Evidence-Informed Nursing Clinical Practices for Wound Debridement

An overview of wound assessment and debridement options

ABSTRACT
Debridement, a mainstay of nursing clinical practice, refers to the removal of dead or unhealthy tissue from a wound to facilitate healing. Debridement is one component of the concept of wound bed preparation that has long guided the approach to wound management. The ability of a wound to heal must be determined prior to the initiation of any method of debridement. In areas where high-quality, comparative studies on the relative benefits of different debridement modalities are lacking, nurses should adopt an evidence-informed approach to care. To do this, nurses must understand the importance of following a comprehensive, holistic approach when treating chronic wounds. Nurses should have knowledge of inflammation and infection control and of the fundamentals of moisture management, recognize the need for debridement in healable wounds, and be familiar with different debridement options. This article provides nurses with a wound management framework, an overview of wound debridement options based on the potential for wound healing, and scope of practice considerations for developing a plan of care. A composite case is presented to illustrate the critical considerations in wound care.

Keywords: evidence-informed practice, interprofessional team, nursing competency, scope of practice, wound debridement modalities

Depending on the goals of care and the status of the wound, debridement may be included in the wound care plan. Debridement is defined as the removal of devitalized (nonviable) or contaminated tissue from or adjacent to a wound to aid healing.[1] Assessment of the wound bed, including visualizing and documenting the percentage covered by nonviable tissue, is important in evaluating the effectiveness of the care plan. For example, a decrease in percentage of nonviable tissue may indicate the wound is progressing well toward healing, whereas an increase may indicate the treatment plan is not working and debridement may need to be considered.

Devitalized tissue can range in color from white or yellow (slough) to brown or black (eschar). It can be soft or hard depending on the moisture level within the wound, and can range from loose and stringy and easy to remove to adherent to the wound bed and difficult to remove.[2] See Figure 1 for examples of how necrotic tissue may appear within a wound.

Debridement is also necessary to remove debris and bacterial colonies (biofilms) from the wound bed, helping to promote an optimal environment for healing.[3] This is especially important as biofilms can penetrate deep within tissues and have increased tolerance for anti-infective agents. Wounds can stall in the inflammatory state, and nonviable tissue, foreign debris (such as leftover dressing material), and the presence of bacteria impede the wound's ability to progress through the phases of healing in a timely manner.[4]

There are many methods of wound debridement, the most common being autolytic, mechanical, enzymatic, biological, conservative sharp, and sharp surgical. Nurses need to be aware of the interventions within their scope of practice as determined by their nursing regulatory body as well as any pertinent organizational policies. While newer, more advanced debridement methods, including hydrosurgery or low-frequency ultrasound, may save the nurse time in preparing the wound bed, there remains a need for

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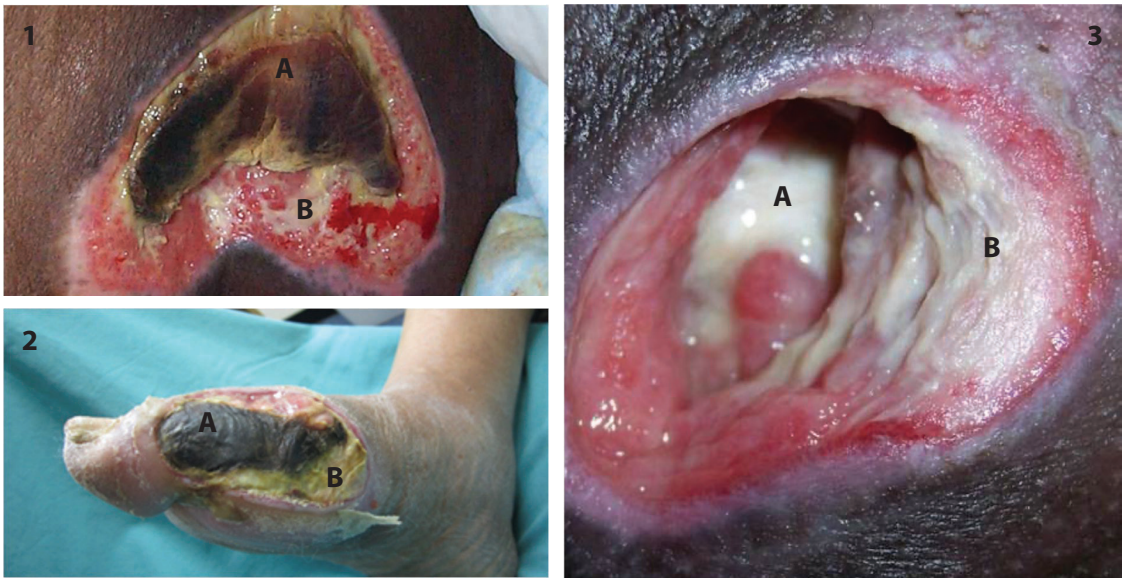
Figure 1. Necrotic Tissue and Slough



1A: Black eschar undergoing autolytic debridement, turning to soft brown eschar; 1B: white/yellow, adherent slough. 2A: Dry, hard black eschar; 2B: dry, soft, yellow adherent slough. 3A: White loosely adherent slough; 3B: white adherent slough. Figure 1.1 reproduced with permission of Elizabeth A. Ayello. © 2020 Elizabeth A. Ayello. Figures 1.2 and 1.3 reproduced with permission of WoundPedia. © 2020 WoundPedia.

better defined patient safety parameters.[5] Whether applying a dressing (foams, alginate, or gelling fibers) that promotes autolytic debridement or using forceps and a scalpel to remove nonviable tissue, the nurse must also take into account patient preferences.[6] Overall, goals of care should consider potential benefits versus risks, as well as the environment, and above all nurses must work within their scope of practice.[6]

This article focuses on debridement, an essential component of local wound care. It discusses important parameters when conducting a wound assessment, including the need for debridement, and provides an overview of debridement methods. It is not intended to guide practice or teach nurses how to perform debridement. It does not replace the need for foundational education in wound management or clinical judgment.

DEVELOPING A PLAN OF CARE

For more than 20 years, skin and wound care clinicians worldwide have incorporated the wound bed preparation (WBP) framework into practice.[7-9] This framework was developed by an international interprofessional panel of key opinion leaders specializing in the field of chronic wound management to provide clinicians with a holistic, evidence-informed approach when caring for chronic wounds. As with many frameworks, WBP has evolved over the years as new evidence emerges and clinical practice changes. The most recent version of the WBP framework was updated in 2024 (see Figure 2).[10] The WBP framework can be used to guide clinicians to first identify and treat the underlying cause of the wound; address patient and family concerns; and establish whether the wound is healable, maintenance, or nonhealable, as defined in Table 1.[10] Once wound healability is established, goals for care and consent should be determined with the patient and the family before local wound care, including debridement, can be evaluated. Debridement is generally reserved for healable wounds.

When developing a plan of care, local wound care should include controlling for inflammation and infection and ensuring appropriate moisture balance. For healable wounds, a moist environment can prevent nonviable tissue from accumulating, thereby avoiding the need for debridement. However, when nonviable tissue persists, debridement is an important component of local wound care. It is crucial to keep in mind that all methods of debridement have contraindications and a risk of complications.[6] Therefore, it is important to ensure that a comprehensive assessment is conducted by a qualified clinician to determine wound healability. Using WBP as a systematic approach to wound assessment can provide nurses with a standardized approach to wound treatment planning.[10]

An interprofessional wound team approach can optimize outcomes.[6,11] Assessing one's scope of practice is paramount when engaging in wound care, and it is equally important to know the roles of the various health care disciplines required for each circumstance to ensure that the patient receives timely and appropriate coordinated care, including referrals when necessary. Recently published best practice recommendations (based on a rigorous scoping review) advise that any nurse performing conservative sharp debridement should first complete a recognized, advanced, curriculum-based education program specific to debridement.[6] Previous education in advanced wound management and completion of a preceptorship component are also recommended. Bedside nurses need to involve members of an interprofessional wound team to address all external, systemic, and local factors related to healing the wound and selecting optimal wound dressings. The nursing process includes assessing, planning, implementing, and evaluating all interventions, and involvement of an interprofessional team should be considered when planning all wound care.

CASE STUDY

A 67-year-old man has a medical history including rectal cancer and recently diagnosed type 2 diabetes. (This case is a composite based on our experience.) He works at a local hardware store and is on his feet most of the day. He smokes one pack of cigarettes a day. The patient lives alone in an apartment, and a recent fall caused an injury to his calf resulting in an open wound. He has been attending the wound clinic twice a week for six months, although his work schedule makes it a challenge to attend all his clinic appointments. His wound is on the lower lateral aspect of his right calf and is round with a punched-out appearance. A lower leg assessment performed six months ago measured an ankle-brachial pressure index (ABPI) of 0.6 and pedal pulses were palpable. Normal ABPI is between 0.9 and 1.4.[11] Currently, there is erythema around the wound, and he finds the wound very painful. The leg has a white pallor when raised and his foot is cold to the touch. Povidone iodine was applied to the wound, as there were clinical signs of reduced perfusion (the pallor on elevation and foot cold to the touch, for example) and signs of superficial infection (it was a nonhealing wound, 2 cm of surrounding erythema, increased pain). Povidone iodine kills bacteria that may inhibit wound healing. In this instance, this is appropriate, as this wound is considered maintenance until further vascular assessment can be performed and increased bioburden managed (reducing bacterial burden is more important than tissue toxicity at this point). It would be imperative to obtain recent blood work to ensure the patient's glycated hemoglobin (HbA_{1c}) is conducive to healing, as elevated blood

Figure 2. Wound Bed Preparation Paradigm

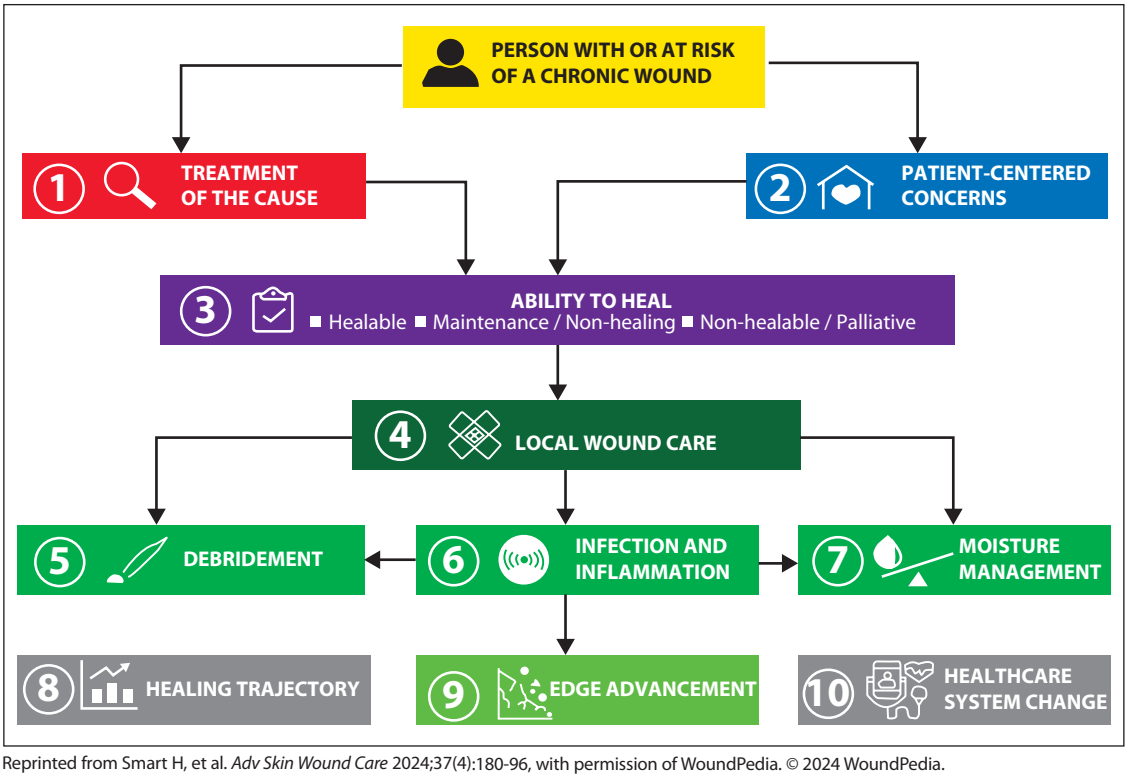


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Table 1. Definitions of Healing Status

Wound Healing Classification	Definition
Healable	Wounds have the physiological capacity to heal (all underlying disease processes are controlled) and the patient can adhere to the recommended care plan.
Maintenance	Wounds have the physiological capacity to heal (but underlying disease processes are not controlled); however, the patient does not have the ability to adhere to the parts of the care plan that are required for their wound to heal, or the health care system does not provide the necessary components of care.
Nonhealable	Wounds do not have the physiological capacity to heal, and the underlying disease cannot be corrected.

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sugar can impact wound status (a healable wound becomes maintenance, for example).

METHODS OF DEBRIDEMENT

All methods of debridement can pose a risk of complications. Conservative sharp wound debridement or sharp surgical debridement (scalpel or scissors, for example) poses the highest risk.[6, 12] For all wounds below the knee, regardless of etiology, measuring vascular blood supply using bedside tools, including an ABPI test or handheld Doppler waveform, is necessary to determine healability.[11, 13] This step should be mandatory for all initial patient assessments. Healability also depends on correcting underlying conditions. For instance, people with diabetes and high HbA_{1c} (over 12%) may be considered nonhealable. This is because glucose has a high affinity for hemoglobin,[14] and abnormal hemoglobin mutations are subject to lower oxygen affinity (as in, for example, sickle cell disease or thalassemia). Oxygen's affinity for hemoglobin decreases with age.[15] In this case study, vascular status (blood flow) may be sufficient, but perfusion (oxygen transfer) is often lacking, especially in the small vessels. Smoking just one cigarette can reduce vascular flow by up to 40% for 90 minutes; therefore, an entire pack will impair blood flow throughout the whole day, significantly affecting perfusion.[16] Other important factors to consider are patient preferences, limitations of the setting (whether a patient residence or medical facility), nurses' scope of practice, risk versus benefit, and the impact on health system resources. The debridement methods are defined and examples of each are provided in Table 2.

Autolytic. Autolytic debridement is an acceptable but slower method of debridement for uncomplicated wounds with localized necrotic tissue. Advanced wound care dressings promote or facilitate autolytic debridement and maintain a moist wound bed. These dressings have become a mainstay of treatment and are commonly used in practice. Autolytic debridement is a natural process where the body's endogenous enzymes and phagocytic cells (such as macrophages) selectively break down the nonviable tissue.[3] Autolytic debridement using advanced dressings enhances the body's natural process of healing. Calcium alginates, hydrocolloids, hydrogels, films, or foams are examples of advanced wound dressings and can be used depending on the wound characteristics.

Mechanical. This method involves using an external force to remove nonviable tissue. Mechanical debridement can be performed in a variety of ways. Proper wound cleansing via irrigation or abrading technique are simple ways of applying mechanical debridement.[17] Using dressings to remove dead tissue by applying them wet and allowing them to dry often causes pain on removal. This method of debridement is nonselective and can damage healthy tissue. Therefore, wet-to-dry dressings are no longer recommended for debridement.[6, 18]

Enzymatic. These preparations contain proteolytic enzymes that selectively break down necrotic tissue. As they are considered pharmacological treatment, they require an order from a prescriber. The enzymatic agent is most effective when applied daily according to the manufacturer's instructions. This method is relatively slow compared to conservative sharp/sharp surgical debridement and requires more visits and additional nursing time, increasing the cost of care. The price of these agents varies, and the wound must be covered with a secondary dressing. Refer to the manufacturer's instructions for specifics about cleansing and secondary dressings.

Biological. Maggots (fly larvae) can be applied to the wound free range or contained within a mesh-type sachet.[19] Patients with sensation intact can feel the maggots moving or experience local pain and may be hesitant to allow this approach. This method requires confirmation that the maggots are contained within the wound bed (see Figure 3). It is crucial to ensure that all maggots are removed from the wound bed once therapy is completed.

Conservative sharp/sharp surgical. Conservative sharp and sharp surgical debridement methods are reserved for nurses and other health care professionals

with advanced education and experience in chronic wound management and debridement. Even if debridement is within their legal scope of practice, nurses need training to achieve the knowledge, skills, judgment, and attitude to safely perform this type of debridement.[6] The ability to differentiate all types of tissue and underlying anatomy is essential as sharp instruments are being used to cut away dead and sometimes viable tissue. This includes scalpels, scissors, hydrosurgical equipment, or other equipment that removes the dead devitalized tissue.[20] While many nurses may perform conservative sharp debridement, sharp surgical debridement is generally reserved for physicians or other health care professionals with formal surgical training.[20]

If the goal is not to heal the wound, such as in a patient who doesn't have the ability to heal, active debridement may be needed to reduce bacterial load, but not down to bleeding viable tissue.[20] Conservative sharp debridement has more flexibility, as it doesn't require the same level of equipment and resources as sharp surgical technique. Conservative sharp debridement can be performed carefully in community settings. Some examples include an outpatient setting–clinic, clinician's private office, or even the patient's home if the environment is safe and has good light-

Table 2. Definitions of Debridement Modalities

Modality	Definition	Examples
Autolytic	Autolytic debridement is facilitated by moisture-donating and/or moisture-retaining dressings to enhance the body's natural process of removing nonviable tissue.	Dressings with a semipermeable or occlusive backing will usually support moisture balance for healable wounds (not too dry and not too moist) where maceration of the wound margin may lead to a stalled or worsening wound. Hydrogels are intended to add moisture directly.
Mechanical	Mechanical debridement includes physical methods of removing tissue, such as allowing a wet dressing to dry, so it pulls the tissue out of the wound with its removal, or abrading the wound with gauze or a microfiber pad.	Wet-to-dry gauze or methylene blue and gentian violet polyvinyl alcohol foam will facilitate autolytic debridement due to the foam sticking to the wound surface. Polyurethane foams work by absorbing fluid and then returning some for moisture balance. Abrading or irrigating wounds with surfactant-based solutions (such as normal saline with 1% betaine) is done to remove biofilm.
Enzymatic	Enzymatic debridement is the introduction of proteolytic enzymes to the wound bed to cleave the collagen strands of the necrotic tissue.	Collagenase is the only agent approved by the FDA and Health Canada for this type of debridement.
Biological	Biological debridement is the placement of sterile, medical-grade larvae into the wound to soften, liquify, and digest soft nonviable tissue and bacteria to promote wound healing.	Medical-grade larvae is supplied by companies with appropriate national licensing for importation and distribution. The larvae may be free range or in sachet (contained) form.
CSWD	CSWD debridement is the removal of clearly identifiable, nonviable tissue (this includes senescent cells and bacteria) with sterile sharp instruments (should not provoke bleeding or extend to viable tissue).	Sterile scalpels, curettes, scissors, and forceps.
Sharp Surgical	Sharp surgical debridement may include the removal of both viable and nonviable tissue down to healthy bleeding tissue to promote healing and create a clean wound bed that facilitates healthy tissue granulation. This method should only be performed in a facility or setting with the equipment required to handle any ensuing emergency, such as an arterial bleed.	Sterile scalpels, curettes, scissors, and forceps.

CSWD = conservative sharp wound debridement; FDA = Food and Drug Administration.

ing. The ability to optimally position the patient is an important consideration to ensure equipment sterility can be maintained and to prevent strain or injury to the patient and the clinician.

Regardless of where debridement is performed, pain management is essential when cutting away the dead wound tissue. Sharp surgical is the quickest way to do this and is recommended by experts as the first-line method when clinically appropriate.[10, 20] This procedure requires a patient's documented consent. Patients should always be given a full explanation of the associated benefits; potential alternative treatments; and risks, including bleeding or pain.

Assessing the need for debridement is paramount when caring for chronic wounds, and it is important that nurses determine the necessity of sharp surgical debridement and can recognize the need for referral to a skilled clinician.

Figure 3. Maggot Debridement Therapy

Heel ulcer with osteomyelitis in a middle-aged woman with diabetes who was being treated with immunosuppressants following a kidney transplant 27 years earlier. A: Healable heel wound with about 40% slough on the surface. B: Surface of the wound covered with sterile maggots to facilitate debridement. C: Majority of confluent debris removed after first application of maggots. D: Wound is 95% healed. Photos reproduced with permission of the BioTherapeutics, Education & Research (BTER) Foundation. © BTER Foundation.

EVIDENCE-BASED VS. EVIDENCE-INFORMED DEBRIDEMENT

It is important to distinguish between evidence-based and evidence-informed practice, as the nursing profession often relies on evidence-informed recommendations and guidelines, especially when high-quality evidence is lacking. Evidence-informed practice uses all available evidence but also includes patient preference, nursing experience, and nursing expertise.[21] Because the debridement process is influenced by the type and location of the wound, stage of healing, and whole patient cofactors (such as other medical conditions, drugs), evidence-informed practice continues to be the gold standard.

High-quality evidence supporting the use of debridement is lacking. This was noted by Stott and colleagues in their summary of the findings of the Cochrane review by Gethin and colleagues examining venous leg ulcer debridement.[22, 23] In 2020, Wormald and colleagues published a Cochrane review of hydrosurgery in burns.[24] Only one randomized controlled trial met their inclusion criteria, with results from 61 pediatric patients. Other systematic reviews have been published on larval therapy,[19, 25] ultrasound-assisted debridement,[26, 27] and collagenase.[22, 28, 29] In these reviews, a very minimal number of studies (range, four to 22) met the inclusion criteria.[19, 22, 24-29] There is still much work to be done to obtain high-quality evidence.

According to Thomas and colleagues, who published a narrative WBP debridement review, the strongest evidence supports biological debridement using maggots.[5] More recent descriptions appear in a continuing education article by Tran and colleagues on the technical consideration for debridement and its impact on the interprofessional team.[20] More high-quality studies are needed.

IMPACT OF KNOWLEDGE, SKILLS, AND JUDGMENT ON OPTIMAL SELECTION

In many countries, care beneath the dermis is a controlled or restricted act to be performed only by regulated health care professionals owing to the procedural potential for patient harm. Nurses must assess their state, provincial, or territorial nursing acts or legislation, as well as health care organizational policies, that provide information on the clinical

procedures they can or cannot perform and whether they are able to initiate or perform them with an order. While conservative sharp and sharp surgical debridement pose a higher level of risk, it is important for the nurse to remember that initiating autolytic debridement through application of a dressing on a lower limb that does not have the capacity to heal can have equally devastating effects. It is important to distinguish between conservative sharp and surgical sharp debridement. Surgical sharp debridement is largely left to advanced wound clinicians, often surgeons or physicians with procedure training in wound care, who work in a controlled setting where emergency management equipment is readily available.

A comprehensive patient assessment, including a focused vascular assessment, is essential for every wound below the knee regardless of etiology. The rate of peripheral arterial disease doubles in adults over the age of 70 and therefore this population should be assumed to have peripheral arterial disease until proven otherwise.[30] Smoking is another major risk factor for peripheral arterial disease. While performing an ABPI is a common component of a comprehensive lower limb assessment, it should never be used to make a diagnosis in isolation from other factors. An ABPI is considered unreliable in people with diabetes (owing to calcification at the blood vessel wall) since a falsely elevated value may be obtained.[13] Any person with diabetes and tissue loss may warrant a referral to a vascular surgeon; however, nurses can use a handheld Doppler to obtain the patient's audible waveform at the bedside. The arterial waveform sounds reflect changes in pressure over time. Multiphasic waveforms (biphasic or triphasic) indicate properly contracting vessels, whereas monophasic waveforms indicate that vessel function is not intact and likely influenced by calcification.[13, 31] Multiphasic waveforms are more likely to indicate an absence of peripheral arterial disease.[13] A handheld Doppler can be performed in less time as the patient can be seated in a chair, does not need to be recumbent for 15 to 20 minutes, and no pressure is applied to the calf muscle.[31] It is rare for nurses to fully interpret the findings of a lower leg assessment without advanced wound care knowledge, both theoretical and practical. Many generalist nurses are taught how to conduct the lower limb assessment, but it takes competency and experience to gain the ability to accurately interpret the findings.

Wound care is a specialized field of practice and requires targeted education. Knowledge of wound care and management strategies comes from successfully completing an advanced wound care education program. It is necessary for employers to ensure that nurses and clinicians have access to current research, guidelines, experience, and expertise in order to maintain current knowledge. One UK-based study reports that at least half of nurses engaged in wound care know debridement is the treatment of choice to remove necrotic tissue; however, 40% of nurses were unable to correctly identify the wound-healing phase.[32] A survey of nurses conducted in 2019 found that fewer respondents than in previous 2004 and 2012 surveys (28% in 2019, 30% in 2012, and 29% in 2004) knew whether nurses in their state or province were licensed to perform minor surgical debridement.[33] In the same surveys, about one-third of respondents (32.5% in 2019, 31.5% in 2012, and 30% in 2004) continued to report receiving sufficient education on evidence-informed chronic wound clinical practices in their core nurse programs.[33]

ROLE OF THE INTERPROFESSIONAL TEAM

Chronic wound management requires collaboration among various disciplines. For a primary nurse responsible for managing a patient with a chronic wound, it is imperative all factors are assessed, and disciplines are pulled into the circle of care in a timely fashion. In many cases, non–wound-related issues are the reason for delayed closure. To correct these impediments, the patient requires access to trained professionals within the issue-specific field.[34] For example, a person with chronic pain may require a chronic pain specialist or a person with mental health needs may require consultation with a psychiatrist prior to creating wound healing goals. Health care systems differ from country to country. Being a wound specialist not only involves having education and experience in wound management, but also requires in-depth knowledge of the respective health system and setting to ensure all individual patient needs can be met.[34] In addition, to access specialists, effective communication within the interprofessional team is equally important. Although research demonstrates that wound-related decision-making is best supported by the interprofessional team, there is little documentation about the interprofessional team's decision-making process.[35] It is important to include generalist nurses as part of the team, as they are responsible for the implementation portion of the nursing process and can report on the day-to-day wound status (progression, unchanged, or deterioration) and protocols. In cases where autolytic or mechanical debridement is ordered, the generalist nurse will be responsible for applying a dressing to facilitate wound debridement and monitoring the effects of the debridement. Therefore, it is important that all nurses participating in wound management obtain some degree of wound knowledge. There is also little evidence available on what factors guide nurses' clinical decision-making. One study identified the value in consulting and referring to an available interprofessional team for optimal patient care.[36] Generalist nurses should regularly assess and refer to the interprofessional team at the first signs of infection or wound deterioration.

Table 3. The NERDS and STONEES Mnemonics

Superficial Colonization/Infection	Deep and Surrounding Infection
Nonhealing wound	**S**ize is increasing
Exudative wounds	**T**emperature is increased
Red and bleeding granulation tissue	**O**s, probes to bone or exposed bone
Debris (yellow or black necrotic tissue)	**N**ew or satellite areas of breakdown
Smell or unpleasant odor from the wound	**E**rythema/edema (periwound area reddened or swollen)
	Exudate is increased
	Smell or unpleasant odor

Note: Pain is a symptom not a sign but can substitute for one sign if it is localized and not related to another factor, either superficial or deep.
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DEBRIDEMENT IN RESOURCE-LIMITED SITUATIONS

Chronic wounds are a global concern and a public health problem, especially in countries with limited resources.[37] Many regions within low- and middle-income countries do not have access to any health care let alone specialized care. In these settings, products or therapies may not be available and the primary focus of importance becomes measures to prevent the wound from further damage and thorough cleansing with an antiseptic solution to prevent infection.[38]

CASE STUDY FOLLOW-UP

The patient in our case study with a nonhealing lower leg wound would benefit from an interprofessional team approach. Following the WBP paradigm, we can determine the underlying cause of the wound, correct any modifiable underlying factors, appropriately manage the patient's concerns, and reassess vascular status for wound healability. The patient presents with a wound that is not on a healing trajectory and further signs of arterial insufficiency are present. His continued smoking contributed to his arterial demise. The patient was referred for a lower limb assessment, which concluded arterial insufficiency (ABPI, 0.3) and the wound was deemed nonhealable. The patient was referred to a vascular surgeon to assess for revascularization and to a smoking cessation program.

The mnemonic NERDS/STONEES (see Table 3) can be used by nurses to easily assess for signs of superficial or deep or surrounding infection.[39] The signs of vascular compromise should prompt referral for a segmental duplex lower-leg Doppler vascular assessment or vascular computed tomography angiogram. If the vascular assessment indicates adequate perfusion to the area of injury, then consider the patient's environment and circumstances to determine appropriate debridement options. Referral to the interprofessional wound team provides improved coordination of care and would reduce clinic visits, help achieve wound closure, and enable the patient to remain pain free provided they adhere to smoking cessation measures.

CONCLUSION

WBP is a systematic approach to facilitate wound healing that considers the cause, patient concerns, and healability prior to selecting the method of debridement. When debridement is clinically indicated, there are several options to consider that depend on patient preference, nurses' scope of practice, and the clinical setting. The nursing profession often relies on evidence-informed recommendations, especially when high-quality evidence is lacking. Evidence-informed practice relies on all available evidence, but also includes patient and nursing experience and nursing expertise. Generalist nurses should regularly assess the wound and refer to the interprofessional team at the first signs of infection or wound deterioration. ▼

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