

An update on wound management

SUMMARY

Wound management involves an understanding of the aetiology and pathophysiology of a wound, the healing process and how best to manage both. Acute wounds can occur suddenly, such as burns and skin tears. Chronic wounds fail to progress through the normal stages of healing and can include ulcers, pressure injuries and infected wounds.

Dressings and bandages provide the optimal environment for the healing of all wound types. It is important for healthcare practitioners to understand the key differences in their properties, uses and precautions. Selecting the ideal dressing or bandage can minimise the healing duration, reduce the bioburden, and improve a patient's quality of life.

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Keywords

bandages, dressings, wound care, wound pathophysiology

Aust Prescr 2023;46:29–35

<https://doi.org/10.18773/austprescr.2023.006>

Introduction

The prevalence of wounds continues to increase because of the ageing population, rising incidence of diabetes and respiratory diseases, and poor nutrition. The skill of identifying and treating wounds grows with our understanding and knowledge of the processes of wound repair and healing. There are many types of wound treatments available. This often causes confusion and the misuse of products.

On any given day in Australia, around 500,000 people have an unhealed wound, and the annual financial impact is more than \$3 billion. These costs are both direct, in terms of wound treatment, and indirect such as the impact on the ability to work. Cost savings can be achieved by appropriate wound management.¹⁻³

Over the last 50 years, the emphasis has been on developing a range of wound dressings with properties of absorption, hydration and antimicrobial activity. Wound care has seen a shift from simple dressings to devices and products that incorporate pharmaceutically active ingredients.⁴ Current and future treatments include biologicals, topical immunosuppressants, growth factors and various types of tissue matrices.

Assessment

The ageing process affects most structures of the skin. The skin loses hair follicles, sebaceous glands that supply natural moisture to the skin, receptors (including those for touch, pressure, pain and temperature), blood supply and sweat glands. As a result, the skin becomes thinner, more brittle, avascular and more prone to injury.⁵

Comorbidities and various intrinsic and extrinsic factors significantly affect wound healing (see Box 1).⁶

Assessing the patient and wound is critical to facilitate an accurate diagnosis and thus an appropriate management strategy. The main issues to consider are the wound type, wound position, wound shape, level and type of exudate, presence of any comorbidities, drugs being used, nutritional state and known investigations.

There are several tools that can be used as part of the assessment including the TIME and MEASURE frameworks (see Box 2).^{7,8,9} These allow clinicians to consider a wide range of factors relating to the wound and patient.^{8,9}

General principles

The management of any wound involves addressing the cause of the wound and the use of dressings or bandages. Wound dressings can be divided into two broad groups – inert/passive and interactive/bioactive.

Inert dressings fulfil very few of the properties of an ideal dressing and can be subclassified into absorbent and non-absorbent. They include gauze, lint, non-adherent dressings and tulle dressings. They have limited (if any) use as primary dressings (which are

Box 1 Factors that affect wound healing

Intrinsic factors

- health status
- immune function
- age
- extremes of body mass
- diabetes
- nutritional status

Extrinsic factors

- mechanical stress
- debris
- temperature
- drying or maceration
- infection
- chemical stress
- other factors (e.g. smoking, drugs)

Box 2 Assessment tools**TIME framework⁷**

- Tissue
- Infection
- Moisture balance
- wound Edge

MEASURE framework⁸

- Measure (length, width, depth and area)
- Exudate (quantity and quality)
- Appearance (wound bed, including tissue type and amount)
- Suffering (pain type and level)
- Undermining (presence or absence)
- Re-evaluate (monitoring of all parameters regularly)
- Edge (condition of edge and surrounding skin)

applied directly on the wound), but some are useful as secondary dressings (which are used on top of primary dressings).

Interactive dressings alter the wound environment and interact with the wound surface to optimise healing. Interactive dressings can be absorbent, non-absorbent or moisturising. They include films, hydrocolloids, foams, hydrogels and hydroactive dressings. They have the properties of protection, absorption, hydration, antimicrobial action and tissue modulation.

When instructing a patient or their family or carers on the use of dressings, remember to keep it simple to increase the likelihood that a product will be used correctly.

Acute wounds

Acute wounds occur suddenly and can include burns, lacerations, grazes and skin tears.¹⁰

Burns

The main aims of burn management are to prevent infection, reduce pain and provide an ideal wound-healing environment. It is important to identify the type, depth and area of a burn.^{11,12}

Many burn injuries are superficial. They involve pain, discomfort and disruption to a patient's routine activities of daily living. Most superficial burns involve only the top layer of the skin. These burns do not form blisters and generally heal in 3–6 days without scarring. The superficial burns requiring specialist care are typically in patients who are immunosuppressed. The essential management of a superficial burn involves the immediate application of cold running tap water for 20–30 minutes, but not ice, as temperatures

below 5 °C may deepen burns. This is followed by the use of silver dressings or amorphous or sheet hydrogels.¹³ The use of topical silver-containing treatments has shifted from creams to metallic silver dressings. The use of a topical silver cream on a mucous surface will result in the formation of a mucilaginous slime on the surface of the tissue, which is cytotoxic and slows healing.

Deep burns, on the other hand, are associated with scarring, functional defects, psychological problems, costs to the community and contractures. Deep burns involve damage to the dermis and subcutis. It is essential to assess the cause of and extent of damage associated with deep burns. Management involves infection prevention, debridement and grafting.

Skin tears

As a result of skin ageing and the epidermal layer separating more easily from the dermis with age, skin tears are common in older people. The main cause is trauma from manual handling (e.g. transferring a patient from a bed to a chair, removing adhesive tapes, falls, and collisions with bed rails and wheelchair foot plates).

If possible, align the skin back in place, secure with adhesive skin strips, such as Steri-Strips, and cover with a silicone foam dressing. If there is a loss of the epidermis, cover the area of loss with a silicone tulle before the application of a silicone foam dressing.

In addition to treatment, it is essential to identify the risk of recurrence and introduce a plan for prevention. The use of an effective moisturiser twice a day can reduce the risk of skin tears significantly.^{14,15}

Chronic wounds

A chronic wound is described as an acute wound that has not healed after six weeks. Chronic wounds fail to progress through the normal stages of healing and can include venous leg ulcers, pressure injuries, diabetic foot ulcers, neoplasia, and atypical wounds such as vasculitis.¹⁰

If you are treating a chronic wound and observe no improvement after four weeks of management, it is then essential to reassess and consider a biopsy or referral to a specialist wound clinic. It is important to note that a non-healing wound can become neoplastic.

Venous ulcers

Venous leg ulcers are the most common ulcers. The cause is valve incompetence, with consequent venous hypertension forcing fluid into tissues, producing hypoxia at the periphery. The initial wound is often traumatic, with poor healing due to the presence of hypoxic tissue. The main features include

oedema, staining due to haemosiderin deposition, lipodermatosclerosis, presentation in the lower third of the leg, an often-painless presentation, an irregular shape and the potential for copious exudate.

It is important to perform a vascular assessment to identify a clear venous pathology and check the arterial system to ensure that compression is safe. Other aspects of the wound can be addressed with specific dressings placed under the compression (see Table 1).^{4,10,16-18}

If a venous pathology is confirmed, apply graduated compression bandages or stockings to the ulcers (see Table 2). There are different grades of stockings available to provide different pressures. The minimum coverage should be from the toes to the knee, with a compression pressure of 30–40 mmHg at the ankles.¹⁸

Arterial ulcers

Arterial ulcers result from reduced arterial blood flow. The features include claudication, pain at rest, a reduction in the ankle brachial index score, weak or absent pedal pulses and sluggish or poor capillary refill. The wounds are regular in outline with a punched-out appearance, and the ulcer site is usually at or below the ankles.

The acute management of arterial ulcers usually involves improving blood flow through angioplasty, stenting or bypass grafting and, if necessary, the amputation of a digit or limb. Pain management is often necessary.¹⁶

Diabetic foot ulcers

Diabetic wounds can be classified as either neuropathic, ischaemic or neuroischaemic. Neuropathic wounds are painless and thus often unnoticed, occur over bony prominences or areas of pressure, and will heal with a sufficient blood supply. Ischaemic wounds are painful and not necessarily in areas of pressure. A poor blood supply negatively affects healing. Neuroischaemic wounds involve the loss of both sensation and arterial blood supply.

Optimising glycaemic control is critical for management. The main management issues are ensuring that the circulation is adequate, that any infection is controlled and that pressure is removed. It is essential to involve a multidisciplinary team including an orthotics specialist and podiatrist in the management of diabetic foot ulcers. Treatment will often involve antimicrobial dressings and pressure off-loading. Pressure off-loading refers to reducing or removing weight placed on the feet, which is achieved using felt devices and specialised footwear that are provided by podiatrists. There is a new treatment containing sucrose octasulfate with strong evidence for its use.^{19,20}

Management should involve regular review and examination of the patient. It should also involve education of the patient, their family or carers and healthcare providers, as well as appropriate footwear and the treatment of non-ulcerative pathology.^{19,21,22} These include changes in the skin and nails, such as plantar erythema, xerosis (dry skin), fungal toe infections and dystrophic nails.

The ongoing risk of foot ulcers includes the impact of sensory loss, which can be assessed by daily inspections of the feet for blisters, fissures, bleeding or lesions such as tinea between the toes. Treatment of dry skin and lesions, and the removal of calluses caused by autonomic neuropathy are important.

Pressure injuries

Pressure injuries are a frequent problem for patients in hospital and residential aged-care facilities. When pressure of more than 30 mmHg is applied over bony prominences, this physically closes off small vessels, resulting in hypoxic tissue and ischaemic injury. Pressure injuries may also be caused by friction or shear forces.

It is important to identify patients at risk using screening tools, such as the Norton or Braden scales, and to manage risk factors. Skin damage in the sacral region can also be caused by incontinence-associated dermatitis, but this is not classified as a pressure injury. The main management strategy involves off-loading, dressings, improving nutrition if necessary, and the use of pressure-reducing surfaces on beds and chairs.²³⁻²⁷

Wound infection

Infection is a major factor in delaying wound healing. However, most chronic wounds have bacteria present on the surface, but they are not necessarily infected.

Tissue biopsy is the most accurate method of identifying an infection. Do not swab chronic wounds routinely, as this often leads to unnecessary antibiotic use and does not address the underlying problem. However, if a swab is to be used, the Levine method is preferred, described as follows. The wound should be cleaned with water or saline, not an antimicrobial solution. Following this, identify 1–2 cm of clean wound tissue. Rotate the applicator for five seconds while applying sufficient pressure to produce fluid from the wound tissue. Do not obtain a specimen from exudate, eschar or necrotic material.

Infected chronic wounds are more often due to the presence of anaerobes. For localised wound infections, use topical antimicrobials (e.g. polyhexamethylene biguanide (PHMB), octenidine dihydrochloride, chlorhexidine, povidone-iodine). For systemic or spreading infections, systemic antimicrobials are required in combination with

Table 1 Wound dressings^{4,10,16-18}

Product Classification	Properties	Uses	Precautions
Tulles			
Paraffin gauze (e.g. Jelonet)	Protects new tissue growth Atraumatic to surrounding skin Conformable to wound bed	Low- to high-exuding wounds Primary dressing over superficial low-exuding wounds	No longer used due to shedding of fibres and being open weave
Nonparaffin (e.g. Cuticerin, Adaptic, Atrauman)	Provides a protective layer		May dry out if left in place for too long
Silicone (e.g. Mepitel)	Contact layer is soft silicone	Wounds in patients with fragile skin	Consider allergies to soft silicone adhesives
Non-adherent dressings			
Basic (e.g. Melolin, Cutilin)	Cotton wool with plastic surface Very low absorption	Primary dressing over superficial low-exuding wounds	Will not cope with moderate or high levels of exudate
High absorption (e.g. Mesorb, Vliwasorb, Zetuvit)	Polymers Highly absorbent	Moderate- to high-exuding wounds Secondary dressing over exuding wounds	Do not use on dry or low-exuding wounds
Film dressings			
(e.g. Opsite, Tegaderm)	Polyurethane film Moisture control Breathable bacterial barrier Transparent (allows for visualisation of the wound)	Primary dressing over superficial low-exuding wounds Secondary dressing over alginate or hydrogel primary dressing	Do not use on patients with fragile or compromised surrounding skin Do not use on moderate- to high-exuding wounds
Hydrocolloid dressings			
(e.g. DuoDERM, Comfeel)	Absorb low to moderate levels of fluid Promote autolytic debridement	Clean, low- to moderate-exuding wounds	Do not use on dry or necrotic wounds or high-exuding wounds May encourage overgranulation May cause maceration Do not use on diabetic wounds
Foam dressings			
Standard (e.g. Lyofoam Max, Allevyn)	Fluid absorption Moisture control Conformable to wound bed Thermal insulation Cushioning	Moderate- to high-exuding wounds Low- to non-adherent products available for patients with fragile skin	Do not use on dry or necrotic wounds or those with minimal exudate
Soft silicone (e.g. Mepilex, Allevyn Life)	Non-adherent	Wounds in patients with fragile skin Pressure prevention	Consider allergies to soft silicone adhesives
Hydroactive dressings			
Foam like (e.g. Biatain, Tielle)	Fluid absorption Moisture control Conformable to wound bed Similar but not the same as foam dressings	Moderate- to high-exuding wounds Products available for cavity wounds Low-adherent products available for patients with fragile skin	Do not use on dry or necrotic wounds or those with minimal exudate
Alginate dressings (e.g. Kaltostat, Algisite M)	Fluid absorption Promote autolytic debridement Moisture control Conformable to wound bed Some products are haemostatic	Moderate- to high-exuding wounds Products in the form of ropes available for cavity wounds Products available with silver for antimicrobial activity	Do not use on dry or necrotic wounds Use with caution on friable tissue (may cause bleeding) Do not pack cavity wounds tightly

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Table 1 Wound dressings^{4,10,16-18} (continued)

Product Classification	Properties	Uses	Precautions
Hydrogel dressings			
Sterile amorphous (e.g. Intrasite, Purilon)	Rehydrate wound bed Moisture control	Dry and low- to moderate-exuding wounds and superficial burns	Do not use on high-exuding wounds or where anaerobic infection is suspected
Preserved amorphous (e.g. Solugel, Solosite)	Promote autolytic debridement Cooling	Products available with antimicrobials	May cause maceration
Sheet (e.g. Hydrotac Transparent)	Provide pain relief		
Antimicrobial dressings			
Iodine	Effective against bacteria, mycobacteria, fungi, protozoans, spores and viruses – no evidence of resistance to iodine	Critically colonised wounds or wounds with clinical signs of infection	Consider sensitivity to iodine Short-term use recommended (e.g. 3 months) to minimise risk of systemic absorption
Cadexomer iodine (e.g. Iodosorb)		Low- to high-exuding wounds	
Polyethylene glycol iodine (e.g. Inadine)	Debrider Some products stimulate wound healing	Diabetic wounds	
Silver (e.g. Acticoat, Mepilex Ag, Aquacel Ag, Biatain Ag)	Effective against a broad range of bacteria, fungi and viruses	Critically colonised wounds or wounds with clinical signs of infection Low- to high-exuding wounds Products available with foam and alginates or carboxymethylcellulose for increased absorption	Some products may cause discolouration Consider sensitivity to silver Discontinue after 2 weeks if no improvement and re-evaluate
Polyhexamethylene biguanide (PHMB) (e.g. Prontosan)	Newer non-toxic products Effective against a broad range of bacteria, fungi and viruses	Sloughy, low- to moderate-exuding wounds	Do not use on clean, granulating wounds
Dialkylcarbamoyl chloride (DACC) (e.g. Sorbact)		Critically colonised wounds or wounds with clinical signs of infection	
Hypochlorous acid (e.g. Microdacyn)			
Enzymatic alginate gel (e.g. Flaminal)			
Miscellaneous dressings			
Sucrose octasulfate (e.g. UrgoStart)	Controls wound protease levels Stimulates wound healing	Clean wounds that are not progressing despite correction of underlying causes, exclusion of infection and optimal wound care	Do not use on dry wounds or those with leathery eschar

topical antimicrobial therapies; the choice of systemic antimicrobial should be based on identification of the causative organism and its susceptibilities.²⁸

Biofilms have been described as an aggregate microorganism with unique characteristics and enhanced tolerance to treatment and the host defences. Wound biofilms are associated with impaired wound healing and signs and symptoms of chronic inflammation. Systemic antimicrobials in general do not penetrate biofilms and management involves debridement and the use of products such as cadexomer iodine.²⁸

The bioburden refers to the number of microorganisms in a wound, the pathogenicity of which is influenced by the microorganisms present (i.e. the species and strain), their growth and their potential virulence mechanisms.² The major roles for antimicrobial dressings in wound management are to reduce the bioburden in acute and chronic wounds that are infected or are prevented from healing by microorganisms, and to act as an antimicrobial barrier for acute and chronic wounds at high risk of infection or reinfection.^{28,29} Types of antimicrobial dressings are listed in Table 1.

Wound dressings

Dressings provide the best environment for wound healing in combination with the management of the cause of the wound and factors impacting healing. Table 1 lists the different dressings that are available. The general rules for dressings are as follows:

- allow 2–3 cm of dressing greater than the size of the wound
- place a third of the dressing above and two-thirds below the wound
- remove dressing when strikethrough occurs
- remove dressing with care in older patients
- do not pre-moisten alginate dressings
- no single dressing will meet all the requirements.

Bandages

There are three main roles for a bandage: keeping a dressing in place, supporting an injured joint and assisting venous return by compression. Table 2 lists the different types of bandages and their uses.

Compression is the major management strategy for venous disease, and this can be provided with the use of bandages, stockings and wraps. Before applying compression to the legs, it is essential to confirm sufficient arterial circulation.³⁰

Crepe bandages are not appropriate for the management of venous leg ulcers and have little use for dressing retention. Light cohesive or tubular bandages are the most appropriate and cost effective for dressing retention.

Resources

The [Wounds Australia website](#) has guidelines on Prevention and Management of Venous Leg Ulcers, Prevention and Treatment of Pressure Ulcers Injuries, Aseptic Technique in Wound Dressing Procedure, Atypical Wounds - Best Clinical Practices and Challenges, and Wound Infection in Clinical Practice: Principles of Best Practice.

The [Department of Veterans' Affairs website](#) has a wound care module with a wound identification and product selection chart available to download.

Conclusion

Wounds present with unique characteristics and needs. The decision to treat wounds should be based on a sound knowledge of the patient, underlying cause and goal of management. Wound management is not simply applying a dressing. It involves an accurate diagnosis of the underlying cause and treating this cause. A dressing manages the wound environment, not the cause. <

Table 2 Bandages and stockings

Type	Uses	Examples of products
Crepe bandage	Limited	Handycrepe
Light cohesive bandage	Dressing retention	Handy Gauze Cohesive, Peha-haft
Light tubular bandage	Dressing retention, limb protection	Tubifast
Elastic cohesive bandage	Limb support, compression	Coban, Co-Plus
Compression bandage	Venous disease	
• high stretch		Tensopress, SurePress, Setopress
• short stretch		Comprilan, Lastolan
Compression multiple-layer bandage	Venous disease	Coban 2, Profore
Compression wraps	Venous disease	Venosan, JOBST, Sigvaris
Compression stockings	Venous disease, deep vein thrombosis prevention	Venosan, JOBST, Sigvaris

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