

Wound dressings: principles and practice

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Abstract

Knowledge of clinically and cost-effective wound management is an obvious requirement for surgeons, yet wound care education rarely features within the medical curriculum. As a result surgical trainees are often poorly placed to join in multidisciplinary wound management and may feel threatened when asked to manage wound complications. A vast range of dressing products exists yet robust evidence of the function and effectiveness of individual products is often lacking. An understanding of wound pathophysiology, a defined treatment goal and regular wound assessment combined with knowledge of basic wound dressing categories will provide guidance on product selection for different clinical situations and wound types.

Keywords Cost effectiveness; wound assessment; wound dressings; wound healing; wound pathophysiology

Although wound management is an essential component of care, especially for surgical patients, it is a task that is frequently seen to be an area of nursing rather than medical practice and only when complications occur does the medical team become involved in direct treatment decisions. As a result many doctors are not specifically trained in wound care and have little or no knowledge of wound pathophysiology, dressing practice or the range and function of dressings available. This is somewhat surprising as the incidence of wound complications such as surgical site infection (SSI), pressure ulcer occurrence and amputation in diabetic foot ulceration are all seen as care quality indicators for surgical care provision.

Evidence underpinning dressing choice is often regarded as poor with few randomized clinical trials supporting treatment decisions. Care is therefore based largely on expert opinion¹ and subject to local variability with diverse product formularies. This only serves to increase the problem for surgical trainees rotating between hospitals as they may be faced with products with which they have little experience of working.

The basic requirements for all wounds to heal are a clean, adequately perfused wound environment free from infection, necrotic tissue and foreign material. Systemic factors such as nutritional and immunological status, stress, smoking and medical comorbidities such as renal failure and diabetes all impact on

wound healing. For optimal wound healing these factors must be managed effectively.

Pathophysiological considerations informing dressing choice and development

Although wounds are either classified as acute or chronic and are then further subdivided into subcategories such as pressure ulcers, venous leg ulcers, diabetic foot ulcers, traumatic wounds and surgical wounds, the basic function of dressings used in their care remains the same, that is to provide a protective barrier to prevent bacterial contamination and absorb exudate. Work by Winter in the 1960s² established that a moist wound environment was conducive to improved wound healing with more rapid reepithelialization. Although the initial research was carried out on acute wounds the principle has been extended to include the management of all wounds. As a result dressings have evolved and are now designed to optimize wound bed moisture content by either donating fluid, absorbing excess exudate or controlling moisture loss.

Intact skin, by acting as a barrier to water vapour loss, performs an important function of controlling moisture balance. Once skin is damaged this and other skin functions such as physical protection, thermal regulation are in part lost. A range of dressing products have been developed to restore these functions in damaged skin while maintaining normal transepidermal moisture loss in surrounding intact skin thus avoiding maceration in the peri-wound area. Moisture vapour transmission rate (MVTR) is therefore an important consideration when evaluating dressings. The use of occlusive dressings, particularly on chronic wounds where bacterial overgrowth and therefore wound infection is a potential problem, initially raised concerns. Hutchinson et al. reviewed the use of these dressings, comparing infection rates between occlusive and non-occlusive dressings in over 100 published studies finding that rates were 2.6% versus 7.1% ($p < 0.001$) in favour of occlusive dressings.³ In this situation preventing bacterial ingress into the wound would therefore appear to be more important than local bacterial overgrowth in causing wound infection.⁴ Occlusive dressings also tend to produce an acidic wound environment which itself reduces bacterial overgrowth.

Other factors that need to be taken into consideration when selecting dressings is the interaction between dressing material and the wound bed. This includes the release characteristics of any agent, usually an antimicrobial such as silver contained within the dressing, the potential for shedding of dressing material into the wound, the adherence of the dressing to the wound, the ability of the dressing to bind bacteria, and the capacity of the dressing to hold exudate or donate fluid. When handling fluid the dressing needs not only to absorb fluid but also to take the exudate away from the wound bed without lateral spread so that the peri-wound skin is protected from maceration. A wound dressing may be a single product or may combine two or more layers of dressing material consisting of a primary wound contact layer and a secondary retention or absorptive layer which is not in direct contact with the wound.

Dressing fixation is also important. Adherence to intact skin needs to prevent leakage and allow skin mobility, but not cause skin stripping or pain on dressing removal. There has been

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significant investment in improving dressing adhesive performance and developing skin barrier products to prevent peri-wound skin damage while maintaining dressing wear time.

Although rapid wound healing is the primary aim of care for the majority of patients there are some in whom this is either not possible, such as those with a fungating tumour, or in whom healing will be slow and prolonged. In such patients symptom control, with minimal interference to lifestyle, are the basic treatment aims and care will focus on pain, exudate and odour control. Maintenance of dry eschar or the mummification of a necrotic digit is also an appropriate treatment strategy in some patients and requires a different approach to dressing selection with wound desiccation rather than hydration the main treatment aim.

What constitutes an ideal dressing?

It is important, not only that a dressing performs the function it claims, but that it does so in a cost and clinically effective way. Cost effectiveness is achieved by accurate clinical assessment and diagnosis and the appropriate choice of treatment.⁵ This may not always be achieved by using the cheapest product and may be dependent as much on dressing wear time as product selection.⁶ Factors such as healing time, nursing costs, frequency of dressing changes and requirements for other products such as secondary dressings, antibiotics and analgesics all need to be considered when selecting a wound dressing product. At times the use of multiple products may be necessary but in general this should be discouraged. Some dressings, such as antimicrobial dressings, potentially impact adversely on cellular function and so their use should be time restricted and reserved for specific indications.⁷

An ideal dressing or combination of dressings is considered to be one that ensures optimal healing by:

- maintaining high humidity
 - removing excess wound exudate
 - permitting thermal insulation
 - allowing gaseous exchange
 - conforming to the wound surface
 - facilitating, when necessary, debridement
 - minimizing scar formation
- and
- is impermeable to extraneous bacteria
 - is non-fibre shedding/non-toxic
 - is non-adherent, comfortable and conforming.

Other than for a primary closed surgical wound rarely will one single dressing type cater for the changing wound bed status of a chronic or non-healing open acute wound. Careful assessment of the wound and the peri-wound tissues should inform dressing selection and dressing performance should be evaluated at each dressing change.

Wound assessment and choosing and appropriate dressing

Closed surgical wounds require a different approach to open acute and chronic wounds. NICE guidance on surgical site infection⁸ emphasizes the importance of maintaining optimal physiological conditions during surgery and anaesthesia. The role of dressing selection is a secondary factor in wound outcome and a simple interactive dressing is recommended such as an

occlusive film with pad, topical antimicrobial agents should not be used routinely. When applying a postoperative dressing the dressing should be fitted to allow for limb or joint movement to avoid dressing traction blistering. Surgical cavity wounds should be managed with a hydrofiber or alginate, with or without an antimicrobial component depending on predicted bioburden, covered with a secondary dressing such as a hydrocolloid or foam dressing. Topical negative pressure therapy may also be appropriate and its use is becoming routine after digital ray amputation in patients with diabetes, when tendon and bone is exposed in traumatic wounds, when large areas of tissue loss occur (e.g. after debridement in the management of pressure ulceration or necrotizing fasciitis), and in the management of a dehiscenced surgical wound or the open abdomen.⁹

Dressing use needs to be integrated into an overall management plan, which may include compression therapy for venous disease or offloading for pressure ulcers or diabetic foot ulceration. Dressing for a chronic or non-healing open acute wound should be chosen according to the wound bed status and the desired treatment aim and reviewed regularly as treatment progresses. Debridement is, for example, frequently an on-going process that may require repeating periodically throughout the healing process, often using a variety of debridement methods. The term 'maintenance debridement' has been used to describe this process.¹⁰

Wounds can be described and documented by the percentage tissue type or the colour of the wound bed. Four basic descriptors are commonly used indicating the state of the wound bed.

Tissue type	Colour
• Necrotic	• Black
• Sloughy	• Green/yellow
• Granulating	• Red
• Epithelializing	• Pink

Dressings have specific functions and dressing selection will be further modified by wound hydration, exudate levels, wound site, the state of the surrounding skin and any history of dressing contact sensitivity or allergy.

Wound dressings

Figure 1 describes a selection process for currently available and commonly used dressings based on wound depth, exudate levels and wound bed characteristics. Details on individual dressings can be found at www.dressings.org or from publications such as the *Wound Care Handbook 2014-2015*. Many NHS Trusts have their own wound care formulary from which to select a restricted range of products. When selecting dressings decisions should be made on the basis of the treatment goal, the timeline for care and how the progress and outcome will be measured. Modern dressings aim to provide enhanced functionality, such as greater ability to manage exudate, within a low profile product with extended wear time.

Low or non-adherent contact layer dressings

These dressings are applied directly to the wound bed and do not adhere to the wound surface or cause significant trauma during

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