WUWHS POSITION DOCUMENT: EXECUTIVE SUMMARY

The role of non-medicated dressings for the management of wound infection

Every wound has the potential to become infected. Traditionally, treatment for infected wounds – and for managing the risk of infection – has been through use of topical antimicrobials (e.g. creams or dressings) or antibiotics (medication). These treatments work by killing the bacteria that causes infection.

However, antimicrobial resistance (AMR) is a severe and growing problem. This means that the number of species of bacteria becoming resistant to treatment is increasing. In order to limit this problem, we should be aiming to reduce the amount of antimicrobial and antibiotic treatments that are prescribed, to avoid treatments becoming ineffective. Working to limit the spread of AMR in this way is known as antimicrobial stewardship. It is vital that we all work to limit AMR, or our ability to treat infection will diminish, mortality levels rise and severe complications become more common.

Non-medicated wound dressings (NMWDs) are effective in managing wound infection without the need for topical antimicrobials or antibiotics, as they have a different mode of action, based on physical mechanisms and chemical interactions. NMWDs are important for the treatment of both acute and chronic wounds, enabling reductions in bioburden while not contributing to AMR.

This position document offers innovative perspectives and new clarity on the role of NMWDs, and how they can be used to help fight AMR in wounds. The document comprises three key articles, which aim to provide guidance on:

- The characteristics of NMWDs
- Their role in the prevention and management of infected wounds
- Clinical evidence to support their use.

Paper 1: Biofilm and infection recognition and management in the context of antimicrobial stewardship

Biofilms are structured communities of bacteria that have been found to withstand antimicrobial concentrations 100 to 1,000 times higher than that of free-floating (planktonic) microbes. Based on published studies, it is evident that most chronic wounds are likely to contain biofilms, which appear to play a role in the delay or even lack of healing.

The underlying causes of chronic non-healing wounds may include other patient factors, such as diabetes, peripheral vascular disease, peripheral neuropathy, trauma and increased plantar pressure. However, once a wound is established in a person with multiple comorbidities, any infecting bacteria may contribute to keeping the wound in a non-healing state, due to the continuous inflammatory response produced by these microorganisms.

A dominating factor of biofilm tolerance seems to be due to the slow growth or dormancy of the bacteria. This is important, as most antibiotic agents act on metabolic pathways in active bacterial cells. Therefore, in the case of slow-growing or dormant bacteria, antibiotics can be less effective. Another proposed contributor to biofilm tolerance is the production of a protective matrix called extracellular polymeric substance (EPS), which helps biofilm resist antimicrobial treatments.

While the exact role of biofilm tolerance is poorly understood, it is well established that biofilms are resistant to antimicrobial and antibiotic treatment and so can persistently cause wound chronicity and complications.

Therefore, using management strategies that consider antimicrobial stewardship is vital in any wounds where biofilm is suspected. It is essential that every provider selects and correctly administers the appropriate antibiotic for the patient, while causing minimum harm to the individual, as well as protecting individuals from the risk of resistance in the future.

A greater understanding of the physiology and structure of biofilms has led to a reduction of antibiotics and the introduction of biofilm-based wound care as an accepted concept for current practice. The wound is debrided, cleansed and a specific dressing, containing an antimicrobial or providing a physical mechanism of action (i.e. NMWD), is used to reduce bioburden and to help wound healing. If there is no progression towards healing after 2 weeks, a change in antimicrobial dressing should be encouraged, if considered appropriate.

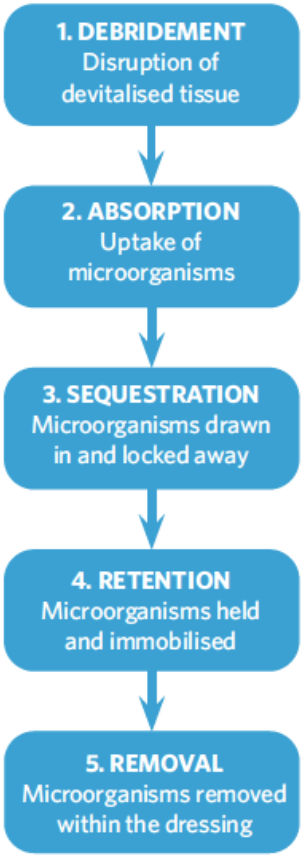
Currently, there is limited evidence as to which antimicrobial dressing should be used, or whether one antimicrobial agent will demonstrate better outcomes than another. The field of wound care must now work towards optimising antibiotic and antimicrobial usage to avoid overuse and consider antimicrobial stewardship. Clinicians also need to evaluate NMWDs as a significant addition to their daily practice ‘toolbox’ for effectively eradicating bacteria through physical mechanisms.

Paper 2: Non-medicated wound dressings: Defining their role

NMWDs, as suggested by their name, do not contain any active antimicrobial agent. For a NMWD to diminish the impact of bacteria (e.g. infection) they must reduce wound bioburden via a mechanism(s) other than active killing — for example, by physical means only. For the purpose of this paper, the authors suggest a NMWD be defined as "**a wound dressing that does not contain any active/pharmaceutical component, but reduces bacterial load via alternative methods**" including:

- Removing the devitalised tissue within which bacteria may reside and which are outside the normal host immune response surveillance system
- Maintaining a low bioburden level by the absorption, sequestration (taking temporary possession), retention and removal of bacteria at the wound site.

Figure 1: Mechanism of action of NMWDs for infection prevention and management



Optimal antimicrobial mode of action involves multiple steps taking place in a coordinated manner: debridement (disruption of devitalised tissue), absorption (uptake of microorganisms), sequestration (microorganisms drawn in and locked away), retention (microorganisms held and immobilised) and removal (microorganisms removed within the dressing), while each of these mechanisms is still able, individually, to reduce bacterial numbers (Figure 1).

1. Debridement

There are several debridement methods available to clinicians, which include:

- Mechanical
- Autolytic
- Enzymatic
- Surgical.

Each method has its own advantages and disadvantages, which help to determine the most appropriate method for any given clinical situation. Debridement results in the disruption of devitalised tissue containing a large proportion of the wound's bacterial load, and this disruption aids in subsequent removal of the bioburden, as evidenced in recent experimental studies.

A number of NMWDs support debridement. In the case of hydro-responsive wound dressings (HRWDs) — dressings that can deliver or absorb moisture depending on the environmental fluid balance — wound debridement is promoted by the softening and detachment of the devitalised tissue by the availability of the Ringer's solution. Clinically, these dressings have been shown to be very effective in reducing signs and symptoms of infection.

2. Absorption of wound exudate and bacteria

Poor exudate management can cause maceration of the wound tissue and peri-wound skin, and can have a negative impact on the patient's wellbeing. Superabsorbent polymer (SAP)-containing dressings demonstrate excellent exudate-absorbing capacity with a high fluid retention and are used to manage wounds with moderate-to-high levels of wound exudate production, without the risk of exudate leakage and maceration.

3. Sequestration

The term sequestration comes from the Latin word *sequestrare*, which essentially means taking something and locking it away. The term has been used to describe the mechanism whereby exudate, debris and bacteria are drawn into the core of the dressing and held within a wound dressing matrix. As bacteria uptake progresses, the sequestration of these components within the wound dressing results in their reduction in the wound environment, so limiting their damaging effects.

4. Immobilisation and retention

The ability of materials within dressings to aid in the absorption and sequestration of bacteria indicates that these dressings physically remove bacteria from the wound, thus reducing bacterial load without any bacterial killing. Bacteria that are physically retained by adherence to the dressing material and within the confines of a wound dressing are easily removed when the dressing is changed. Repeated application and removal of these dressings is accompanied by a regular reduction in the level of bacteria found within the wound bed.

HRWDs reduce the microorganisms within the wound bed through all of these presented physical mechanisms of action (Figure 1). Examples of other NMWDs that exemplify one or more of the mechanisms of action include:

- **Carboxymethylcellulose (CMC)**
- **Dialkylcarbamoylchloride (DACC)**
- **Hydro-conductive wound dressings**

It is now known that alternative methods of managing wound infections are required in order to limit the spread of AMR. NMWDs — dressings that do not contain any active/pharmaceutical component and reduce bacterial load via alternative mechanisms — offer an ideal option in the drive to promote antibiotic stewardship by providing effective treatment for the reduction of wound bioburden in a physical manner, without contributing to AMR.

Paper 3: Non-medicated wound dressings in infected wounds or wounds at risk of infection: How to use in practice

In all wounds, different levels of inflammation are observed at each phase of healing and, without microbiological investigation, this can make it difficult to differentiate inflammation from infection. The inflammatory response needs to be recognised as a significant contributing factor to tissue damage in infection.

Wounds with covert or overt signs of infection are diagnosed as infected according to the clinician's experience and setting. If an infection has been diagnosed or biofilm is suspected, an effective wound infection/biofilm management protocol should be implemented to manage the infection, reduce microbial load, and to determine whether systemic antibiotic treatment is necessary. Therapeutic decisions in wound management should be based on well-defined criteria for correct diagnosis. Clinicians need to correctly evaluate the indicators of inflammation, which may be suggestive but not conclusive for wound infection. Recognising and differentiating inflammation from infection in early stages, permit the progress of wound healing, avoiding over-prescription of antimicrobials.

NMWDs may be considered in these circumstances as preferred to antimicrobial dressings, to handle high exudate levels and potentially detrimental wound exudate composition.

An optimal dressing should provide relief for the wound from excessive levels of proteases in the wound exudate, which may destroy growth factors and newly formed granulation tissue. This approach would support the principles of antimicrobial stewardship programmes and avoid the misuse and overuse of medicated treatment. Figure 2 outlines factors to consider when using NMWDs for the management of excessive inflammation/wound infection/biofilm.

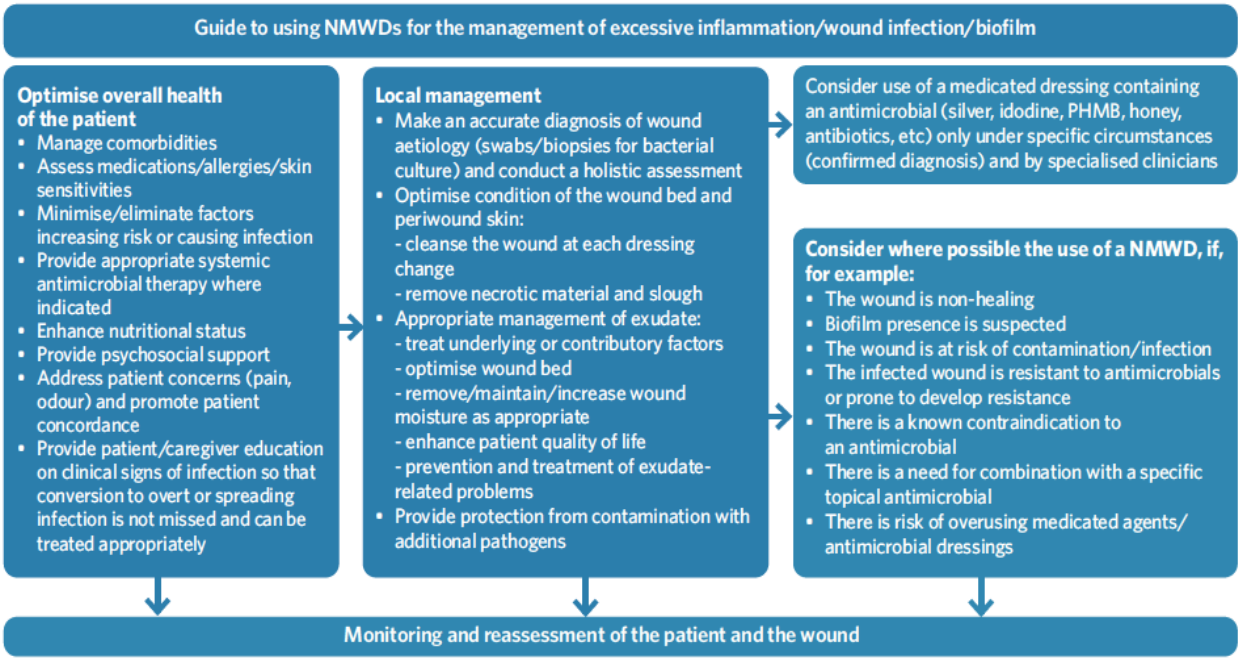


Figure 2: Factors to consider when using NMWD for the management of excessive inflammation/wound infection/biofilm

If a wound has excessive non-productive inflammation, is infected, or biofilm is suspected, then NMWDs represent an alternative to antimicrobial dressings and, if necessary, they may be used in conjunction with other antimicrobial agents, to aid in the overall management of the infection and contribute to reducing the level of bacterial bioburden.

NMWDs – such as HRWDs (HydroClean®)

- Do not contain any active antimicrobial agent – Ringer's solution is released to help soften devitalised tissues and cleanse the wound
- Support autolytic debridement and stimulate normalisation of wound environment
- Inactivate excess MMPs (matrix metallo-proteases), inducing the progress to granulation tissue formation
- **Are ideal for infected wounds or wounds at risk of infection as they effectively eradicate bacteria by physical ways, while not inducing bacterial resistance**

NMWDs – such as SAP dressings (Zetuvit Plus Silicone/Border®)

- Do not contain any active antimicrobial agent
- Absorb and bind the bacteria and proteases (MMPs), thus contributing to an undisturbed wound healing

- **Are ideal for exuding wounds at risk of infection as they effectively absorb and retain the exudate containing wound healing inhibitors and bacteria by physical ways, while not inducing bacterial resistance.**