

Advisory Document for Wound Bed Preparation in New Zealand

He ahu umanga ngaio hei whakamahu poka

Advancing Practice and Knowledge in Wound Management

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Disclaimer

This document has been developed as a guide to support safe wound care practice in Aotearoa/New Zealand, however, it is not a substitute for education, and wound related competencies, experience, and the use of clinical judgment. Each health care professional is responsible for their own individual professional clinical practice and scope of practice as per their regulatory body such as Nursing Council of New Zealand/ Te Kaunihera Tapuhi o Aotearoa.

1. Introduction

In accordance with the aims of the New Zealand Wound Care Society (NZWCS) this advisory document has been designed to guide clinical practice in wound bed preparation.

The NZWCS aims are:

- To improve outcomes and quality of life for people with wound and skin integrity problems.
- To guide and promote evidence-based practice and wound prevention and management education across relevant health care settings.
- To be involved at local, national and international level on issues relating to wound prevention and management.

Wound Bed Preparation (WBP) is defined as a structured and systematic approach to identify and remove local barriers to accelerate healing in open wounds. WBP serves to enhance and optimise healing treatments and advanced therapies.(1)

The NZWCS supports the application of WBP with additional resources such as affiliations to online learning platforms, wound related guidelines and assessment forms available on the NZWCS website e.g. Diabetic Foot Ulcer, Pressure Injury, and Venous Leg Ulcer forms.

Key Points:

- Wound healability needs to be determined prior to commencement of WBP. A holistic assessment of the patient and wound are an essential element of WBP.
- Any underlying patient condition, including pain, which will delay healing must, where possible, be managed appropriately.
- An increased understanding of the importance of biofilms in delaying wound healing has resulted in a more structured approach to WBP. Biofilms cannot be seen but may be present in 60-100% of chronic wounds. (2) Standard culture methods are not able to capture the presence of biofilm or relevant bacteria.
- There are several different methods of debridement and it is essential that clinicians choose the appropriate method for the patient and the wound they are treating.
- Continued disruption of biofilm and ongoing control of bacteria is the next essential step in the process. (2)

An interdisciplinary approach is needed to manage complex healable and non-healable wounds to ensure a holistic and cost-effective approach.

2. Purpose & Scope

Purpose: The purpose of this document is WBP to enhance and optimise healing in chronic and complex wounds.

Scope: Health care professionals carrying out WBP and debridement must meet the requirements of, and practice within, their scope of practice within their professional and employment organisations. See Appendix 1.

3. Factors Affecting Wound Healing

Complicating factors can have a major impact on the progression of healing. (3) This useful guide to clinical practice categorises the factors that delay healing into four key groups:

- Patient related factors
- Wound related factors
- Skill and knowledge of the healthcare professional
- Resources and treatment related factors. (3)

Patient Related Factors:

Patient related factors need to be identified to determine underlying pathology and associated co-morbidities. The main factors are best categorised into intrinsic and extrinsic.

Intrinsic local factors - poor venous drainage, lymphoedema, increased skin tension, poor surgical apposition.

Intrinsic systemic factors - aging, conditions which reduce blood and oxygen flow (such as peripheral arterial disease), diabetes, obesity, immunological disorders, renal disease, decreased perfusion, organ failure, sepsis, malignancy.

Extrinsic factors - infection, poor nutrition, tobacco use, radiotherapy, chemotherapy, foreign body, mechanical pressure, psychosocial, polypharmacy, sensitivity to treatment or product.

Cultural Considerations:

To ensure clinical practice is acceptable, a partnership between the health care professional and the patient/family (tūroro/whānau) in regard to using conventional and traditional wound healing modalities is vital(4). Using appropriate cultural models of care such as Te Whare Tapa Wha offers a cultural framework which may optimise health outcomes for Māori.(5)

Traditional healing modalities such as Rongoā Māori incorporate wellbeing dimensions of cultural models into wound care and treatment. The healthcare professional is advised to have input from local Māori healthcare providers for information regarding traditional Māori healing (Rongoā Māori). Rongoā Māori is informed by ancestral knowledge passed down through the generations and has at its core the enhancement of Māori wellbeing. Rongoā is formulated into a Māori cultural context in which understanding of events leading to ill health and its impact is addressed through a range of culturally bound responses. (4)

Wound Related Factors:

Wound duration, fibroblast senescence, wound size, depth and location on pressure bearing surface or mobile area, unhealthy wound bed condition, ischaemia, exaggerated inflammatory phase, matrix degradation and reduced growth factor bioavailability all reduce tissue repair.(6) Infection and the prolonged presence of bacteria/biofilm in the tissue stimulate chronic inflammation further delaying healing. (2) The initial response to wound care can guide prediction of healing time and tissue viability.

Skills and Knowledge of Healthcare Professionals

Healthcare professionals require ongoing wound prevention and treatment education to increase knowledge and skills so cost-effective and appropriate management is provided. As professionals we

need to critically reflect on our practice to ensure we are providing the best possible care and outcome for the patient. This involves working with the patient holistically by identifying the patients', family/whānau needs and concerns, barriers to healing, and engaging in collaborative practice.(3)

Resources and Treatment Related Factors

Healthcare professionals require access to a range of wound care products and equipment with supporting evidence-based procedures. New approaches to wound care continue to be investigated, such as molecular biomarkers to recognise and target treatment earlier and more effectively.(7) It is important that new approaches to wound management are accessible, transferrable and are cost-effective for healthcare professionals to utilise.

4. Patient and Wound Assessment

Wound assessment is used to describe a wound at a given point in time:

- Accurate wound assessment and an understanding of the complexities of wound management is essential in ensuring that cost-effective and evidence-based interventions are used.
- Wound assessment will help determine the treatment; practitioners need to ensure they have the essential skills required to plan, implement, and evaluate care on an individual basis.
- Wound assessment should be repeated at any dressing change, or if there is a clinical indication for it, to establish indications for healing.
- Comprehensive assessment of the patient involves inclusion of the whole patient not just the hole in the patient.
- A structured approach incorporating a wound assessment model is necessary and recommended.

Wound Tissue Types:

Wound assessment includes the interpretation and classification of tissue in the wound. Tissue colours (see Figure 1) are often assessed as a percentage within the wound and may include:

- Necrotic: can be soft and wet, or hard and dry; the colour can be black or dark brown/tan.
- Slough: moist or wet; typically, yellow or grey/green colouration. Note yellow may indicate bone, cartilage, tendon, ligament or fat.
- Fungating: dry or wet; may bleed easily, and have a mix of colours ranging from black, yellow to red, crater or cauliflower appearance.
- Granulation: moist; pink or red; healthy granulation should be firm and granular which is often described like cobble-stone or a raspberry; friable tissue may indicate local infection.
- Hyper or over-granulation: raised moist beefy red tissue; often occurs when the wound is too wet, foreign body is present, friction or increased bacteria.
- Epithelialised tissue: dry, pink or white, final stage of wound healing.

Refer to Appendix 2 for Wound Product Selection Guide and Aim of Treatment, for Chronic Wounds.

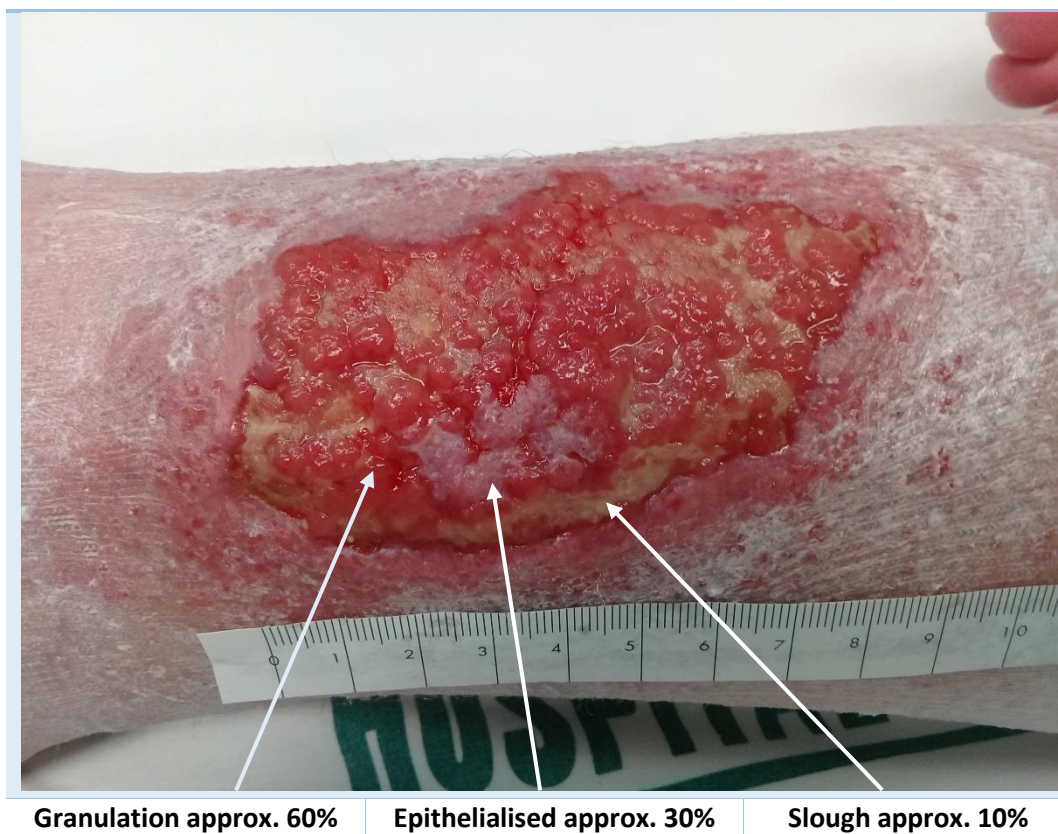
Wound Exudate

Exudate is necessary in wound healing, but when pro-inflammatory cytokines and matrix metalloproteases (MMPs) are elevated, and growth factors and mitogenic activity are lower, wound healing is stalled.(8) Assessment of exudate should include type, colour, consistency, amount and odour. Current dressing regime and determining wound aetiology plus other factors, such as low serum albumin levels, can also affect exudate levels.(8) Refer to the World Union of Wound Healing Societies Consensus Document for further information including types of wound exudate. (8)

Wound Edge

To advance epithelialisation, the edge of the wound needs to be moist and at the level with wound tissue.(9) Unhealthy wound edges include macerated, undermined and rolled: these need to be addressed to advance wound healing.(9,10) Ensure undermined wounds are not over packed and leave a gap between the undermined tissue edge and dressing to allow wound advancement.

Figure 1: Tissue Types



Wound Assessment Models to Support Wound Bed Preparation:

There are several well-known assessment models which are continually evolving and are now much more holistic. Listed below are a few examples:

TIME – provides a framework to address factors in the wound bed which delay healing. Components focus on management of necrotic tissue, infection and exudate.(11)

- Tissue management
- Inflammation and infection control

- **Moisture balance**
- **Epithelial (edge) advancement**

A recent expert review recommended an expansion of TIME which includes a Clinical Decision Support Tool providing a systematic, structured, evidence-based approach to wound management. It involves a holistic assessment and involving the multidisciplinary team (MDT) as appropriate, wound assessment and treatment using TIME, and evaluation.(12)

- **Assess:** accurate assessment, measurement and diagnosis of the patient and their wound
- **Bring in the MDT** to promote holistic care
- **Control and treat systemic causes**
- **Decide appropriate treatment**
- **Evaluate treatment and wound management goals**

The **TRIANGLE** of Wound Assessment(9) includes assessment of:

- The wound bed and types of tissue using TIME
- Wound edges
- Peri-wound skin that extends 4cm from the wound bed

HEIDI A structured approach to define health status of patient and tissue type within the wound and identify associated factors which may impact on the plan of care and the process of healing.(13)

- **History:** medical, surgical, pharmacological, psychosocial, barriers to healing.
- **Examination:** the patient as a whole, then the wound.
- **Investigations:** such as, X-ray, Duplex scan, bloods, wound cultures.
- **Diagnosis:** follow accepted pathway.
- **Intervention** (see Appendix 2 Wound Product Selection Guide for Chronic Wounds).

Comprehensive History:

History of presenting wound: site, date of onset, duration (>6 weeks considered chronic wound), any associated symptoms such as pain, exacerbating factors - include past dressings used and what has worked what has not.

- History of previous wounds at the same site or fractures affecting the same limb.
- Medical/ Surgical history.
- Medications, over the counter medicines, alternative therapies, rakau rongoā (native flora herbal preparations).
- Social history- smoking tobacco/vaping use, alcohol intake, mobility, living status – care and supports in place.
- Review of appropriate systems i.e. vascular history - claudication or rest pain for wounds on the lower limb.
- Is this an accident which resulted in a wound that treatment could be funded by Accident Compensation Corporation (ACC) e.g. skin tear, pressure injury.

Examination:

- Location of wound(s).

- Wound measurements including length, width, depth, undermining, sinuses, and tunnels. Note if the wound probes to bone there is a risk of developing osteomyelitis and a base-line x-ray is recommended, and the treatment plan may include debridement and/or antibiotics.
- Use TIME to describe the wound bed and surrounding tissue including odour and exudate.
- For all leg wounds perform basic lower leg assessment including temperature, pulses, and capillary refill time. If there is uncertainty whether the blood supply is normal, early referral for an advanced lower limb assessment should be considered. These include ankle brachial pressure index (ABPI) and non-invasive vascular studies (NIVS).

Document the Assessment:

- Utilise your organisational wound care plan or wound assessment tool to guide the assessment process.

Investigations: will be determined by the above findings:

- Wound swab to identify infection.
- Biopsy to rule out neoplasm.
- Arterial or venous investigations including ABPI, NIVS or Duplex scan.
- X-rays to determine osteomyelitis.

Diagnosis:

Wounds are a result of trauma, venous insufficiency, arterial insufficiency, inflammatory, neuropathic, pressure, neoplastic or unknown aetiology. To make a diagnosis you need to be able to consult a clinician who can help with the diagnosis to then be able to facilitate the best treatment possible.

Interventions:

Discuss proposed plan of care with patient/whānau identifying goals of wound healing. In some cases, healing may not be possible due to underlying condition such as cancer or peripheral vascular disease. Management of symptoms e.g. pain, infection, exudate, and odour are the goals of care.

- Document your plan of care, review date and timeframe for wound reduction, healing or palliation.
- Ensure all clinicians are aware of the plan and can implement it.

5. Pain Assessment

Wound Pain:

Wound pain can be broadly categorised into two main types:

- Nociceptive pain results from activity in the neural pathways secondary to actual tissue damage; for example, trauma, prolonged pressure causing ischaemia, bruises, burns, fractures, and infection. These conditions can all heal, therefore acute nociceptive pain will be expected to resolve. (14) Common descriptors include nagging, aching, tender, sharp or stabbing pain. (14,15)

- Neuropathic pain is caused by nervous system lesions or dysfunction, for example diabetic peripheral neuropathy. This pain is more persistent often leading to chronic pain; it is often described as shooting, burning, and pins and needles. (14,15)

Note: Allodynia can result from continuous pain; this causes a person to experience pain from a non-painful stimuli. (15)

Pain can affect sleep, function, and increase anxiety leading to increased cortisol levels that can affect the immune system and healing, hence pain assessment and management are paramount.(15) MacLeod(16) defines pain as a combination of sensory, emotional, and cognitive phenomenon and as a stressor, ongoing pain will interfere with wound healing (see Figure 2).

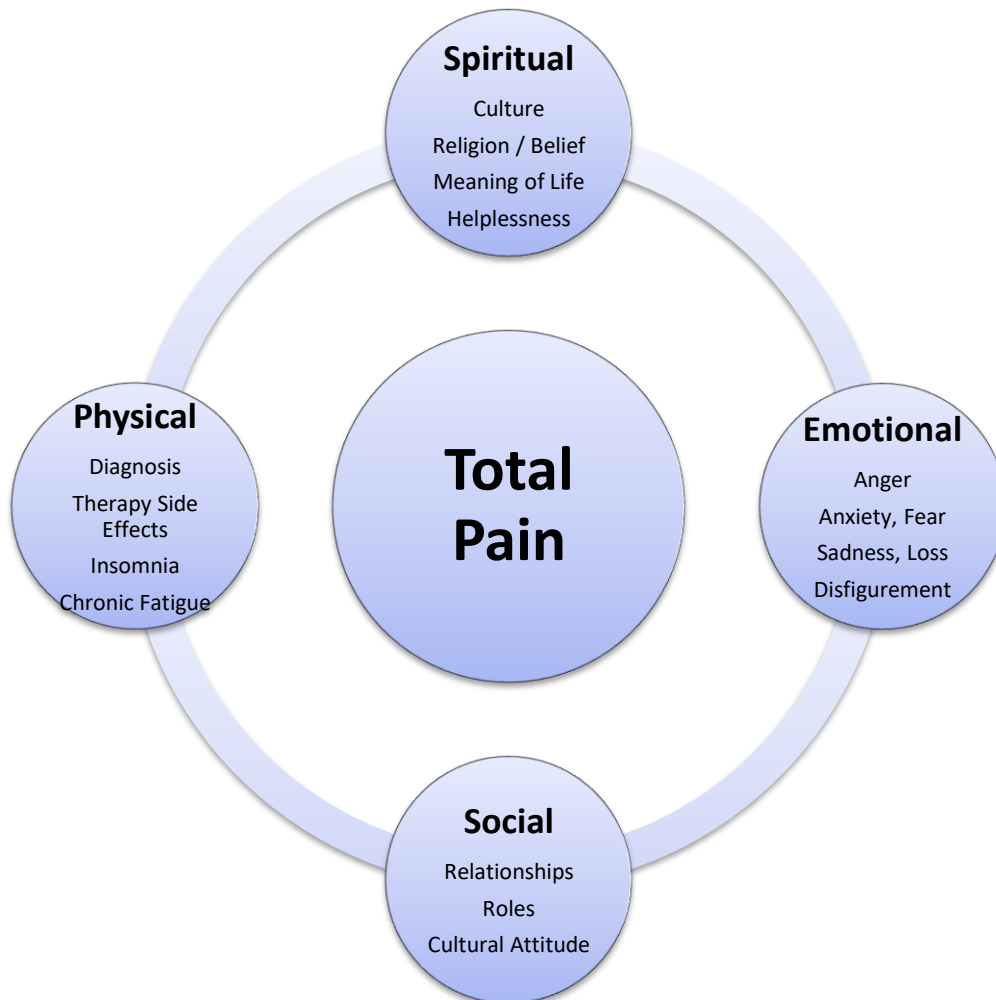


Figure.2 –Adapted from MacLeod. (16)

Pain assessment:

- It is essential to be guided by the patient’s description of pain as it applies to them, this will assist the healthcare professional to determine whether the pain is acute or chronic, neuropathic, and/or nociceptive.
- Use a validated pain assessment tool that is appropriate to the population, such as children and people with dementia.
- Procedural pain is associated with wound cleansing and dressing procedures; and operative pain with interventions such as debridement or biopsy. (15)

- When assessing pain note onset, duration, type, location, frequency, persistency, and severity. Note precipitating and alleviating factors.
- Pain assessment should occur pre, during and post WBP procedures, especially during any debridement procedure
- An increase or change in pain is a strong indicator of infection.(15)
- Painful stimuli below the injury level in patients with spinal cord impairment can lead to an increase in spasticity and/or a potentially fatal hypertensive condition called autonomic dysreflexia. (17)
- Consider what current pharmaceutical and non-pharmaceutical interventions are being used, and their effectiveness.
- Pain associated with underlying conditions such as inflammatory diseases and limb ischaemia need to be referred urgently to relevant Clinicians.

Pain Management:

Identify causes of pain and help manage these:(15)

- Gain verbal consent prior to any procedure and advise the patient they can stop the procedure at any time.
- Explore other pain strategies such as allowing the patient to help cleanse/dress their wound, massage, and using relaxation techniques such as breathing and music.
- Ensure prescribed analgesia is used prior to painful procedures (e.g. oral, inhalation, topical and/or intravenous) and assess the effectiveness of this.
- Consider factors that can contribute to pain such as infection, maceration, ischaemia, and pressure.
- Dressing removal and antimicrobial dressings can contribute to pain.
- Avoid prolonged wound exposure.

6. Diagnosis and Treatment Planning:

A comprehensive history, physical examination and diagnostic reasoning will lead to an accurate diagnosis of the wound and a plan of treatment. A plan of care should include:

- Care that is co-designed with patient/family-whānau/carer and relevant interdisciplinary team members.
- Treatment goals are holistic, realistic, and achievable, some wounds may not heal, seek expert advice if there is any doubt.
- Patient risk factors for wound healing are identified and incorporated into the plan of care.
- Availability of resources, equipment and wound care supplies within your health care setting.(3)
- For wounds related to/caused by trauma or treatment injury, patients may be eligible for Accident Compensation Corporation [ACC] funded wound care related consumables - see ACC website.

7. Wound Infection

Wound infection is a common complication in both acute and chronic wounds. In 2016 the International Wound Infection Institute (IWII) updated the principles and practice for wound infection.(18)

Wound infection delays the healing process and, if left untreated, may progress to systemic and life-threatening sepsis/illness. Early identification and management are important to reduce morbidity and mortality rates. Addressing local wound infection using a local application of an effective topical antimicrobial reduces the potential for development of spreading infection and developing antibiotic resistance. (18)

Stages of Wound Infection:

The approach to treatment will depend on the extent of the infection. The IWII continuum characterises the relationship between microbes, infection, and recommendations for systemic or local treatments,(18) see Figure 3.

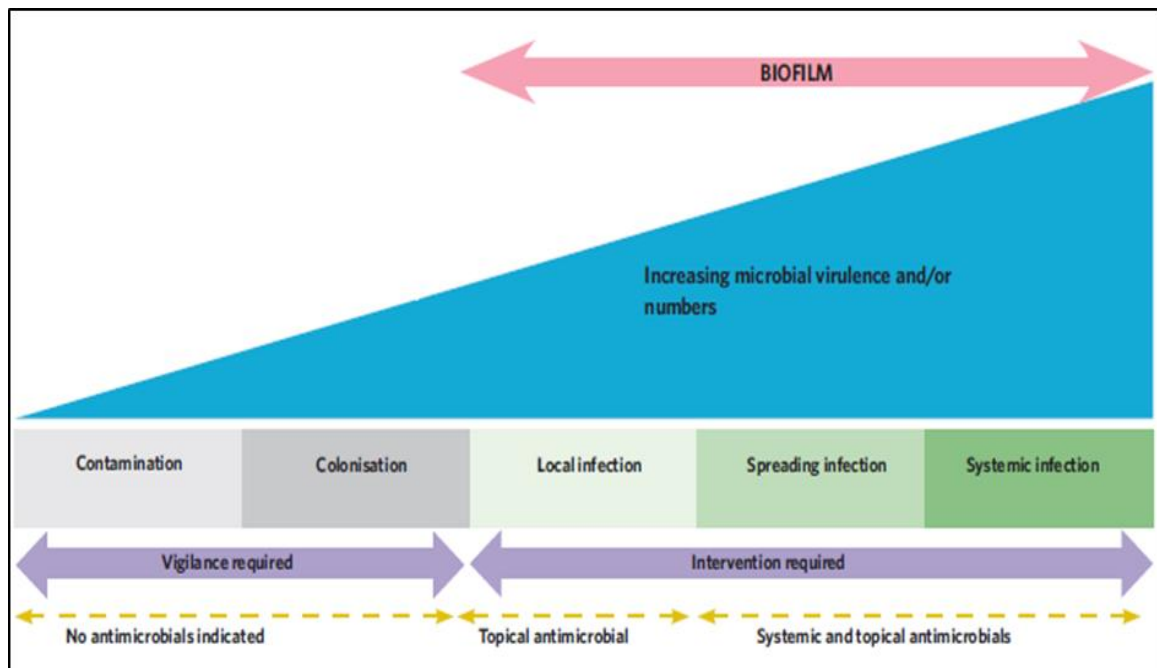


Figure 3: IWII Wound Infection Continuum. (16)

As microorganisms proliferate in a wound, the host response to the infection may progress from localised symptoms in and around the wound, to more systemic effects as shown in Table 1.

Contamination ²⁶	Colonisation ²⁶	Local infection		Spreading infection ^{22, 23}	Systemic infection ^{22, 23}
All wounds may acquire micro-organisms. If suitable nutritive and physical conditions are not available for each microbial species, or they are not able to successfully evade host defences, they will not multiply or persist; their presence is therefore only transient and wound healing is not delayed	Microbial species successfully grow and divide, but do not cause damage to the host or initiate wound infection	Covert (subtle) signs of local infection: ^{2,27,36} <ul style="list-style-type: none"> ■ Hypergranulation (excessive 'vascular' tissue) ■ Bleeding, friable granulation ■ Epithelial bridging and pocketing in granulation tissue ■ Wound breakdown and enlargement ■ Delayed wound healing beyond expectations ■ New or increasing pain ■ Increasing malodour 	Overt (classic) signs of local infection: ^{2,27, 28, 35, 36} <ul style="list-style-type: none"> ■ Erythema ■ Local warmth ■ Swelling ■ Purulent discharge ■ Delayed wound healing beyond expectations ■ New or increasing pain ■ Increasing malodour 	<ul style="list-style-type: none"> ■ Extending in duration +/- erythema ■ Lymphangitis ■ Crepitus ■ Wound breakdown/dehiscence with or without satellite lesions ■ Malaise/lethargy or non-specific general deterioration ■ Loss of appetite ■ Inflammation, swelling of lymph glands 	<ul style="list-style-type: none"> ■ Severe sepsis ■ Septic shock ■ Organ failure ■ Death

Table 1: Signs and symptoms associated with stages of the wound infection continuum.(18) Copyright permission given by Dr G Sussman, for information retrieved from Wound infection in Clinical Practice via email on 6th Dec 2019.

Diagnostics to Identify Wound Infection:

The clinician's observation and understanding of signs and symptoms is important to assist with identifying developing wound infection. Figure 3 and Table 1 provide guidance on identifying levels of infection.(18)

Further investigations for clinical microbiology are indicated for:

- Acute wounds with classic signs and symptoms of infection.
- Chronic wounds with signs of spreading or systemic infection.
- Infected wounds that have failed to respond to antimicrobial intervention or are deteriorating despite appropriate antimicrobial treatment.
- Wounds where the presence of certain species would negate a surgical procedure (e.g. beta haemolytic streptococci in wound bed prior to skin grafting). (16)

Clinical Microbiological Sampling Techniques include:

- Wound swab using the Levine technique (Table 2).
- Collection of pus in a sterile specimen container.
- Needle aspiration.
- Tissue biopsy: wounds with antibiotic-resistant species. Sample from edge and centre of wound bed.

Wound Swabs:

Superficial wound swabbing is frequently used, although it has limited use in identifying colonisation versus infection in chronic wounds, especially if a biofilm is present. However, laboratory investigation provides clinicians with information about the organisms present in a wound and their antibiotic sensitivities, which can inform treatment decisions. The Levine technique is considered the preferred sampling method, see Table 2. (16)

Step	Action	Further information
1	Cleanse and debride wound prior to wound culture	<ul style="list-style-type: none"> ■ Inform and seek permission from patient to obtain specimen ■ Cleanse wound using warm normal saline ■ Debride non-viable tissue as required ■ Cleanse wound again
2	Moisten culture tip	<ul style="list-style-type: none"> ■ Moisten culture tip with sterile normal saline, especially with dry wounds
3	Where to obtain specimen	<ul style="list-style-type: none"> ■ Obtain specimen from cleanest area in the wound ■ Where possible, do not obtain from slough or necrotic tissue
4	Technique	<ul style="list-style-type: none"> ■ Inform the patient that procedure may cause discomfort ■ Place wound culture into wound ■ Firmly press swab into wound and rotate ■ Using a sterile technique, place swab into culture container
5	Label appropriately	<ul style="list-style-type: none"> ■ Patient label on culture container and pathology slip ■ Provide site, time and initials of who obtained specimen (e.g. left medial distal malleolus wound) ■ Provide as much relevant history as appropriate: <ul style="list-style-type: none"> ■ Current antibiotic or medication (steroid) ■ Comorbidity (DM) ■ Specific microbe suspected (<i>Pseudomonas aeruginosa</i>) ■ Provisional diagnosis of wound ■ Duration of wound
6	Apply dressing as appropriate	<ul style="list-style-type: none"> ■ Medicated dressings may be appropriate ■ Moisture management and wound bed preparation principles should be adhered to

Table 2 – The Levine Technique adapted from IWII. ¹⁶ page 12

Note: Wound Biopsy and Needle aspiration should only be undertaken by staff trained in local procedures. Advanced diagnostic techniques are not routinely available and must be ordered by Infection Control Specialist / Microbiologist.

8. Biofilm

A biofilm is described as an aggregate of bacteria tolerant to treatment and the host defence,(2,19) see Table 3. The subject of biofilm in chronic wounds is complex and a recent position document has given guidelines for the treatment of biofilm(2); these include:

- WBP and biofilm removal/disruption include use of an appropriate debridement methods to disrupt biofilm and remove necrotic and devitalised tissue.
- Use of topical surface surfactants which lower surface tension and assist disruption of potential or actual biofilm formation from the wound surface.
- Use of antimicrobials immediately after debridement to reduce bacterial growth on vulnerable tissue.
- Repeat the process as necessary, a single debridement is not enough to prevent biofilm reforming.
- Reassess regularly to see if treatment objectives are being achieved.

Table 3: The Stages of Biofilm Development Adapted (2)

Stages of Biofilm Formation	Stage Description	Action to Manage Biofilm
Reversible attachment	Micro-organisms attach to surface; this initial attachment is reversible	Clean the wound – consider using a surfactant and/or monofilament fibre wand or pad
Permanent surface attachment 2-4 hours	Planktonic microbes attach and form micro-colonies	Dressing with surfactant and antimicrobial
Protective matrix forms 6-12 hours	Bacteria start to secrete surrounding matrix and micro colonies become more tolerant to systemic and local biocides	Continue
Increasing tolerance to biocides 2-4 days	Without disruption micro colonies become fully mature biofilm colonies and further biofilm colonies can develop	Debride regularly and follow up with monofilament wand or pad, surfactant and antimicrobial
Reformation 24-72 hours post disruption	There is rapid recovery from mechanical disruption and a mature, tolerant biofilm reforms. There are 24 hours after debridement when antimicrobials are most effective in reducing bacteria	Repeat whole process at 72 hours Re-assess wound regularly

9. Antiseptics and Antimicrobial Dressings:

Agents capable of killing (biocidal) or inhibiting (biostatic) micro-organisms are used in conjunction with debridement to prevent biofilm build up see Table 4. (19)

Treatment goals when using antimicrobial wound dressings are to:

- Prevent the spread of local infection and reduce antibiotic use.
- Disrupt biofilm to advance wound healing.
- Achieve faster resolution of spreading infection in conjunction with oral antibiotics.

How do I know which antimicrobial to choose?

In accordance with your wound assessment, e.g. amount of exudate, tissue type, pain or odour, dressing availability and the mode and duration of action.(20)

- Use the 2-week rule, use an antimicrobial for 2-weeks then review.
- If there are signs of improvement, and signs and symptoms of infection are resolving, discontinue the antimicrobial dressing. Often longer use of antimicrobials are required in chronic wounds.
- If the wound is improving, but the signs and symptoms of infection are still present, continue for a further 2 weeks with the same antimicrobial or a different one.
- If the wound probes to bone, a baseline x-ray and antibiotics are recommended.

- If the wound has deteriorated, fully reassess patient holistically, as well as wound factors, and consider an alternative product or systemic antibiotic treatment.

Table 4: Products Available in New Zealand to Disrupt/Manage Biofilms Adapted from Wounds UK.(20) For additional product information the Silver Chain Wound Care Manual is recommended. (21)

Active control	Mode of delivery	Rationale for use	Guidance for use
Iodine Povidone iodine Cadexomer iodine	Solution, cream, ointment, spray, or impregnated dressings	Localised or spreading infection. To prevent wound infection or recurrence in susceptible patients. Rapidly kills microorganisms and suppresses biofilm formation.	Dress 2-3x weekly If not improving at 10-14 days, re-evaluate and review change of dressing regime
Medical (UMF) grade honey	Liquid, gel sheet, impregnated dressing, barrier cream	Autolytic debridement Impede biofilm formation and disrupt established biofilm Reduce odour Decrease wound related pain and inflammation	Not suitable for highly exuding wounds. Ensure direct contact with wound bed Secondary dressing required *Caution bee venom allergy
Octenidine dihydrochloride	Solution and gel (gel used as a dressing)	Cleanse and decontaminate wound. Manage wound bioburden/biofilm Autolytic debridement Donate moisture to wound	Solution: leave on 5 min. Apply solution to wound bed, leave for 5 minutes. Can be used to soften adhered dressings
Polyhexamethylenebiguanide (PHMB)	Solution, gel, impregnated dressings, and debridement pad	Cleanse/decontaminate wound Suppress biofilm formation Reduce wound odour Manage wound bioburden	Solution: leave on 10-15 min. Gel: can be used in cavities. Pads used for conservative debridement
Super oxidised solution of hypochlorous acid and sodium hypochlorite	Gel, solution	Moist healing environment Physical kill of bacteria Reduces inflammation	Apply spray close to wound Do not rinse off
Polymeric	Hydrophilic urethane matrix contains mild, nontoxic wound cleanser and surfactant	Moisturiser Soothing – reduce pain Includes a silver version	Cavity and flat foam dressing
Silver: Metallic, Nano-crystalline, Ionic	Impregnated dressings	Manage wound bioburden Provide antimicrobial barrier Reduces inflammation	Some dressings require wetting to activate Silver, follow manufacturer instructions. Use for 2 weeks, can be used up to 4 weeks if improving, otherwise re-assess
Monofilament pads/wands(22)	Mechanical action	Breaks down and removes wound debris and skin flakes and keratosis. Disrupts and removes biofilm	Should be used moist and may be used in conjunction with antimicrobial cleansing solutions which contain a surfactant

10. Wound Debridement:

Wound debridement and peri-wound skin care is an essential part of wound bed preparation and aims to remove non-viable tissue and disrupt established and forming biofilm. (2,10,23,24) Non-viable tissue and biofilm delay wound healing and provide a focus for infection, prolong the inflammatory response and obstruct wound re-epithelialisation and contraction. Biofilm can also form in peri-wound skin debris, hence it is important the wound bed and peri-wound skin, up to 10-20cm surrounding the wound, is cleansed to remove loose tissue, exudate and skin scales using an antiseptic or antimicrobial wash or surfactant solution.(10) (see Figure 4) Attention to the wound edge, such as shaving callus and hyperkeratosis, removing rolled-under and devitalised tissue will facilitate wound advancement.(10)



Figure 4: Pre and post skin cleansing to remove surface contaminants and skin scales.

Debridement should be performed more than once to reduce the impact of biofilm reformation, initially at least every 72 hours if not 48 hours.(2,23) To aid biofilm removal it is recommended debridement leads to pinpoint bleeding as tolerated by the patient (see Figure 5.(10) Ongoing wound assessment will determine what level of debridement is required and when it is no longer needed. It is paramount that products which disrupt biofilm reformation are used (see Table 4).

Debridement Considerations

- Healability of the wound and patient condition.
- Patient safety and informed consent.
- Inform the patient they can stop the procedure at any time.
- Healthcare professional knowledge and skill level.
- Adhere to local debridement / wound care policies and protocols.
- Patient participation (e.g. washing/showering the wound and surrounding skin).
- Environment and resources (e.g. lighting, magnifying devices assist with more accurate assessment and debridement, safe body positioning).
- Prevent cross-infection (hand hygiene, PPE, sterile equipment, and dressings).
- Manufacturers' instruction should always be followed along with local policies and procedures.
- In larger complex wounds debridement may be achieved over a period of days or weeks.
- Adequate perfusion to aid wound healing.

- Avoid debridement that causes any pain in autoimmune disorders such as pyoderma gangrenosum.
- Pain management.
- Identified devitalised tissue and structures (e.g. tendon, bone).
- Risk of bleeding (anatomical areas, bleeding disorders and anticoagulant therapy).
- Risk of infection in immunosuppressed patients.
- Wounds located on the feet, hands, and face require specialist involvement to ensure safe and effective treatment.
- Avoid debridement on stable, hard, dry eschar in ischemic wounds on the lower limb/feet(25).



Devitalised tissue should be removed at each dressing change.

Forefoot debridement causing pinpoint bleeding.

Figure 5: Debridement



Autolytic debridement: a hydrogel has softened the non-viable tissue on a chronic burn injury.

Conservative debridement: metal forceps were used to remove the slough causing no bleeding or pain. A dressing was used to further debride the firm slough.

Figure 6: Autolytic and Conservative Debridement (photos taken the same day).

Methods of Debridement

Debridement methods will depend on the skill level and competency of the registered health professional. To help guide practice Table 5 lists debridement options, methods and the level of skill recommended.

Table 5: Debridement Description and Methods

Debridement Description and Methods	
Autolytic: Slowest method using wound products to provide moisture donation, a highly selective process involving macrophage and endogenous proteolytic enzymes which liquefy and separate necrotic tissue and eschar from healthy tissue. Autolytic debridement may be further facilitated by scoring eschar.(10,24,26)	
Autolytic Methods	Skill Level
Dry Necrosis: use moisture denoting products e.g. hydrogels, enzymatic, hydrocolloids, combination dressings including soft silicones, polyurethane films.	Low
Moist to Wet Non-Viable Tissue: use wound products to aid debridement and obtain moisture balance, e.g.: antimicrobials (see Table 4), enzymatic, alginates, hydrofibers, cellulose dressings, foam dressings, and composite dressings.	Low
<i>Practice point: Autolytic debridement with occlusive dressings is contraindicated for infected wounds. Dressings that support autolytic debridement should not be left in place for longer than 3 days so that the progression of wound debridement and any onset of infection can be closely monitored.</i>	
Mechanical: Physical force is applied to the surface of the wound to disrupt and remove non-viable tissue and debris. (10,24)	
Mechanical Methods	Skill Level
Monofilament wands and pads(22), gauze or antiseptic sponges, to break down and remove wound debris, skin scales and keratosis.	Low
Dry, or wet to dry, gauze dressings: this can be painful and is not recommended with newer options available.	Low
Pressure irrigation, pulsed lavage, hydrotherapy, low frequency ultrasound	Moderate
Sharp: Includes surgical and conservative debridement. (10,24,27)	
Sharp Methods	Skill Level
Sharp using scalpel and scissors under topical or general anaesthetic to viable bleeding tissue. Usually performed in theatre or specialist clinic.	High
Conservative using scalpels, curettes, scissors, and forceps causing minimal pain or bleeding. See Figures 5, 6 and 7.	Moderate to High
Biological: Use of sterile larvae (from <i>Lucilla Seratica</i>) which selectively remove non-viable tissue through excretions and secretions of proteolytic enzymes and mouth hooks which liquefy and ingest non-viable tissue and bacteria.(28).	Moderate



Note necrosis is naturally separating at the skin and wound edge. Advise the patient the wound may appear deeper or larger when non-viable tissue is removed.

Conservative sharp debridement, using a forcep and blade to remove the dead tissue causing no pain.

Post debridement with no bleeding. A hydrogel was used to soften and deslough the wound bed.

Figure 7: Conservative Sharp Debridement

RECOMMENDATION: For additional practice information we advise reading: (22)

Murphy C, Atkin L, Swanson T, Tachi M, Tan YK, Vega de Ceniga M, Weir D, Wolcott R. International consensus document. Defying hard-to-heal wounds with an early antibiofilm intervention strategy: wound hygiene. *J Wound Care* 2020; 29(Suppl 3b):S1–28.

11. Future developments

New approaches to wound care and treatments have been and continue to be investigated. These include gene expression profiling.(29) Wound dressing products derived from animals, advanced interventions and technologies and therapies are already in use. Access to patient genetic data by clinicians in future treatments will play a major role in determining wound outcomes not previously utilised. (28)

12. Summary

At the time of publishing, this advisory document contains the most up to date evidence available around the area of wound bed preparation; however, new products and methods are constantly coming into the market and need to be evaluated as to their effectiveness and acceptability to health professionals and patients. What remains constant is the need for holistic and comprehensive wound assessment. Wound bed preparation is undertaken by health professionals, such as Registered Nurses working in New Zealand, who are managing/overseeing patient care. They require to have the knowledge and skills to provide safe and effective wound care.

Appendix 1

Recommendations for Wound Debridement undertaken by Nurses in New Zealand. (29)

The purpose of the New Zealand Wound Care Society advisory document is to provide robust, evidence-based advice on wound bed preparation for clinicians to use in practice. In regards to conservative sharp, surgical sharp and ultrasonic wound debridement these types of debridement involve clinical knowledge and skills that need to be acquired, and are attached to relevant rigorous competency and education programmes alongside mandatory clinical preceptorship. This document does not credential the nurse to undertake these types of debridements in clinical practice.









Credentialing is the responsibility of the employing organisation of the nurse. The competence framework for the domains of practice can be found on the Nursing Council of New Zealand / Te Kaunihera Tapuhi o Aotearoa website. The purpose of Nursing Council, working under The Health Practitioners Competence Assurance Act (2003) is to regulate nursing practice and ensure the competence of the nurse, in order to protect public safety.

There is currently (as at 2020) no wound debridement algorithm for nurses in New Zealand and the subject has been ad hoc, relying on international publications to guide practice. Conservative sharp wound debridement is currently undertaken by healthcare professionals, with a current Annual Practising Certificate, who have had their competence framework to practice assessed in their respective working environments, alongside clinical mentoring and supervision.

A suggested pathway for Registered Nurses with a current Annual Practising Certificate, wanting to undertake conservative sharp and ultrasonic wound debridement is to explore options to expand their practice. This could include undertaking postgraduate level 8 study in biological science for practice, and a specialty practice wound care paper to achieve a Post Graduate Certificate in Health Science. Additionally, extensive experience in wound care nursing and clinical supervision in conservative sharp wound debridement by a qualified mentor such as a Nurse Practitioner, Wound Clinical Nurse Specialist or Vascular/General Surgeon. Attendance at wound debriding courses are encouraged to expand knowledge (attendance does not mean you are clinically able to perform debridement). The employing organisation will need to credential the nurse, however there is currently no framework associated with competency for conservative sharp wound debridement in New Zealand.

The act of conservative sharp wound debridement remains the responsibility of the individual nurse under the governance of their employers own credentialing policy, to ensure practice is safe, competent, repeatable, and within the confines of the nurses' advanced knowledge, skill acquisition and scope of practice.

Appendix 2: Wound Product Selection Guide for Chronic Wounds (Adapted). (31)

ALERT: Any pressure related wound requires pressure relief. This includes diabetic foot ulcers. Wounds located on the lower leg or foot should have a vascular assessment (e.g. ABPI/TBPI) before compression is commenced.				
Wound Type		Aim of treatment:	Aim of primary dressing:	Secondary dressing:
Healing Wound		-Protect and encourage epithelialisation/granulation	-Low adherent to prevent damage to wound bed and/or hydrocolloid to enhance moisture balance and encourage epithelialisation	-Island dressing if using non-adherent primary -Absorbent pad
Dry Eschar		-Conserve eschar in dry state to encourage healing beneath, or if ischaemic, until surgical review.	-To protect and keep wound dry and inhibit infection i.e. non-moisture donating anti-microbial wipe, dry gauze/ combine	-Soft pad, gentle cotton or tubular bandaging
Moist Eschar (edges)		-If signs of good perfusion evident (pink, intact surrounding skin) debride slough -Enhance autolytic debridement by scoring, ensure moisture balance	--Absorb moisture as autolysis takes place i.e. hydrofibre®/ hypertonic saline dressing/foam	-Foam -Absorbent pad See section on debridement
Slough-low exudate		-Promote autolytic debridement -Moisture balance -De-slough wound	-Donate moisture i.e. hydrogel or hydrocolloid -Cadexomer iodine, medical grade (UMF) honey, enzymatic debride	-Hydrocolloid -Foam -Simple absorbent pad
Slough-moderate to high exudate		-Accelerate autolytic debridement/absorb exudate.	-Moisture reduction, prevent maceration -infection prevention i.e. hydrofibre, foam, hypertonic saline dressing, cadexomer iodine, Manuka UMF honey	-Foam -Absorbent pad See section on debridement
Clinically infected-mod/high exudate	 	-Reduce local bacterial load -Accelerate autolytic debridement/absorb exudate Disrupt biofilm -Systemic antibacterial treatment if indicated	-Contain/control exudate -Surfactant cleanser & monofilament wand/pad -Prevent maceration -Reduce bacterial burden i.e. silver dressings, hydrofibre®, foam, hypertonic saline dressing, cadexomer iodine, medical grade (UMF) honey,	-Contain exudate -Simple absorbent pad -Extra absorbent pad eg SAG technology
Malodorous/fungating-moderate/high exudate		Establish if palliative wound -Manage odour//absorb exudate -Manage bleeding -Address pain	-Absorb odour & exudate -charcoal dressing -Control infection (bacterial or fungal) silver hydrofibre® and foams, calcium alginates, absorbent foam pads to reduce dressing frequency (dispose of dressings promptly to reduce room odour) Topical anaesthetic preparations as prescribed	-Simple absorbent pads changed frequently -Super absorbent pad if changed less frequently Consider referral for, or biopsy to establish aetiology and potential surgical intervention

Definitions

Autolytic - The breaking down of cells or tissues by their own enzymes. Also called self-digestion.

Angiogenesis - Process of vascularisation of tissue involving development of new capillary blood vessels.

Arterial insufficiency - Reduced arterial blood flow in the artery due to narrowing of the lumen leading to ischaemia.

Bacterial bioburden – The presence of bacteria that is sufficient to delay or stop wound healing without causing the classic inflammatory signs and symptoms of infection.

Biofilm – A biofilm is described as an aggregate of bacteria tolerant to treatment and the host defence.

Cleansing solutions – Wound cleansing solutions include sterile normal saline, sterile water, potable water, commercial cleansing agents containing surfactant, and topical antiseptics.

Competence - The combination of skills, knowledge, attitudes, values, and abilities that underpin effective performance of a health professional.

Credential - A qualification, achievement, quality, or aspect of a person's background, especially when used to indicate their suitability for something.

Conservative sharp wound debridement - The removal of loose avascular tissue without pain or bleeding.

Debride – Involves the removal of non-viable tissue on a wound bed to promote wound healing.

Delayed healing – Occurs when there is minimal or no change in wound size after 4 weeks of treatment.

Epithelialisation – Takes place following the formation of granulation tissue in the base of the wound and occurs as epithelial cells migrate across this new tissue to form a barrier between the wound and the environment.

Eschar, dry stable – Firm, dry necrotic tissue with an absence of drainage, oedema, erythema or fluctuance. It is black or brown in colour and is attached to the wound edges and wound base.

Eschar, soft boggy – Soft necrotic tissue, which is black, brown, grey, or tan in colour. It may be firmly or loosely attached to the wound edges and wound base. Fluctuance and drainage may be present.

Exudate - Liquid material composed of serum, fibrin, cellular debris and white blood cells that escapes from the tissues into the wound. Can be serous, haemoserous, sanguineous or purulent.

Fungating – A wound with cancerous or non-cancerous rapidly growing tissue which is generally cauliflower-like in appearance.

Gangrene – Death or decay of body tissue which may involve bacterial infection. Is usually due to loss of blood supply to the affected area and can be wet or dry.

Granulation tissue – New connective tissue and tiny blood vessels that form on the wound bed during the healing process. It appears as firm, red, moist, pebbled healthy tissue.

Healable wound – Wounds are healable when the cause can be treated, there is adequate blood flow for healing and risk factors that impede healing can be mitigated. Normal wound healing occurs

in a predictable trajectory. However wound healing trajectories can be heterogeneous and non-uniform and some wounds present with a prolonged wound healing trajectory.

Hypergranulation tissue – Granulation tissue which is in excess of what is needed for healing. Presents as beefy red, moist tissue that extends above the level of the skin (proud flesh) and is caused by excess moisture in the wound, friction on the wound surface, infection, or a foreign body in the wound. Delays wound healing by preventing or slowing epithelial cell migration across the wound surface.

Infection – A disease in a part of your body that is caused by bacteria or a virus.

Ischaemia - Deficiency of blood caused by functional constriction, or obstruction of, a blood vessel to a part.

Maceration - softening and breaking down of skin or wound surface resulting from prolonged exposure to moisture/fluid.

Maintenance wound – A potentially healable wound that is not healing/slow-to-heal due to patient, wound and/or health system barriers.

Necrosis - death of tissue.

Neuropathy - functional disturbance and/or pathological changes in the peripheral nervous system.

Non-healable wound – Wound not able to heal due to insufficient blood supply, an inability to treat the cause of the wound (malignant wounds) or an inability to treat factors impacting wound healing (immune compromised patient).

Non - touch Aseptic Technique – Technique used to limit the transfer of microorganisms from one person to another by minimising the microbe count and preventing cross contamination; includes sterile, no-touch and clean technique. The technique chosen is based on the clinical condition of the client, aetiology of the wound, location of the wound, invasiveness of the procedure, goal of care and agency policy.

Oedema- Presence of abnormal amounts of fluid in intercellular tissue spaces.

Peri-wound - The area of skin around a wound.

Potable water – Tap water that is deemed safe to drink by local water authorities.

Sharp wound debridement - A surgical procedure that uses scissors, scalpels and other sharp instruments to cut away or remove infected/non-viable tissue. It improves the wound's appearance and promotes enhanced healing.

Slough - Soft, moist necrotic tissue, brown, tan, yellow or green in colour. May be thin or thick and consistency may be fibrous, stringy, or mucinous. Is firmly or loosely attached to the wound edges and base.

Wound cleansing - Removal of dirt, loose metabolic waste, or foreign material.

Wound debridement - Removal of adherent, dead or contaminated tissue from a wound inclusive of necrotic material, eschar, devitalised tissue, serocrusts, infected tissue, hyperkeratosis, slough, pus, haematomas, foreign bodies, debris, bone fragments or any other type of bio-burden from a wound with the objective to promote wound healing.

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