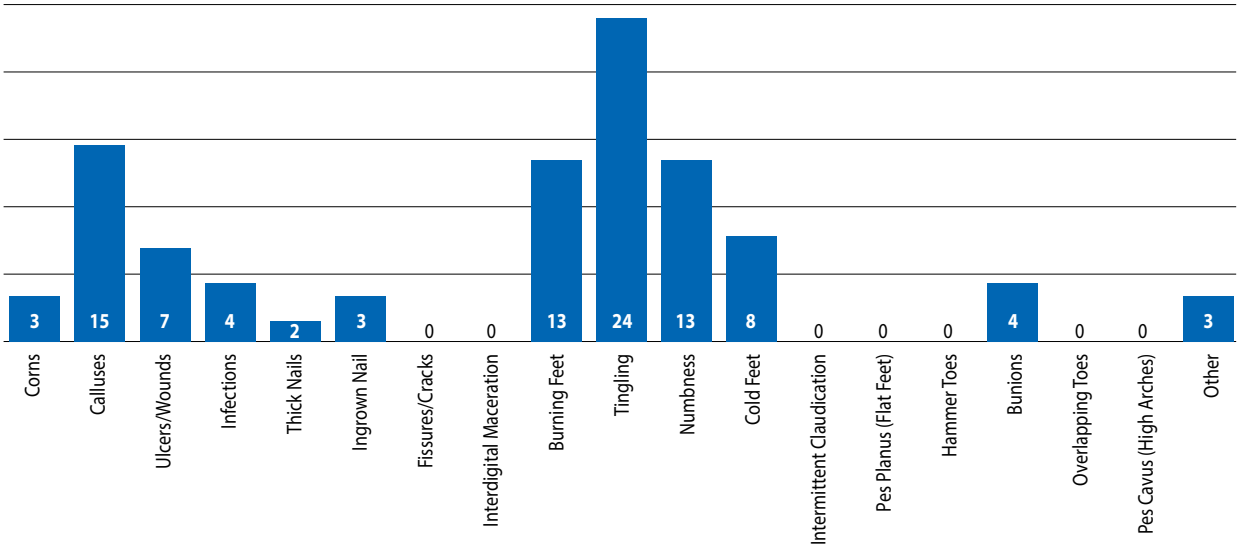

Figure 3: Reported foot pathologies across all three clinics

Table I: Duration of diabetes in patients at the three different clinics

Clinic		Clinic A		Clinic B		Clinic C	
		n	%	*n*	%	*n*	%
Duration of diabetes (years)	0–9	98	59	97	59	71	43
	10–20	57	35	50	31	82	49
	21–40	10	6	15	9	14	8
	41–80	0	0	1	1	0	0
	Total	**165**		**163**		**167**	

The recorded diabetic risk factors were consistent across the three clinics, emphasising the importance of addressing these factors in diabetes management (Figure 2). Hyperkeratosis and peripheral neuropathy were the most prevalent foot pathologies reported, suggesting a need for specialised care in managing these conditions (Figure 3). Burning feet, ulcers/wounds, and numbness also exhibited noteworthy percentages, indicating areas of concern for patient foot health (Table II). The utilisation of referral pathways as a form of management varied across the three clinics (Figure 4). This approach demonstrates a comprehensive strategy for addressing patients' specific needs.

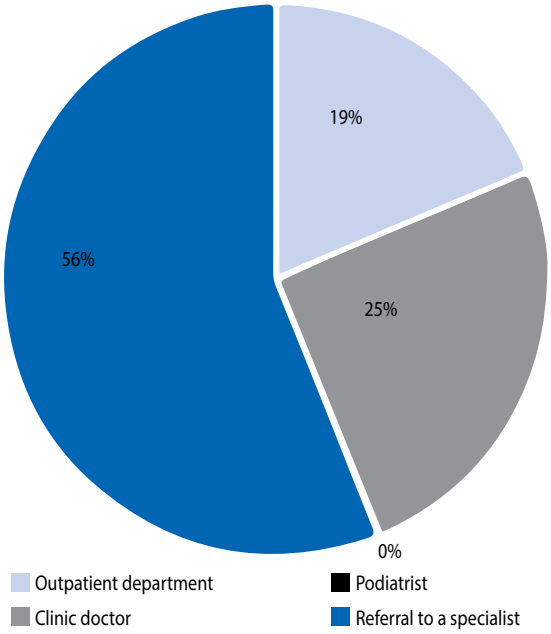

Figure 4: Referral pathway across all three clinics

Discussion

Prevalence of diabetic foot complications at the primary healthcare level

This study highlights the number of diabetic foot complications presenting at PHC centres and the percentage of those who already have diabetic foot complications that occur in PHC facilities. The distinction between males and females is critical since research has shown that diabetes is more common among males than females. The literature highlighted that most patients who present at PHC clinics in South Africa are predominantly females.[10]

Based on the provided information, it is confirmed that the 566 patients whose files were collected from PHC centres all presented with diabetic

Table II: Reported foot pathologies at the three different clinics

		Clinic A		Clinic B		Clinic C		Total	
		n	%	*n*	%	*n*	%	*n*	%
Reported foot pathology	Corns	10	2	22	6	11	2	43	3
	Calluses	67	15	36	10	136	19	239	16
	Ulcers/wounds	33	8	18	5	62	9	113	8
	Infections	12	3	14	4	47	7	73	5
	Thick nails	1	0	2	1	30	4	33	2
	Ingrown nail	24	5	10	3	11	2	45	3
	Fissures/cracks	0	0	0	0	0	0	0	0
	Interdigital maceration	0	0	0	0	0	0	0	0
	Burning feet	53	12	62	17	80	11	195	13
	Tingling	103	24	109	30	134	19	346	23
	Numbness	52	12	44	12	105	15	201	13
	Cold feet	41	9	31	8	42	6	114	8
	Intermittent claudication	0	0	0	0	0	0	0	0
	Pes planus (flat feet)	0	0	0	0	4	1	4	0
	Hammer toes	0	0	2	1	0	0	2	0
	Bunions	31	7	7	2	11	2	49	3
	Overlapping toes	0	0	2	1	0	0	2	0
	Pes cavus (high arches)	0	0	0	0	0	0	0	0
	Other	11	3	8	2	25	4	44	3
	Total	**438**		**367**		**698**		**1 503**	

foot complications. This implies that the patients seeking care at these centres indeed have diabetic foot complications. Given the previous remark, the outcomes of this study are relevant since community foot health promotion should arguably be available at all PHC centres. It could be argued that podiatrists are best suited to drive this initiative and there is a need for podiatrists at the level of PHC centres to assist with the early identification and management of diabetic foot complications and risk factors.

In addition, having podiatrists at this level of healthcare could help reduce primary and secondary amputation and prevent amputation in the remaining limb. Podiatrists at the PHC level could drive diabetic foot screening, early identification of risk, as well as foot health education initiatives and provide preventative treatments. The current district health delivery system in South Africa mandates that these preventative strategies or interventions be available at the PHC level. Without these structured interventions, patients at the PHC level risk developing severe complications that may result in losing a limb.[11]

However, podiatric services are only available at a few PHC centres in South Africa, and these are all centred in Gauteng. In cases where podiatric services are available, they remain poorly structured and ignored or unknown by other healthcare professionals.[12] Without structured foot health services, one might argue that diabetic patients are not given quality care at lower levels of care in the health system. The exclusion of podiatrists from the PHC team has resulted in a lack of, or severely limited, preventative foot health interventions in most PHC settings. This statement implies that patients presenting at these facilities may be deprived of a critical component of care, early identification, and prevention of complications, which ought to occur at the PHC level. The status quo should be changed if there is any hope of making a significant impact in the care of diabetic patients in South Africa.

Management of diabetic foot complications at primary healthcare centres

Because of their heavy workloads and training gaps, nurses may struggle to perform diabetic foot evaluations and screenings and implement an adequate management plan.[12] Evidence of diabetic foot complications in patients seen at PHC centres signals the need for early targeted interventions at this level of care. Such interventions must include effective prevention measures, early detection of diabetic foot issues, and appropriate assessment and management.

However, although there is an obvious need for foot health services at the PHC level, the service delivery structure still leans heavily towards a curative, high-cost care approach with limited adherence to a defined referral system. The predominantly hospital-centric healthcare system and emerging epidemics prevent the successful provision of quality, comprehensive, and integrated primary care to millions of South Africans.

The current study found that the 536 patients who were part of this study were inadequately assessed concerning their foot complaints. The patient files reviewed in this study highlighted the poor capture of foot-related complaints or pathologies in patients seen by nurses at the PHC level. This finding highlights these patients' risk as their complaints may be overlooked, incorrectly captured, or ignored during consultation.

Lack of guidelines in managing patients with diabetic foot complications

The Department of Health in South Africa lacks policies for foot-related problems, raising concerns about the ability of nurses to assess diabetic patients effectively. In terms of diabetic foot services, there is a strong justification and demand for a rethinking of health service provision, planning, and delivery in South Africa.

Based on existing diabetic foot complication recommendations, this study found that diabetic foot disease awareness was poor. To reduce the burden of diabetic foot disease, type 2 diabetes mellitus (T2DM) patients should have access to improved screening and prevention programs, as well as patient education while maintaining an active approach to risk factor modification, footwear, and identifying the at-risk foot.[13] South African policymakers need to use these factors to generate guidelines for the healthcare system when encountering a diabetic foot.

A study in the Western Cape found that no diabetic individuals had their feet screened, prompting a quality-improvement effort to increase diabetic foot care by healthcare clinicians at primary care clinics. The screening instrument can be completed in 1–3 minutes.[14]

Diabetic screening identifies asymptomatic individuals at high risk of developing the disease, with guidelines establishing care standards for high-quality treatment.[15] Evidence-based interventions should be used to develop recommendations for T2DM prevention, diagnosis, and treatment, as studies show that these practices significantly improve patient outcomes.[16]

Poorly defined referral pathways for patients with diabetic foot complications

A comprehensive strategy for foot healthcare is crucial, including primary prevention, secondary prevention, and tertiary referral routes. This can be achieved through the active participation of podiatrists at the PHC level. This study found that 313 patients were referred to specialists, but it is unclear which specialist and foot pathologies were referred.

Nurses need assistance managing diabetic foot complications, and a structured foot health service should be accessible at the PHC level. The referral system is failing, with nurses unaware of podiatrists' foot health services at tertiary hospitals. To improve the referral system, PHC nurses must build strong relationships with podiatrists and develop channels of contact. Visits to healthcare experts are essential for adherence, and stable visits have been positively rated by patients.[17]

Need for podiatrists as part of the primary healthcare team

The research suggests that podiatrists should be included as part of the PHC team. This study's findings demonstrate the need for podiatrists at this level of treatment. It is suggested that in the absence of podiatrists, most patients arriving at these clinics will go untreated.

In this study, 392 patients presented with neuropathy, 127 with structural deformities and peripheral vascular disease, and 118 with foot ulcers. These findings emphasise the importance of including podiatrists as PHC team members. PHC nurses deal with an ever-increasing number of patients, which has resulted in limited consultation time and, as a result,

an increase in the lack of effective management of diabetic patients, which has led to the current study's finding of many diabetic foot risk factors.

Research has discovered the necessity for podiatrists to be part of the PHC team. In the absence of podiatrists, the research participants agreed that very little is done to treat patients with foot and lower limb problems.[11] The Gauteng Department of Health is divided into five health districts, each with sub-districts. Professional nurses provide curative care, with the assistance of medical officers. District hospitals and community health centres offer support services. The department re-engineered PHC through three service streams without podiatrists.

Conclusion

In South Africa, there are major challenges regarding the management of diabetic foot complications. A significant segment of the patient population is systematically and structurally overlooked. This is a quantifiable finding as evidenced by this study. Diabetic patients with foot issues are being neglected across the country, which is a growing concern.

Conflict of interest
The authors declare no conflict of interest.

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Ethical approval
Ethical approval was obtained from the University of Johannesburg, Faculty of Health Sciences, Research Ethics Committee (REC-768-2020).

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The role of continuous topical oxygen therapy as an adjunctive treatment in non-healing chronic wounds: a South African perspective

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Background: This study aims to investigate the impact of continuous topical oxygen therapy (cTOT) as an adjunct to routine standard of care (SoC) in several patients with chronic, hard-to-heal wounds at the Wound Management Centre in Pretoria, South Africa.

Patients and methods: Patients with non-healing wounds lasting more than 30 days without active, untreated infection or osteomyelitis were included in this study. Following review and informed consent, patient, wound, and pain assessments (numeric rating scale, NRS) were performed. The cTOT system (cTOT, NATROX® O_2 wound therapy) was applied to the wound and covered with an appropriate secondary dressing. Wound assessments and dressing changes were performed weekly until healing was achieved.

Results: A total of 14 patients received cTOT. Two patients were lost to follow-up, and one failed to return to the clinic after eight weeks of treatment; however, data from that point were included. Six wounds healed within a mean duration of 11.7 weeks. The diabetic foot ulcer (DFU, Texas grade 2B, patient 4) took the longest time to heal (17 weeks), whereas the fastest healing was seen in a venous ulcer (VU) reported to heal in just six weeks, despite a duration of seven months before cTOT. The mean area reduction across the 12 wounds was 78.6%. The NRS pain score was shown to reduce in 5/6 wounds by 3.2 points on average (2–4 range).

Conclusion: cTOT proved to be a valuable adjunct to help improve wound healing and reduce pain in these challenging wounds in South Africa, highlighting the possible benefit of access to this therapy for patients with chronic, non-healing wounds in the region.

Keywords: non-healing wounds, topical oxygen therapy

Wound Healing Southern Africa 2024;17(1):16-21

Introduction

There is a paucity of data on the burden of wounds across South Africa. However, a recent study reported a wound burden of 34.6% in patients admitted to hospital.[1] Several factors drive the increased need for efficient wound care in South Africa, including a demand for faster recovery of patients with wounds, the need for shortened hospital stay, the rising incidence of chronic diseases that can result in wounds (diabetes, cancer, autoimmune diseases), and the expected increase in the number of surgical procedures.[2] Therefore, more effective treatment pathways will be required to support a growing number of non-healing wounds.

Evidence-based care algorithms can be further optimised with the addition of advanced wound interventions, such as topical oxygen therapy (TOT), that can be easily used and adapted to a patient's lifestyle. TOT is advocated as adjunctive to good standard of care (SoC) when a hard-to-heal wound has not reduced size by more than 40–50% within one month.[3-5] Oxygen supports multiple essential wound-healing functions. Oxygen demand is high in a wound, initially due to the inflammatory processes, as the production of reactive oxidative species (ROS) by phagocytes is oxygen-dependent. Adequate oxygen is also needed for cellular activity throughout the many tissue repair processes, such as the maturation of collagen fibres and appropriate fibroblast proliferation in wounds.[6-10]

Following injury, poor blood circulation, oedema, injured microcirculation, and contraction of vessels in traumatised tissue all limit oxygen distribution to a wound.[8] These issues are common across all chronic, non-healing wounds. Whilst the pathologies that lead to chronic wounds differ on a macro scale, such as diabetes vessel damage, venous skin damage, oedema vascular constriction, and vascular insufficiency, the impact of these states on the actual wound environment in any non-healing wound provides similar challenges.[11,12] This environment results in reduced wound perfusion and oxygen in the localised wound, thereby reducing the wound's capacity to heal.[11,12] Thus, reversing hypoxic conditions in any chronic non-healing wound should support faster healing by supporting the increased demand for oxygen required by the immune response, cell migration, and tissue repair processes.

This case series examined the impact of incorporating continuous topical oxygen therapy (cTOT) as an adjunct to routine SoC in patients with hard-to-heal wounds at the Eloquent Advanced Wound

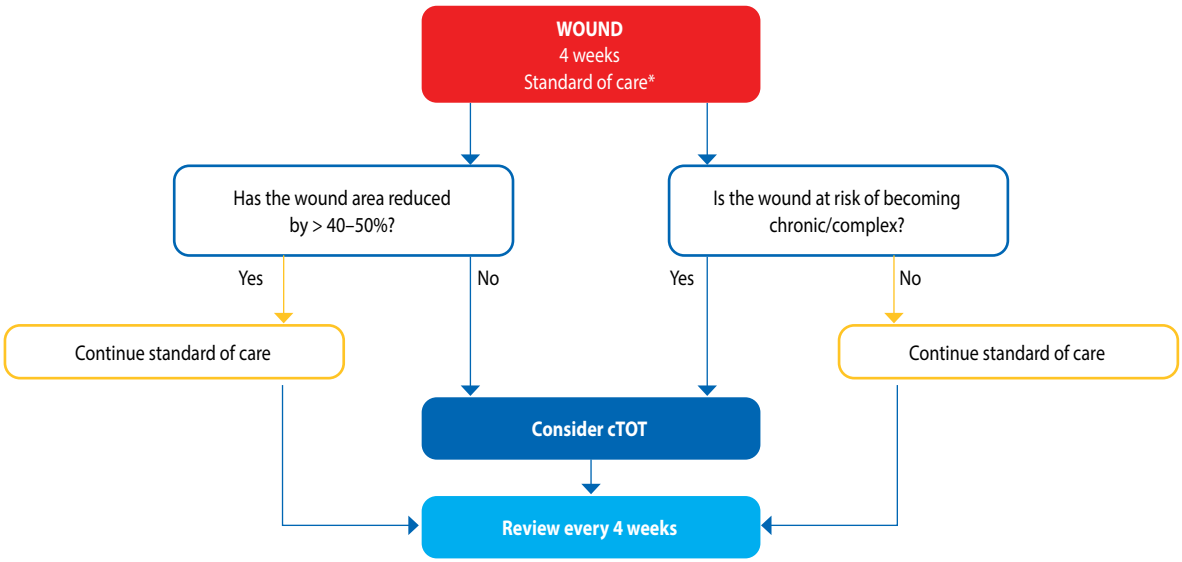

Figure 1: Recommended treatment pathway for the use of cTOT[3,13]
cTOT – continuous topical oxygen therapy
* Standard of care appropriate to wound and patient

Table I: Patient demographics and wound information

Patient				Comorbidities	Wound			
#	Age	Sex	Fitzpatrick scale		Type	Location	Duration (months)	Previous treatments
1	62	M	6	Diabetes (type 1), hypertension, neuropathy	DFU (Texas 3B)	Left forefoot	3	Cadexomer iodine with foam, Hydrofiber Ag dressing, silver foam dressings, PHMB foam, silicone foam
2	53	M	3	Hypertension, PAD, previous MI, DVT, heart failure	AU	Left lower leg lateral	3	Medical-grade honey with silicone foam and light compression
3	83	F	2	Hypertension, PAD, oedema, heart failure	VU	Right leg anterior	4	Silicone foam dressing with medical-grade honey ointment to deslough
4	62	M	3	Diabetes (type 2), hypertension, neuropathy (both feet), Charcot	DFU (Texas 2B)	Left plantar midfoot	12	PHMB foam, honey, silver, PHMB and betaine gel, NPWT, cadexomer iodine
5	73	F	6	Hypertension	VU	Left leg medial	30	Variety of treatments
6	41	F	5	Vitiligo, Lupus	Burn (using IR heat lamp)	Left thigh	3	Petroleum-impregnated tulle, various dressings, antibiotics and analgesia, medical-grade honey with foam dressings, blister graft
7	69	F	2	Venous hypertension	VU	Left lower leg	7	Silicone foam dressing, cadexomer iodine, silver foam dressings
8	25	M	2	Quadriplegia C4–C5	PI (stage 3)	Sacrum	2	Medical-grade honey ointment
9	80	M	2	Hypertension, PAD, venous hypertension, revascularisation	Mixed vascular ulcer	Left leg posterior medial	3	Icing sugar, medical-grade honey, fusidic acid cream
10	25	M	2	None	Surgical (postoperative dehiscence)	Left leg lateral	2	Impregnated povidone-iodine tulle, foam dressing
11	62	M	6	TB, lung removed, extensive thorax surgery	Surgical	Thorax left lateral side	14	Povidone-iodine ointment and gauze, ceramic granules, whole blood clot therapy
12	60	F	6	Hypertension, venous insufficiency, venous hypertension, limb deformity	VU	Right leg anterior	23	Medical-grade honey, petroleum-impregnated gauze tulle, PHMB, SSD cream
13	67	F	2	Hypertension, renal failure, venous insufficiency	VU	Bilateral lower legs	> 144	Various, including compression
14	70	M	2	Paraplegic, colostomy, venous hypertension, venous insufficiency, dependent oedema partly resulting from paraplegia	VU, the wound started as spider bite 12 years ago	Left leg lateral	144	Variety of treatments, including compression

AU – arterial ulcer, DFU – diabetic foot ulcer, DVT – deep vein thrombosis, F – female, IR – infrared, M – male, MI – myocardial infarction, N/A – not applicable, ND – no data/lost to follow-up, NPWT – negative pressure wound therapy, PAD – peripheral artery disease, PHMB – polyhexamethylene biguanide, PI – pressure injury, TB – tuberculosis, SSD – silver sulfadiazine, VU – venous ulcer

Management Centre in Pretoria, South Africa, between 2022 and 2023.

Patients and methods

Patients with a history of hard-to-heal wounds of any aetiology for longer than 30 days were included in this case series. Patients were excluded if any active, untreated infection or osteomyelitis was reported. Patients were eligible for adjunctive therapy if they had less than 40–50% reduction in the wound area in alignment with recommendations, detailed in Figure 1.[3,13]

Wound assessment

Following informed, written consent from the patients, standard patient and wound assessments were performed, capturing the previous management regime, wound aetiology, and wound details (tissue description, size, duration, and location). Pain was assessed using a numeric rating scale (NRS) scored 0–10, where 0 is no pain and 10 is the worst pain possible.

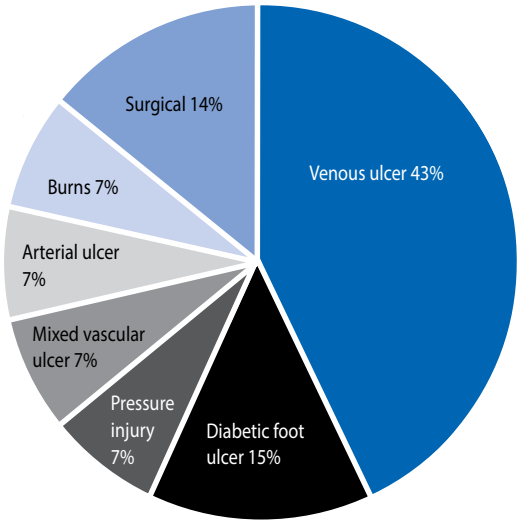

Figure 2: Breakdown of assessed wound aetiologies (*n* = 14)

Table II: Wound assessment information from 14 patients treated with NATROX® O_2 cTOT

#	Wound	Week 1			End of treatment					Time to healing* (weeks)
		Wound area (cm^2)	Wound appearance	Pain score (NRS 0–10)	Wound area (cm^2)	Wound appearance	Pain score (NRS 0–10)	Week	Wound area reduction (%)	
1	DFU (Texas 3B)	24	Granulation, epithelial tissue	0	0	Healed	0	14	100	14
2	AU	13	Sloughy, some granulation, epithelial tissue	5	ND	ND	ND	ND	ND	ND
3	VU	17.5	Sloughy, some granulation, epithelial tissue	3	2.5	Granulation, epithelial tissue	0	7	85.7	N/A
4	DFU (Texas 2B)	1.5	Slough, granulation, epithelial tissue	0	0	Healed	0	17	100	17
5	VU	6.3	Slough, granulation tissue	3	3.2	Some slough, granulation tissue	0	12	49.2	N/A
6	Burn	28	Granulation, epithelial tissue	0	0	Healed	0	12	100	12
7	VU	29.3	Slough, granulation tissue	4	0	Healed	0	6	100	6
8	PI (stage 3)	7.5	Sloughy, some granulation, epithelial tissue	0	0	Healed	0	12	100	12
9	Mixed vascular ulcer	11.3	Slough, necrotic, some granulation	3	0.5	Nearly healed, patient self-care	3	14	95.6	N/A
10	Surgical	2.1	Granulation, epithelial tissue	2	0	Healed	0	9	100	9
11	Surgical	4.5	Granulation, epithelial tissue, exposed muscle/ bone	0	2.7	Granulation, epithelial tissue	0	20	40	N/A
12	VU	32	Some slough, granulation, epithelial tissue	4	25	Granulation, epithelial tissue	0	8	21.9	N/A
13	VU	60	Some slough, granulation, epithelial tissue	0	ND	ND	ND	ND	ND	ND
14	VU	40	Slough, granulation tissue	0	19.6	Some slough, granulation, epithelial tissue	0	7	51	N/A

AU – arterial ulcer, DFU – diabetic foot ulcer, N/A – not applicable, ND – no data/lost to follow-up, NRS – numeric rating scale, PI – pressure injury, VU – venous ulcer
* If applicable
Wound area (cm^2) was calculated by multiplying the maximum wound length (cm) by the maximum wound width (cm). Patients 2 and 13 were lost to follow-up (no data past week 0) and were not included in the analysis. Patient 12 had eight weeks of treatment but failed to return to the clinic.

Treatment regime

The wound was initially cleaned with cleansing solutions containing either hypochlorous acid or polyhexamethylene biguanide (PHMB), and betaine. If required, either sharp debridement or mechanical debridement pads were used. A baseline wound image was then captured using a tablet or mobile phone device (Samsung, Korea). The cTOT system (NATROX® O_2, NATROX Wound Care, Cambridge, United Kingdom) was applied directly to the wound bed and covered with a semipermeable, secondary dressing appropriate for exudate management based on wound assessment and needs.

Wound assessments were performed weekly to monitor progress and change dressings for up to six visits or until healing was achieved. Patients were followed up a month after wound closure.

Results

A total of 14 patients were eligible for adjunctive treatment with wound aetiologies, shown in Figure 2, and additional patient demographics and wound information are in Table I. Two patients were lost to follow-up, and one failed to return to the clinic after eight weeks of treatment; however, data from that point were included. The remaining 11 patients showed either complete healing (n = 6) or ongoing progression to healing (n = 5).

The wound area, pain score (NRS 0–10), and appearance at baseline and the end of cTOT treatment are shown in Table II. Six wounds healed within a mean duration of 11.7 weeks. The DFU Texas grade 2B (patient 4) took the longest time to heal (17 weeks), whereas the fastest healing was seen in a venous ulce (VU) reported to heal in just six weeks despite a duration of seven months before cTOT. The mean area reduction across the 12 wounds was 78.6% during the treatment period (64.3% excluding the six healed patients). Of the six patients that identified initial wound pain, the score from 0 to 10 was reduced by the end of treatment in five wounds by 3.2 points on average (2–4 range). Clinician feedback reported that the ease of application of the device also made it user-friendly for the patients, who, in some cases, could apply the cTOT device by themselves at home.

Below is a summary of four cases as examples within the different types of wounds in the study (Figure 3). The cTOT was well tolerated by the patients with rapid wound healing progression despite the previously long non-healing duration, as demonstrated in Figure 3. Two complicated diabetic foot ulcers (DFUs) (patients 1 and 4) briefly used TOT for 12 and 14 weeks, respectively. Healing was demonstrated by week 14 for patient 1 and week 17 for patient 4. Similar results were shown in patient 6 (burn), which healed in 12 weeks with softer quality scarring reported anecdotally by the clinical team following six weeks of cTOT treatment and good SoC. Finally, patient 8 highlights the management of a stage 3 pressure ulcer; cTOT was applied under a semi-occlusive foam dressing along with SoC for nine weeks, with complete healing recorded at this time, which remained healed at follow-up.

Discussion

The burden of non-healing wounds is growing globally, and South Africa is no exception.[14,15] Whilst acute traumatic wounds tend to predominate in terms of prevalence in South Africa, more complex and severe chronic wounds are increasingly reported in ageing demographics and those with comorbidities.[1,16,17] Furthermore, the financial burden of wounds in South Africa was reported with an estimated spend on wound care of $1.1630 billion in 2019, quoted as purchasing power parity in billions of international dollars, (PPP international $ billion).[18] In addition, patients with non-healing wounds will often have a lower quality of life score compared with other chronic conditions.[19,20]

Non-healing wounds require timely interventions in addition to good SoC to progress healing. The availability and access to advanced therapies have been shown to directly impact on reducing morbidities in chronic wounds, with a recent United States study highlighting a 33% reduction in amputation rates in diabetes patients with access to Medicaid healthcare.[21] TOT is advocated as adjunctive to good SoC when a hard-to-heal wound has not reduced size by more than 40–50% within one month.[3,22] Moreover, TOT use is endorsed and recommended by international expert guidance, including the International Working Group on the Diabetic Foot (IWGDF), the Wound Healing Society (WHS), and the American Diabetes Association (ADA), with potential benefits highlighted across any non-healing wound.[3-7,10,22,23]

This guidance is supported by a growing body of high-level evidence that advocates using cTOT as a beneficial adjunct to wound healing in these hypoxic wounds. The substantive meta-analysis and randomised controlled trial (RCT)-level evidence in DFU is supported by broader real-world evidence in DFU and other chronic wound aetiologies, including leg ulcers (venous and arterial) and other traumatic or surgical non-healing, chronic wounds.[11,24-39]

cTOT delivers a continuous low flow of low-pressure oxygen to the wound, 24 hours a day, seven days a week. The oxygen is generated from the surrounding air using a small electrochemical oxygen generator unit, powered by rechargeable batteries and is wearable and silent. The oxygen is delivered to the wound through a thin, flexible tube using an oxygen delivery system (ODS) and is covered by a semi-occlusive dressing. Once positioned, the ODS is covered with an appropriate secondary semi-occlusive dressing to manage the wound exudate. cTOT is compatible as an adjunctive therapy alongside the gold SoC for the specific wound (i.e. compression for VUs and offloading for DFU). The device is portable, discreet, and silent, enabling the patient to continue their daily activities with minimal disruption.[3]

In this case series, cTOT, along with SoC as appropriate for the wound and the patient, was successfully employed across challenging wounds of different aetiologies with a previous long duration of non-healing. During treatment, rapid progress was observed in wound size reduction (almost 80%). The wounds that healed completely (42.8%) did so, on average, within less than 12 weeks. This concurs with published data, demonstrating a 44.4% healing rate compared to standard care alone (28.1% healed), and a 70.1% reduction in wound area compared to only a 40% reduction in the standard care group in a recent RCT in DFU in a 12-week study.[29] Similar outcomes were reported in other chronic wounds, particularly VUs. In a recent case series of 20 patients with non-healing VUs, 40% of wounds demonstrated complete healing.[37]

Findings were further corroborated in two large observational studies from Kaufman et al.[36] in which cTOT was effective in healing DFUs, pressure ulcers, and "other" chronic wounds. However, it was most

Patient 1: Complicated DFU on forefoot with history of underlying osteomyelitis and amputation of the second toe. Duration: 3 months	**Patient 4: Complicated Charcot DFU plantar. No underlying osteomyelitis present.** Duration: 12 months	**Patient 6: Complicated full-thickness burn on right thigh. NATROX® applied to the main ulcer.** Duration: 3 months	**Patient 8: Quadriplegic patient; multiple pressure ulcers due to defective equipment during loadshedding in SA. Sacral pressure ulcer stage 3.** Duration: 2 months
			
Week 1	**Week 1**	**Week 1**	**Week 1**
			
Week 6	**Week 6**	**Week 6** cTOT therapy discontinued	**Week 4**
			
Week 12 cTOT therapy discontinued at week 9*	**Week 17** cTOT therapy discontinued at week 14*	**Week 12** Wound healed	**Week 8** cTOT therapy discontinued at week 9*
Patient continued home care with silicone-bordered dressing; healed at 14 weeks. 	Wound healed at week 17 and is still intact at home. 	Follow-up to monitor scaring and overall healing. Hypertrophic scarring improved. The TOT site had better, softer quality scarring present.	Patient continued with pressure care; healed at 12 weeks. 

Figure 3: Four case examples of different non-healing wound aetiologies from the study highlighting the progress of cTOT treatmentcTOT – continuous topical oxygen therapy, DFU – diabetic foot ulcer, SA – South Africa
* Therapy discontinued before complete healing due to clinic access issues

effective in healing chronic venous leg ulcers (60% VUs in the healed/healing group vs. 18% in the non-responder group).[36] An overall reduction in VU wound area of 52% was achieved following the cTOT intervention.[11,36] This remarkable effect was also reflected in this case series with the fastest healing observed in a VU in just six weeks, despite a duration of seven months before cTOT. This promising data highlights the beneficial healing outcomes across multiple types of chronic wounds and warrants further exploration in controlled studies.

In this study, a marked reduction in pain in five patients during and following treatment highlights the additional benefits of cTOT use,

which may aid patient well-being and engagement with care. This finding is congruent with the published data of cTOT use in DFU, showing a significant reduction in mean pain scores from 2.4 (± 1.8) at baseline to 0.5 (± 1.0) at three months ($p = 0.008$).[31] Furthermore, recent data from Sweden highlighted that 76% of patients whose wounds were treated with cTOT reported a substantial relief of pain during the therapy, and 53% had complete resolution of all pain symptoms, resulting in a concurrent cessation of opioid medication in 69% of patients.[37]

Injury-associated pain, combined with inflammation, oedema, ischaemic nerve damage, and infection, can lead to a vicious cycle of pain in chronic wounds.[40,41] This is compounded by the fact that opioid medications used for chronic wound pain can delay wound healing, and the literature reports that some wounds are refractory to analgesic treatments.[42,43] Patients with chronic wounds find the pain particularly distressing, with one recent qualitative meta-synthesis of studies highlighting pain as one of the most common symptoms of venous leg ulcer (VLU), which significantly affects the patient's life.[44,45] Therefore, adequate pain management is an essential part of the patient journey and may help improve patient compliance with treatment plans.[41] Hence, as demonstrated in this report, alternative technology interventions, such as cTOT, that can support pain reduction in addition to the multiple benefits of wound progression and healing, should be considered to help patients regain their lives.

In this series, an improvement in the quality of granulation tissue and scarring was reported, an area that wider controlled trials should further substantiate. Furthermore, none of the cases with healed wounds had any further breakdown at the one-month follow-up visit, frequently observed with previous treatment strategies in those patients. This enhanced durability concurs with a post hoc analysis in a follow-up to a recent RCT, which demonstrated that 85% of wounds healed with cTOT remained healed at one year following treatment compared to only 60% with good SoC.[46]

Conclusion

The role of oxygen is critical to the wound environment and progression of wound healing, irrespective of aetiology, and has been substantiated in this case series using cTOT as an advanced intervention that positively influences wound healing. cTOT was found to be a beneficial adjunctive therapy to progress wound healing in these previously recalcitrant, challenging wounds. The ease of application of the device and pain reduction in the wounds supported a user-friendly, patient-centred approach to care, allowing patients to regain control of their wounds.

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Conflict of interest

L Naude created and led the case series. L Naude, E Woodmansey, and W Cole contributed to data analysis and interpretation, literature review, and manuscript preparation. E Woodmansey and W Cole are employees of NATROX® Wound Care (Inotec AMD Ltd., United Kingdom).

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Ethical approval

This observational study followed routine practice and measures, so no additional ethical approval was required. All patients provided written consent to participate in this case series.

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Perspectives on wound care in nursing homes: an agenda for knowledge translation in the South African context

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Background: The high risk of wounds among older people necessitates an evidence-based approach to wound care in nursing homes. This study explores the perspectives of nurse managers on the need to improve wound care in South African nursing homes to inform knowledge translation endeavours.

Methods: Utilising an exploratory, descriptive, qualitative design, 14 nurse managers from diverse nursing homes in the Tshwane District, Gauteng, were interviewed via telephone. The collected data were then thematically analysed.

Findings: Findings reveal improvement needs at the level of the resident and their family, the staff, and the organisation. Key issues include the need for enhanced psychological, emotional, and financial support for residents, capacity building to improve care staff's knowledge, attitudes, and wound care practices, and organisational support for accessing advanced wound care products and multiple health professionals.

Conclusion: The study emphasises the complexity of wound care in nursing homes and the imperative for a person-centred, integrated, and interprofessional approach to address these challenges on multiple levels. Insights into context-specific problems can inform the development of interventions and strategies, hence, an agenda for knowledge translation. Continuous learning, collaboration, and organisational support are essential to establish evidence-based wound care practices in nursing homes.

Keywords: continuous education, evidence-based practice, interprofessional collaboration, knowledge translation, nursing homes, wound care

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Introduction

The prevalence of wounds among older people in nursing homes can be as high as 92%.[1] The frail and bedridden are particularly vulnerable to developing pressure injuries.[2] Old age comorbidities and the vulnerabilities of the ageing skin further increase the risk for wounds, such as venous leg ulcers, diabetic foot ulcers, and skin tears, while also slowing wound healing processes.[3,4] These acute or chronic wounds affect the psychological and socioeconomic well-being of the affected individuals and their circle of care, including their families.[5,6] Additionally, the increasing incidence of antibiotic-resistant infections highlights the critical need for evidence-based wound prevention and management practices within nursing homes.[7]

Wound care within nursing homes presents a multidimensional challenge, requiring an interprofessional approach backed by organisational support and adequate resources. Furthermore, translating research evidence into practical application is a complex process, necessitating strategies and solutions tailored to meet the unique problems experienced in the context, namely in nursing homes.[8,9] If efforts to improve practice through knowledge translation are not aimed at the specific problems, the knowledge translation project might not make a real impact, wasting time and resources.

Despite numerous studies conducted in the field of wound care and nursing homes, there is a notable absence of data on wound prevalence in South Africa and a lack of understanding regarding the prevalent issues that necessitate evidence-based interventions in nursing homes.[10-12] Consequently, this study seeks to explore the perspectives of nurse managers, who play a pivotal role in coordinating care within nursing homes, in the areas necessitating improvement in wound care. The perspectives gained from this exploration aim to inform the knowledge translation agenda to improve wound care in South African nursing homes.

Methods

The study design, participants, sampling, recruitment, data collection, data analysis, and ethical considerations are described.

Study design

This study used an exploratory, descriptive, qualitative design, using individual telephonic interviews and thematic analysis. This design was suitable for exploring the perspectives of nurse managers on wound care provided in nursing homes. Data were collected between April and May 2021.

Population, sampling, and recruitment

The target population was nurse managers from nursing homes in the Tshwane District in the Gauteng province of South Africa. In this study, nursing homes refer to both non-profit organisations (NPOs) and

retirement estates. In this section, the term "retirement estate" refers to the higher income homes. Gauteng is the most densely populated and predominantly urban area, hosting a mix of private retirement estates and NPO-registered nursing homes.[13] A mix of profit and NPO-registered nursing homes was sought for variety in the financial capabilities of nursing homes and their residents since it influences the ability to access resources (e.g. the ability to afford medical aid) and consequently affects the needs for improvement of wound care.[14]

The financial capability of residents living in retirement estates generally differs from those residing in faith-based and welfare-funded nursing homes. Therefore, a sampling grid was used to categorise NPO-registered nursing homes (welfare-funded, faith-based, or non-governmental) and retirement estates for maximum variation sampling, ensuring a mix of homes. An initial set of nursing homes was purposively sampled from different geographical areas in the Tshwane District for each sampling grid category from the Department of Social Development's list of 17 NPO-registered nursing homes and from the 24 privately owned retirement estates identified from an online directory of retirement facilities in South Africa.[15] Nursing homes and retirement estates had to include frail care and assisted living to cater to the diversity of wound types and associated needs.

The nurse managers from the initially selected nursing homes were contacted telephonically, followed by emails providing study details. Eligibility required being a registered nurse who could understand and speak English. If initial contacts were unavailable, the nurse manager declined participation, or more participants were needed, recruitment continued for each nursing home category through purposive or snowball sampling. The sample size was determined by data saturation and was achieved after 12 interviews and confirmed with another two interviews.

At the end of data collection, 27 nurse managers were contacted, and several were unavailable or declined. The 14 nurse managers who participated included seven from higher-income retirement estates (HI), four from middle-income, faith-based, or other non-governmental nursing homes (MI), and three from lower-income welfare-funded nursing homes (LI). Findings are reported concerning the nurse managers of the three income groups using these participant code abbreviations.

Data collection

Data collection was conducted using individual telephonic interviews necessitated by the COVID-19 pandemic's restrictions on face-to-face interactions. Participants were instructed to be in a private, quiet room during the interview, scheduled at their convenience, either from their home or office. The interviews aimed to explore areas for improvement through two questions, 1) on the improvements nurse managers would wish to see in their nursing home related to wound care and 2) what additional support for these improvements would be required. These questions were part of a semi-structured interview designed to identify key stakeholders and their roles in wound care within nursing homes. However, findings related to stakeholders and their roles are not included in this paper.

The questions' clarity were pre-tested by a registered nurse with experience in quality improvement in nursing homes. To ensure accuracy in data collection, the interviews were audio-recorded with the participant's permission. Post-interview, reflective notes were taken to document any disturbances during the call, the researcher's impressions of the responses, and emerging themes. Each participant was assigned a unique code to maintain confidentiality.

Data analysis

Audio recordings were transcribed verbatim by a skilled transcriber. The researcher then checked the accuracy of these transcripts by simultaneously listening to the recordings and reviewing the transcripts. Subsequently, the transcripts were uploaded to ATLAS.ti version 9 for analysis. According to Saldaña's iterative coding and analysis process, an inductive thematic analysis approach was used.[16] Initial topics were listed following descriptive coding, followed by merging and categorising topics to develop mutually exclusive themes and sub-themes. Member-checking was conducted with six participants, who verified the identified themes and refined the sub-themes. The remaining participants were unavailable for follow-up discussions.

Findings

The findings are organised into three themes: improvement needs at the resident and family level, staff level, and organisational level, each with several sub-themes (Table I). Given that effective change and knowledge

Table I: The themes and sub-themes in the needs for improving wound care in nursing homes

Theme	Sub-theme
1. Improvement needs at the resident and family level.	1.1 The need for psychological support for residents with wounds to cope and change their lifestyle.
	1.2 The need to secure access to essential accessories for residents with wounds or wound complications.
	1.3 The need for continuous nursing home staff support based on trusting relationships.
	1.4 The need for residents' and their families' commitment to a best-practice wound care approach.
2. Improvement needs at the staff level.	2.1 The need to improve nursing home staff's wound care knowledge specific to their level of responsibility through formal and in-service training.
	2.2 The need for training in the most effective and affordable wound dressings.
	2.3 The need for training in the emergency management of acute wounds.
	2.4 The need to address attitudes towards wound care responsibilities to ensure consistency and continuity of care.
3. Improvement needs at the organisational level.	3.1 The need to improve access to advanced wound care products.
	3.2 The need to improve access to comprehensive care offered by an interdisciplinary team.

translation in evidence-based wound care necessitates interventions across multiple levels, these findings facilitate comprehensive planning.

Improvement needs at the resident and family level

The participants indicated the need for enhanced psychological, emotional, physical, and financial support for residents suffering from wounds. This support should come from external professionals as well as the nursing homes' staff. There is a demand for more tailored support to address the challenges associated with wounds, including facilitating coping mechanisms and promoting the necessary lifestyle adjustments.

> *"… especially if we come to bigger complicated wounds, I would really think that a psychologist should also be involved, just to get them to realise what they do have an influence on how we go (about) in the future …"* (HI 4)

A nurse manager from a lower-income nursing home indicated the necessity for assistance from counsellors and social workers in securing access to essential accessories, such as wheelchairs and prostheses, for residents experiencing complications from wounds, including amputations.

In addition to the need for support from professionals usually external to the nursing home, participants emphasised the role of nursing home staff in fostering the emotional well-being of residents with wounds, given the staff's constant presence. They highlighted the importance of establishing and sustaining a trusting relationship between staff and residents. Such a relationship is important not only for assisting residents in managing their wounds but also for supporting them through the challenging transition of being "uprooted" from their homes to the nursing home environment.

Moreover, the need was raised for the residents' and families' commitment to a best-practice approach for wound care, which could be facilitated through awareness-raising efforts. This need alluded to the frustrations experienced when residents or their families do not report the wound in time or resist the wound care treatment plan. Awareness should also be raised among the general public since they often influence views on wound care treatment, resulting in harmful self-treatment, especially among residents in the assisted living or self-care sections of nursing homes.

> *"We've got one resident … that the doctor wanted to admit for specialised wound care and IV antibiotics, and he point blank refused. He said, 'There is nothing wrong with my leg, I will make sure it heals properly.' Unfortunately, it ended up in an amputation." (HI 4)*

Improvement needs at the staff level

Participants identified a need for improving wound care knowledge, attitudes, and practices of the care staff. The term "care staff" encompasses care workers and nurses at various levels of qualification and responsibility towards wound care. These include the nurse manager, registered nurses with four-year qualifications, staff nurses with two-year qualifications, and auxiliary nurses with one-year qualifications.

Both low- and high-income nursing home participants observed a deficiency in the care staff's knowledge necessary to execute their designated roles in wound care effectively. For instance, care workers who primarily manage daily resident activities, such as mobilisation and skin care, were perceived to lack awareness of wound risk factors among residents. Similarly, nurses tasked with direct wound care frequently lacked knowledge of the latest and most effective wound care products, which are essential for optimal wound bed preparation.

> *"They (care workers) don't do the anatomy and physiology, they don't understand why people sustain pressure, … there must be in-service training in the facility continuously, but the wound care sister can give more specific inputs via in-service training ..."* (HI 1)

> *"… because we don't really have the knowledge to do something else, or to buy different plasters, now you buy this range, and it is totally wrong for that wound."* (HI 7)

There is a specific need in all nursing homes for affordable yet effective wound dressings and the requisite training to determine the most appropriate products for various types of wounds and their respective stages of healing. A nurse manager at a retirement estate, where nurses provide support for residents in assisted living, highlighted the need for these nurses to receive training that enables them to make informed decisions during emergencies. Such emergencies frequently occurring in nursing homes include uncontrollable bleeding from a skin tear due to warfarin intake or a laceration resulting from a fall. The importance of both ongoing in-service training and formal education for managing all wound types across all categories of care staff was emphasised. Some participants proposed that the advanced wound care practitioner, as an expert in the field, should contribute to the in-service training.

> *"You know if there are facilities that give us the training and maybe … if we can train in our facility one sister per year being an executive wound care sister …"* (LI 1)

Coupled with a lack of knowledge, attitudes such as ignorance towards wound care responsibilities were also seen as problematic. If only one person is trained in wound care, others may neglect the wound treatment plan. Therefore, continuous training of all levels of care staff is essential.

> *"… they know they must report, but they are just ignorant …"* (MI 1)

> *"… because if something is not written on a list, they won't do anything, … if I am on leave for four days, they will wait until I come back and they won't, you know they don't think that they can ask somebody else ... so, it is quite a problem, so that is why I am saying continuous education …"* (MI 1)

Participants perceived that the lack of knowledge and negative attitudes led to inconsistent wound care practices and an inability to follow a wound care treatment plan, detrimental to wound healing.

> *"… now somebody goes in between and puts on a dry dressing. You are just starting the whole thing all over, because the moment you pull that dressing off, you pull off all that, (the new tissue and granulation) …"* (MI 3)

Improvement needs at the organisational level

Feedback from participants highlighted two primary areas necessitating organisational support for wound care improvement: 1) the acquisition of advanced wound care products and 2) engagement and access

to health professionals. Addressing these needs entails a financial investment to bridge the healthcare provision gaps that residents or their financially constrained families cannot cover since free public healthcare outreach to older people in nursing homes or within the community is restricted. Although out-of-pocket private healthcare services can be offered to individuals in nursing homes, these services are often costly. A participant from a welfare-oriented nursing home reported that older individuals lacking medical insurance sometimes visit primary healthcare clinics where they may receive wound care products. Nonetheless, the frail and bedridden who are unable to afford private healthcare services at the nursing home, remain deprived of the necessary wound care.

> *"… there are people, even though they have a medical aid, they don't necessarily have funds for all these extra costs, … if we can get more people involved by maybe helping us to get more products that we can use it …"* (MI 2)

> *"… they've (pharmaceutical company) got good products, … but their prices are sometimes very, very high … so that makes it a little bit difficult to make use of, and because most of our elderly patients' funds are limited, … let's for instance say we need alginate, then we might make use of (the company) because they are the only one that's got that specific product …"* (HI 4)

The requirement for access to a comprehensive interdisciplinary team was another stated need. Frequently, healthcare professionals, including occupational therapists, social workers, physiotherapists, and wound care practitioners, are not part of the nursing home staff and are instead engaged through private consultations. Retirement estates are more inclined to have healthcare professionals as permanent staff than nursing homes with fewer resources. Nevertheless, the financial constraints make the permanent employment of a diverse range of healthcare professionals challenging. Despite these obstacles, nurse managers aspire to implement an interprofessional approach for optimal care.

> *"I don't have a physiotherapist. I don't have an occupational therapist, … the bigger old age homes, they have, we don't ... so we have to outsource everything, … I would love to have a full disciplinary team on board but it is not possible."* (MI 3)

> *"I say the whole team must actually work together, and it would be very nice to have a wound care clinic closer to one's facility …"* (MI 1)

Discussion

Improving wound care in nursing homes necessitates a comprehensive, integrated approach that addresses the multifaceted challenges at the resident, family, staff, and organisational levels. The insights derived show the range of needs for improving wound care and the complexity thereof in the nursing homes of both lower and higher-income categories.

Findings that residents with wounds need more support to achieve psychological, emotional, physical, and financial well-being underscores the principles that wound care requires a person-centred, holistic, and interprofessional approach, and not merely a focus on the "hole" in the person.[17-19] The World Health Organization supports interprofessional wound care as an evidence-based and person-centred approach since it entails shared decision-making among the healthcare professionals, the patient, and their family.[20,21] Shared decision-making can promote a common understanding and commitment to best-practice wound care, a need raised in this study.[22] Additionally, awareness-raising, as suggested by the nurse managers, can enhance commitment to evidence-based wound care, combat harmful myths about wound care, and encourage prompt reporting of a skin problem.

An interprofessional approach to wound care is challenging in the study's lower, middle and higher income nursing homes due to the lack of access to healthcare professionals, such as advanced wound care practitioners, physiotherapists, occupational therapists, and social workers. The involvement of skilled healthcare professionals is required to prevent and manage wounds effectively.[18] For example, dieticians with expertise in performing a nutritional assessment should be involved for optimal pressure injury prevention. Lack of access to a range of healthcare services often relates to the residents' and families' limited financial resources, as well as the limitations in the current fragmented healthcare system regarding access to healthcare for all.

The study showed that the organisation's support for an interprofessional approach was a primary need, but access to quality care extends to a system level. Specialised public healthcare that is free of charge offers limited services to older people in nursing homes, while private healthcare is expensive.[23,24] Therefore, policies are required to ensure access to healthcare for all older people in the new era of National Health Insurance, especially considering the growing ageing population in South Africa.[25] Innovations such as telemedicine may be necessary to access support for an interprofessional approach.[26]

The role of the nursing home staff in the emotional support of the resident with a wound has been emphasised in this study. Therefore, the attitudes of the staff should be addressed. Another primary need was for the staff to enhance their wound care knowledge and skills to align with their respective responsibilities for wound care. Recent knowledge-attitude-practice studies in the South African nursing home context are limited. However, a survey conducted in Gauteng found that almost half of the health professions, including general medical practitioners, pharmacists, and nurses attending to patients with wounds, had no formal wound care training.[27]

Knowledge and skills for effective pressure injury management are barriers to evidence-based care in various countries' long-term care facilities.[28-30] This study showed that nurse managers perceived continuous education as the most effective to train nursing home staff and would prefer additional support for training from advanced wound care practitioners. Continuous education and training programmes have proved effective in implementing evidence-based wound care in nursing homes.[31]

Limitations

Needs were reported from the perspective of nurse managers. Other stakeholders might have a different perspective on the needs. Therefore, future studies can explore the need for improving wound care from the perspective of the resident, staff, interprofessional team members, and organisational and system-level stakeholders.

Conclusion

The study presented the needs agenda that should be addressed in future practice improvement and knowledge translation studies for improving wound care outcomes in nursing homes. The complexity of nursing home wound care necessitates a person-centred, integrated, and interprofessional approach. Adopting such practices and fostering a culture of continuous learning and collaboration can enhance the quality of life of residents in nursing homes. Given these complexities, future knowledge translation efforts should follow a systematic, theory-based framework to guide the path to improved wound care outcomes.

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Conflict of interest

The author declares no conflict of interest.

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Ethical approval

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Adcock Ingram Critical Care (AICC), a leading manufacturer and supplier of hospital and critical care products in Southern Africa, is expanding its reach in Ostomy and Advanced Wound Care. On 1 February 2024, AICC and Convatec signed a sales, marketing and distribution agreement covering South Africa and neighbouring countries.

Convatec is a globally renowned medical products and technologies company focused on therapies for managing chronic conditions, with leading positions in advanced wound care, ostomy care, continence care, and infusion care.

Colin Sheen, MD at AICC says: "This strategic agreement will add an important new pillar to AICC's business. As a key pharmaceutical company in Southern Africa, AICC takes its responsibility towards healthcare professionals and patients seriously. As part of our commitment and responsibility to healthcare providers and patients, this agreement between AICC and Convatec is aligned with our mission to provide quality products that improve the health and lives of people in the markets we serve."

The agreement extends throughout South Africa and neighbouring countries, and includes the import and distribution of a range of finished products in Advanced Wound Care, Ostomy Care and Continence Care. Convatec's solutions provide various clinical and economic benefits that include infection prevention, protection of at-risk skin, and improved patient outcomes.

Sameer Singla, Vice President – Asia, Middle-East, Africa (AMEA) at Convatec says: "Convatec is pleased to partner with AICC to extend the reach of our products and solutions for patients. Convatec is committed to supporting people living with challenging medical conditions, and to addressing the care gap between the support patients need and what healthcare professionals can provide, which underpins our 'forever caring' promise. We look forward to partnering with AICC to meet the needs of patients and healthcare professionals."

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About Convatec

Pioneering trusted medical solutions to improve the lives we touch: Convatec is a global medical products and technologies company, focused on solutions for the management of chronic conditions, with leading positions in advanced wound care, ostomy care, continence care, and infusion care. With around 10,000 colleagues, we provide our products and services in almost 100 countries, united by a promise to be forever caring. Our solutions provide a range of benefits, from infection prevention and protection of at-risk skin, to improved patient outcomes and reduced care costs. Convatec revenues in 2023 were over $2 billion. The company is a constituent of the FTSE 100 Index (LSE:CTEC). To learn more about Convatec, please visit http://www.convatecgroup.com

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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.

1. Which phases are applicable to burn wound healing?	
a	Inflammation
b	Proliferation
c	Remodelling
d	All of the above
2. Superficial partial burns	
a	do not heal spontaneously
b	heal spontaneously by epithelialisation
c	heal by melanocyte migration
3. Full-thickness burns	
a	should be left to heal spontaneously by epithelialisation
b	should not be skin grafted
c	should be skin grafted
4. Donor sites	
a	behave like superficial partial-thickness burns
b	behave like deep partial-thickness burns
c	typically form granulation tissue
5. Haemostasis for donor site bleeding was achieved by	
a	adrenaline solution 1:1000 sprayed onto the wound with a bulb syringe
b	adrenaline solution 1:1000 injected into the wound
c	topical adrenaline solution 1:100 sprayed onto the wound with a bulb syringe
6. Time to wound healing in published studies is homogenous.	
a	True
b	False
7. Published studies on donor site dressings typically include the following dressing types:	
a	iodine
b	foams
c	tulle gras
8. Early removal of certain dressings in partial-thickness wounds can be traumatic and lead to bleeding.	
a	True
b	False
9. Dressing choice for superficial partial burns should include the following considerations:	
a	infection delay
b	must contain iodine
c	atraumatic
10. Delayed wound healing can be caused by:	
a	trauma at wound dressing interface
b	prevention of infection
c	management of systemic factors
11. Greys Hospital takes referrals via:	
a	Whatsapp
b	phone calls
c	vula referral app
12. In this hospital, wounds are washed with	
a	chlorhexidine soap and water
b	iodine solution
c	sterile saline
13. Keratinocytes	
a	migrate from viable skin appendages in the dermis
b	are completely destroyed in partial thickness burns
c	are not responsible for epithelialisation
14. Physiological factors can affect larger surface area burns.	
a	True
b	False
15. Healing of the superficial partial burns and donor sites in this study usually occurred in	
a	5–7 days
b	7–14 days
c	14–21 days

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