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Implementing a Locally Made Low-Cost Intervention for Wound and Lymphedema Care in Western Kenya

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Keywords

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Introduction

In Western Kenya, the burden of chronic wounds and lymphedema has a significant impact on functionality and quality of life, driven by physical discomfort, impaired mobility, and foul odor. The epidemiology of chronic leg ulcers in sub-Saharan Africa is limited. In other regions of the world, chronic leg ulcers are common with 60% of leg ulcers present for more than 6 months, and one-third persisting for over 1 year.[1] In addition to venous stasis ulcers and diabetic ulcers, in sub-Saharan Africa, there is a high burden of traumatic soft tissue injuries[2–5] and thus traumatic wounds contribute to the burden of chronic leg ulcers. With lymphedema, there is also progressive functional impairment leading to disfiguring changes, skin hardening from fibrosis, and recurrent skin infections. These are associated with mental health illness[6–8], social stigma[9,10], poor quality of life[11,12], and economic burden.[13–17]

Major barriers to provision of wound and lymphedema care in Western Kenya, as in other regions of sub-Saharan Africa, include availability, affordability, and accessibility. Compression therapy is the well-established standard of care for chronic leg ulcers from venous disease and lymphedema.[18,19] Pre-packaged compression bandages used for wound and lymphedema management in resource-replete settings are cost-prohibitive, 7-20 USD exclusive of import taxes, and often not available. At Academic Model Providing Access to Healthcare (AMPATH) health centers in Western Kenya, two medical assistants, a dermatologist, and a primary care physician from Laguna Honda Hospital and Rehabilitation Center in San Francisco trained clinicians and nurses to apply donated, pre-packaged compression bandages. After anecdotal observations that the donated two-component compression bandages were effective in managing venous leg ulcers and lymphedema, AMPATH Dermatology and AMPATH Pharmacy collaborated to develop a sustainable local alternative.[20] AMPATH is a partnership between Moi Teaching & Referral Hospital (MTRH), Moi University College of Health Sciences, and a consortium of North American academic medical centers. AMPATH, a President's Emergency Plan for AIDS Relief-United States Agency for International Development (PEPFAR-USAID)-supported implementing partner, collaborates with the Ministry of Health (MOH) to serve a catchment area of over eight million people and has supported HIV care delivery for over 165,000 patients at over 500 sites across Western Kenya. Using the infrastructure and healthcare delivery model

created through HIV care, AMPATH has been providing care for other chronic diseases, including diabetes, cancer, and dermatologic conditions.

Since 2017, locally available materials have been utilized to create an inexpensive, two-component compression bandage in Kenya for 2-3 USD each[20], modeled after the Unna boot. The first component is an inner paste bandage layer consisting of gauze impregnated with zinc oxide paste. The second component is an elastic crepe bandage, which can be applied with or without compression (Figure 1). Trained pharmacists and pharmacy technicians assemble the two-component compression bandages at MTRH, a public national referral hospital. Assembly time is 15 minutes per bandage. Bandage assembly is centralized to maintain quality assurance and preparation in a clean area to minimize the risk of contamination. These compression bandages are available for purchase at MTRH and also delivered to county and sub-county health facilities through the AMPATH revolving fund pharmacy network that supports the MOH pharmacies throughout Western Kenya. The revolving fund pharmacy model enables stable provision of medications and medical supplies by using revenue generated from sales to restock, thereby helping to ensure a reliable supply in the face of stock-outs at government facilities.[21]

Availability of affordable bandages has resulted in more patients seeking wound and lymphedema care at the MTRH Wound Clinic and several AMPATH-supported county and sub-county facilities. Since June 2018, 1200 compression bandages have been sold through the AMPATH revolving fund pharmacies at three sites across Western Kenya. An estimated 250 patients have been treated with these bandages. This expansion of wound and lymphedema care has led to training sessions on wound and lymphedema assessment and provision of adjuvant therapies, such as metronidazole gel, to address wound odor.[22,23] Moreover, providers have found additional uses for the bandages for conditions which require a protective bandage without compression, such as neuropathic ulcers and skin erosions caused by bullous drug eruptions. Prior to the development of these bandages, providers had extremely limited bandage options for protecting compromised skin.

Herein, we will present a series of cases including traumatic ulcer, venous stasis ulcer, lymphedema from Kaposi sarcoma, neuropathic ulcer, and bullous drug eruption that have benefited from management with the aforementioned low-cost locally made bandages. We will also reflect on key elements that have enabled successful implementation of this intervention and opportunities for scaling up this intervention across Western Kenya.

Venous stasis ulcer

A 65-year-old woman presented with a history varicose veins and 5-year history of recurrent venous leg ulcers on the left medial and lateral leg (Figure 2A–B). The wound was cleaned with normal saline and then mechanically debrided with a surgical blade and dissecting forceps. With the ankle joint positioned at 90 degrees, a two-component compression bandage was applied to the lower limb, starting from the mid-dorsum foot and ending just below the knee. Wound cleaning and compression bandage application occurred in clinic once to twice weekly. After several sessions, the patient’s daughter, who is a nurse, was taught the compression bandage application technique to enable home-based care and reduce frequency of clinic visits. The patient was advised to return every two weeks for assessment

or earlier for non-improvement of wounds. On Day 44, both medial and lateral wounds were completely healed (Figure 2C–D). Upon discharge from the wound clinic, the patient was advised to wear compression stockings.

Traumatic ulcer

A 54-year-old woman presented with a 2-week history of a traumatic wound from a motorbike accident (Figure 3A). Wet gauze bandages had been applied regularly at an outside hospital, but the patient had not observed any improvement. Following wound cleaning with normal saline, mechanical debridement using a surgical blade and dissecting forceps was performed, and a two-component compression bandage was applied in clinic every 1 to 2 weeks. Four months later, the wound was completely healed (Figure 3B). The patient reported having less pain and easier mobility.

Lymphedema from Kaposi sarcoma

A 44-year-old man presented with numerous skin nodules and large red tumors on a swollen right leg and foot (Campisi stage 3 lymphedema[24]). He complained of severe pain and odorous fluid draining from the tumors that impacted his activities of daily living and participation in social activities. Past medical history was notable for HIV (CD4 count and viral load were unknown), for which he had been taking antiretrovirals (lamivudine/tenofovir disoproxil fumarate/efavirenz) and cotrimoxazole for two years. Leg swelling had been present for about two years and skin lesions had developed four months prior. Skin biopsy confirmed a diagnosis of Kaposi sarcoma. After eight cycles of bleomycin and vincristine chemotherapy, the tumors had improved significantly but lower extremity edema was still present. A two-component compression bandage was applied in clinic and changed weekly. Following 10 weeks of compression therapy without continued chemotherapy, the patient noted that his leg swelling no longer affected his ability to walk, perform household tasks, or engage in social activities—even though photographs taken before and after the intervention do not reveal an appreciable difference in appearance (Figures 4A–C).

Neuropathic ulcer

A 75-year-old woman presented with an ulcer on the right heel of approximately five years' duration. She reported that five years ago she was diagnosed with malaria and treated with intramuscular quinine administered in the right gluteal muscle. A few days after treatment, the injection site was swollen and the right limb was numb. Intramuscular quinine is typically administered in the anterior thigh to avoid injury to the sciatic nerve, which can cause neuropathy. Soon thereafter, she observed an ulcer on the right heel. She denied a history of diabetes. The wound had been cared for with regular cleaning and dry gauze dressings every 2-3 days. This was intermittently accompanied by use of topical antibiotics and systemic antibiotics (exact medications unknown). Upon presentation to our clinic, the injection site swelling and numbness had subsided. Based on the history, appearance, and location of the ulcer, a diagnosis of neuropathic ulcer was made. The ulcer was cleaned with normal saline and metronidazole gel was applied to the ulcer base. Two-component bandages were applied from the dorsum of the foot at the point of the metatarsophalangeal joint to just above the lateral malleolus in clinic weekly. Bandages were applied without

compression, as plantar pressure is believed to play an etiologic role in the development of neuropathic ulcers. After ten weeks, the ulcer was healed (Figure 5A–B).

Bullous drug reaction

A 50-year-old woman presented with multifocal purpuric ovoid patches and sheets of sloughing skin without mucosal involvement that began 3 days prior to admission "immediately" after taking 2 doses of trimethoprim-sulfamethoxazole (TMP-SMX) for common cold symptoms (Figure 6A). The patient noted that she frequently took TMP-SMX for common cold symptoms. TMP-SMX is a prescription drug in Kenya, but some pharmacies will dispense it without a prescription. She had no prior history of skin rashes or drug allergies. A diagnosis of generalized bullous fixed drug eruption was favored, and atypical Stevens Johnson Syndrome-Toxic Epidermolysis Necrosis was considered. A skin biopsy was not performed because the results would not alter management in this setting and the cost of histopathology specimen processing is 15 USD, which would have imposed a significant financial burden on this patient. TMP-SMX, the culprit drug, was stopped and supportive care commenced. In the absence of alternative skin-directed therapies, the inner layer of the bandages—the zinc oxide impregnated gauze layer—was applied to the denuded skin without compression. After 10 days, the patient's skin had re-epithelialized (Figure 6B).

Discussion

Since the development of locally made low-cost bandages in Western Kenya, patients suffering from a range of wound and lymphedema etiologies have been successfully managed with these bandages. Patients with venous leg ulcers, traumatic leg ulcers, and leg lymphedema from Kaposi sarcoma have received compression with these bandages through tighter application of the outer layer elastic crepe component. Patients with neuropathic ulcers and bullous drug eruptions have received application of these bandages without compression.

Improvement of venous leg ulcers and leg lymphedema with compression bandages is consistent with this intervention being the standard of care treatment for these conditions. As traumatic injuries lead to disruption in lymphatic and venous blood vessels, it is not surprising that compression therapy would help to heal traumatic ulcers. For neuropathic ulcers and bullous drug eruptions, the bandages are used without compression to provide a protective dressing. For neuropathic ulcers, there is potentially the added benefit of off-loading pressure that may be playing a role in the healing process. Of note, this case series is limited by the selection of cases from a range of clinical conditions that had positive outcomes, and there may be instances where patients do not improve with this intervention. In order to evaluate the efficacy of these low-cost bandages, longitudinal studies with standardized and validated outcome measures for each disease of interest are required. A randomized controlled trial to assess the impact of these low-cost compression bandages on KS lymphedema is currently ongoing.[25]

In our experience, two-component compression therapy is associated with few adverse events (e.g. discomfort, itch) when used in an appropriate patient with an appropriate amount of compression. We consider compression therapy contraindicated in patients with a

history of peripheral arterial disease or signs of peripheral arterial disease on exam (e.g. cool limbs, poor distal pulses), untreated deep vein thrombosis, decompensated heart failure, and neuropathic ulcers. In the absence of reliable access to ankle-brachial index/toe-brachial index measurements and vascular imaging studies, physical exam findings are heavily relied upon. Doppler ultrasound to evaluate for deep vein thrombosis is available in our setting. Compression bandages are applied weekly in clinic. This is consistent with standard of care practice around the world for two-component compression therapy. Patients tend to have varying levels of tolerance for compression therapy and are counseled on potential for discomfort or pain. If the patient reports pain after application of the compression bandage, we reassess for contraindications, decrease the amount of compression by loosening the bandages, and recommend paracetamol (acetaminophen). We are unable to measure the exact amount of compression delivered due to the cost of interface pressure sensors. If pain persists, then compression therapy is aborted. Patients are instructed to call their provider if they develop pain after leaving the clinic, so that the provider can determine if the bandages should be removed and/or the patient should return to clinic sooner than previously planned. Since zinc oxide is inert and the only ingredient impregnated in the gauze, we would not expect to see allergic or irritant contact dermatitis. However, when patients are unable to keep the bandages dry due to the rainy season or their occupation (farming, fishing), pruritus does occur and can be associated with irritant contact dermatitis. This resolves with application of clean, dry bandages. During the rainy seasons, bandages are often changed more frequently, about every 3 days compared to every 7 days.

To-date, successful implementation of locally made bandages has been enabled by strong interdisciplinary collaboration among Dermatology, Pharmacy, Oncology, and Nursing. This collaboration has been fostered by the shared vision of addressing a commonly neglected group of skin conditions—wounds and lymphedema—that impact individuals, families, and their communities. From Dermatology, Oncology, Pharmacy, and Nursing, there are highly motivated individuals (“champions”) who are collaborating members on the team. As providers managing wounds and lymphedema in Western Kenya are few and far between, our dermatologist and wound care nursing team members have appreciated exchange of ideas and clinical support from one another when faced with challenging cases and limited resources. Our Pharmacy team members have been pivotal in helping to meet the increased demand for the bandages from Fracture Clinic and have continued to maintain bandage supplies across multiple facilities. With over a decade of partnership between the AMPATH revolving fund pharmacy and MOH pharmacies throughout Western Kenya[21], the supply chain for bandage distribution was already in place, enabling efficient and timely delivery to health facilities.

From project inception, our primary objective was to support and train Kenyan providers in taking care of patients with wound and lymphedema care needs. Our project first began as a partnership between Dermatology and Pharmacy. With pilot grant funding, this grew to include Oncology with a focus on addressing the lymphedema care needs of Kaposi sarcoma patients who are primarily treated at a sub-county health facility three hours away from MTRH. As patients with KS lymphedema began reporting improvement with symptoms and functioning associated with compression bandage use, our Kenyan team member began receiving referrals for patients with chronic wounds. The North America-based Dermatology

team was able to provide clinical mentorship through in-person meetings several times a year, coupled with remote mentorship via regular conference calls, WhatsApp messaging, and electronic mail communications. This Kenyan team member now participates as a lead trainer in our wound and lymphedema care training sessions at other sites across western Kenya.

Colleagues also introduced us to the MTRH Wound Clinic, directed by a nurse with specialized training in wound care. This nurse was eager, motivated, and qualified to develop wound care in both the outpatient and inpatient settings. The MTRH Wound Clinic is physically located next to the Fracture Clinic (Orthopedics) and, through successful healing of traumatic skin wounds associated with orthopedic injuries, there was a subsequent rise in awareness and popularity of the locally made low-cost bandages. In fact, from June 2018 through September 2019, 21 of 57 patients (37%) seen at the MTRH Wound Clinic had a traumatic skin wound associated with a fracture. Through partnership with Nursing, we have been able to think more broadly and identify strategies for improving wound care across MTRH and Western Kenya. This increase in local capacity has enabled us to continue expanding access to additional patients.

For many patients in Western Kenya, weekly to twice weekly travel to MTRH, a national referral hospital, is not feasible due to time, transportation costs, lost income, and employment considerations. As such, increasing wound and lymphedema care capacity at county and sub-county health facilities that are referring patients to MTRH is needed. We have conducted several training sessions at a county facility where there is a high burden of chronic leg wounds, and nurses were keen on learning how to care for wounds with local resources. Our initial training session was open to everyone working at the facility. This was then followed by two sessions with a smaller group of nurses from sites throughout the facility that were interested in obtaining wound care training. We also conducted a training session at a sub-county facility where KS patients receive care, with the goal of expanding facility-wide awareness of the uses of the bandages beyond KS lymphedema.

Moving forward, we will continue to train interested, motivated nurses and clinicians to provide wound and lymphedema care with local resources. Beyond training, we aim to support the development of wound care services at county/sub-county facilities. Ideally, a wound or lymphedema care “champion” would be identified at each of these health facilities to take leadership in this clinical domain, provide clinical support to lower level health facilities, and appropriately refer to the national referral hospital level. Ongoing support can be provided through periodic training sessions, as well as telemedicine. Store-and-forward, asynchronous telemedicine would enable wound and lymphedema care providers to submit challenging cases to obtain guidance on diagnosis and management, which may include referral to MTRH for more specialized care.

Still, we need options for patients who cannot consistently access a health facility that has wound and lymphedema care capacity. In select patients, we have had success with training family members to perform wound/lymphedema care and apply the bandages, as described in the venous stasis ulcer case. For lymphedema from KS, some patients have performed self-care at home, including wrapping their own legs with the bandages. Home-based care

delivery models, in which the patient or a caregiver assesses the wound and/or lymphedema and then applies the bandages as appropriate, is a promising option. Self-care and home-based care models have been successful for lymphedema from lymphatic filariasis[26–30], podoconiosis [31,32], and cancer.[27,33] In low- and middle-income countries, self-bandaging for lymphedema from lymphatic filariasis[29] and podoconiosis[31,32] has been included in home-based care models. Evaluation of this approach and determination of optimal candidates for home-based care, as well as development of standardized training and assessment protocols, are needed in our setting. There are also opportunities to integrate the use of other materials into home-based care. For example, banana leaves have been used successfully for management of wounds[34–36] with steam used as a sterilization technique.[36]

In sum, this project has made two-component compression bandages affordable and more available to patients in Western Kenya. Since implementation, these bandages have been used with compression to treat venous leg ulcers, traumatic leg ulcers, and KS lymphedema, as well as without compression to treat neuropathic ulcers and bullous drug eruptions. Implementation of wound and lymphedema care has prioritized support and mentorship of Kenyan providers. Future studies should evaluate the efficacy of the locally made bandages in the treatment of venous leg ulcers, traumatic leg ulcers, lymphedema, neuropathic ulcers, and bullous drug eruptions. We have also made gains with improving utilization of these bandages at MTRH; however, there is imperative need to expand utilization to a much larger catchment area in Western Kenya. As Kenya has prioritized attainment of universal health coverage[37], we must account for the various challenges that patients, families, and communities, as well as providers, health facilities, and health systems, face when providing care to an entire population.

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References

1. Harrison MB, Graham ID, Friedberg E, Lorimer K, Vandevelde-Coke S. Regional planning study. Assessing the population with leg and foot ulcers. Can Nurse. 2001;97(2):18–23.
2. Chokotho L, Mulwafu W, Jacobsen KH, Pandit H, Lavy C. The burden of trauma in four rural district hospitals in Malawi: a retrospective review of medical records. Injury. 2014;45(12):2065–2070. [PubMed: 25458068]
3. Sanyang E, Peek-Asa C, Bass P, Young TL, Jagne A, Njie B. Injury factors associated with discharge status from emergency room at two major trauma hospitals in The Gambia, Africa. Injury. 2017;48(7):1451–1458. [PubMed: 28408082]
4. Hulme P Mechanisms of trauma at a rural hospital in Uganda. Pan Afr Med J. 2010;7:5. [PubMed: 21918694]

5. Ogendi JO, Ayisi JG. Causes of injuries resulting in a visit to the emergency department of a Provincial General Hospital, Nyanza, western Kenya. Afr Health Sci. 2011;11(2):255–261. [PubMed: 21857858]
6. Mousley E, Deribe K, Tamiru A, Tomczyk S, Hanlon C, Davey G. Mental distress and podoconiosis in Northern Ethiopia: a comparative cross-sectional study. Int Health. 2015;7(1):16–25. [PubMed: 25062906]
7. Obindo J, Abdulmalik J, Nwefoh E, et al. Prevalence of depression and associated clinical and socio-demographic factors in people living with lymphatic filariasis in Plateau State, Nigeria. PLoS Negl Trop Dis. 2017;11(6):e0005567. [PubMed: 28570585]
8. Ton TG, Mackenzie C, Molyneux DH. The burden of mental health in lymphatic filariasis. Infect Dis Poverty. 2015;4:34. [PubMed: 26229599]
9. Abdulmalik J, Nwefoh E, Obindo J, et al. Emotional Difficulties and Experiences of Stigma among Persons with Lymphatic Filariasis in Plateau State, Nigeria. Health Hum Rights. 2018;20(1):27–40. [PubMed: 30008550]
10. Tora A, Mengiste A, Davey G, Semrau M. Community Involvement in the Care of Persons Affected by Podoconiosis-A Lesson for Other Skin NTDs. Trop Med Infect Dis. 2018;3(3).
11. Franks PJ, Moffatt CJ, Doherty DC, Williams AF, Jeffs E, Mortimer PS. Assessment of health-related quality of life in patients with lymphedema of the lower limb. Wound Repair Regen. 2006;14(2): 110–118. [PubMed: 16630098]
12. Stolldorf DP, Dietrich MS, Ridner SH. A Comparison of the Quality of Life in Patients With Primary and Secondary Lower Limb Lymphedema: A Mixed-Methods Study. West J Nurs Res. 2016;38(10):1313–1334. [PubMed: 27151079]
13. Babu BV, Swain BK, Rath K. Impact of chronic lymphatic filariasis on quantity and quality of productive work among weavers in an endemic village from India. Trop Med Int Health. 2006;11(5):712–717. [PubMed: 16640624]
14. Ramaiah KD, Das PK, Michael E, Guyatt H. The economic burden of lymphatic filariasis in India. Parasitol Today. 2000;16(6):251–253. [PubMed: 10827432]
15. Ramaiah KD, Guyatt H, Ramu K, Vanamail P, Pani SP, Das PK. Treatment costs and loss of work time to individuals with chronic lymphatic filariasis in rural communities in south India. Trop Med Int Health. 1999;4(1):19–25. [PubMed: 10203169]
16. Ramaiah KD, Radhamani MP, John KR, et al. The impact of lymphatic filariasis on labour inputs in southern India: results of a multi-site study. Ann Trop Med Parasitol. 2000;94(4):353–364. [PubMed: 10945045]
17. Tekola F, Mariam DH, Davey G. Economic costs of endemic non-filarial elephantiasis in Wolaita Zone, Ethiopia. Trop Med Int Health. 2006;11(7): 1136–1144. [PubMed: 16827714]
18. Grada AA, Phillips TJ. Lymphedema: Diagnostic workup and management. J Am Acad Dermatol. 2017;77(6):995–1006. [PubMed: 29132859]
19. O'Meara S, Cullum N, Nelson EA, Dumville JC. Compression for venous leg ulcers. Cochrane Database Syst Rev. 2012 11 14;11:CD000265.
20. Chang AY, Tonui EC, Momanyi D, et al. Development of Low-Cost Locally Sourced Two-Component Compression Bandages in Western Kenya. Dermatol Ther (Heidelb). 2018.
21. Manji I, Manyara SM, Jakait B, et al. The Revolving Fund Pharmacy Model: backing up the Ministry of Health supply chain in western Kenya. Int J Pharm Pract. 2016;24(5):358–366. [PubMed: 26913925]
22. Lyvers E, Elliott DP. Topical Metronidazole for Odor Control in Pressure Ulcers. Consult Pharm. 2015;30(9):523–526. [PubMed: 26350892]
23. Paul JC, Pieper BA. Topical metronidazole for the treatment of wound odor: a review of the literature. Ostomy Wound Manage. 2008;54(3):18–27; quiz 28–19.
24. Campisi C, Boccardo F. Microsurgical techniques for lymphedema treatment: derivative lymphatic-venous microsurgery. World J Surg. 2004;28(6):609–613. [PubMed: 15366754]
25. Chang AY, Karwa R, Busakhala N, et al. Randomized controlled trial to evaluate locally sourced two-component compression bandages for HIV-associated Kaposi sarcoma leg lymphedema in western Kenya: The Kenyan Improvised Compression for Kaposi Sarcoma (KICKS) study protocol. Contemp Clin Trials Commun. 2018;12:116–122. [PubMed: 30402565]

26. Aggithaya MG, Narahari SR, Vayalil S, Shefuvan M, Jacob NK, Sushma KV. Self care integrative treatment demonstrated in rural community setting improves health related quality of life of lymphatic filariasis patients in endemic villages. Acta Trop. 2013;126(3):198–204. [PubMed: 23499714]
27. Douglass J, Graves P, Gordon S. Self-Care for Management of Secondary Lymphedema: A Systematic Review. PLoS Negl Trop Dis. 2016;10(6):e0004740. [PubMed: 27275844]
28. Jullien P, Some J, Brantus P, Bougma RW, Bamba I, Kyelem D. Efficacy of home-based lymphoedema management in reducing acute attacks in subjects with lymphatic filariasis in Burkina Faso. Acta Trop. 2011;120 Suppl 1 :S55–61. [PubMed: 21470557]
29. Narahari SR, Bose KS, Aggithaya MG, et al. Community level morbidity control of lymphoedema using self care and integrative treatment in two lymphatic filariasis endemic districts of South India: a non randomized interventional study. Trans R Soc Trop Med Hyg. 2013;107(9):566–577. [PubMed: 23832181]
30. Wijesinghe RS, Wickremasinghe AR, Ekanayake S, Perera MS. Efficacy of a limb-care regime in preventing acute adenolymphangitis in patients with lymphoedema caused by bancroftian filariasis, in Colombo, Sri Lanka. Ann Trop Med Parasitol. 2007;101(6):487–497. [PubMed: 17716431]
31. Negussie H, Kassahun MM, Fegan G, et al. Podoconiosis treatment in northern Ethiopia (GoLBet): study protocol for a randomised controlled trial. Trials. 2015;16:307. [PubMed: 26177812]
32. Negussie H, Molla M, Ngari M, et al. Lymphoedema management to prevent acute dermatolymphangioadenitis in podoconiosis in northern Ethiopia (GoLBeT): a pragmatic randomised controlled trial. Lancet Glob Health. 2018;6(7):e795–e803. [PubMed: 29773516]
33. Ridner SH, Fu MR, Wanchai A, Stewart BR, Armer JM, Cormier JN. Self-management of lymphedema: a systematic review of the literature from 2004 to 2011. Nurs Res. 2012;61(4):291–299. [PubMed: 22565103]
34. Bitter CC, Erickson TB. Management of Burn Injuries in the Wilderness: Lessons from Low-Resource Settings. Wilderness Environ Med. 2016;27(4):519–525. [PubMed: 28029455]
35. Gore MA, Akolekar D. Evaluation of banana leaf dressing for partial thickness burn wounds. Burns. 2003;29(5):487–492. [PubMed: 12880731]
36. Guenova E, Hoetzenecker W, Kisuze G, et al. Banana leaves as an alternative wound dressing. Dermatol Surg. 2013;39(2):290–297. [PubMed: 23387359]
37. Kenya Ministry of Health. Transforming Health: Accelerating Attainment of Universal Health Coverage. Kenya Health Sector Strategic and Investment Plan (KHSSPI), July 2013-June 2017 https://www.who.int/pmnch/media/events/2013/kenya_hssp.pdf. Accessed January 9, 2020.

Key Points:

- Major barriers to provision of wound and lymphedema care in Western Kenya include availability, affordability, and accessibility of bandages.
- At Academic Model Providing Access to Healthcare (AMPATH) in Western Kenya, dermatologists and pharmacists collaborated to develop a two-component compression bandage modeled after the Unna boot using locally available materials that costs 2-3USD and is distributed through a revolving fund pharmacy network.
- Venous leg ulcers, traumatic leg ulcers, and leg lymphedema from Kaposi sarcoma are treated with the compression bandages; neuropathic ulcers and bullous drug eruptions are also treated with the bandages—without compression.
- In partnership with nursing, utilization of these bandages at the national referral hospital and a few county facilities has increased, but expanded utilization to a much larger catchment area is needed.

Synopsis

In Western Kenya, the burden of chronic wounds and lymphedema has a significant impact on functionality and quality of life, driven by physical discomfort, impaired mobility, and foul odor. Major barriers to provision of wound and lymphedema care include availability, affordability, and accessibility of bandages. At the Academic Model Providing Access to Healthcare (AMPATH) in Western Kenya, dermatologists and pharmacists collaborated to develop a two-component compression bandage modeled after the Unna boot using locally available materials that cost 2-3USD and is distributed through a revolving fund pharmacy network. Venous leg ulcers, traumatic leg ulcers, and leg lymphedema from Kaposi sarcoma are treated with the compression bandages; neuropathic ulcers and bullous drug eruptions are also treated with the bandages—without compression. In partnership with nursing, utilization of these bandages at a national referral hospital and a few county facilities has increased, but increasing utilization to an expanded catchment area is needed.

Figure 1:
Leg wrapped with locally made low-cost two-component compression bandage

Figure 2:

Venous leg ulcer on the lateral left leg (A) and medial left leg (B) at initial presentation. After 44 days of compression therapy, healed ulcers on the lateral left leg (C) and medial left leg (D).

Figure 3:
Traumatic leg ulcer at initial presentation before debridement (A) and four months later when healed, leaving scar and dyspigmentation (B).

Figure 4:
Kaposi sarcoma lymphedema and tumors at initial presentation (A), after 8 cycles of bleomycin-vincristine chemotherapy and prior to compression therapy (B), and after 10 weeks of compression therapy (C).

Figure 5:
Neuropathic ulcer on right heel at presentation (A) and 10 weeks after weekly ulcer cleaning, metronidazole gel, and application of two-component bandages without compression (B). White substance is zinc oxide paste residue from the inner layer bandage.

Figure 6:
Bullous drug reaction from trimethoprim-sulfamethoxazole at presentation (A) and 10 days later after culprit drug cessation and skin-directed therapy utilizing the bandages as protective dressings, without compression (B).