

The Triangle of Wound Assessment: a holistic framework from wound assessment to management goals and treatments

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The negative impact of wounds on patients is significant, and includes pain, reduced quality of life and social isolation. Optimal wound healing can reduce the burden of chronic wounds on patients and the health economy. The Triangle of Wound Assessment is a holistic framework that clinicians can use to improve wound assessment, with particular focus on the wound bed, wound edge and periwound skin (World Union of Wound Healing Societies, 2016). This framework can help guide clinicians to select the most appropriate and effective intervention to improve patient outcomes and to ensure prudent use of healthcare resources.

Globally, the demand for healthcare resources continues to grow as the demographics of the population change, long-term conditions become more prevalent, patient expectations rise and medical technology advances. The impact of a wound on the patient is significant, with patients reporting pain, reduced quality of life and social isolation (Franks et al, 2006; Palfreyman 2008). To promote optimal wound healing and to reduce the impact of chronic wounds on the patient and the health economy, clinicians need frameworks, tools and education that facilitate accurate and comprehensive wound assessment, correct identification of wound management goals and selection of evidence-based wound treatments and interventions.

The Triangle of Wound Assessment is recognised as a holistic framework to improve wound assessment and to ensure effective treatment interventions are based on that assessment to improve patient outcomes and ensure more appropriate use of healthcare resources (World Union of Wound Healing Societies [WUWHS], 2016). It is also a framework that can support wound management decisions and treatment goals [Figure 1]. This is demonstrated in the two case reports presented on p37 and p38.

The main goal of treatment is usually wound healing, although, for some patients, it may be to provide comfort and control symptoms, such as in those who are receiving palliative care (Woo et al, 2015). Treatment goals should aim to correct the underlying cause of the wound (e.g. compression therapy for underlying venous disease and pressure offloading for patients with pressure

ulcers and diabetic foot ulcers), and to manage and prevent identified problems on the wound bed, wound edge and periwound skin.

Wound bed

Wound bed preparation is essential to optimise the wound for healing (European Wound Management Association [EWMA], 2004). The Triangle of Wound Assessment is a holistic framework that focuses not only on the wound bed, but beyond the edge to the periwound skin, to promote wound healing and a positive outcome for the patient (Dowsett et al, 2015). Management goals will be set based on the assessment framework and will include removal of non-viable tissue, managing exudate, reducing bacterial burden and ensuring the wound edges are moist, intact and flush with the base of the wound, as well as preventing and treating periwound skin problems, such as maceration.

Tissue type

The specific characteristics of the tissue within the wound bed play an important role in the wound-healing continuum. Where tissue is non-viable or deficient, wound healing is delayed. It also provides an opportunity for infection to develop, prolongs the inflammatory response, mechanically obstructs contraction and impedes re-epithelialisation (Vowden and Vowden, 2011). The management plan should aim to remove non-viable tissue, reduce the risk of infection, and protect and promote new tissue growth.

Debridement is the process of removing devitalised tissue and foreign material from

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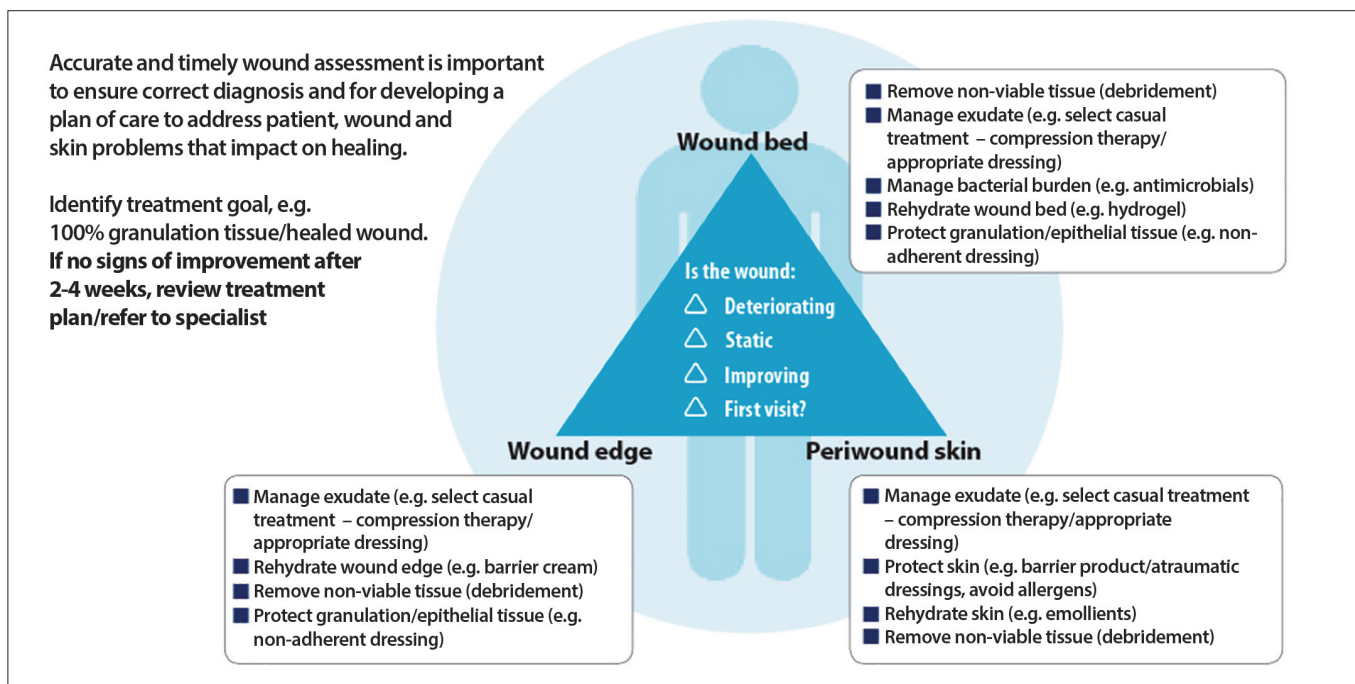


Figure 1. Using the Triangle of Wound Assessment (WUWHS, 2016) — devising a management plan.

a wound. In many cases, this process occurs naturally. However, some patients have underlying pathology, which affects the ability of the body to debride the wound naturally. In a chronic wound, debridement is often required more than once because the healing process can stop or slow down, allowing further devitalised tissue to develop. Debridement is frequently an ongoing process and will involve the integration of a number of debridement methods if healing is to be optimised (Wolcott et al, 2009).

Where debridement is an option, the following methods may be used: surgical, sharp, autolytic, enzymatic, larval or mechanical. The method or mechanism of debridement will depend on the patient, the wound and the expertise of the clinician (Leak, 2012). Where the best debridement option for the patient is beyond the skills and competence of the practitioner, the patient should be referred to the most appropriate specialist. Successful debridement is often associated with a progressive reduction in wound exudate, reduction in odour and the appearance of a healthy granulating wound bed (Vowden and Vowden, 2011).

In case report 1, surgical debridement allowed for fast removal of devitalised tissue; ongoing maintenance debridement and wound protection was achieved with moist interactive wound healing and exudate management using Biatain® Silicone foam dressing (Coloplast Ltd) to achieve a successful outcome for the patient.

Exudate

Exudate is produced as part of the inflammatory stage of wound healing and the volume of exudate

will usually decrease as the wound heals (Wounds UK, 2013). Chronic wounds usually produce moderate to large volumes of exudate, which can delay wound healing and cause maceration of the wound edge and periwound skin. Chronic exudate leads to the breakdown of the extracellular matrix proteins and growth factors, prolongs inflammation and inhibits cell proliferation (Tengrove et al, 1999).

Managing wound exudate effectively is essential because excessive wound exudate can lead to protein deficiency, wound edge and periwound skin maceration and delayed wound healing. Assessment of exudate is important to ensure the correct treatment is selected, and should include the level and type of exudate and its interaction with the dressing. Leakage or strikethrough has the potential to lead to the development of infection, resulting in an increased volume of exudate and a change in consistency to thick, purulent and cloudy.

The Triangle of Wound Assessment framework enables clinicians to choose an appropriate management plan based on exudate levels and type to ensure moisture balance is achieved. The most widely used methods for managing excessive exudate are negative pressure wound therapy (NPWT) and absorbent dressings that maintain an appropriate moisture balance, thus avoiding maceration or desiccation of the wound bed (Dowsett, 2008). In addition, the dressing needs to conform to the wound bed to reduce dead space and fluid accumulation, which can lead to the development of infection (Sibbald et al, 2000; Cutting et al, 2009).

In case report 1, wound exudate was well controlled and the periwound skin was protected

with the initial use of NPWT and then Biatain Silicone foam dressing, resulting in wound size reduction and reduced dressing changes. The ability of the dressing to conform to the wound ensures that dead space is eliminated and infection prevented.

Infection

Wound infection occurs when a wound is invaded by proliferating microorganisms to a level that invokes a local or systemic response in the host. The presence of microorganisms within the wound causes local tissue damage and impedes wound healing. The diagnosis of wound infection is based on clinical judgement and advice should only be sought from laboratories when confirmation of an infection is needed, when an antimicrobial intervention has failed, when a patient requires screening for a specific organism, or when healing is stalled and all other confounding issues have been addressed (EWMA, 2005).

The classic signs and symptoms of wound infection include inflammation, new or increasing pain, local heat, swelling, advancing redness and purulence (WUWHS, 2008). However, these indicators are less likely to appear in chronic wound infection and, therefore, clinicians must be familiar with the secondary signs of infection, including pain, increase in wound size, friable granulation tissue, increase exudate levels and delayed healing (Gardner et al, 2001).

It is important for clinicians to distinguish between local and systemic infection to ensure the correct management goal is set and the treatment choice is appropriate to achieve bacterial balance and reduce inflammation. The

goal of treatment should be to prevent infection by following universal infection principles, removing non-viable tissue and controlling exudate. Where the diagnosis of infection has been made, the goal will be to treat with topical antimicrobials for local infection, and systemic antibiotics for spreading or systemic infection. Best practice recommendations suggest that topical antimicrobials should be used for a two-week period and then the patient and the wound should be reassessed and treatment evaluated (Wounds International, 2012). The practice of alternating topical wound therapies has gained popularity, with the premise that this strategy suppresses a range of microbes through the application of a different antimicrobial in a two- to four-week rotation (International Wound Infection Institute, 2016). It is important to regularly reassess the wound and the patient, and to monitor the response to treatment.

Wound edge

The wound edge needs to be moist, intact, attached to and flush with the base of the wound to enable migration of epithelial cells. Wound edge migration is a good predictor of healing in patients, and regular wound measurement is essential to evaluate the effectiveness of the treatment plan (Greatrex-White and Moxey, 2013). Wound edge problems, including maceration, dehydration or undermining, will be identified using the Triangle of Wound Assessment and a management plan to address these put in place.

When the patient presents with abnormal wound edges, such as raised or rolled edges, they should be referred to a specialist for further assessment. At the wound edge, the aim is to

Table 1: Using the Triangle of Wound Assessment framework in clinical practice to assess and manage patients with chronic wounds (adapted from Schultz et al, 2003; Dowsett and Newton 2006).

Management goal	Treatment	Outcomes
Remove non-viable tissue	Debridement: episodic or continuous: autolytic, sharp surgical, enzymatic, mechanical or biological	<ul style="list-style-type: none"> ■ Granulation and epithelial tissue ■ Wound healing
Manage exudate	Apply moisture balance dressing based on level and type of exudate: foam, hydrocolloid, alginates, gelling fibres, negative pressure wound therapy. Ensure dressing conforms to the wound bed. Use antimicrobial dressing if exudate is caused by infection	<ul style="list-style-type: none"> ■ Moisture balance ■ Prevention of maceration and dehydration ■ Wound healing
Manage bacterial burden	Prevent dead space that may lead to the accumulation of fluid and bacteria Remove infected foci with topical/systemic antimicrobials	<ul style="list-style-type: none"> ■ Bacterial balance and reduced inflammation ■ Wound healing
Wound edges to be moist, intact and flush with the base of the wound	Reassess cause or consider corrective therapies: debridement, grafts, biological agents adjunctive therapies	<ul style="list-style-type: none"> ■ Advancing edge of wound ■ Wound healing
Protect/prevent periwound skin problems	Rehydrate skin; protect skin; exudate management; remove callus/hyperkeratosis	<ul style="list-style-type: none"> ■ Periwound skin intact ■ Prevention of maceration, dry skin or callus

lower barriers to effective wound healing by reducing dead space that can lead to bacterial growth, debriding thickened or rolled edges, improving exudate management, and reducing maceration through appropriate treatment and dressing selection (WUWHS, 2016). Correct management of wound exudate is an integrated part of wound edge treatment because it will help to prevent wound edge maceration, as demonstrated in the case reports.

Periwound skin

The periwound area has been defined as the area of skin extending to 4 cm beyond the wound (Dowsett and Allen, 2013). Patient assessment includes the identification of factors that will increase the risk of periwound skin damage, such as the amount of exudate and the presence of bacteria. Problems in this area include maceration, excoriation, dry skin and hyperkeratosis. Most commonly seen in clinical practice are problems associated with exudate, where poor treatment choices lead to maceration and an increase in wound size. Assessment should aim to identify those patients at risk of periwound skin damage and measures put in place to reduce the risk of damage. This will include minimising periwound contact with wound exudate, protection of the area with an appropriate barrier and use of atraumatic or soft silicone dressings to avoid skin stripping. If callus or hyperkeratosis is present, the treatment goal will be to debride and ensure a structured skin care regimen to prevent further development of callus. Ongoing unresolved issues of the periwound skin that are not responding to treatment should prompt referral to a specialist.

Conclusion

The Triangle of Wound Assessment is a framework that enables clinicians to assess patients and their wound holistically, with particular focus on the wound bed, wound edge and periwound skin. The framework supports clinical decision-making in setting management goals and the most appropriate treatment to achieve the best outcome for patients and their wound.

Case report 1

A 51-year-old immobile male with urinary and faecal incontinence presented with a recurring pressure ulcer over the left ischium after flap surgery [Figure 2]. Appropriate repositioning was employed, but failed to prevent the pressure ulcer. The patient sat every day for approximately four to six hours in a wheelchair with a gel-chair cushion for pressure relief, but there was a lack

of clear instructions for correct repositioning and mobilisation.

The patient had chronic progressive encephalomyelitis with tetraspasticity in both arms and legs. He had multiple sclerosis for 20 years, with progressively limited movement and a significant deterioration in general condition and nutrition status. He was cared for by his wife, and a wound specialist from a home care institution managed the wound.

The pressure ulcer had previously been treated with silver alginate and polyurethane foam dressings. Autolytic debridement of necrotic tissue was performed when needed. Infection of the wound was persistent, exacerbated by the formation of new necrotic tissue over the wound bed.

At baseline the wound measured 6 cm (length) x 2 cm (depth) x 3.5 cm (width). The wound bed tissue was sloughy, and thick, yellow exudate was present. Extensive surgical debridement was performed, followed by antimicrobial therapy with silver alginate dressing in the undermining area of the wound.

Biatain Silicone sacral dressing was selected for exudate management, conformability of the dressing to the wound bed and protection of the wound edge and periwound skin. The dressing was changed every two days. Pressure relief and a high-calorie diet supplemented with vitamins were also initiated. Suprapubic catheterisation was performed to relieve urinary retention due to the patient's urinary incontinence. Physical therapy was also started because the patient had spasticity in his arms and legs and was immobile.

Review: Surgical debridement was performed three times within six days. This helped to clear the wound bed from necrotic tissue, which had caused previous infection. The wound was cleansed with Octenisept antiseptic (octenidine dihydrochloride 0.1 g and 2-phenoxyethanol 2g per 100g) for the first 10 days (later replaced with Ringer solution at every dressing change). After eight days, granulation tissue was present in the wound bed and local antimicrobial therapy with the silver alginate dressing was stopped; and only Biatain Silicone Sacral was used. Wound contraction was observed on day 12 in the undermining area.

After 20 days, dressing change was reduced to every third day. Granulation and epithelial tissue started to appear, and the wound size had reduced. There was no moisture eczema, which is commonly seen with other pressure ulcer dressings, because Biatain Silicone was able to absorb exudate vertically without lateral spread in the dressing.



Figure 2: The wound at presentation.



Figure 4: The wound at presentation.



Figure 3: Review 2 at day 29.

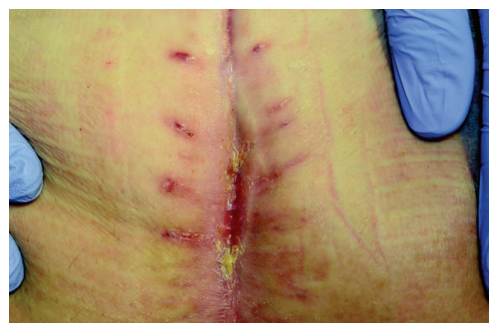


Figure 5: Review 2 at day 30.

Review 2: The wound size had reduced by almost 50% after 29 days [Figure 3]. The wound bed now mainly comprised granulating tissue and the level of exudate production was low. Biatain Silicone dressing's ability to manage exudate and conform to the wound bed protected the periwound skin and wound edge from maceration. The dressing also provided a moist wound-healing environment. Biatain Silicone sacral dressing did not adhere to the wound bed and was intact on removal, reducing trauma and pain for the patient.

Conclusion

The high absorbency of Biatain Silicone sacral dressing prevented maceration of the wound edge and periwound skin. Because the dressing conformed well to the wound bed, the 2 cm deep wound did not require a filler (only the undermining part of the wound edge required a silver-alginate filler at the beginning to treat the infection). The clinician concluded that Biatain Silicone sacral dressing provided optimal treatment for this patient's pressure ulcer.

Case report 2

A 68-year-old female with cancer presented with a wound dehiscence three weeks after removal of the uterus and both ovaries via a laparotomy incision [Figure 4]. The patient is obese and has a learning disability. Three weeks after wound suture dehiscence occurred, a deep infection developed along the surgical wound.

The wound was initially managed with negative pressure wound therapy. Wound closure by secondary intention occurred after 14 days. However, in the distal wound pole, a wound dehiscence reoccurred. After removing a number of sutures and performing debridement, wound management took place outside the hospital.

At baseline, the wound measured 8 cm (length) x 1.2 cm (depth) x 2.2 cm (width). The wound bed comprised mainly granulating tissue. Exudate was present, but there was no maceration at the wound edge or periwound skin.

The wound was opened at the lower end and cleansed and rinsed with Ringer solution. Biatain Silicone foam dressing was selected for exudate management and wound protection. Because the patient was obese, care had to be taken when applying the dressing due to belly folds. Despite this, the clinician found that Biatain Silicone foam dressing was easy to apply and conformed well to the wound cavity. The dressing was changed after 24 hours.

The clinician rated the absorption capacity of the foam dressing as 'excellent'. The dressing was also effective in protecting the wound edge and periwound skin from maceration. There was no pain reported from the patient during dressing change. Thereafter, the dressing was changed every two days.

Review 1: The wound was reviewed after 14 days; the wound size had reduced to 5.5 cm (length) x 0.4 cm (depth) x 1.2 cm (width). More granulating and epithelial tissue was observed on

the wound bed. Exudate production had reduced to a low level, so it was decided that dressing changing intervals would change to every three to four days. The patient was able to shower with the dressing intact, increasing her quality of life.

Review 2: On review 16 days later (day 30), the wound had closed [Figure 5].

Conclusion

The high absorbency of Biatain Silicone foam dressing meant fewer dressing changes were needed, and a wound filler was not required, resulting in cost savings. The dressing was effective at protecting newly formed granulation tissue despite skin folds being present, and there was no difficulty with applying the dressing. No maceration of the wound edge or periwound skin was observed, so therapy interruption and risk of secondary infection were minimised.

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Declaration

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