

# A systematic approach to wound care and debridement of the diabetic foot ulceration

**T**he diabetic foot ulceration is a complex medical dilemma. In order to successfully treat the wound and the patient, certain time-honoured and evidence-based practices must be adhered to for a positive outcome. The TIME concept and the 4-Week Model have proved to be effective in producing expected outcomes.

Chronic wounds are a national and international epidemic, masked by many comorbidities. Nearly 60 million people in the US are living with diabetes and/or vascular disease, which are the leading causes of chronic wounds. Patients that suffer from non-healing wounds often find themselves with unnecessary hospitalisations and lower-extremity amputations. Patients with chronic wounds have longer lengths of stay, unplanned readmissions and higher cost of treatment. The US spends in excess of USD50bn annually on treating chronic wounds, and a staggering USD8bn on amputation procedures alone. Fuelled by an ageing population, increased obesity and a rising rate of diabetes, chronic wounds are projected to increase at a compound annual growth rate of nearly 3% over the next 5 years (Nussbaum et al, 2018).

Aggressive and appropriate wound management is essential to gain positive outcomes that enhance patient satisfaction and save healthcare dollars. The TIME Concept (Schultz et al, 2003; *Figure 1*) of wound bed preparation is a key factor in wound management. The “T” stands for Tissue management — this means debridement. This is often the single most important factor in allowing wound healing to move forward. There are many types of debridement that can be applied to a wound. These include sharp and/or surgical, autolytic, chemical, mechanical, hydrosurgical, ultrasonic and larval debridement. Debridement means the removal of all necrotic

soft tissue. This also allows for the removal of a significant source of bacterial burden, while activating platelets. While the wound may become larger after debridement, the wound edge has now been stimulated and healing can occur. Higher frequency of debridement improves healing outcomes (Wilcox et al, 2013), so some form of debridement at every visit is important. Wound cleansing is also part of debridement. This should occur at every dressing change. Materials that can be used for this process can include tap water, sterile water, sterile saline, antiseptics, polyhexamethylene biguanide and even diluted povidone iodine. Negative pressure wound therapy (NPWT) can be part of this process too. NPWT can remove wound exudate, aid in controlling bioburden and infection, reduce oedema, promote granulation tissue, increase perfusion and potentiate the edge effect.

The “I” stands for Infection and Inflammation — this must be controlled if the wound is to proceed to closure. Appropriate antibiotics may be used in either parental or topical fashion, depending on the patient status. Matrix metalloproteinases must be controlled and maintained in check. Remember that the lymphatics have been permanently damaged as a result of the offending ulceration, so some form of compression may be necessary, depending on blood flow.

The “M” stands for Moisture Balance — excessive moisture or drainage must be controlled so as to not decrease cellular migration. Excessive exudate will result in maceration and slow wound healing, while insufficient exudate will result in cell death and slough.

The “E” stands for Epithelial Edge Advancement — advancing of the wound edges. Weekly (or every visit) cleansing of the wound edge, stimulates and allows for keratinocyte migration and eventual wound closure.



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TIME Principles of Wound Bed Preparation			
Tissue non viable or deficient	Infection or inflammation	Moisture imbalance	Edge of wound non advancing or undermined
Defective matrix and cell debris	High bacterial counts or prolonged inflammation	Desiccation or excess fluid	Non-migrating keratinocytes Non-responsive wound cells
Debridement	Aniticrobials	Dressings compression	Biological agents Adjunct therapies Debridement
Restore wound base and ECM proteins	Low bacterial counts and controlled inflammation	Restore cell migration, maceration avoided	Stimulate keratinocyte migration

Figure 1. The TIME Concept (Schultz et al, 2003).

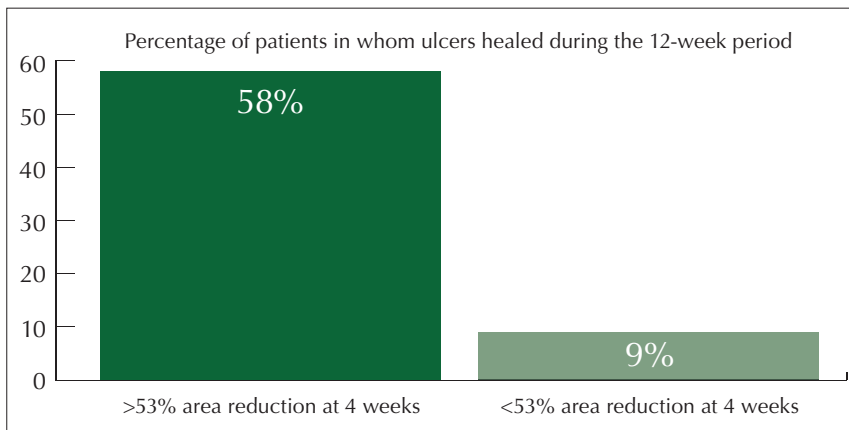


Figure 2. Percentage change in wound area of diabetic foot ulcers over a 4-week period is a robust predictor of complete healing in a 12-week prospective trial (Sheehan et al, 2003).

Dressings and advanced wound modalities play an important role in each step of the TIME concept. It is important to choose the appropriate dressing that will aid in each step of the wound healing process. We now have the ability to control the wound environment by what we apply to the wound and when we apply it. The goal is to restore normal wound physiology that will then increase wound healing.

The 4-Week Model (Sheehan et al, 2003; Figure 2), will allow us to move forward with our dressing choices without losing valuable time. If we do not see evidence of 50% closure by 4 weeks, it is time to re-evaluate the patient and select a new dressing choice. Continuing to treat the patient the same way, for extended periods of time without

reassessment, or a change in wound treatment, will result in a stagnant, non-healing wound.

As the issues of treatment of the wound are contemplated, addressing the needs of the patient, overall, should not be forgotten either. The quality of life issues that present themselves during the course of healing can be complex. Psychological issues can include high rates of anxiety and depression, a feeling of hopelessness, and fear of what may or may not happen. Physical issues can include pain from the wound or from trying to accommodate to the wound, excessive exudate and odour, and sleep disturbances that will further exacerbate any discomfort. There are issue concerning functional abilities. How much disability is present and how dependent are these patients on others for help. Are these patients able to function in the workplace and can they function socially in leisure activities? From a social and community point of view, these patients may have issues with their loss of mobility, an increasing isolation and ongoing embarrassment over their condition (Phillips et al, 1994; Hareendran et al, 2005; Green et al, 2009). While these patient-oriented issues go well beyond the actual treatment of the wound itself, they do address the overall treatment of the patient with the diabetic foot wound.

Adherence to the principals of methodical debridement and wound assessment, as well as proper dressing selection to allow for the maximum potential for wound healing, will result in better wound-healing outcomes and fewer complications. ■

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