Ten top tips: wound cleansing


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Chronic wound healing is a major burden to patients, healthcare systems and governments (Guest et al, 2017; Nussbaum et al, 2018). Current accepted practice for non-healing, healable, non-malignant wounds is proactive management that includes the principles of wound bed preparation/T.I.M.E. framework (Tissue, inflammation/infection, moisture balance and edge of the wound)/biofilm-based wound care (Schultz et al, 2017). Therapeutic cleansing is one strategy of several that should be completed with each dressing change/procedure. There is ongoing discussion, debate and further research required of what solutions, at what temperature, duration of exposure of the solution on the wound bed to be clinically effective for planktonic and biofilm microbes, cytotoxicity, ease of use, access and cost economics. We used to think it was so simple. One thing most clinicians agree on is that if they are cleaning the wound then this needs to be effective and not just anointing the wound.

These top 10 tips for wound cleansing provide a brief overview of the why, the what and the how.

1 Why: goal of cleansing: In 2007, Rodeheaver and Ratliff (2018) defined wound cleansing as the "removal of surface contaminants, bacteria and remnants of previous dressings from the wound surface and its surrounding skin". Wound cleansing has additional benefits, such as improved visualisation of the wound bed and edges, removal of organic and non-organic material, and removal of excess exudate. Sometimes, even an acute wound requires a surfactant cleanser to remove adherent blood or exudate on or surrounding an incision line prior to removal of sutures or staples. Normal saline can be used but then more mechanical action is required and may increase pain. An additional goal for the patient is feeling socially clean.

2 Why: types of solutions and their efficacy: There are many options for wound cleansing and criteria for choosing should include the following:

- Acute or chronic wounds
- Risk of infection or recurring infection or current infection
- Low cytoxicity to cleanse wound but not high enough to damage healthy cells
- Ease of use and availability
- Clinical efficacy
- Cost effectiveness — unit cost can be high but rapid effect and vice versa.

There is still considerable debate and discussion in the literature about the clinical efficacy on wound-cleansing solutions. There is much discussion in the literature and among clinicians regarding the conflicting information on the following:

- Laboratory testing with contact times of 24 hours versus the actual clinical use of 10–15 minutes or less of wound cleansing with passive soaking
- Limited evidence regarding a wound cleanser and mechanical action and the synergy of the two and does it increase efficacy
- Whether the products were tested or have evidence for planktonic microbes or biofilm or both
- Debate also concerns lack of strong evidence from *in vivo* studies.

The healthcare practitioner must rely on local policy and review of the evidence for themselves.

3 How: solution delivery and techniques for adequate cleansing: How the solution is delivered to the wound bed will contribute to its efficacy in adequately cleansing wounds. First, enough solution needs to be used, with a recommendation of 50–100 ml per cm^2 of wound space as a minimum amount (Gabriel et al, 2019). The exception to this volume recommendation would be commercially available wound cleansers in spray dispensers. These will be covered in the section on surfactants.

Clinicians should deliver the solution with adequate velocity to disrupt surface debris without forcing bacteria into tissues. A number of studies have examined the force, or pounds per square inch (PSI), that will adequately disengage bacteria and detritus from the wound surface. A range of 4 to 15 PSI has

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Table 1. Provides a list of options and their characteristics (adapted from International Wound Infection Institute, 2016; Johani et al, 2017).

Solution	Type	Cytoxicity	Effect on Biofilm	Comment
Sterile normal saline 0.9%	Isotonic	None	None	Sterile, non-antiseptic solution
Sterile water	Hypotonic	None	None	Sterile, non-antiseptic solution
Potable tap water	Varies in content	Unknown/ variable	None	Not sterile
Polyhexamethylene biguanide (PHMB)	Surfactant antimicrobial	Low to none	Surfactant qualities disrupt biofilm attachments Highly effective against Gram negative biofilm with 15-minute exposure	Lowers liquid surface tension, allowing greater spread and facilitating separation of non-viable tissue Does not promote bacterial resistance
Octenidine dihydrochloride	Surfactant antimicrobial	Low to none	Delays attachment and inhibits growth of biofilm and planktonic bacteria Studies have shown that shorter time needed to soak to reduce bacterial burden	Lowers liquid surface tension, allowing greater spread and facilitating separation of non-viable tissue Does not promote bacterial resistance long term effect not known
Superoxidized Solution, Hypochlorous acid and sodium hypochlorite	Antiseptic	May vary depending on concentration	Conflicting evidence from *in vitro* and *ex vivo* data but complete reduction of Gram negative biofilm and >4 log reduction with Gram positive biofilm with 15-minute exposure	Hypotonic and functions through osmotic gradients facilitating moistening and separation of viable/non-viable tissue osmotically
Povidone iodine antiseptic solution 10%w/v equivalent to 1%w/v available iodine	Antiseptic	Yes, varies on concentration and duration of exposure	Very effective on Gram positive and Gram negative biofilm with 15-minute exposure	Rinse after cleansing
Chlorhexidine with cetrimide 0.015% irrigation solution	Cationic broad-spectrum biocide with cetrimide surfactant properties	May vary depending on concentration	Very effective on Gram positive biofilm and 3.96 log reduction with Gram negative biofilm with 15-minute exposure	

been determined to be the safest and most effective range depending on the perceived need to clean. A force of 15 PSI has been shown to remove bacteria more effectively than 10 PSI (Rodeheaver and Ratliff, 2018). As a general rule, lower pressures are adequate for cleansing clean granulating wounds with higher pressures reserved for those wounds requiring deeper cleansing.

Historically, there has been a sense among clinicians that clean, granulating wounds need not be cleansed so as not to disturb or remove the natural wound exudate. With the more recent appreciation of the microscopic presence of both planktonic and bacterial biofilm, some degree of cleansing should be carried out even with the perception of a clean wound surface.

A combination of a syringe and an intravenous angiocath of various sizes can adequately deliver the solution of choice at a meaningful PSI. In general, the larger the syringe, the lower the pressure achieved, but when a needle or angiocath is added, the larger the needle, the higher the pressure (Percival et al, 2017). See *Table 2* for potential combinations.

4 What: surfactants: Surfactants are surface active agents that lower the surface tension between liquids and liquids, and liquids and solids, making them easier to separate. Surfactants are commonly used in day-to-day life, such as in shampoos, to separate oils and styling products from the hair allowing them to be rinsed away, as well as in dish washing detergents to loosen food and greasy materials from dishes and pots.

Their use in wound care is fairly common. Surfactants by the nature of their chemical structure and chemical charge help break the bonds of the foreign bodies to the wound surface. The strength of their chemical reactivity is directly proportional to their cleansing capacity and toxicity to cells. Therefore, cleansing capacity needs to be balanced against toxicity to wound healing cells (Percival et al, 2017). Many wound cleansers contain surfactants and there are available data that demonstrates the positive impact of these cleansers in the enhancement of wound closure through improved removal of debris and exudate, and reducing the presence of microorganisms that have been shown

Table 2. Examples of syringe and catheter combinations to achieve desired wound cleansing (White and Asimus, 2014).		
Syringe MLs	**Needle/angio gauge**	**PSI**
35	25	4
35	21	6
35	19	8
20	18	12
12	22	13
12	19	20
6	19	30

to be a significant factor in delayed wound healing (Percival et al, 2017). It is important to differentiate those cleansers indicated for cleansing wounds from those intended for skin, such as those used for incontinence, as the toxicity to cells in the open wound would be greater.

5 When: infected and non-healing/stalled wounds: A chronic wound is defined by the International Wound Infection Institute (IWII) as "a wound that has a slow progression through the healing phases, or shows delayed, interrupted or stalled healing due to intrinsic and extrinsic factors that impact on the individual and their wound" (IWII, 2016). Although there are numerous factors for delayed healing (blood flow, repeated injury and host factors, disease, for instance), biofilm is considered a significant factor in a healable wound. Therefore, when wound infection is discussed, acute infection (planktonic microbes) and chronic infection (biofilm) should be differentiated. It has become accepted practice that when a wound is infected then therapeutic wound cleansing should occur at each dressing change (IWII, 2016). For wounds that are not infected (healing), sterile saline or water and in some circumstances, potable tap water, is acceptable.

6 When: After debridement care: An important step often not considered or performed is the cleansing of the wound bed after sharp debridement has been performed. The wound bed usually looks very clean and healthy, but tissue or debris, which may not be seen by the naked eye, on the wound bed still harbour bacteria, which are likely to contribute to regrowth after a dressing is reapplied. The presence of this detritus will also likely contribute to the cellular production of proteases, which may recreate a hostile wound environment.

7 How: the sequence of cleansing (limb hygiene and wound cleansing during a wound dressing procedure): Anticipating the requirements for wound dressing procedure should occur regardless of setting (acute or in the home). If delivering care in the home then informing the patient what is required prior to arriving: taking analgesia (if required or appropriate), getting the equipment out such as a clean bowl and linen, making a clean space and removing pets from the area. There are certainly challenges regardless of the environment, would you think in a hospital setting that you would have access to a trolley or other equipment but sometime even there you have to improvise. Once all the equipment has been organised and hand hygiene has been performed, the patient provided with a comfortable position and respecting their privacy, the old dressing is removed (if the patient has already removed the dressing ask them to place it in a plastic bag or container so that it can be evaluated for level of exudate, type of exudate and condition of the outer dressing). Reviewing the old dressing adds to the assessment. It is crucial since it allows clinicians to view colour and viscosity, as well as volume, to support whether there is a biofilm present or not; the area of dressing in contact with wound is a mirror to the wound. Aseptic principles are not to be compromised and the type of aseptic technique will be determined based on the type of wound, depth and/or exposed structures, complexity, patient risk factors and skill of the healthcare professional. Once the dressing is removed, a pack (a sterile gauze moistened with a solution to prepare for the wound cleansing) can be placed on the wound while the periwound and/or limb is cleansed. The limb and periwound can be cleansed with a pH neutral cleanser using moistened cloths or commercial cleansing pads. A cloth that has touched the body should never be put back into the water as this contaminates the water, therefore, several cloths are required. Once adequate cleansing of the periwound/limb has occurred and all dried skin and debris has been removed then the wound is cleansed. Moisturising is important after cleansing but if an adhesive is to be applied, the moisturising will occur once the dressing procedure has been completed. The summary of sequence is as follows:

- Prepare the environment and the patient
- Apply gloves and remove the old dressing
- Remove gloves and conduct hand hygiene
- Apply new gloves and apply a sterile pack on the wound and commence cleaning the

periwound/limb
- Remove gloves and conduct hand hygiene (depending on type of aseptic technique one would apply sterile or non-sterile gloves at this point)
- Cleanse the wound according to the needs of the wound and skill of the healthcare professional
- Apply the new wound dressing after changing gloves once again.

8 How: personal protection and patient safety: Often, clinicians may not be inclined to wear personal protective equipment (PPE) for general wound care, however, one must always don PPE when using any cleansing agent or device where aerosolisation or splashing may occur to prevent exposure and cross contamination.

9 Managing the pain: An international survey conducted of wound practitioners revealed that one of the primary considerations related to dressing changes was avoidance of pain and trauma to the patient (European Wound Management Association, 2002). While cleansing wounds is a critical step in effective wound management, often the act of cleansing can cause significant discomfort for the patient. To effectively clean, one must strive to do so as painlessly as possible. The use of topical anaesthetics applied prior to attempting particularly aggressive cleansing can go a long way towards the prevention of cleansing related pain (Evans and Gray, 2005). As mentioned earlier, the use of surfactant-based cleansers can enable easier removal of debris from the wound surface. Additionally, the use of monofilament or microfiber pads for ease of lifting debris from the wound surface may also improve the patient's tolerance.

10 Does temperature matter? Yes, temperature does matter. According to McGuiness et al (2004), when a wound tissue temperature falls below 33°c, it has a negative impact on mitotic activity of the cells. Therefore, warming of the solutions and decreased disturbance of the wound bed by reducing the frequency of dressing changes can reduce these temperature fluctuations (Rippon et al, 2012). Anecdotally, it is common practice for healthcare professionals to visit a patient in the morning, remove dressings, and then not always tell the nurse taking care of the patient; the wound then cools down and is exposed. So timing of the removal and the dressing procedure should be planned or at least staff informed.

Conclusion

Wound cleansing is an essential component in the management of open wounds. Attention to detail can improve the effectiveness of one's approach to obtaining a cleaner wound and be helpful in moving a wound towards a state of readiness to heal. WINT

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