WORLD UNION OF WOUND HEALING SOCIETIES

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CONSENSUS DOCUMENT

# Implementing Wound Balance:

## Outcomes and future recommendations

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# Foreword

Non-healing wounds can reduce quality of life (QoL) for millions of people globally, are costly, and result in significant patient, clinician and healthcare system burden (Guest et al, 2020; Ahmajärvi et al, 2022; Queen and Harding, 2023; Sen, 2023). There is a significant need to proactively address the projected rise of non-healing wounds by earlier intervention, resource optimisation and patient-centred care.

The concept of 'Wound Balance' developed in 2023 can help address these unmet needs (Wounds International, 2023). Wound Balance aims to create a holistic picture of the patient and their wound so clinicians can achieve a balance between the many facets of wound care planning and achievable goals.

Effective patient communication has long been identified as a major goal (King and Hoppe, 2013; Wang et al, 2020). Most people with chronic wounds receive their treatment in either community or nursing/home-care settings (Lindholm and Searle, 2016; Blome et al, 2024). This consensus publication presents the findings from a global network of wound care clinicians who have implemented Wound Balance in their clinical settings for a variety of wound aetiologies. It aims to provide practical tips and actionable insights for wound care clinicians around the world in implementing and achieving Wound Balance for their patients.

A major focus of this consensus is to provide patient communication strategies for wound care clinicians in these settings. However, recommendations from this consensus are equally applicable to all wound care practitioners in all clinical settings, including podiatrists, vascular specialists, general physicians and acute care clinicians.

**Harikrishna K. R. Nair, Chair**

# What is Wound Balance?

First introduced in 2023 (Wounds International, 2023; **Figure 1**), Wound Balance is a concept that aims to integrate various critical parameters which offer continuity and individualised care, and support clinical decision-making while placing the patient at the centre of all care. With patient goals being a priority, the focus moves from managing wounds to leveraging intention of healing wounds, whenever possible, and as early and effectively as possible (Wounds International, 2023).

The Wound Balance approach involves a shared journey between the patient and clinician, where the patient's QoL, preferences and expected clinical outcomes are central to decision-making. Engaging the patient is essential for achieving desired outcomes and enhancing the overall patient experience (Wounds International, 2023). Central to Wound Balance is balancing physiological factors through consideration of biomarkers when assessing the wound healing journey to allow for early identification of barriers that may delay healing.

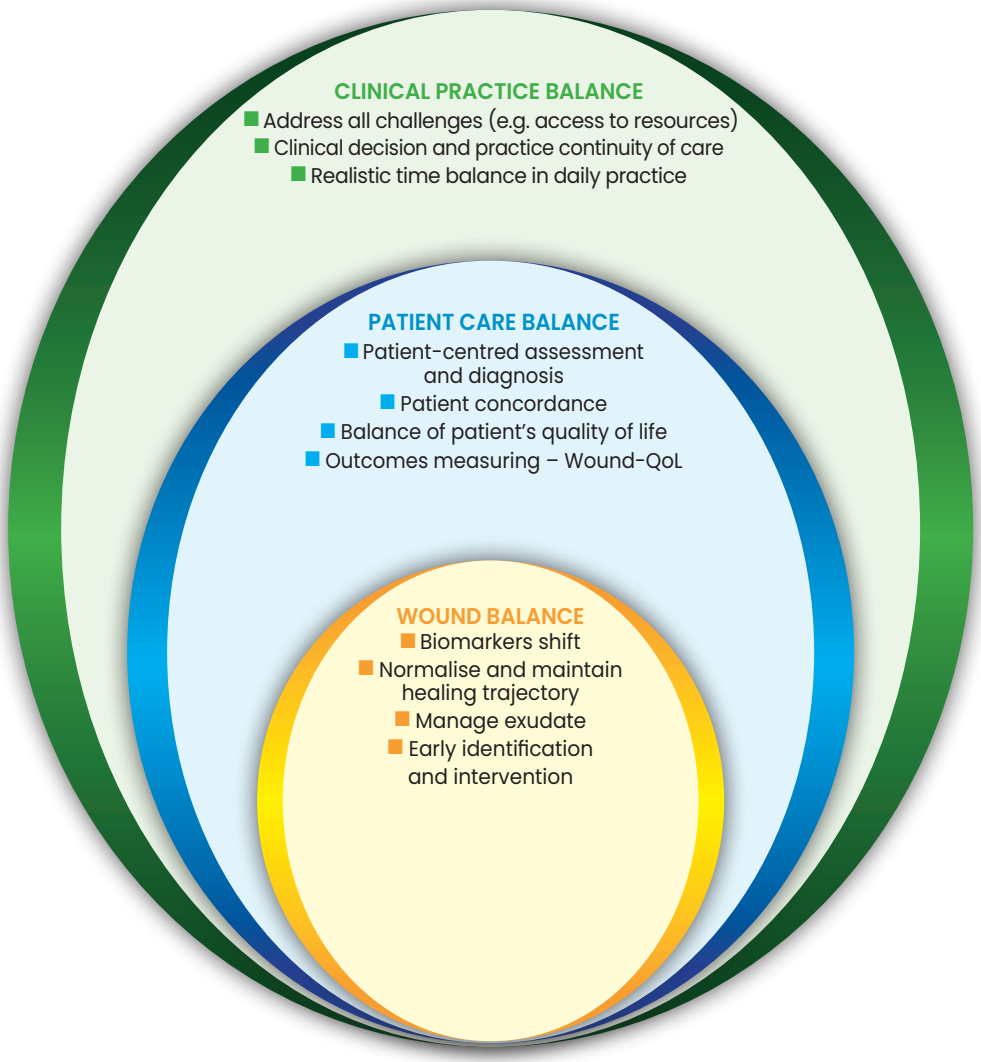
Wound Balance can be used across the life span for people with impaired skin integrity. Wounds in the older population present a unique set of challenges (Gould et al, 2015; Fletcher et al, 2024). During a person's lifespan, the skin can become more vulnerable and susceptible to frailty and impaired integrity, especially in the older population (Langemo et al, 2021; Walker, 2022). There are significant changes in skin morphology upon aging, leading to increased risk of tears (Khalid et al, 2022). In addition, the inflammatory phase becomes longer and the production of healing inhibitors increases (Khalid et al, 2022). With the concomitant increase in comorbidities, these factors put the older population at a higher risk of non-healing wounds (Langemo et al, 2021).

Managing wounds and implementing Wound Balance is not restricted to the older person. In the UK, the House of Lords (2021) advised that there was an increase in younger patients with non-healing wounds, usually due to comorbidities affecting the wound healing process, including diabetes, arterial and venous disease. In the US, there is a rise in younger people with non-healing wounds, projected to become a long-term healthcare challenge (Sen, 2023).

As well as deteriorating QoL, non-healing wounds cause significant financial costs to the healthcare system and to patients (Kapp and Santamaria, 2017; Guest et al, 2020). This financial impact and the reduced ability to perform routine life activities is a significant challenge for patients with a non-healing wound.

Early intervention with evidence-based treatments is the mainstay of Wound Balance, which can be achieved by a patient-centred, individualised care plan and a QoL-focused patient-clinician partnership (Blome et al, 2024) with the aim of healing the wound rather than simply managing it (Trouth, 2024).

**Figure 1.** The Wound Balance concept can help address the complexities and comorbidities involved in non-healing wounds (adapted from Wounds International, 2023).



# Why is Wound Balance important?

The wound healing trajectory should follow four phases (Wounds International, 2023): haemostasis, inflammation, proliferation and remodelling, allowing for timely wound healing. However, there are factors that can negatively impact the trajectory, including venous insufficiency, arterial insufficiency, diabetes, autoimmune disease, immunosuppression, infection, nutritional deficiency and carcinogenesis (Avishai et al, 2017; Sibbald et al, 2021). Wound Balance can assist clinicians to balance the right equilibrium between promoting healing and managing the factors that may hinder it (Erfurt-Berge et al, 2021; Wounds International, 2023).

Several biomarkers have been shown to affect Wound Balance, with an imbalance at biomarker level helping to identify a non-healing wound (Wounds International, 2023). These are:

- Matrix metalloproteinases (MMPs; principally MMP-2 and MMP-9)
- Elastase from polymorphonuclear granulocytes (PMN elastase)
- Growth factor inactivation/matrix destruction
- Aberrant local inflammation (M1/M2-dominated inflammation, oxidative stress)
- Missing angiogenesis/granulation tissue induction/epithelial cell migration
- Nutrient/oxygen deficiency (adapted from Wounds International, 2023).

Full holistic assessment, clinician experience and using evidence-based interventions are the gold standard for wound healing (Wounds International, 2023; Blome et al, 2024; Trouth, 2024). However, there is an emerging need to incorporate wound healing biomarker assessment into this process to understand the healing trajectory at a cellular level (Mikosiński et al, 2022) and to identify and provide early intervention to people at risk of non-healing wounds (Lindley et al, 2016; Mikosiński et al, 2022).

Venous leg ulcers (VLU), one of the most common types of lower limb ulcers, have an excess of protease activity as well as inactivated growth factors within the wound environment (Herrick et al, 1997; Lauer et al, 2000; Buchstein et al, 2009; National Institute for Health and Care Excellence [NICE], 2024). Proteomic and immunological assays have demonstrated that expression of several protein biomarkers is significantly different between healing versus non-healing wounds (Eming et al, 2010; Stacey et al, 2019). A study of wound exudate obtained from people with a VLU (n=57) assessed levels of 9 healing biomarkers pre- and post-application of a silicone superabsorbent (SAP) dressing (Mikosiński et al, 2022). Compared to acute wounds, there was significant change observed in the levels of the majority of biomarkers, indicating a complex interplay of molecular factors involved in the healing process, with Mikosiński et al (2022) suggesting that using biomarker profiles could potentially identify those patients that may be more likely to develop non-healing wounds.

- **The panel acknowledges an unmet need for large-scale, global studies of wound biomarkers to advance translational research, enhance the understanding of wound healing patterns and identify new therapeutic targets. The panel recommends that a comprehensive, holistic assessment, informed by the clinician's experience and clinical judgment, is essential for understanding the wound healing trajectory.**
- **The emerging science of biomarkers can complement this assessment by providing valuable molecular evidence.**

# Why do wounds become non-healing?

With the rising prevalence of non-healing wounds, it is crucial to understand the underlying pathophysiology and which skin malfunctions lead to them (Guest et al, 2020; National Library of Medicine [NLM], 2023a). To achieve this goal, the normal function of the skin must first be considered.

The skin is the largest organ of the body and performs crucial physiological functions, including homeostasis, thermoregulation and providing a barrier to extrinsic agents (Walker, 2022). Wounds cause breaks in skin integrity, disrupt biological functions and expose the body to both internal and external threats such as infection, necrosis and, ultimately, sepsis and loss of limb and life (Ayavoo et al, 2021).

Wound healing occurs as a sequential process of haemostasis, inflammation, cell proliferation and scar formation (Wounds International, 2023; NLM, 2022; 2023a). These sequential phases can be overlapping, eventually resulting in reconstituted tissue, as the wound heals (Mamun et al, 2024).

Definitions of non-healing wounds vary widely. Generally, a wound is considered 'non-healing' if it has not started to heal after 4–12 weeks (NLM, 2022), although Cullen and Gefen (2023) suggest using 6 weeks or ≤3 months as the cut-off point. Dissemond et al (2022a) have classified wounds as non-healing from day one if an underlying disease is present (e.g. diabetes or vascular insufficiency) or use an 8-week duration-based definition for other cases. This variation in definition and lack of understanding of underlying pathophysiology and comorbidities may further exacerbate this situation, leading to missed opportunities for earlier intervention.

Upon entering a non-healing state, a wound can persist for months, years or even a lifetime (Cullen and Gefen, 2023). In all wounds, inflammation plays a key role throughout the wound healing trajectory and significantly influences whether a wound will heal or become non-healing (Sawaya et al, 2020; Zhu et al, 2022). When a wound has occurred, inflammation drives the healing and repair processes; however, excessive or prolonged inflammation can disrupt this balance, leading to chronicity. Notably, different types of inflammatory patterns have been identified in non-healing wounds, with distinct patterns proposed for various stages of chronic wound healing (Krzyszczyk et al, 2018). These patterns involve a number of molecular and cellular factors that can act as biomarkers of wound chronicity (e.g. proinflammatory cytokines, reactive oxygen species and proteases; Krzyszczyk et al, 2018; Gao et al, 2024). Therefore, a deeper understanding of inflammation and these wound healing biomarkers can help clinicians manage wound chronicity and identify new therapeutic targets [Gao et al, 2024; **Figure 2**].

Dysfunction of metabolic, immune and/or nervous systems can lead to non-healing wounds (Raziyeva et al, 2021). Studies of wound exudate have identified that biomarkers are elevated in chronic wounds and, when surrounding tissues are exposed to chronic wound fluid, wound healing is inhibited (Trengove et al, 2000; Ulrich et al, 2005). A biological marker, or biomarker, is a substance that signifies a biological state. Progress in genomics, proteomics and molecular pathology has produced numerous potential biomarkers with clinical value. Research has pinpointed various cellular activities and mediators related to wound healing that can act as biomarkers (Patel et al, 2016). MMPs are crucial for the mechanism of wound healing including cell adhesion, cell migration and tissue remodelling. For healthy progression of wound healing, the extracellular matrix (ECM) has to be remodelled; MMPs are competent at eliminating all damaged areas of the ECM and, to maintain tensile strength of the skin in this process, endopeptidases, such as MMPs, are methodically involved (Kandhwal et al, 2022). In a comparative study of acute and chronic wound healing, Nwomeh et al (1998) identified that MMP-8 were significantly higher than MMP-1 in healing wounds, whereas in non-healing,

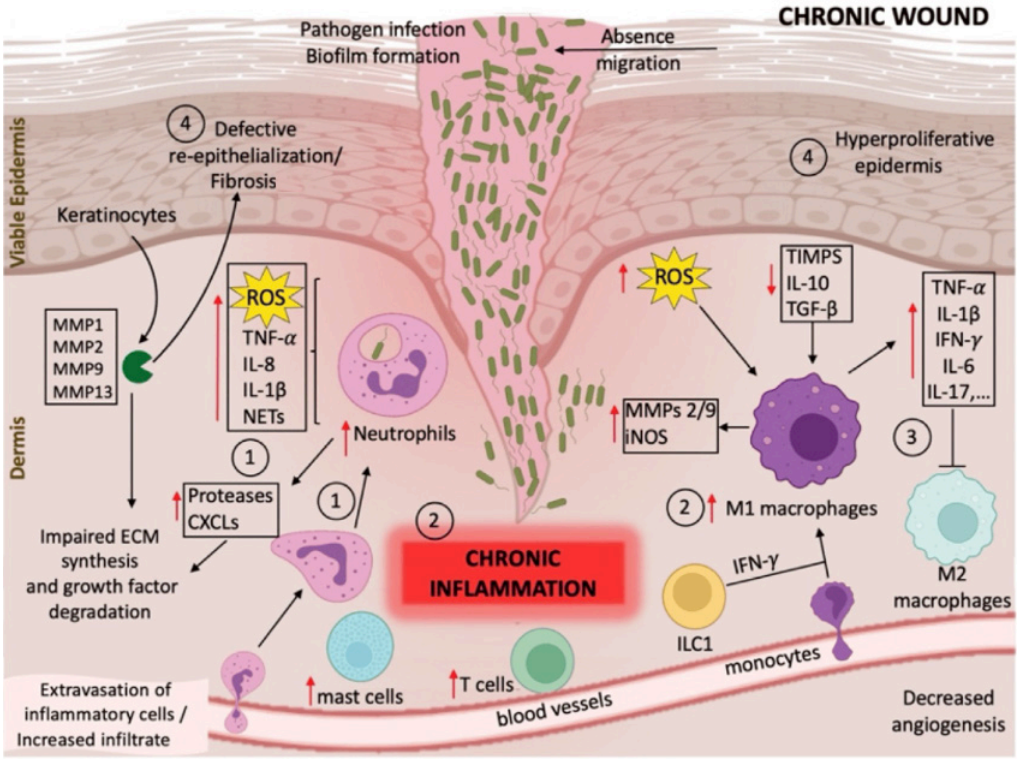



**Figure 2.** The complex molecular pathways involved in wound chronicity. Non-healing wounds get 'stuck' in the inflammatory phase (red), an occurrence now identifiable through biomarker analyses. Numbers 1-4 represent the phases of homeostasis, inflammation, proliferation and tissue remodelling, respectively. (Adapted from Schilrreff and Alexiev, 2022).

*Abbreviations: CXCL, C-X-C motif ligand chemokines; ECM, extracellular matrix; IFN, interferon; IL, interleukins; ILC, innate lymphoid cells groups; iNOS, inducible nitric oxide synthase; MMP, matrix metalloproteinases; NET, neutrophil extracellular traps; ROS, reactive oxygen species; TGF, transforming growth factor; TNF, tumour necrosis factor; TIMPS, tissue inhibitors of metalloproteinases.*

chronic wounds, higher levels of MMP-1 and MMP-8 and lower amounts of tissue inhibitor of metalloproteinase 1 (TIMP-1) were found when compared to healing wounds (Armstrong and Jude, 2002).

It is crucial that potential factors and comorbidities that can determine whether a wound will heal successfully in a timely manner are considered [Table 1]. Due to this complexity, clinicians are consistently challenged by difficulties in predicting the wound healing trajectory, as well as identifying individuals who may be at risk of developing non-healing wounds. An understanding of wound healing biomarkers can help achieve Wound Balance by combining molecular-level information with the clinicians' experience (Wounds International, 2023). The panel discussed the role of biomarkers, recognising there was a lack of easy methods to directly quantify biomarkers in daily/current practice. However, they agreed that clinicians can effectively recognise local signs implying disbalance of biomarkers through wound bed assessment, levels of exudate, slough, pain, malodour, etc. Through this assessment, clinicians recognise when

**Table 1: Complicating factors and comorbidities that can impact wound healing. (Adapted from Sibbald et al, 2021).**

| Recently controlled systemic disease | Relevant previous surgeries/procedures | Nutrition | Medications that may inhibit healing |
|---|---|---|---|
| • Diabetes<br>• Neuropathy<br>• Cancer<br>• Fragile skin<br>• congestive heart failure<br>• Renal disease<br>• Lung disease<br>• Cognitive impairment<br>• Other | • Scar tissue<br>• Hardware<br>• Foreign body<br>• Radiation therapy | • A validated nutritional screening tool<br>• Ability to eat<br>• Malabsorption syndromes | • Cytotoxic antineoplastics<br>• Immunosuppressants<br>• Corticosteroids<br>• Vasoconstrictors<br>• Anticoagulants<br>• Nonsteroidal anti-inflammatory drugs |

wound healing has stalled and the importance of promoting movement to the normal healing trajectory by rebalancing wound biomarkers. The panel further agreed that timely interventions should be undertaken to reverse negative effects of unbalanced biomarkers and not wait until the wound had become chronic, for example, clinicians must implement treatments that reduce bacterial load and excessive levels of proteases.

- **The panel recommends there is a significant need to agree a definition for the time period when a wound becomes defined as non-healing. The definition recommended by this panel can be found in the section titled 'Why do wounds become non-healing?'**

# Importance of early intervention in achieving Wound Balance

Due to the large number of dynamic factors affecting wound healing outcomes, wound care requires clinicians to develop a multidimensional mindset. There are three major dimensions that affect wound healing outcomes for every patient (Blome et al, 2024):

1. Wound Balance
2. Patient care balance
3. Clinical practice balance.

With the rising incidence of chronic wounds, especially in the younger, working-age population, there is a need for clinicians and healthcare systems to implement wound healing approaches that improve healing time and optimise use of resources (Carter et al, 2023). The concept of Wound Balance provides a way to help clinicians understand all dimensions holistically, including wound bed assessment, patient assessment and development of a treatment plan which promotes wound healing within available resources (Trouth, 2024; see **Figure 1**). **Figure 3** shows how wound healing can become impeded.

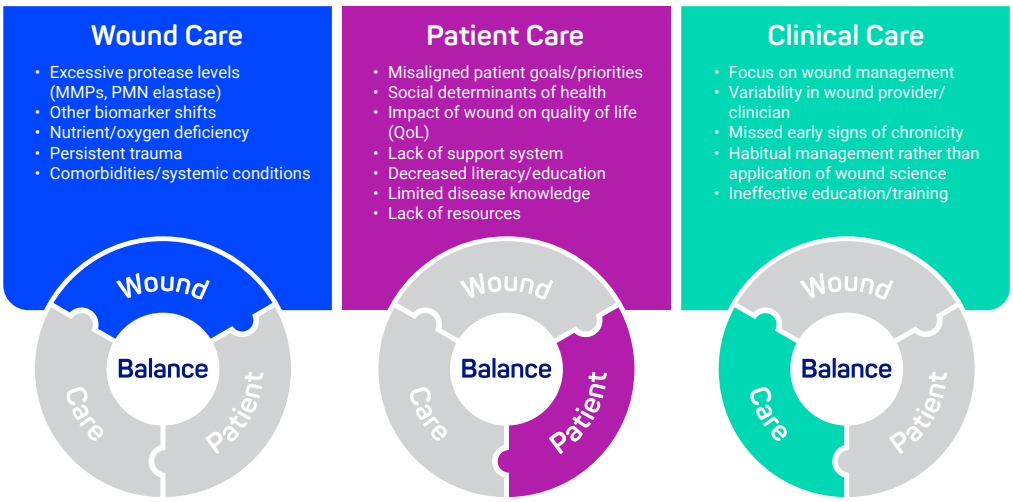



**Figure 3.** Factors impeding wound healing.

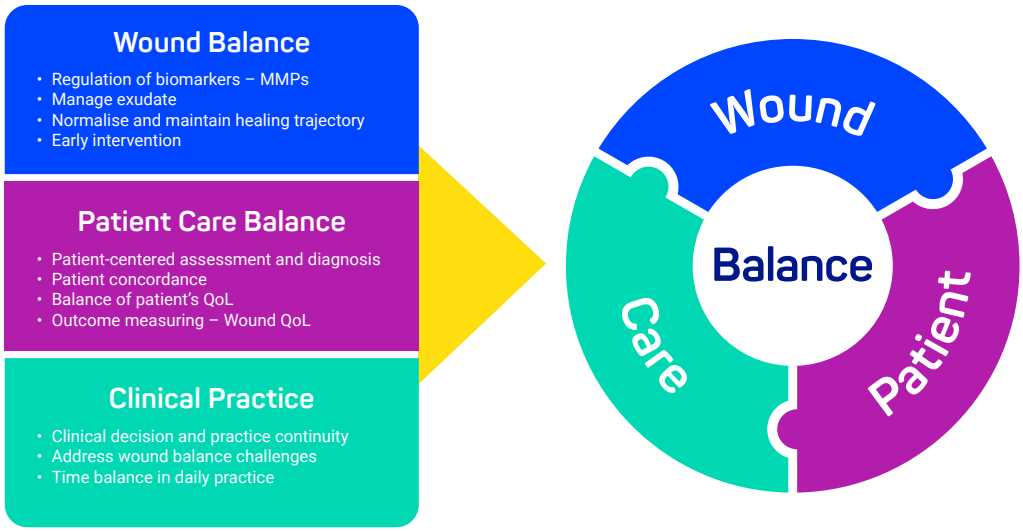
*Abbreviations: MMP, matrix metalloproteinases; PMN, polymorphonuclear.*

Wound Balance promotes the following goals (Wounds International, 2023; Trouth, 2024):

- Shift the goal of treatment from simply managing wounds to healing wounds, whenever and as early as possible
- Remember the wound microenvironment in terms of acute versus chronic wound biomarkers; achieve early interventions with the latest, evidence-based treatments to ensure treatment is aligned with the biomolecular state of the wound
- Improve both patient communication and satisfaction to achieve long-term patient engagement and healing outcomes.

Implementing Wound Balance can improve outcomes, as summarised in **Figure 4.**

**Figure 4.** Benefits of implementing Wound Balance.




- **The panel recommends that, due to its simplicity and thoroughness, the concept of Wound Balance can be used for early intervention and applied to all wound aetiologies by clinicians at all levels of experience and skills.**

# Assessing the wound for early intervention using TIMERS and BIOMES

Early patient and wound assessment is essential. There are various assessment tools available for clinicians, for example, the M.O.I.S.T concept (Moisture Balance, Oxygen Balance, Infection Control, Supporting Strategies, Tissue Management; Dissemond et al, 2022b) and TIMERS (Tissue, Infection/Inflammation, Moisture, Wound edge, Repair/Regeneration, Social; Figure 5). TIMERS can be used by clinicians with any level of knowledge (Lumbers, 2019). It considers social factors that may affect the patient's QoL in addition to wound bed assessment and may act as an appropriate assessment tool for all clinicians to implement Wound Balance in practice (NLM, 2025).

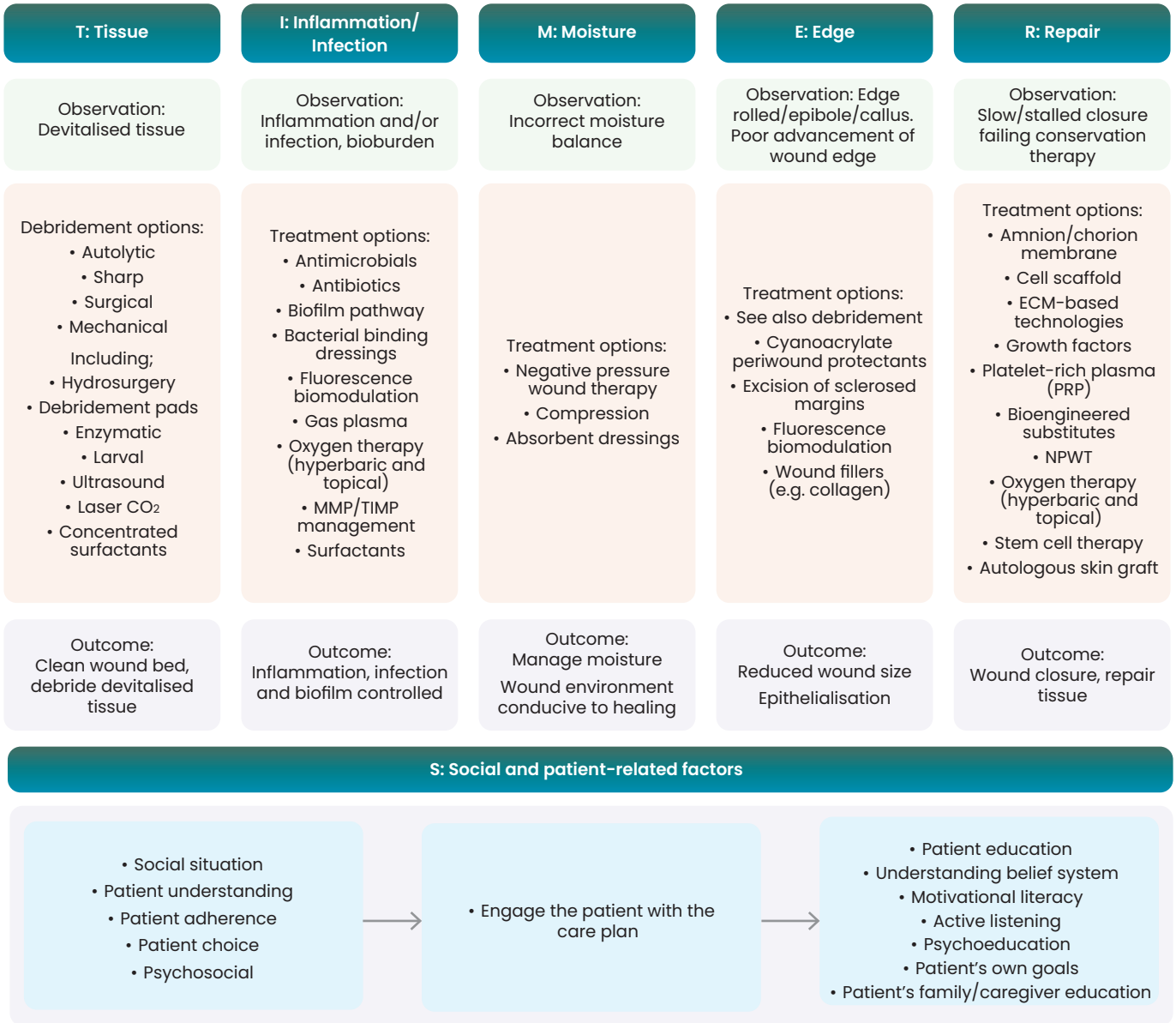



**Figure 5.** The TIMERS framework for managing non-healing wounds outlines the principles for diagnosis and holistic assessment, as well as social- and patient-related factors (adapted from Atkin et al, 2019).

Another assessment tool is BIOMES. 'BIOMES' can be used to define and assess risk of non-healing at each wound assessment, identifying barriers to healing that require consideration [Table 2].

**Table 2: Barriers to wound healing can be defined using the BIOMES system described in this table. The presence of each of the barriers leads to a score of 1 when classifying the risk of a wound becoming non-healing. Low risk: no BIOMES; moderate risk: 1 of the BIOMES factors present; high risk: 2+ BIOMES factors present.**

| Barrier to wound healing | Explanation/examples | Present/absent? |
|---|---|---|
| **B**lood flow impairment | • Intrinsic factors involved: peripheral vascular disease, coronary artery disease<br>• Extrinsic factors involved: ability to walk, smoking. | |
| **I**nfection control | • The infection can be caused by fungi, bacteria and viruses living in the wound environment (collectively called 'microbiome') | |
| **O**verloading | • Caused by not using offloading devices | |
| **M**etabolic disorders/ comorbidities | • Diabetes, glucose control<br>• Nutritional deficiencies. | |
| **E**xudate/moisture/bioburden | | |
| **S**ocial/Economic barriers | • Unable to access/afford care | |

# Debridement: Restoring Wound Balance and healing trajectory

Following wound and patient assessment, it may be necessary to undertake debridement. Non-healing wounds may contain nonviable/dead tissue, cellular debris, biofilm and/or slough (Anghel et al, 2016). Debridement is the process through which these elements are removed to encourage re-epithelisation and achieve healing (Mayer et al, 2024). Inadequate debridement leads to a decreased likelihood of wound healing due to the presence of physical and chemical barriers and/or infection; it may be harder for clinicians to assess the wound in the presence of the debris, dead tissues and slough (Mayer et al, 2024). Therefore, routine debridement is a crucial requirement to convert a non-healing wound back to an acute wound and, without this, Wound Balance cannot be achieved (Wounds International, 2023). Some commonly used techniques for debridement include autolytic, biological, enzymatic and surgical debridement (NLM, 2023c).

Not all wounds are suitable for debridement and some wounds can only be debrided by a specialist, with multidisciplinary considerations (Mayer et al, 2024). Surgical debridement is a faster method and can help reverse the trajectory of a non-healing wound by moving a chronic wound into an acute wound, overcoming the inflammatory stage (Eriksson et al, 2022). However, generally, this skill is only performed by surgeons. In some countries, podiatrists and nurse consultants are trained to perform sharp debridement; this can only be performed by appropriately trained, skilled and competent practitioners in accordance with local guidance. Not all primary care clinicians are trained, or permitted, to undertake debridement. This is further complicated by the fact that the need for debridement can vary from simple, autolytic debridement to aggressive, surgical debridement (Eriksson et al, 2022). Making the suitable debridement choice to improve the wound healing trajectory is a complex issue, due to a range of different local policies/guidelines and skills of health care professionals. Autolytic debridement (e.g. via HRWD) is a 'softer' method that can be undertaken by most clinicians, regardless of the level of their experience (Choo et al, 2019).

The typical decision pathway that clinicians may take when considering debridement is presented in **Figure 6**. The consensus panel highlighted how often clinicians working in primary care/community settings may not be trained, competent or capable of safely undertaking sharp debridement **[Table 3]** and that autolytic debridement (e.g. via HRWD dressings) may be the most appropriate option for their patients.

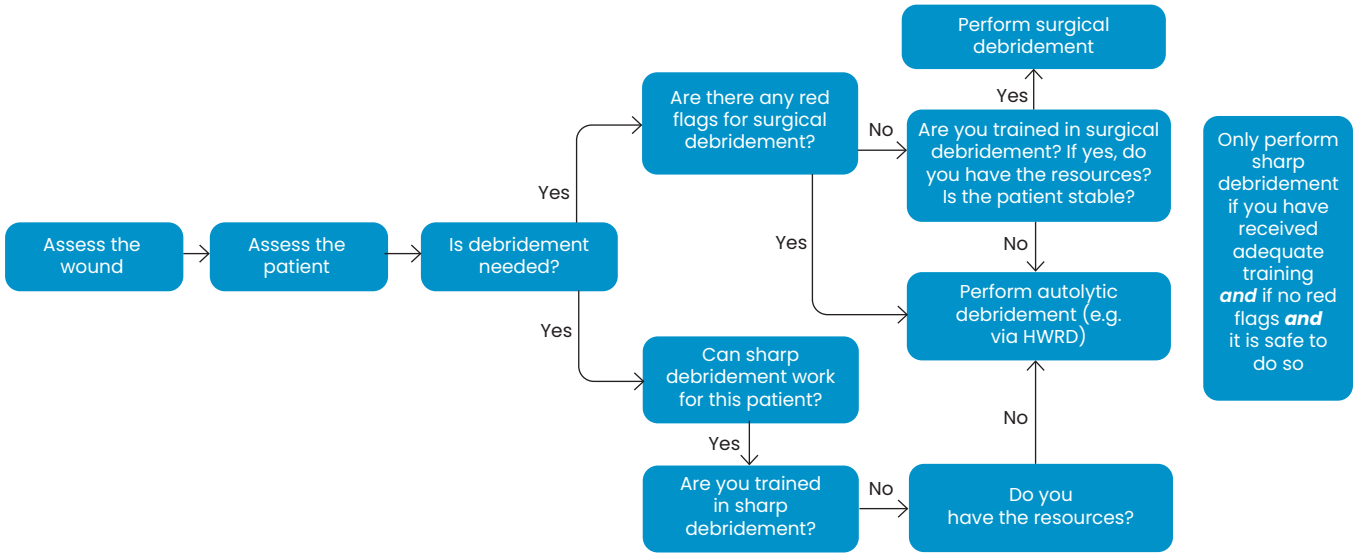



**Figure 6.** Potential decision-making considerations in debridement. *Abbreviation: HWRD, Hydro-responsive wound dressing.*

**Table 3: The common red flags clinicians must be aware of. If present, these red flags require specialist considerations for the level of debridement.**

When assessing the wound, it is crucial to understand wound aetiology and complicating factors/comorbidities. Refer to **Table 1** to review these complicating factors. Once wound aetiology has been determined, the optimum debridement method can be chosen as per clinical need, healthcare setting and in line with clinician capability. The red flags and actions outlined below can help wound care clinicians decide when to seek specialist opinion. Once a debridement method has been decided on, the wound should be cleansed before any debridement can take place.

| Red flag/symptoms | Red flags for surgical debridement | Action needed/specialist input needed |
|---|---|---|
| A small or new wound in a person with diabetes and/or vascular disease | Yes | Earliest intervention via involvement of a multidisciplinary team (no waiting for 12 weeks to label it as 'chronic') |
| Necrosis | Yes | Should be seen by a wound care specialist |
| Impeded blood flow | Yes | Should be seen by a vascular specialist |
| Suspicion of arterial involvement | Yes | Should be seen by a vascular specialist |
| Skin transplants | Yes | To be decided by a surgeon/relevant specialist |
| Mixed aetiology ulcers | Yes | Should be seen by a vascular specialist, likely in a multidisciplinary team (MDT) setting |
| Others (complex — e.g. comorbidities, ageing) | Yes | Should be assessed in a MDT setting |
| People with dementia and/or learning disabilities | Yes | Due to lack of cognitive function, the risk of significant physical injury is high, especially in home-care settings. Therefore, autolytic debridement or SAP dressings may be preferred |
| Recurrent wound | Yes | Identify the comorbidities and complicating factors in a MDT setting |
| When the debridement procedure does not align with patient goals. For example, the patient wishes to stay at home and does not consent to surgical debridement | Yes | Use autolytic debridement (e.g. via SAP dressings) |
| Very dry wound | Yes | Use autolytic debridement (e.g. via HRWD dressings) |
| Increased exudate and/or pain | Yes (if with pain) | Suspect infection and discuss whether systemic antibiotic treatment is required. Locally, high-absorbing SAP dressings can be used |
| Depression | Yes | Employ autolytic debridement (e.g. via SAP dressings) to reduce further anxiety/pain |
| Certain medications (e.g. anticoagulation) | Yes | Increased bleeding risk may limit surgical debridement; consider non-surgical options such as autolytic or enzymatic debridement |
| Immunological wounds (e.g. pyoderma gangrenosum) | Yes | These wounds must be assessed by a clinician specialised in immunological/dermatological wounds. Only use autolytic debridement |
| Oncological wounds | Yes | Proceed only with oncologist/palliative physician approval |

**Wound care specialists include tissue viability nurses, vascular specialist nurses, podiatrists, surgeons, dermatologists with expertise in wound care, etc.*

As well as identifying red flags, clinicians should be able to identify a non-healing wound from the level of inflammation. There is a need for a simple guide to summarise the common, inflammation-related red flags that clinicians may observe in their routine practice. **Table 4** can help differentiate the 'right' kind of inflammation (i.e. the inflammation apparent in a healing wound) from the 'wrong' kind (i.e. the inflammation that may indicate non-healing and/or infection). **Box 1** provides a toolkit for routine wound assessment and treatment planning.

**Table 4: Differentiating between the 'wrong' and 'right' type of inflammation in a wound (Image courtesy of Emmanuelle Candas).**

**Wrong inflammation = too much inflammation (depicted in the image below):**


**Box 1: A proposed toolkit for wound assessment and treatment plan**

- Assess the wound (use the wound assessment steps outlined in **Figure 7**)
- Determine wound aetiology/cause of the wound
- Check patient history for comorbidities
- Rule out red flags using BIOMES or TIMERS
- Assess patient's QoL with the Wound-QOL tool
- Use Wound Balance for treatment objectives
- Choose the appropriate SAP dressing to initiate treatment
- Review and re-assess the patient as per your local guidelines and within a MDT setting, where applicable.

- **The panel recommends that surgical or sharp debridement should only be undertaken by appropriately trained healthcare professionals.**
- **The panel recommends that wound healing and aggressive treatment (e.g. debridement) may not always be the primary objective. Following the Wound Balance principle will assist clinicians to align patient goals and clinical needs (e.g. reduction of necrotic tissue, bioburden and/or inflammation).**

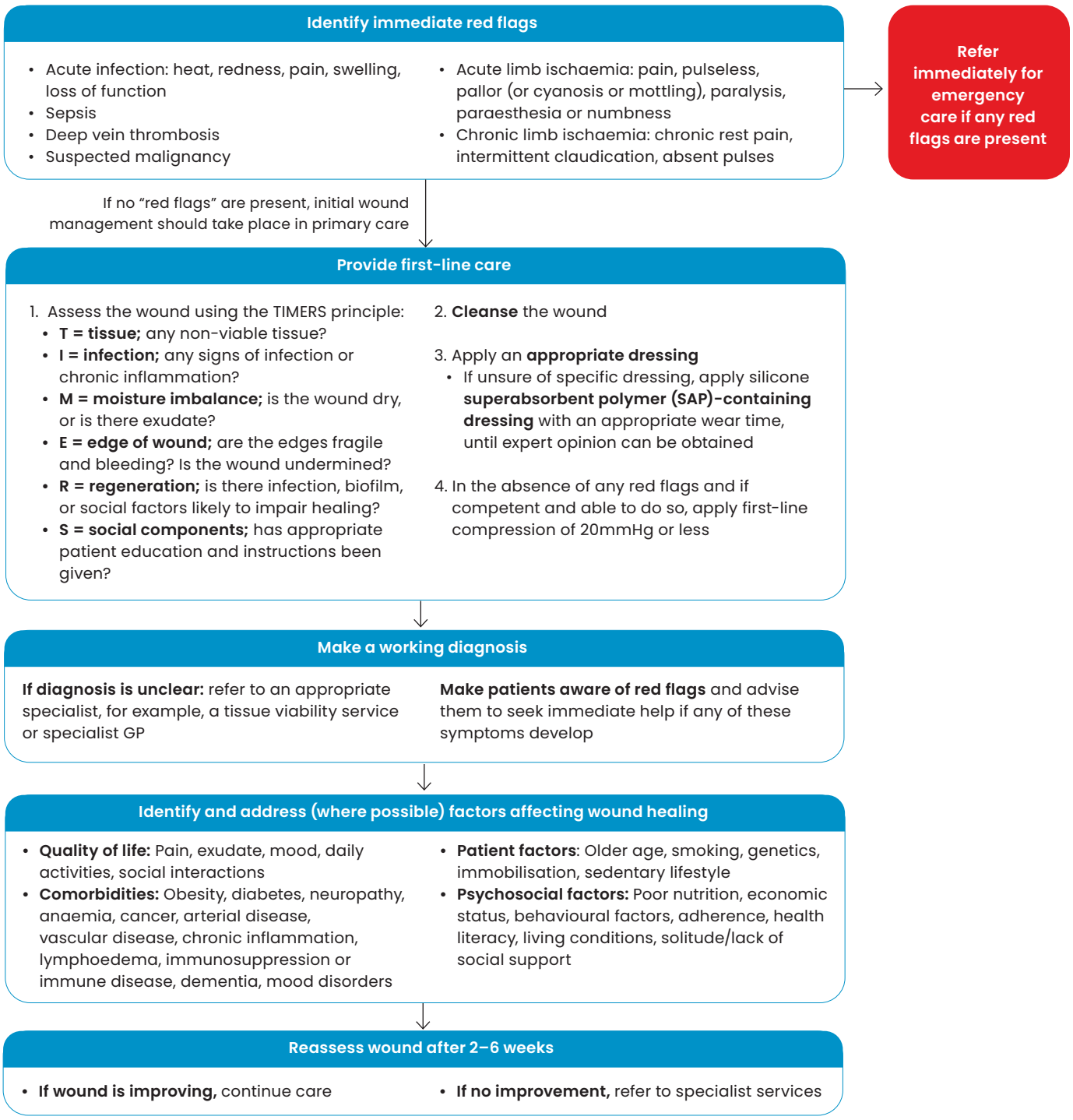



**Figure 7.** Suggested algorithm for initial wound management in primary care (adapted from Blome et al, 2024).

# Real-world ease-of-use of the Wound Balance concept

There are a large number of wound dressing types available, with the resultant complexity of choice for clinicians, who may find it harder to tailor wounds with particular dressings (Shi et al, 2020). The panel found the concept of Wound Balance easy to follow, because it reduces the 'noise' surrounding complicated wound-related concepts. It also simplifies confusing dressing choice when attempting to combine dressings compatible with other treatments, such as compression therapy. The panel also commented that they preferred to use one dressing type to promote wound healing and found that SAP dressings were fully compatible with compression therapy. For lower limb wounds, the clinicians stated that SAP dressings managed the smaller-sized wounds with low levels of exudate, especially under compression in an effective manner.

The use of SAP dressings for prophylaxis of skin damage was also explored. A US survey of wound specialists (n=12) assessed how clinicians view the performance of multi-layered SAP dressings in wound prophylaxis (Swoboda, 2024). All clinicians selected SAP dressings as the dressing of choice for wound prophylaxis. The clinicians believed that the SAP dressings were 'helpful', 'worthwhile' and 'protective' for wound prophylaxis (Swoboda, 2024).

- **The clinicians believed that the SAP dressings were 'helpful', 'worthwhile' and 'protective' for wound prophylaxis. The panel notes that the HRWD dressings hydrate the wound, allowing for debridement. Any sign of a 'hyper-hydration' effect does not damage the skin and soon resolves.**

# Superabsorbent polymer (SAP) dressings for achieving Wound Balance: Mechanism of action and practical tips

To achieve Wound Balance, practical measures should be taken to reduce factors that inhibit healing and increase 'healing factors' to allow the wound to progress. SAP dressings provide the multifactorial, Wound Balance benefits that non-healing wounds require from a dressing. The three main groups of SAP dressings are characterised by similar modes of action, supporting the shift to a normal healing trajectory [Figure 8].

There are three main families of SAP-containing dressings:

- **Hydro-Responsive Wound Dressings (HRWDs):** These dressings not only facilitate autolysis but also sequester excess levels of proteases, such as MMPs and bacterial load. They contain superabsorbent polyacrylates and continually release Ringer's solution into the wound, facilitating cleansing, softening necrotic tissue and slough, and enabling autolytic debridement
- **Silicone SAP Dressings:** These dressings maintain an adequate level of moisture in the wound microclimate, prevent maceration and peri-wound damage, and absorb and sequester wound healing inhibitors through their mechanism of action [Figure 8]
- **Superabsorbent Dressings:** These dressings offer effective absorption and retention capacity in highly exuding wounds, preventing leakage and strikethrough.

All three groups are characterised by similar modes of action, supporting the shift to a normal healing trajectory. While HRWDs and superabsorbent dressings are used when specific red flags are identified (such as the need for debridement and the presence of high levels of exudate), silicone SAP dressings are highly versatile and can be used as an optimal early intervention to avoid the aggravation of complex wounds. Silicone dressings are widely used in wound care, particularly for non-healing wounds requiring long-term management—due to their softness and non-traumatic adherence (Ousey et al, 2016; Atkin et al, 2020; LeBlanc and Woo, 2022; Gefen et al, 2024). One crucial goal of long-term care is to minimise the risks associated with excess exudate, necrotic tissue and slough and to reduce the potential for infection and unpleasant effects of exudate (e.g. smell and leakage; Tickle, 2013; Wounds International, 2019). Superabsorbent polymers (SAPs) offer the advantage of high exudate absorbance capacity. They keep the wound surface moist, which promotes autolytic debridement, a natural defence process that removes dead tissue and debris from the wound site (Ousey et al, 2016; Choo et al, 2019). Furthermore, SAP dressings also bind and inhibit the action of wound healing inhibitors, such as MMP2 and elastase, as well as microorganisms (Probst, 2019; Candas et al, 2021; Veličković et al, 2020; 2022; 2023; 2024). In a recent *in vitro* study, Ball et al (2025) compared the effectiveness of 6 silicone foam dressings versus a silicone SAP one in removing MMP, human neutrophil elastase (HNE) and calprotectin (HCP) from a test solution. An enzyme-linked immunosorbent assay indicated that, by 24 hours, silicone SAP versus silicone foam dressings removed HNE and HCP to a greater extent and achieved complete elimination of MMPs.

Although some patients may be intolerant to the dressing component(s), there are no contraindications to the SAP dressings.

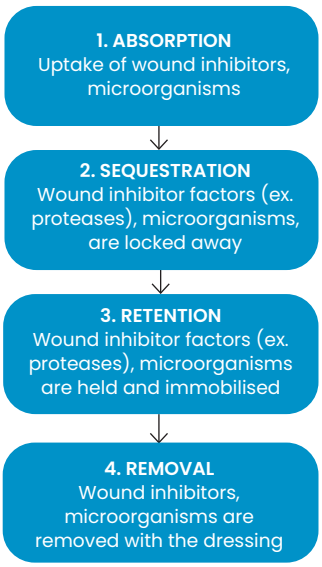



**Figure 8.** The mode of action of SAP dressings (adapted from Wounds International, 2023).

# Importance of effective patient communication in achieving Wound Balance - enhancing clinical care

Living with a wound can be challenging both emotionally and physically. Patient communication and shared decision-making is at the heart of Wound Balance (Wounds International, 2023). The clinical care component of Wound Balance allows clinicians to focus on parameters to support clinical decision making and ensure the patient is at the centre of all care interventions. This shared decision-making involves all stakeholders, such as healthcare professionals (HCPs), carers, family members, support workers and unregistered care/nursing home staff.

The panel agreed it was the responsibility of all healthcare professionals to ensure that patients are informed, engaged, understand and consent at every stage of the assessment and treatment process. Education for patients and carers presented in easy-to-understand language and in a range of formats can help increase engagement: printed educational materials and handouts can improve outcomes for both clinicians and patients (Giguère et al, 2020; Bhattad and Pacifico, 2022).

Many patients are involved in their own care, especially when in the community; as such, it is important they are able to easily apply and remove wound dressings. The ease-of-use of SAP dressings was highlighted as a positive outcome during the implementation of Wound Balance in all clinical settings.

Table 5 offers practical tips and highlights considerations when aiming to achieve Wound Balance and optimal patient communication.

**Table 5: Patient communication tips when setting treatment goals and expectations.**

- Ensure that the patient/carer understands and agrees with their treatment objective. Avoid using language with negative connotations (e.g. 'hard-to-heal wound')
- Ask the patient/carer to repeat the plan back to you to ensure they have fully understood it
- Provide both verbal and written patient education materials; audio material should also be provided, where possible. Where available, provide translated materials as per patient's needs
- Take into account the effect of pain, anxiety, depression and lifestyle factors when communicating with your patient
- For people with dementia, ensure to include the next of kin in all discussions and obtain informed consent for the treatment plan
- Provide appropriate support for people with disabilities (e.g. learning disabilities, deafness and vision impairment)
- Where needed, arrange for translators to be present
- Share educational materials with all carers and support staff, and include them in all decisions and discussions.

Blome et al (2024) have suggested several different initiatives to improve clinician and patient engagement by implementing Wound Balance:

1. Create easy-to-use educational resources that simplify international wound care guidelines for non-specialist clinicians and patients.
2. Develop multidisciplinary forums to discuss latest advances and achievements.
3. Improve collaborations with local or national medical societies and with medical and nursing schools.
4. Arrange patient engagement activities.

- **The panel recommends that patient education and guidance should be provided both verbally and in printed format, and to encourage patients to repeat their understanding of the treatment plan, and where necessary, information should be reiterated to ensure clarity.**

# Language and terminologies are important to achieve consistency in practice

There is variation in wound care terminologies globally. The panel examined possible obstacles to implementing and assessing wound care interventions due to the inconsistent use of language and terminologies. This encompassed various terms employed to describe a non-healing wound, with the panel identifying a range of expressions used in clinical practice [Table 6]. The inconsistency in terminology can be confusing for clinicians and may carry negative connotations for patients; for example, "failed to heal" wound suggests to the patient that the wound will never heal.

Use of consistent language and terminologies can help achieve better outcomes for patients and assist clinicians in providing timely interventions (Alnaser, 2020; Holm et al, 2021; Sharkiya, 2023). Clear, consistent communication helps with collecting accurate information during wound assessment, addressed QoL-related concerns for patients and helps with self-care, all of which form the pillars of the concept of Wound Balance (Sharkiya, 2023; Wounds International, 2023).

Table 6 highlights the language/terminologies that wound care clinicians should strive to use versus others that should be avoided to ensure a clear and positive message for patients and carers.

**Table 6: Recommendations on language and terminologies for patient communication.**

| Terminology | Meaning | Implications |
|---|---|---|
| **Terminologies to be reconsidered** | | |
| Failed-to-heal wound | A wound that has become chronic and does not appear to be healing | With its negative connotation, this term may impact the confidence of both patient and clinician by implying that this wound may never heal |
| **Terminologies to avoid** | | |
| Chronic wound | A wound that has not healed after 4-12 weeks (NLM, 2022) | Clinicians may not take necessary actions until a wound has become chronic as per this definition, leading to missed opportunities and wasted resources. Patients may also feel discouraged upon hearing this terminology |
| Non-healing wound | A wound that has not healed after 4-12 weeks (NLM, 2022) | Same as above |
| Infected and/or dehisced surgical wounds | A surgical wound that becomes infected and/or dehisced after surgery (Wounds International, 2024) | Typically, these wounds are not seen as non-healing wounds. However, surgical wounds that fail to heal have a similar underlying pathophysiology as chronic wounds (NLM, 2023b). Therefore, there is a need to educate clinicians and patients about the factors and comorbidities that may increase risk of infection and dehiscence |

**Table 6: Recommendations on language and terminologies for patient communication.** (Continued)

| Terminology | Meaning | Implications |
|---|---|---|
| **Terminology that should be preferably used in future** | | |
| Complex wound | An acute or chronic wound in a person with comorbidities/ complicating factors<br><br>The word 'complex' depicts the 'whole patient', not just the wound | This definition:<br>• accounts for the 'whole patient', not just 'a hole in the patient'<br>• depicts the level of urgency that such a wound requires<br>• highlights that this patient must receive care within a MDT setting<br>• shows the importance of keeping patient goals in mind<br>• encompasses all wound terminologies described above: non-healing, chronic, failed-to-heal and infected surgical wounds<br>• applies to all clinical settings.<br><br>Note that not all complex wounds become non-healing or chronic; however, they all require prioritised care. Since every non-healing, chronic wound begins as a small wound, early intervention is essential to prevent complications and promote optimal healing. |

The consensus panel explored the importance of all HCPs being able to understand and implement Wound Balance through proactive, early intervention rather than passive, reactive wound management when the wound becomes non-healing. To achieve early intervention, there is a need to provide a comprehensive education programme for all clinicians (Pađen et al, 2024), including an increased awareness of optimal methods for clinician-patient communication (Pađen et al, 2024).

- **To achieve consistency in clinical care, wound chronicity definitions should be revisited.**

# Improving patients' QoL using Wound Balance

Measuring and improving a patient's QoL is essential to achieve Wound Balance. People living with non-healing wounds face a unique set of daily challenges that affect both their routine life activities and their mental health (Wounds International, 2023). These patients experience reduced mobility, pain and distress associated with exudate leakage and malodour; these issues, in turn, lead to social isolation, anxiety, depression and disengagement with their treatment (Olsson et al, 2019; Zhu et al, 2022). Therefore, QoL-related measures form the core of achieving patient care balance (Wounds International, 2023).

The Wound-QOL is a tool that can be used to measure health-related QoL for people living with non-healing wounds (Blome et al, 2014; von Stülpnagel et al, 2021; Janke et al, 2024; **Table 7**). This tool can be used in routine wound care to assess the overall impact of a wound on patient's QoL throughout the patient journey.

Gathering information about patient QoL is beneficial on an individual level and can also provide scope for change, providing evidence that can inform practice and make a difference. The existence and use of the measurement tool can help patients to feel validated, and potentially reassured that they are not alone in experiencing specific wound-related QoL issues.

**Table 7: Wound-QoI-17 questionnaire on QoL of people with non-healing wounds.**

| in the last 7 days... | | Not at all | A little | Moderatley | Quite a lot | Very much |
|---|---|---|---|---|---|---|
| 1 | ...my wound hurt | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | ...my wound had a bad smell | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | ...there was a disturbing discharge from my wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | ...the wound had affected my sleep | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | ...the treatment of the wound has been a burden to me | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | ...the wound has made me unhappy | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | ...I have felt frustrated because the wound is taking so long to heal | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | ...I have worried about my wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | ...I have been afraid of the wound getting worse or of new wounds appearing | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | ...I have been afraid of bumping the wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | ...I have had trouble moving about because of the wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12 | ...climbing stairs has been difficult because of the wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13 | ...I have had trouble with day-to-day activities because of the wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14 | ...the wound has limited my leisure | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15 | ..the wound has forced me to limit my activities with others | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16 | ...I have felt dependent on help from others because of the wound | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17 | ...the wound has been a financial burden to me | ☐ | ☐ | ☐ | ☐ | ☐ |

Completing the questionnaire also gives patients the opportunity to communicate information that may not be visible in person, or that they might not choose to raise if not directly invited to. Many patients have developed coping strategies that may mean their issues are not visible. Additionally, the questionnaire may help to uncover issues that may have gone unnoticed – for example, issues with pain or sleep may be indicative of an underlying problem.

When using such tools, it is important that this is followed up with the patient – for example, if the patient is given a QoL questionnaire to complete, this can be discussed at their next visit and used to establish new treatment goals. To achieve wound balance, it needs to be ensured that such tools are utilised, with the patient assessed and re-assessed to identify improvements or potential problems along the healing journey.

Understanding – both of the science and the individual patient – is essential to the wound balance concept. As clinicians, if we understand the patient, their wound and their overall health and wellbeing, we can address the relevant issues and reduce barriers to healing.

Engaging patients in their own care, building a relationship of trust and improving their experiences has been proven to improve outcomes. Considering the patient's QoL, and the aspects that really matter to them as an individual, is beneficial to every stage of their wound healing journey.

- **The panel recommends that patients experiencing social isolation or lack of access to appropriate wound care should receive suitable education so they can successfully manage self-care and achieve healing. With its effective, holistic and affordable treatment options, Wound Balance can help patients achieve these goals.**

# International clinicians' experience: How has the concept of Wound Balance helped clinicians achieve their goals in different clinical settings

After the introduction of the concept of Wound Balance in 2023 (Wounds International, 2023), a global panel of clinicians initiated its implementation in their local settings. This panel included clinicians from Germany, France, the UK and the US. Despite differences in the healthcare systems of these countries, the challenge of improving outcomes for people with complex, non-healing wounds were the same. SAP dressings were used in all of these settings, with the QoL and healing outcomes recorded **[Appendix 1]**.

The clinicians participating in this Wound Balance roll-out had the following goals:

- Use the Wound Balance concept to create a holistic treatment plan for each patient
- Employ SAP dressings in the treatment plan as early as possible to achieve complete healing
- Assess and report the outcomes in this consensus meeting.

As demonstrated by the case studies in **Appendix I**, consistently positive outcomes were reported by the clinicians upon implementation of Wound Balance via SAP dressing.

The clinicians shared their experience of implementing Wound Balance via SAP dressings in routine clinical practice. SAP dressings were found to be applicable for all wound aetiologies, in all clinical settings and throughout the wound healing trajectory. Following implementation, the clinicians reported:

- Less frequent dressing changes required (continuity of treatment may also improve patient satisfaction and engagement)
- Control of MMPs
- Antibacterial impact
- Improvement of the patients' QoL
  - Patients staying in work
  - Improvement of life activities
- Increased patient engagement
- Improved financial benefits for patients due to less dressing changes and reduced number of prescriptions required.

The consensus panel stated that, in their experience with wounds that do not require urgent reviews, SAP dressings can provide an optimal therapeutic solution due to their high absorbance and ease-of-use without causing maceration, leading to fewer dressing changes. This reduced frequency of dressing changes with SAP dressings leading to overall cost-savings and a reduction in travel costs for patients who were not required to attend clinics on a daily basis. The use of SAP dressings under compression therapy was agreed as important. This is because, once compression therapy is initiated, these low-exudate wounds may often become more 'wet', leading to significant patient discomfort and disengagement from their treatment. A SAP dressing is able to effectively manage exudate, thereby reducing patient discomfort.

The clinicians' experience with Wound Balance and use of SAP dressings on non-healing wounds **[Appendix I]** depicts the high impact that Wound Balance has played in improving outcomes. It can, therefore, be inferred that implementing Wound Balance at an early stage

via evidence-based interventions, such as the SAP dressings, is an achievable goal in routine care to improve healing and reduce clinician time and is cost-saving due to reduction in dressing use. The panel shared their experience of implementing Wound Balance and SAP-containing dressings in their own clinical practice, stating they had witnessed improved healing outcomes. The panel reported satisfaction with their own achievements, improved confidence and the development of a high level of patient-clinician trust.

**Figure 9** summarises the overall benefits that can be achieved by implementing the concept of Wound Balance.


**Figure 9.** The overall benefits reported by clinicians upon implementing Wound Balance via SAP dressings.
*Abbreviations: QoL, quality of life; SAP, superabsorbent polymer.*

- **The panel agreed that global gaps exist in wound care, with significant variations in people being able to access specialists for complex wounds. In a majority of the clinical settings, routine surgical or sharp debridement was not achievable, and clinicians tended to use autolytic debridement due to its ease-of-use. In the US, this situation was further complicated due to the need to navigate the health insurance system. The panel stated there should be educational tools and referral pathways in all localities to ensure knowledge dissemination and equitable care access for people with non-healing wounds.**
- **The panel recommends effective and timely assessment, and that implementation of Wound Balance can improve outcomes and reduce cost while improving QoL outcomes.**

# Final recommendations on Wound Balance

There is emerging evidence that the environment of a non-healing wound may be modulated by wound dressings to resemble an acute-phase environment: Mikosiński et al (2022) found that treating non-healing wounds with SAP dressings results in a major shift in the pattern of biomarkers towards normal healing within 14 days, with the shift persisting for 12 weeks. In this study, a total of 57 VLU patients were treated with a protease-modulating polyacrylate wound dressing. Within 14 days, levels of neutrophil elastase, MMP-2 and fibronectin reduced significantly and remained stable. In addition to demonstrating the impact of SAP dressings, it highlighted that, although biomarkers may not yet be useful in predicting the healing trajectory, the understanding of this molecular picture can help clinicians apply Wound Balance for non-healing wounds.

There is a need for large-scale studies to further explore biomolecular modulation and its role in wound healing.

Furthermore, the recommendations from the panel experts emphasise the importance of diagnosing, defining and providing early intervention, i.e. within first 2 weeks, in contrast to 4-6 or 12 weeks, when the wound becomes non-healing. SAP dressings support this early intervention through their specific mechanism of action, addressing the re-balance of critical biomarkers which, in excess, act as wound inhibitors. The shift to normal wound healing can be objectively evaluated through improved wound evolution, although biomarkers are not measured in daily practice.

# Conclusion

The risk factors and comorbidities for non-healing wounds are rising globally (Carter et al, 2023; Sen 2023). With the simultaneous rise in the aging population and projected shortage of a qualified health force (Boniol et al, 2022; World Health Organization, 2025), there is a global need to simplify wound care paradigms, especially for non-healing wounds. This can also improve development, training and retention of registered wound care clinicians at a time when non-healing wounds are beginning to be seen as a 'silent epidemic' (NLM, 2025). Furthermore, minimising the long-term care costs of non-healing wounds can help reduce the huge costs associated (Guest et al, 2020; Sen, 2023; NLM, 2025). The principles of Wound Balance can improve wound healing and improve patient outcomes through timely assessment.

The case studies in this consensus demonstrate that Wound Balance can be achieved in all wound aetiologies and clinical settings, throughout the lifespan, and throughout the wound healing trajectory.

# Appendix I: Case studies demonstrating the implementation of Wound Balance

**The case studies presented below depict a wide range of patient groups with numerous wound aetiologies using the Wound Balance concept.**

**Case study 1** [Figure 10]: An 89-year-old female with dementia presented with VLUs on both legs (duration of 3 years). She had been cared for in her own home, but wound healing was not progressing. On admission to hospital, a holistic assessment was undertaken. Using the concept of Wound Balance, the objective was to heal the wound using autolytic debridement with a SAP dressing. This treatment was initiated on day 0; by day 94, the wounds had improved significantly and continued improving. Throughout the treatment, there were no signs of infection.


**Figure 10.** An 89-year old female with dementia and VLUs on both legs. Images A–F show the progression of the right leg from day 0 to day 94, and images G–L show the same time frame for the left leg. Images F and L show the wound healing progression in both legs. (Images courtesy of Emmanuelle Candas.)

**Case study 2** [Figure 11]: An 85-year-old immobile male patient with significant comorbidities (ischaemic stroke, vascular dementia, malnutrition, atrial fibrillation, atrial hypertension, dyslipidaemia, chondrocalcinosis, chronic renal failure and metastatic prostate cancer) was receiving palliative care and assessed as 'high-risk' for developing pressure ulcers. Following holistic assessment and using the Wound Balance concept, he was prescribed a multilayered SAP dressing to be applied to both heels. He developed no pressure ulcers.

**Figure 11.** An 85-year-old male receiving palliative care and at risk of pressure ulcers on both heels. The image depicts the application of the SAP dressing. (Images courtesy of Emmanuelle Candas.)

**Case study 3** [Figure 12]: A 94-year-old male with Lewy body dementia and a history of falls presented at clinic following replacement of a hip prosthesis. Between January-April 2013, he had undergone 4 surgical procedures for dislocation of the hip prosthesis. On examination, he presented with a lower limb wound that had developed from traumatic pressure caused by a leg splint. The treatment objective for this patient was 'healing'. Treatment with a SAP dressing was initiated on day 0. By day 6, inflammation had significantly reduced and, by day 77, the wound had achieved significant healing.


**Figure 12.** A 94-year-old patient with a lower limb wound, dementia and a history of falls. The images depict the impact of the SAP dressing between day 0 to day 77 (A-C). (Images courtesy of Emmanuelle Candas.)

**Case study 4** [Figure 13]: A 52-year-old male was admitted following an underwater diving incident resulting in C6 tetraplegia. He reported feelings of shame and embarrassment due to the position of the wounds, which included a sacral and heel pressure ulcer. Following assessment and discussion with the patient, treatment with a SAP dressing was commenced with the objective of wound healing.

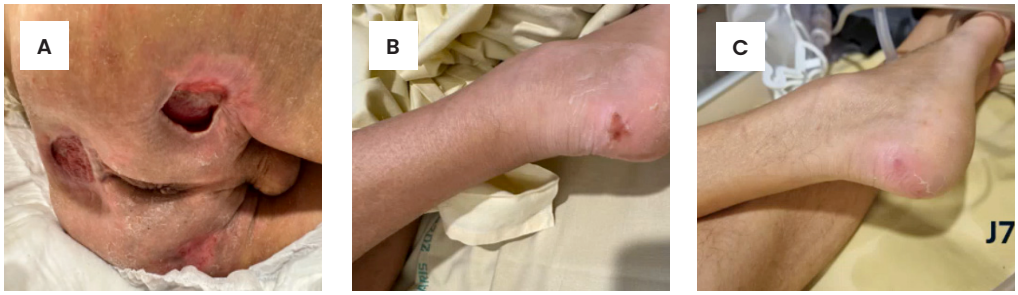



**Figure 13.** A 52-year-old patient, following a diving accident. A: The position and appearance of the sacral wounds. B: Initial presentation of the heel pressure ulcer. C: Healing outcome achieved via a SAP dressing. (Images courtesy of Emmanuelle Candas.)

**Case study 5** [Figure 14]: A 70-year-old male presented with non-healing diabetic foot ulcers (DFUs) on both feet, which had been present for over 8 months. His medical history included type 2 diabetes, hypertension, coronary artery disease, depression and gastritis. The patient was referred from a skilled nursing facility, where the wounds had been treated with regular debridement and dry dressings.

On initial assessment, the appearance of the wounds did not immediately suggest a clear cause for their non-healing. The right foot ulcer was a full-thickness wound measuring 2.5cm x 1.4cm x 0.6cm [Figure 14A], while the left lateral foot ulcer extended to the deep dermis and measured approximately 3cm x 1.8cm x 0.8cm [Figure 14B]. The base of both ulcers was a mix of granular and fibrotic tissue, with no signs of bone involvement. There was no drainage, no surrounding erythema, and only mild 1+ pitting oedema. Blood flow was assessed, with dorsalis pedis and posterior tibial pulses at 2/3, and capillary refill times were less than 3 seconds. The initial ankle-brachial index was within normal limits.

BIOMES was implemented to assess the wound. Given the patient's multiple comorbidities and the chronic nature of the ulcers, advanced biologics were introduced. Aggressive debridement techniques were used, followed by the application of dehydrated human amnion chorion membranes. Improved blood glucose control was also prioritised to support healing.

Within two months, the wound on the right foot had almost completely closed, with a skin bridge forming between two smaller wounds. The left foot ulcer measured 0.8cm x 0.6cm x 0.4cm, and the right foot ulcers measured 0.9cm x 0.8cm x 0.5cm (proximal) and 0.3cm x 0.2cm x 0.5cm (distal).

Despite progress, the patient was lost to follow-up for approximately six weeks. On return, the left foot wound reverted to its original size of 3cm x 1.8cm x 0.8cm, now with increased swelling and drainage. Upon reassessment with the BIOMES tool, a significant change in ankle-brachial pressure index (ABPI)was noted, revealing non-compressible vessels. An urgent referral was made to the vascular team, and two-layer compression dressings, along with Zetuvit SAP dressings were applied to manage moisture and swelling.

Within one month, the wounds had nearly healed. At the six-month follow-up, the wounds remained closed [Figure 14C and 14D], and remained fully healed, demonstrating the importance of comprehensive, ongoing assessment and timely intervention, including collaboration with vascular specialists.

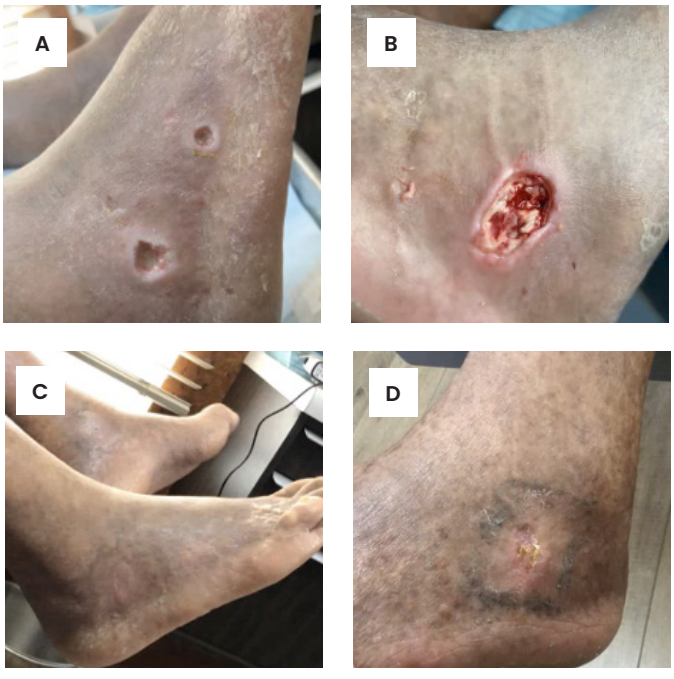



**Figure 14.** A 70-year-old male with DFUs on both feet. A and B: DFUs at presentation (right and left leg, respectively). C and D: DFUs upon healing (right and left leg, respectively). (Images courtesy of Trent Brookshier.)

**Case study 6** [Figure 15]: A 70-year-old female presented with a heavily exuding wound and surgical site dehiscence following a total ankle replacement. 'Infection' and 'lack of access to care due to travelling' were identified as the major barriers to healing via the BIOMES tool. The patient received SAP dressings and was advised to change them twice per week when travelling. Oral antibiotics were also prescribed to control the infection.

At the time of the third visit [Figure 15B], the wound was showing signs of improvement. By two months (data not shown), the wound healed completely from its original size of 4cm x 3cm x 0.2cm. The wound was clean, free of cellulitis and showed no signs of infection. There was no undermining, tracking or observable eschar or necrotic material. No muscle, tendon, capsule or bone involvement was noted.

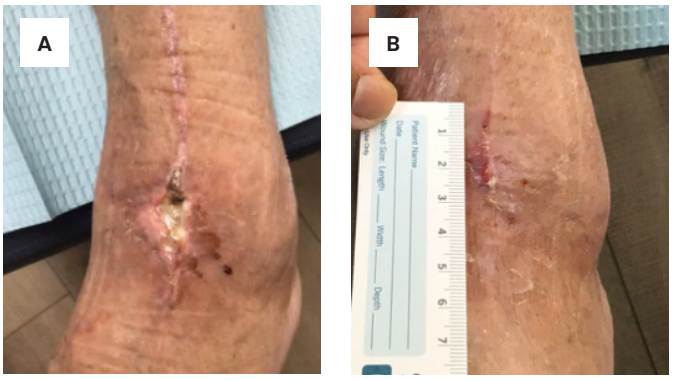



**Figure 15.** A 70-year-old female with a dehisced surgical wound. A: Upon presentation. B: Upon third visit. (Images courtesy of Trent Brookshier.)

**Case study 7** [Figure 16]: A 71-year-old female presented with Charcot neuroarthropathy, resulting in complete bone collapse and a non-healing wound at the base of the foot. The patient had been living with the wound for several years and initially declined intervention. One of the major barriers to healing was the patient was unable to access health insurance and, therefore, potentially had to rely on self-care practices.

On assessment, the necessity to correct the deformity and address the underlying cause of the wound was communicated. However, the patient declined surgical intervention at that time. Over time, the wound worsened, eventually leading to hospitalisation. During the hospital stay, the bony plantar prominences contributing to the wound's persistence were addressed through surgical intervention. After undergoing surgery to remove the collapsed bone, the patient received a skin graft on the surgical wound. Due to the high drainage, SAP dressings were prescribed. Post-operatively, an elliptical incision and Zetuvit was used to manage the drainage and assist in wound closure

Wound healing was achieved following 6 weeks. This case study highlights the importance of an early intervention via a wound specialist/surgeon. The clinician also highlighted that a majority of patients may not even be aware that wound care centres exist in US clinical settings. Within the US primary care systems, there is a need to improve clinician education on Wound Balance. This can help ensure that patients receive complete information on accessing wound care centres in a timely manner.


**Figure 16.** A 71-year-old female with Charcot neuroarthropathy. A, B and C depict presentation, post-surgery status and complete healing, respectively. (Images courtesy of Trent Brookshier.)

**Case study 8** [Figure 17]: A 48-year-old male presented with a 1-month-old foot ulcer. The patient had a recent history of uncontrolled diabetes, polyneuropathy, Charcot neuroarthropathy, functional blindness and hyperlipidaemia. All comorbidities were proactively addressed by managing the inflammation, biofilm, comorbidity management, and offloading. Upon treatment with SAP dressings, by week 11, the patient achieved complete healing as well as better management of their comorbidities.

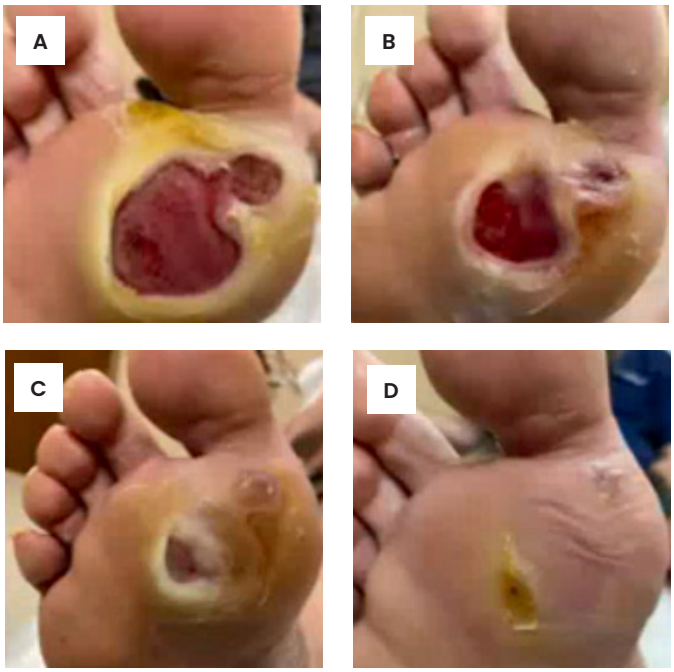



**Figure 17.** A foot ulcer in a 48-year-old male with several comorbidities. A-D: Progression of wound healing between day 0 and week 11. (Images courtesy of Laura Swoboda.)

**Case study 9** [Figure 18]: A 47-year-old female presented with a non-healing surgical wound after bowel resection surgery. The patient had a history of smoking. A Wound Balance-based treatment approach was employed to proactively address inflammation, biofilm and lifestyle factors (increased protein and vitamin D intake and decreased tobacco usage). The patient received SAP dressings along with negative pressure wound therapy. Complete healing was achieved by week 6 and the patient was able to resume routine life activities.

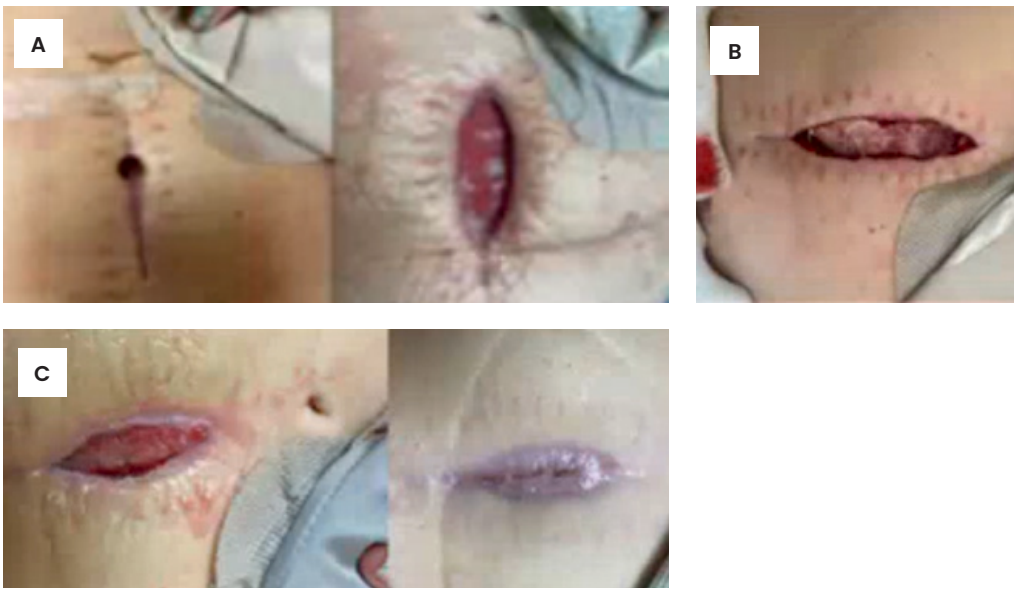



**Figure 18.** A 47-year-old female with a dehisced surgical wound in the abdomen. A, B: The various stages of wound dehiscence. C: Healing achieved at week 6. (Images courtesy of Laura Swoboda.)

**Case study 10** [Figure 19]: An 82-year-old female awaiting knee replacement surgery was unable to proceed with the operation due to the presence of a lower limb ulcer. The patient's QoL was significantly impacted by knee osteoarthritis; she had been on the surgical waiting list for 18 months. The risk of infection associated with the ulcer posed a threat to the planned procedure, potentially leading to further delays or cancellation. Treatment with a SAP dressing and compression therapy was initiated to provide autolytic debridement and reduce the risk of infection. The patient achieved complete healing by 3 weeks (data not shown), and she was able to have the knee replacement surgery, with a significantly improved QoL post-surgery.

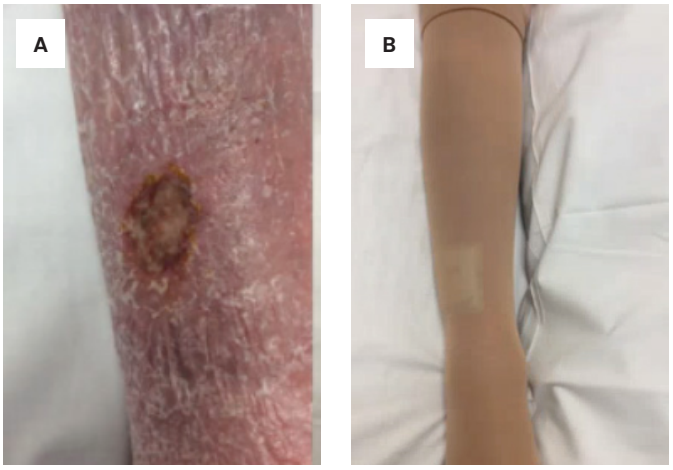



**Figure 19.** A 82-year-old female patient with a lower limb ulcer. A: Upon presentation. B: With a SAP dressing and compression stocking. (Images courtesy of Sharon Trouth.)

**Case study 11** [Figure 20]: A 60-year-old female presented with a 6-month old recurrent VLU. The patient was in debilitating pain, with the VLU affecting every aspect of her life, including work. Wound aetiology was assessed and the underlying pathophysiology determined to be venous insufficiency. Treatment was initiated with a SAP-dressing and compression therapy via hosiery. The SAP dressing helped manage the exudate and patient was able to achieve self-care. The pain was reduced significantly, with healing achieved by week 3. Overall, the clinician found the application of Wound Balance was easy to use and allowed for timely healing despite the patient suffering with a recurrent VLU.

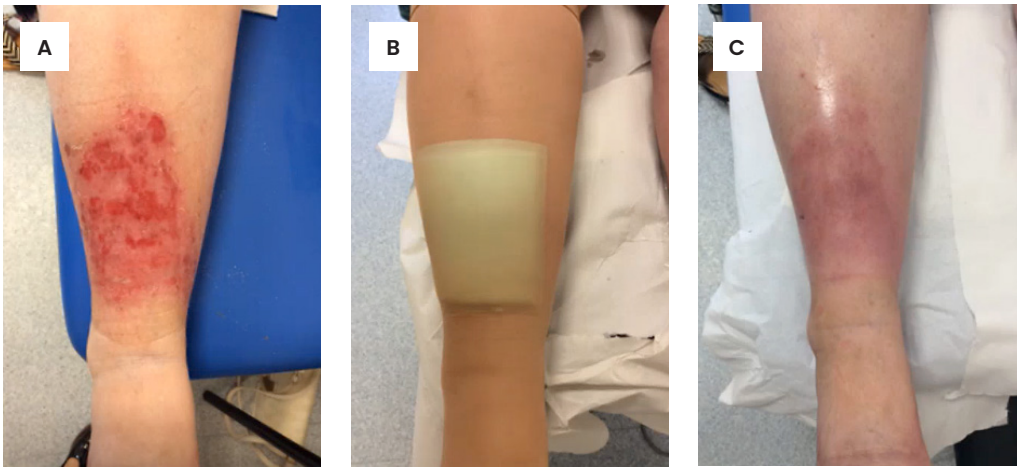



**Figure 20.** A 60-year-old female with a 6-month old recurrent VLU upon presentation (A). B: A SAP dressing has been applied. C: Healing is achieved at 3 weeks. (Images courtesy of Sharon Trouth.)

**Case study 12** [Figure 21]: A 78-year-old female with a two-year history of recurrent leg ulceration had not received compression therapy due to the absence of a confirmed underlying aetiology. A full holistic assessment was undertaken, leading to a diagnosis of venous leg ulceration. Treatment was initiated with Resposorb and therapeutic 40mmHg compression therapy, resulting in complete wound healing within 12 weeks (final results not shown).

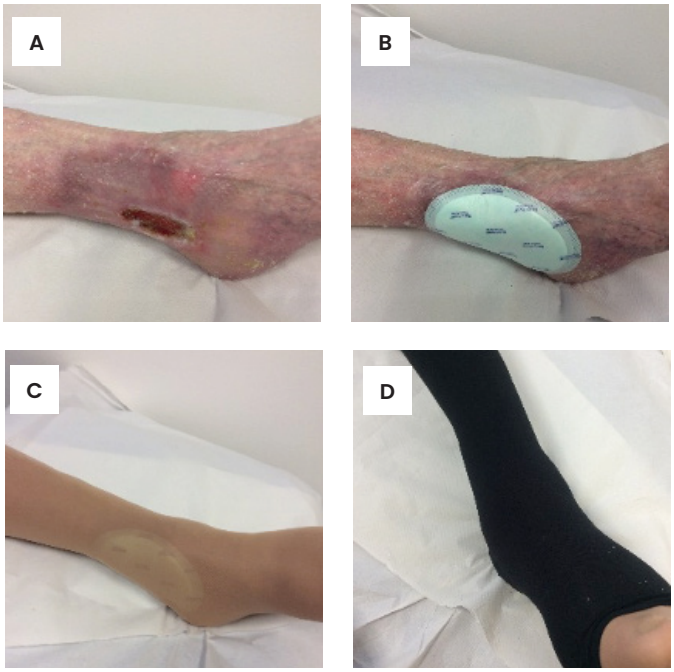



**Figure 21.** A 60-year-old female with recurrent leg ulceration (A-D: Wound journey and the application of compression therapy). (Images courtesy of Sharon Trouth).

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