

Embedding Wound Hygiene into a proactive wound healing strategy



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Section 1. The DNA of Wound Hygiene

In the first consensus document, published in 2020, the panel proposed that healthcare professionals (HCPs) involved in the practice of wound care move away from the term 'chronic wounds' and begin using 'hard-to-heal' wounds instead.¹ This call to change terminology is driven by two factors: to acknowledge the fact that any wound, independent of type and aetiology, may be hard-to-heal, and to rethink these wounds through language that indicates that barriers to healing can be overcome. Therefore, the panel reiterates that 'hard-to-heal' will be the terminology and wound type referred to throughout this document. (For a reminder of all key definitions, see Table 1).

Table 1. Key terminology definitions

Hard-to-heal wound	A wound that presents with factors that impede achievement of healing. These factors may present at any time, and hard-to-heal wounds may be defined as such from the start – for example, due to underlying factors or difficult anatomical location. They may also be judged as hard-to-heal after failure to respond to evidence-based standard of care. The concept of Wound Hygiene is based on the premise that all hard-to-heal wounds contain some level of biofilm. Because of the speed with which biofilm forms, a wound that exhibits vesiculae, slough and an increase in size by the third day of its occurrence can be diagnosed as hard-to-heal.
Complex wound	A wound that presents with complicating medical, clinical, psychological, socio-economic or wound-related factors that put the wound at risk of failing to heal with standard therapy in an orderly, consistent and timely manner.
Chronic wound	Indicates a wound that will not heal, that will persist, and may even be viewed as incurable. This document dispenses with the term chronic wounds in favour of hard-to-heal wounds, signifying that barriers to healing posed by the presence of biofilm can be overcome.
Wound biofilm	A complex community of different species of bacteria and fungi that causes a sustained, subclinical local wound infection, but can protect itself from the host's immune response and is tolerant to antibiotics and antiseptics. ² Biofilm can form within hours and can reach maturity in 48–72 hours. ³ All wounds contain some level of biofilm, which is invisible to the naked eye.
Wound hygiene	An established concept in wound care that promotes healing of hard-to-heal wounds. The biofilm must be addressed early with a strategy comprising wound cleansing (wound and surrounding skin), mechanical debridement (initial debridement if necessary, as well as maintenance), refashioning the wound edge, and biofilm-targeted management (or antibiofilm therapies) and prevention. Wound hygiene comprises a set of four tasks that should be carried out regularly and repetitively.

Hard-to-heal wounds: the cost of waiting

It is already estimated that 2–6% of the population worldwide are living with wounds, and that figure is expected to increase as the population of people 65 years or older – those most affected by hard-to-heal wounds – will see an additional 50+ million added to their ranks by 2050.^{4,5} The costs attributed to care for people living with wounds stretch to \$60 billion a year in the United States alone, and comprise 2–4% (and growing) of healthcare expenditures across Europe.^{6–8} Additional concerns include rates of antibiotic use, which contribute to antibiotic resistance; disproportionate use of nursing time; and detrimental effects on quality of life for people living with wounds, including pain, impaired mobility and psychological effects.^{9–11}

The time to act against this crisis and in support of each and every person living with a wound is now – both on a global level and at the individual wound management

level. This begins with a significant contributor to delayed healing that should be assumed to be present in every wound: biofilm.^{12–14}

Oral biofilm reforms within 24 hours of the performing of oral hygiene.¹⁵ Similarly, in hard-to-heal wounds, biofilm can form and reform after disruption within hours, and its presence can be assumed to be the primary barrier and cause of hard-to-heal wounds (Table 1).¹ To initiate and support healing – reducing the burden of hard-to-heal wounds on individuals and health systems – antibiofilm strategies must be considered in order to continuously disrupt and remove biofilm, as well as avoid its reformation throughout the trajectory of wound care management.^{16,17}

Antibiofilm strategies are a well-accepted part of wound care practice. In a recent survey, 87.8% (n=1,283) of respondents (N=1,460) reported that they consider

whether biofilm is present when completing a routine wound assessment.²⁶ Furthermore, 70% (n=897) of respondents (74–1280) said they use an antibiofilm strategy to manage biofilm in wounds.²⁶ Over the last decade, biofilm management practices consisted of regular debridement followed by antibiofilm reformation strategies, including the use of topical antimicrobial dressings.²⁷

Wound Hygiene: a simple, 4-step approach

Despite the awareness and use of antibiofilm strategies, the crisis in wound care has not abated. This consensus document reiterates the need to go further, with a structured approach for overcoming the barriers of biofilm to healing, called Wound Hygiene—an antibiofilm method that aims to uproot the cause of a common pathology in the population of people living with hard-to-heal wounds.¹

Wound Hygiene comprises four key activities (Fig 1):¹

- **Cleanse the wound and periwound skin.** Carried out at every dressing change, to prevent recolonisation of the wound originating in the wound bed or via the surrounding skin
- **Debride the wound.** Carried out at every dressing change, using a method determined by wound assessment and HCP skill level, to remove devitalised tissue, adherent exudate and senescent cells, and optimise the wound bed to move towards healing
- **Refashion the wound edges.** Carried out according to a method determined by wound assessment and HCP skill level, to remove areas that can harbour biofilm and ensure that skin edges are contiguous with the wound bed, to facilitate epithelial advancement and wound contraction
- **Dress the wound.** Applying an antimicrobial dressing that effectively manages residual bacteria to prevent regrowth/reformation of new biofilm (Fig 1).

A key underpinning component of Wound Hygiene is that everyone can do it. Wound Hygiene can be implemented by everyone, regardless of their skill level (for example, to debride does not always mean sharp debridement, but recognises that certain HCPs can be trained in methods such as curette).¹ The mentioned survey found that 80.3% (513/639 respondents) of those who have implemented Wound Hygiene say that they have seen improvements in healing rates with the use of Wound Hygiene at each wound assessment.²⁶ The survey also found three key barriers to implementing Wound Hygiene, self-identified by the respondents:²⁶

1. **Lack of confidence.** In particular, around debridement. However, the survey found that large numbers of HCPs who have implemented Wound Hygiene are using a wide variety of debridement methods (not just sharp debridement) to ensure this critical step is carried out at each dressing change. Recent research shows that repeated debridement to pinpoint bleeding helps achieve wound-healing aims, and HCPs caring for wounds can be reassured that there is a need for vigour in this step of Wound Hygiene.^{28,29} Further guidance is provided in Sections 2 and 3.



Figure 1. The four activities of Wound Hygiene¹

Section 2. Evolving the notion of Wound Hygiene

A hard-to-heal wound remains hard-to-heal until it has fully healed. That is not to say that these are impossible-to-heal wounds but, rather, that the conditions that pose challenges to wound healing are always present and may result in regression of the wound, even if they can be overcome. Therefore, it is important that the healthcare professional (HCP) monitors the rate of wound healing, implements strategies to accelerate wound healing, and ensures the wound is managed through to closure.

Biofilm, in particular, poses a serious threat to wound healing, due to the speed with which it forms and reforms. As a result, a wound that exhibits exudate, slough and an increase in size by the third day of its occurrence may already be defined as hard-to-heal.¹ The concept of Wound Hygiene is based on the premise that all hard-to-heal wounds contain some level of biofilm, and that Wound Hygiene is an effective antibiofilm approach that should be practised at each dressing change, at every tissue stage, until the wound has fully healed.

Why biofilm is a key barrier

It is currently known that biofilm is present in 78% of hard-to-heal wounds, is invisible to the naked eye (often <100µm in size), can reform in as little as 24 hours, and leads to chronicity.² It is a significant contributor to delayed healing that should be assumed to be present in every wound.³⁻⁷ Although biofilm is primarily located on the wound surface, it can aggregate in deeper tissue, and is inconsistently distributed across and within the wound.^{8,9} In addition, any open wound can be colonised by opportunistic pathogens, which do not discriminate between tissue that appears 'healthy' or 'unhealthy'. Studies have shown that biofilm exists in granulation tissue, even as the wound begins to heal.¹⁰⁻¹⁴

Furthermore, hard-to-heal wounds can regress and therefore should always be treated as hard-to-heal until closure. The same practice is adopted in the UK with pressure ulcer (PU) classification, where reverse staging should be avoided—for example, when healing, a Stage 4 PU is documented as a healing Stage 4 PU, not a Stage 3, 2 or 1. Because biofilm can reform rapidly in any tissue, and lead to regression of progress towards wound healing, Wound Hygiene should be applied as soon as possible, at every stage, until healing.

However, biofilm is not the only aspect that leads to hard-to-heal wounds. Factors related to the patient, medical and psychosocial situation can also drive the presence of biofilm (Box 1). The panel proposes that, while biofilm may be the factor that tips a wound into hard-to-heal status, there is a cycle at play that needs to be disrupted through both appropriate management of the patient and any underlying conditions, and the implementation of Wound Hygiene to tackle biofilm.

Box 1. Contributing factors to hard-to-heal wounds¹⁵

Behavioural and psychosocial risk factors

- Psychological stressors (isolation; unhealthy family relationships; fear, depression and anxiety, stress; pain; lack of sleep and poor sleep quality/sleep style due to, for example, sitting)
- Smoking
- Inappropriate alcohol consumption
- Imbalanced diet/malnutrition/poor glucose control
- Poor hydration
- Hiding wounds/making do it yourself dressings

Medical status risk factors

- Body type (obese or underweight status)
- Diabetes mellitus
- Cardiovascular disease (such as peripheral arterial disease, coronary artery disease, chronic venous disease, lymphoedema)
- Immunosuppression (for example, due to medication, pharmacological management or radiation therapy)
- Cancer
- Laboratory values (such as haemoglobin level, hepatic, renal, thyroid function)

Nonmodifiable risk factors

- Immobility/lack of dexterity (to a certain extent) leading to repetitive stress or overload of the skin surface
- Neuropathy
- Increasing age
- Immune system/autoimmune disorders (for example, rheumatoid arthritis)
- Genetic conditions (such as rare diseases and chromosomal disorders)

Evolving the notion of Wound Hygiene



Figure 2. Tissue types and examples of unhealthy granulation tissue

reinforce the idea that this type of tissue is a barrier that can be overcome in hard-to-heal wounds.

When assessing the wound for tissue type, it is important to remember that the state of the tissue is not connected to duration and/or when the wound is entered to the HCP's caseload. Using these five categories, HCPs can more accurately recognise where the wound is and what interventions it requires when it enters their care. All tissue types should receive Wound Hygiene at every dressing change, at every stage, until healing.

Determining the intensity of Wound Hygiene

Wound Hygiene is a practice that seeks to remove biofilm through repeated implementation at every tissue type, until healing. To use the oral hygiene analogy, every person who manages wounds needs to be able to brush the teeth—clean the wound—effectively enough, perhaps with more rigour than is currently being done in practice. The Wound Hygiene survey revealed that lack of confidence, in particular around debridement, continues to exist.⁴³

A study of 20 patients who underwent sharp debridement (18 curette, 1 scalpel, 1 tissue nipper) until bleeding sought to understand the impact on host physiology and wound microbiota based on swab analysis of the wounds' surfaces before and after debridement.⁴⁴ The study found no significant differences in microbiome composition, but instead uncovered anaerobe depletion

at 2 weeks post-debridement, resulting from a gradual decline over days.⁴⁴ In hard-to-heal wound beds, delivery of oxygen via microvasculature can be impeded by underlying factors, anatomic location or the state of the wound bed itself. In this environment, anaerobes proliferate and form biofilm communities, and have been shown to pose a major barrier to healing in various wounds, potentially even resulting in necrotising fasciitis.⁴⁵ Although the sample size was small, these results demonstrate the need for frequent and aggressive debridement to reduce anaerobic proliferation and ensure effectiveness against biofilm.^{44,46} Encouraging news from the survey was that large

Table 2. Implementation of Wound Hygiene by clinical competency^a

Skill level	Wound Hygiene task
General caregiver (routine care)	• Cleanse the wound bed and periwound skin • Debride the wound bed and periwound skin with a soft debridement pad or gauze • Detach the wound edges with a soft debridement pad or gauze • Assess for signs of infection • Apply a wound dressing • Refer patient to an advanced/registered practitioner
General wound care provider	• Cleanse the wound bed and periwound skin • Assess the patient, wound (including vascular supply and infection status) and environment holistically • Identify local and spreading infection • Perform selective sharp debridement of non-viable tissue (and determine when it is appropriate) or thermal therapy • Detach the edges to achieve pinpoint bleeding with soft debridement pad or ring curette • Select and apply a wound dressing • Refer patient to an advanced practitioner
Expert wound care provider	• Diagnose and manage the underlying pathophysiology • Use pharmacotherapy as required • Select and undertake an appropriate method of debridement (eg, surgical sharp debridement) • Cleanse the wound bed and periwound skin • Detach the wound edges • Suture, if required • Select and apply a wound dressing

^aRefer to local regulations for competency requirements and specific policies in your area.

Table 3. Guidance for performing Wound Hygiene tasks

Tissue type	Recommended cleansing intensity	Recommended debridement methods	Recommended refashioning intensity
Necrotic	Vigorous (using physical force)	Intensive • Surgical • Sharp selective (runcle, scalpel, scissors, forceps) • Larval^a • Mechanical debridement (including soft debridement pad, gauze or wipes)	Agitate the wound surface to prevent bleeding
Sloppy	Vigorous	Intensive • Surgical • Sharp selective (runcle, scalpel, scissors, forceps) • Larval • Mechanical debridement (including soft debridement pad, gauze or wipes)	Agitate the wound surface to prevent bleeding
Unhealthy granulation	Vigorous	Intensive • Surgical • Sharp selective (runcle, scalpel, scissors, forceps) • Larval • Ultrasonic debridement • Mechanical debridement (including soft debridement pad, gauze or wipes)	Agitate the wound surface to prevent bleeding
Healthy granulation	Moderate or gentle, depending on confidence and competence	Gentle • Mechanical cleansing/debridement (including soft debridement pad, gauze or wipes)	Selectively rub in circular motion over wound bed and periwound skin, as needed
Epithelialisation	Gentle	Not required	Not required

^aContraindicated in dry necrotic tissue

numbers of HCPs are using a wide variety of debridement methods.⁴² In order to further support this practice and supplement the guidance around the skill levels and Wound Hygiene tasks that are appropriate for each level (Table 2), the panel has developed recommendations regarding the intensity of Wound Hygiene, and the methods that are recommended to focus on removing biofilm (Table 3). The hope is to clarify and build on the simplicity of Wound Hygiene for all levels of people who care for wounds, so that implementation of Wound Hygiene can achieve greater consistency across practice.

The panel encourages everyone who manages wounds to 'clean it like you mean it' (providing there are no contraindications, such as bleeding and pain, and patient consent), 'debride it as much as possible,' and 'don't be afraid of bleeding.' In other words, to be more vigorous, aggressive and confident in using the cleanse-debride-refashion steps to remove unwanted tissue on the surface of the wound. At the same time, the panel re-enforces that practice specific to Wound Hygiene

must be in line with the HCP's professional registration code of conduct, licensure scopes of practice and locally recognised guidelines, and that there are cases in which vigorous application of Wound Hygiene should be used with caution or is contraindicated (Table 4). Wound Hygiene protocols can still be implemented in patients when debridement and edge refashioning are contraindicated. In such instances, the protocol comprises cleansing and application of dressing.⁴³

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Table 4. Contraindications and precautions to debridement and refashioning in Wound Hygiene*

Contraindications	Precautions for debridement that can cause bleeding*	Other precautions
- Wound aetiology is unknown - Acute infection[†] - Inadequate perfusion - Inflammatory or malignant conditions such as: - Critical ischaemia/pyoderma gangrenosum - Gangrene (wet or dry) - Calciphylaxis - Vasculitis - Malignant wounds	- Bleeding disorders - Antiplaquet therapy, anticoagulation therapy*	- Patients in intolerable or unavoidable pain - Patients with a palliative condition where healing is not the ultimate goal - Patients with biologics, such as extracellular matrix products, in situ (as could result in removal of the product)

*Debridement may induce bleeding

*Decision regarding debridement should be made in consultation with an expert/advanced (certified wound specialist, surgeon or other specialist consultant) practitioner

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Key takeaway message

Look out for
'unhealthy
granulation'
tissue

Biofilm is invisible to the naked eye, and can rapidly reform. It is important to consider biofilm and practise some level of Wound Hygiene at all healing stages, because a hard-to-heal wound remains hard-to-heal until fully healed. The three steps (cleanse, debride and refashion) should be performed proactively at every stage, with varying intensities according to tissue type and skill level. It is important to acknowledge a previously undefined type of tissue, where the wound does not necessarily appear unhealthy and where granulation tissue is present, but also is failing to progress: unhealthy granulation tissue.

Section 3. Wound Hygiene: a proactive wound healing strategy

The last decade has seen a movement for healthcare professionals (HCPs) to look at the patient holistically, and the need for this approach has never been more relevant. In hard-to-heal wounds, HCPs must look beyond the wound at other factors including comorbidities, nutrition, mental health and socioeconomic challenges. This emerging trend in wound management demands integrating Wound Hygiene into a more holistic framework, where proactive wound healing (rather than reactive wound management) is endorsed. Therefore, the panel proposes a new framework to adopt a Wound Hygiene protocol of care complemented by a patient-centric approach.

This 3-phase framework (Fig 3) reinforces the importance of assessment, management (using Wound Hygiene) and monitoring, in order to support a more centralised approach by which all HCPs who care for wounds are comfortable with performing Wound Hygiene.



Figure 3. Framework for proactive wound healing

Assess the patient and wound

Accurate patient and wound assessment are critical to ensure that the correct wound management approaches are undertaken, as well as to set goals for management and healing, so that objectives can be achieved. The panel agreed that several aspects of assessment should be non-negotiable, to optimise outcomes:

1. Perform a holistic assessment of overall patient risk and quality of life
2. Give the wound a first name (wound type) and last name/surname (aetiology). Identifying the underlying cause will help determine the desired healing outcome. For example: leg ulcer, venous; or leg ulcer, arterial insufficient

The panel also determined a priority list of key factors to assess for and describe:

- Wound size and presence/extent of undermining
- Wound condition
- Periwound and skin condition (eg, for indications of underlying cause, such as skin signs of chronic venous disease, or pyoderma gangrenosum)
- Wound edges
- Level and type of exudate
- Pulse palpation, doppler assessment, ankle/brachial index, toe/brachial index
- Oedema
- Foot/limb deformities, along with type and suitability of footwear
- Patient's gait
- Mobility
- Baseline medication (eg, steroids, angiotensin-converting enzyme inhibitors)
- Glucose levels
- Observation of presence of varicose veins
- Vascular ultrasound (if indicated)
- Sensory perception
- X-ray examination (if indicated)
- Pain levels

Manage the wound

After a full holistic assessment to identify the wound aetiology, comorbidities and other risk factors, Wound Hygiene should be integrated as part of proactive wound healing. The concept of 'embedding' Wound Hygiene into a proactive wound healing strategy will be most active at the management phase of the framework (Fig 3), and consists of:

- **Identifying tissue type:** at dressing change, evaluate the surrounding skin and assess the wound to identify tissue type before implementing Wound Hygiene. Repeat this action at every dressing change until healing.

- **Determining tools/techniques for Wound Hygiene steps:** identify tissue type before treatment with Wound Hygiene (until healed). This will guide the HCP in determining the intensity and tools/techniques for an optimal practice of the first three Wound Hygiene steps (cleanse, debride and refashion)
- **Performing Wound Hygiene:** steps 1, 2 and 3 of Wound Hygiene (cleanse, debride and refashion) should be performed, to some degree, at each stage of a hard-to-heal wound until it has fully healed. The hard-to-heal wound should be cleansed, debrided and refashioned according to tissue type definition (as covered in Section 2), in preparation for the final step of the Wound Hygiene treatment and any other indication-specific treatments
- **Carrying out Wound Hygiene 'dress' step:** this step involves application of a dressing that will maintain a healthy wound environment, until the next episode of care.¹⁴ Biofilm can reform rapidly, and repeated debridement alone is unlikely to prevent its regrowth.¹⁵ Where appropriate, based on assessment of tissue type and patient circumstances, application of effective topical antimicrobials and antibiofilm agents after biofilm has been physically disrupted can address residual biofilm and suppress its reformation.¹⁶ The dressing should also manage exudate effectively, in order to promote healing.¹⁷ it may be appropriate to step-up or step-down dressing technologies, based on the appearance of the wound, duration of care, and healing response; the effectiveness of the dressing choice should be assessed every 2–4 weeks.¹⁸ An antibiofilm dressing should be used only for as long as it is indicated, after which action should be taken to step-down to either a non-antibiofilm or non-antimicrobial dressing.¹⁹ However, the Wound Hygiene protocol should continue to be applied²⁰
- **Performing indication-specific treatment:** due to the frequent complexity of hard-to-heal wounds, ensuring indication-specific treatment to address the underlying aetiology has been proven highly successful

Key takeaway message

Embedding Wound Hygiene into a proactive wound healing strategy is driven by an assess-manage-monitor cycle that focuses on the whole patient, supplemented by wound- and indication-specific activities, all of which are carried out at the earliest opportunity and then at every dressing change, until healing.

**Apply
Wound
Hygiene
proactively,
until healed**

Conclusion. A call to action for Wound Hygiene

The panel has established and demonstrated the need for a simple, 4-step approach to be used on any wound, at every stage, until healing: Wound Hygiene. It has also highlighted the rationale for being proactive while applying Wound Hygiene, which is summarised below.

The rationale for proactive wound healing

The key principle of Wound Hygiene is 'do something.' Wound Hygiene should be performed at every dressing change, at every stage, until healing. It has been designed with four simple steps that are meant to enable and inspire anyone who manages wounds. With this document, the panel has provided further guidance and information for implementing Wound Hygiene in practice. Everyone who manages wounds is equipped to be proactive, because:

- These wounds are considered hard-to-heal, rather than chronic—do not press the ' snooze button ' on healing
- Biofilm is lurking throughout the whole healing trajectory, at every tissue type
- We consider key tissue types, including unhealthy granulation tissue
- We also consider the patient (not just the wound)
- Wound Hygiene should be considered a standard in wound healing
- A hard-to-heal wound can stall or regress at any time, tissue type, and all aspects (including biofilm, underlying cause/factors, psychosocial factors, etc.) must be consistently assessed and monitored.

Ten commandments of Wound Hygiene

This consensus document calls for ten key steps to be taken by all HCPs who work with patients living with hard-to-heal wounds, to advance the practice of wound care and take immediate steps to overcome the wound-care crisis affecting patients and healthcare systems.

Ten commandments of Wound Hygiene

1. Implement Wound Hygiene safely in any setting, regardless of your skill level
2. Use the term hard-to-heal wound, rather than chronic wound
3. Consider biofilm at all stages—it is invisible to the naked eye, and a key barrier to wound healing
4. Do not wait; treat the wound now
5. Proactively assess (give the wound a first name and a last name/surname)
6. Proactively manage (perform Wound Hygiene and appropriate, aetiology-specific supportive care)
7. Proactively monitor
8. Determine the intensity of Wound Hygiene at each healing stage/tissue type
9. Reassess the wound and the patient at every dressing change, and refer on if more extensive management is required
10. Acknowledge that a hard-to-heal wound remains hard-to-heal until closure, so practise some level of Wound Hygiene at every assessment, on all wounds, until healing