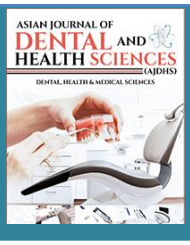

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The Challenges of Chronic Wound Care and Management

Pallav Dave *

Regulatory Compliance Analyst, Louisville, KY, 40223, USA

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*Address for Correspondence:

Pallav Dave, Regulatory Compliance Analyst, Louisville, KY, 40223, USA

Abstract

Chronic wounds are a significant healthcare challenge across the world. They affect approximately 2.21 per 1000 people making them a prevalent challenge that needs to be addressed. The prevalence of these wounds is also growing as the population ages. Various underlying factors such as medical conditions, poor nutrition, diabetes, vascular disease, arterial disease, prolonged pressure, neuropathy, chronic venous insufficiency, and being overweight or obese are contributing to the increasing prevalence of chronic wounds. Addressing chronic wounds is vital. They are a significant healthcare burden that affects the overall quality of life and contributes to the loss of function. Chronic wounds are also painful, which makes them a difficult experience for patients. With the increasing morbidity and mortality attributed to chronic wounds, it is important to ensure treatment interventions are effective to achieve positive outcomes. However, achieving positive outcomes is a challenge because of the existing challenges that impede proper wound care and management. Identifying the challenges that make it difficult to manage chronic wounds effectively is vital to ensure positive outcomes in management. The aim of this review is to identify the challenges that affect chronic wound care and management.

Keywords: chronic wounds, ulcers, wound care, wound management, treatment interventions

Introduction

Chronic wounds refer to wounds that do not progress through the normal healing process as other wounds. As a result, they remain open for longer periods of time. These wounds are a significant challenge to healthcare systems affecting about 2.21 people per 1000 across the world.[1] In the US alone, chronic wounds affect more than 2.5% of the population or 10.5 million people.[2] The incidence of chronic wounds is increasing. In the US, about 1% of the population has an active or healed venous ulcer.[3] Pressure sores are also a significant burden to the population. Another one million of the 30 million people who live with diabetes develop an ulcer every year.[3] The burden of these wounds is projected to increase in the coming years as the aging population increases. Elderly people tend to be disproportionately affected by chronic wounds.[2,4] Factors such as underlying medical conditions, poor nutrition, increased risk of falls, and the likelihood of undergoing surgery can explain why this population is disproportionately affected.[5] In the general population, chronic wounds can be attributed to a number of factors. Some of these factors include diabetes, vascular disease, arterial disease, prolonged pressure, neuropathy, chronic venous insufficiency, and being overweight or obese.[4,6]

Addressing the burden of chronic wounds is vital. They are a significant health burden that contributes significantly to lower quality of life and inability to perform daily functions.[7] Individuals with chronic wounds are prone to infections with a recurrence rate of up to 70% making it even more difficult for patients.[4] Another feature of these wounds is inflammation which means they cause a great deal of pain to the affected patients. Chronic wounds also contribute to the morbidity and mortality burden. According to Jupiter et al.[8] a diabetic ulcer is associated with 40% mortality rate five years after its occurrence. Chronic wounds also contribute significantly to disabilities. 85% of all amputations are attributed to ulcers while diabetic ulcers contribute to 75% of all lower limb amputations.[9] The high morbidity and mortality rates attributed to chronic wounds despite the therapeutic interventions that are available for managing these wounds explain why they are a significant health burden. Chronic wounds are also attributed to a significant financial burden.[10] The difficulty in treating them, the high recurrence rate, and the persistent infections are some of the factors that contribute significantly to the financial burden of treating chronic wounds. Identifying the challenges attributed to chronic wound care and management is vital to their management. By identifying these challenges, it becomes easier to put interventions in place that can improve patient health outcomes.

The aim of this review is to provide an overview of the challenges that are encountered in the care of chronic wounds. The review begins by providing a brief overview of chronic wounds including their classification and pathophysiology. It goes ahead to discuss the challenges that are encountered in the management of these wounds before providing a brief overview of measures that can be taken to ensure success is achieved when it comes to chronic wound care and management.

Classification of Chronic Wounds

Classifying chronic wounds is vital for the provision of adequate care. Classifying these wounds allows for adequate care and treatment interventions.[11] Chronic wounds are mainly classified in three main ways. They include vascular ulcers, diabetic ulcers, and pressure ulcers.[4]

Vascular ulcers

Vascular ulcers can either occur as venous or arterial ulcers. Venous ulcers are the most common type of presenting wound.[12] They result from chronic venous insufficiency or venous hypertension and mostly occur in the lower extremity.[6] Venous ulcers typically present as shallow wounds and normally occur following venous reflux or obstruction.[13] Venous ulcers can be attributed to a number of risk factors. Some of these risk factors are venous disease, old age, obesity, heart disease, arterial disease, insufficiency of the superficial, perforating, or deep veins of the legs, and deep venous thrombosis.[13,14] Arterial ulcers emerge because of impaired tissue perfusion more so the reduced supply of blood to the lower limb.[13] Reduced perfusion leads to ischemia or reduced blood flow making it hard to deliver nutrients which leads to the death of body tissue.[15] It is this reduced blood flow and subsequent death of the body tissue that leads to the occurrence of an ulcer. Arterial ulcers occur on the distal extremities and present as deep wounds where the tendon or bone is exposed.[16] Arterial ulcers are mostly attributed to atherosclerotic disease.[17] Other risk factors that cause arterial ulcers include diabetes, vasculitis, thromboangiitis, hypertension, smoking, advanced age, obesity, and hyperlipidaemia. [15-17]

Diabetic ulcers

Diabetic foot ulcers mostly affect people who are living with type 2 diabetes. Diabetic ulcers mainly occur when diabetes is not well controlled. In the US, diabetic foot ulcers affect an average of 1.6 million people annually.[18] Several factors increase the risk of developing diabetic ulcers. They include peripheral neuropathy, arterial insufficiency, poor glycemic control, foot deformities, calluses, lack of proper foot care, and poor circulation.[15,16, 19,20] Patients with peripheral neuropathy are particularly at a high risk of developing diabetic foot ulcers. This is because they have reduced sensory awareness because of sensory neuropathy. As a result of this reduced sensory awareness, they are less likely to feel pressure, heat, or injury.[21] In normal people, sensory awareness leads to pain and discomfort. However, when it is reduced, pain and discomfort go unnoticed for a long time which increases the risk of developing an injury or formation of an ulcer. This explains why peripheral neuropathy is a significant risk factor for diabetic foot ulcers. Diabetic ulcers develop in three stages. In the first stage, a callus is formed because of neuropathy. Neuropathy normally affects the nerves interfering with sensations and causing their impairment.[22] The impairment of nerves results in what is known as sensory neuropathy. Sensory neuropathy leads to loss of senses and contributes to ongoing trauma.[19] Neuropathy can also occur as motor neuropathy. Motor neuropathy causes damage to motor nerves.[19] It also affects the ability of an individual to coordinate movements which leads to physical deformity of the foot, hammerhead toes and claws, and Charcot's foot.[22] Neuropathy also presents as autonomic neuropathy. Autonomic neuropathy causes the deportation in functions of the sebaceous and sweat glands in the foot.[22] As a result, it makes the skin around the foot dry making it easier to form fissures. A combination of these factors and the continuous trauma to the callus is what results in subcutaneous hemorrhage and eventually the development of an ulcer.[21,23]

Diabetic ulcer is also attributed to severe atherosclerosis. Atherosclerosis develops when the basement membranes of capillaries thicken leading to vascular compromise.[19] Inadequate blood flow makes the wound heal slowly which leads to necrosis and gangrene.[22]

Pressure ulcers

Chronic wound ulcers are also classified as pressure ulcers (PUs). Pressure ulcers occur when there is prolonged pressure over a bony prominence normally lasting 2 to 6 hours.[4] The sustained pressure or compression of the soft tissues makes it difficult for the tissue to get the needed blood flow (ischemia) resulting in tissue death (necrosis) or damage.[24,4] There are four mechanisms that result in PUs. One is sustained high interphase pressure, loss of elasticity in aged skin, the friction that leads to superficial erosions and blisters, and excess skin moisture because of exposure to fluids such as urine, sweat, wound drainage, and fecal matter over a prolonged period of time.[16] Pressure ulcers are attributed to several risk factors. Key among these factors is limited mobility.[16] Limited mobility or impaired sensation increases the risk of developing PUs because of the difficulty the tissue has in getting the needed blood flow.[24] Basically, individuals who have limited mobility are likely to experience reduced blood flow to the tissue. Individuals who are at risk include those who are sedated, and frail, those who have undergone surgery and are not able to move, and those with spinal cord injuries.[24] Other risk factors that contribute to the development of PUs are skin changes that occur naturally with age, cognitive impairment, lower extremity edema, rheumatoid arthritis, and diabetes.[4,16] Skin changes that occur with age increase the risk of developing PUs because of the thinning of the epidermis and dermis.

Challenges in the Care and Management of Chronic Wounds

Addressing chronic wounds is vital because of the burden they cause in healthcare systems. However, addressing chronic wounds is not easy. Despite the advances that have been made in managing chronic wounds, the challenges of proper wound care and management still remain. Various challenges contribute to poor wound healing leading to chronic wounds. To understand these factors, it is important to understand how a wound heals. Wound healing occurs in four phases. They are hemostasis, inflammation, proliferation, and remodelling.[4] Hemostasis is the first phase and it occurs after the injury.[4] The main characteristics of this phase are vasoconstriction and blood clotting.[25] Vasoconstriction and clotting play a critical role in preventing blood loss. They also play a crucial role in providing the provisional matrix for cell migration into the wound a process known as chemotaxis. Chemotaxis marks the beginning of the inflammatory phase. The inflammatory phase is the second phase. The stage normally lasts about seven days.[4] In this stage, phagocytic cells such as neutrophils, macrophages, and lymphocytes help in the healing process.[4] Neutrophils help to clear the invading microbes and cellular debris from the wound area. It does this by releasing reactive oxygen species (ROS) and protases which helps to prevent contamination by bacteria and clear cellular debris.[26] Macrophages are additional cells that help in the healing process. Macrophages are formed when blood monocytes arrive at the site of the wound and differentiate. Macrophages help in wound healing by removing bacteria and nonviable tissue. They release cytokines which facilitates an inflammatory response. Cytokines recruit and activate leukocytes, fibroblasts, keratinocytes, and endothelial cells that help to repair damaged blood vessels and promote tissue regeneration.[26] The proliferation phase does not occur at a particular time and overlaps with the inflammatory phase. Tissue granulation is one of the characteristics of this phase.[4] It also involves the formation of new blood vessels a process known as angiogenesis and epithelialization with fibroblasts and epithelial cells occurring at this stage. These cells play a crucial role in supporting capillary growth, helping in collagen formation, and formation of granulation tissue over the site of the wound. Re-epithelialization occurs when epithelial cells migrate from the wound periphery and adjacent edges of the

wound.[4,26] A thin superficial layer of epithelial cells is laid down over the wound before a more durable layer is laid over time. The remodelling phase occurs once the wound has closed. The duration of this phase varies but starts at around three weeks and can last up to 1 year.[4,27]

Unlike other wounds, chronic wounds do not heal in a normal and timely manner. According to Wallace et al.[27] wounds take an average of 4 to 6 weeks to heal. However, for chronic wounds, the process takes longer and they are even likely to reoccur after a certain period of time. In most instances, these wounds stall at the inflammation phase.[4] Some of the common characteristics of chronic wounds are the excess presence of cytokines, proteases, ROS, and senescent cells. Chronic wounds can be attributed to a number of factors. They include bacterial colonization, impaired collagen production, altered cellular response, ischemia, reperfusion injury and hypoxia.[27] Chronic wounds also occur when failure to achieve complete re-epithelialization happens.[4]

An additional factor that affects healing is bacterial biofilm. Bacterial biofilm occurs in up to 90% of these wounds.[1] Vestby et al.[28] define bacterial biofilm as membranous tissue that is created by a bacteria community that is attached to the wound bed. As a result, they are polymicrobial in nature. Bacteria biofilm occurs as a result of disruptions that occur in the skin microenvironment.[29,30] They affect the wound healing process because they cause slow tissue repair and make the wounds non-responsive to treatment by making it difficult for antibiotics to penetrate the wound.[31]

Several underlying factors can contribute to impaired wound healing. Some of these factors are the presence of chronic conditions such as diabetes, comorbidities, poor nutrition, smoking, and local factors such as tissue edema, oxygenation, dehydration, pressure, and infection.[26,27,32] Systematic factors such as age, stress and obesity, can also affect the wound healing process.[26]

Addressing the factors that contribute to impaired wound healing is vital to achieving positive outcomes. However, this still remains a challenge with a large proportion of the population continuing to suffer from wounds. Access and delivery of care are still a significant barrier that makes it difficult to manage chronic wounds.[32] In most cases, chronic wounds are not given specialized care because they are not considered an actual disease.[5] The care is fragmented with different healthcare providers using different treatment strategies based on their experiences and views.[33] One challenge posed by fragmented care is the lack of coordination and poor communication among care providers. The end result of this is poor quality of care and poor patient outcomes. Taking a multidisciplinary approach can help to address the fragmentation and improve care outcomes. Research documents the importance of a multidisciplinary approach in managing chronic wounds because of their complex nature.[4,5,7,34,35] Mahmoud and Gould,[5] recommend establishing a center of excellence that can promote a multidisciplinary approach to chronic wound healing. Having a center of excellence can also ensure there are systematic care protocols in place to ensure standard wound care. Sen,[6] recommends using different care professionals in the management of chronic wounds. For instance, physical therapists can use different treatment regimens including edema management, debridement, positioning, and mobility improvement to improve care outcomes for patients with chronic wounds.[6] Occupational therapists, on the other hand, can improve outcomes for wound care using treatment regimens such as edema management, positioning, wheelchair management, and toileting programs. Therefore, employing a multidisciplinary approach can lead to positive outcomes and improve patient outcomes.

Chronic Wound Care and Management

Although managing chronic wounds is a complex process, positive outcomes are possible with proper treatment regimens and management techniques. An assessment of the wound and the patient should be done to ascertain the underlying areas of concern before any type of treatment is commenced. Frykberg and Banks,[4] recommend an assessment to identify any underlying areas of concern that need to be addressed to ensure favorable outcomes are attained.

After assessing the patient and identifying all underlying areas of concern, a holistic approach to managing the patient should be taken to ensure positive outcomes. Healthcare providers should not focus on the wound alone. Instead, they should focus on the patient as a whole including addressing all the underlying comorbidities and the factors associated with the wound.[34] Without addressing the underlying factors and comorbidities, it becomes difficult to achieve positive outcomes because they contribute to the likelihood of developing chronic wounds. For instance, nutrition is one of the factors that is constantly mentioned as affecting wound healing.[36] Without proper nutrition support, positive outcomes of chronic wounds are less likely to be achieved.[37] For diabetic patients, it is important to control for hyperglycemia and manage neuropathy.[4] In patients that have pressure ulcers, there is a need to optimize patient mobility and redistribute the pressure to prevent friction.[34] Applying compression for patients with venous ulcers to improve blood flow is also necessary.[38] Therefore, employing a holistic approach and management for patients with chronic wounds other than treating the wound alone is likely to lead to positive outcomes.

After conducting a wound assessment and all the necessary interventions, wound bed preparation should begin. Wound bed preparation is crucial in chronic wound management because it accelerates endogenous healing and ensures the therapeutic measures applied are effective.[34,39] Using the Tissue, Infection/Inflammation, Moisture imbalance, Epithelial edge advancement (TIME) concept can optimize wound bed preparation and lead to positive outcomes.[4] Each component should be taken it account to improve the likelihood of positive wound care.

Debridement is one of the most critical components of wound care. It helps to accelerate the healing process which explains why it is a critical component of care.[4] Debridement entails the removal of non-viable wound components and tissue.[3] It also includes the removal of necrotic tissue, biofilm, and slough. Necrotic tissue and biofilm are known to impair the healing process by prolonging the inflammation phase of wound healing.[40] Debridement can be done in various ways with the most common methods being surgical, ultrasonic, hydrosurgical, mechanical, and autolytic debridement.[41,34] Surgical debridement also known as sharp debridement is a common method of debridement and is considered the most effective.[41,42] It is done using scalpels, curettes, scissors, or tissue nippers. A topic, local, or general anesthesia may also be applied. Effective debridement is considered vital in chronic wound care. If debridement is not done as expected, it can slow wound healing significantly.

Another important aspect that should be considered is offloading. Offloading is mainly applied in treating diabetic foot ulcers and is done to reduce mechanical stress on the wound.[43] Offloading is considered a standard for care for diabetic ulcers and is known to lead to successful outcomes.[4,44, 45]Reducing pressure from wounds helps to accelerate the healing process. In diabetic ulcers, total contact cast (TCC) is regarded as the gold standard for offloading because it enhances pressure redistribution.[46,47] TCC is also considered instrumental because can help to reduce edema.[46]

An additional aspect of chronic wound management that should be considered is infection control. According to Eriksson et al.[3] it is important to assume all chronic wounds are infected with bacteria to provide the necessary level of care that is needed. Assessing whether the wound is infected is vital. This can be done by carrying out a swab on the wound to determine if there is a presence of bacteria that can hinder healing.[3] However, although swabs are considered important, it is vital to note that not all bacteria hinder healing. As a result, routine swab on all chronic wounds is not recommended.[34] To know which wounds to conduct a swab on, clinical diagnosis is recommended.[34] Diagnosis can be done using quantitative biopsy.[34] Using appropriate method to conduct biopsy is vital ensure safety and an accurate diagnosis. After diagnosing whether the wound is infected, infection control can begin. Various measures are recommended in infection control of infected wounds. The first is using cleansing agents and topical antimicrobials that can aid in healing.[40] Different agents can be used to cleanse wounds including normal saline or tap water and dilute vinegar 0.5% acetic acid.[40] Topical antimicrobials are considered vital in the management of chronic wounds and are preferred over systematic antimicrobials. They are used for treating wounds that are superficially infected. They are considered vital in managing these wounds because they directly target the bacteria.[40] The Food and Drug Administration (FDA) recommends minocycline and gentamycin for topical treatment but caution needs to be applied because of the high risk of developing antimicrobial resistance.[40] As such, Eriksson et al. recommend limiting treatment using topic antimicrobials to two weeks to prevent resistance.

Dressing is also a vital part of wound care. According to Eriksson et al.[3] wound dressings perform different functions in wound care and this should be considered when selecting the appropriate dressing. For instance, some dressings are for protection while others are for managing moisture. Some dressings help with pain management while others help with offloading. Choosing the appropriate dressing is vital in aiding with wound healing. For instance, moisture-retentive dressings help to balance moisture by absorbing moisture while still keeping the wound moist.[40,48,49] Examples of moisture-retentive therapies that can used in wound dressing are hydrofibers, acrylics, alginates, hydrocolloids, films, and micronized collagen among others.[3,4,50] All these dressings have different advantages and disadvantages and this should be taken into account when providing care.

Other advanced therapies can also be considered in the care and management of chronic wounds. Examples of such therapies include negative pressure wound therapy, hyperbaric oxygen therapy, bioengineered therapies, acellular therapies, and stem cell therapies.[4,51,52,53] All these therapies have been shown to have different levels of success when it comes to the management of chronic wounds. Choosing the right type of therapy depending on the wound being treated and the underlying needs of the patient is what determines the level of success that will be achieved in treating chronic wounds. Therefore, it is imperative for healthcare professionals involved in chronic wound management and care to select the right type of therapy to ensure success and positive outcomes are achieved.

Strengths and Limitations of the Review

Findings from this review offer a comprehensive discussion on chronic wound care and management. It includes challenges that are experienced in chronic wound care and various management/treatment approaches that can be used to achieve positive outcomes. Understanding the challenges healthcare providers face in the management of chronic wounds can help to identify appropriate strategies that can be used to enhance positive clinical outcomes. Chronic wounds still remain a prevalent challenge and as the population ages, the problem is not likely to go away soon. Therefore, it is imperative to understand the challenges encountered in the care and management of chronic wounds and different treatment/management strategies that can be applied to increase the likelihood of positive outcomes and a better quality of life.

This review has some limitations. It does not follow a rigorous data extraction process and only includes articles that the author considers appropriate to inform this research. Determining the quality of sources included in this review was also difficult because a quality assessment was not done.

Conclusion

Managing chronic wounds is still a significant challenge. Despite advances in interventions to treat these wounds, they pose a significant challenge to healthcare systems around the world. The difficulty of managing chronic wounds stems from their complexity. Underlying factors such as diabetes, poor nutrition, comorbidities, infection, tissue edema, and pressure contribute to the complexity of managing chronic wounds. Addressing these factors is vital in achieving positive outcomes when it comes to treatment of chronic wounds. Addressing these factors requires a multidisciplinary approach that involves different healthcare professionals. It also requires a holistic approach to care that ensures the underlying factors that are contributing to impaired wound healing are addressed. Underlying factors that contribute to impaired wound healing can be addressed by conducting patient and wound assessments. After conducting a wound assessment wound bed preparation should commence. Other crucial management strategies that should be applied to enhance wound healing are debridement, offloading, infection control, and proper dressing. Advanced therapies such as hyperbaric oxygen therapy and negative pressure wound therapy should be applied as appropriate.

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