

Caring for chronic wounds: A knowledge update

Wound care is a lot more sophisticated than it used to be. Here's what you should know about assessing and managing chronic wounds.

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Wound care has come a long way in just a few decades. With our expanded knowledge of wound healing and recent advances in treatment, we're now able to assess wounds more accurately, recognize wound-related problems sooner, provide better interventions, and reduce morbidity.

To bring you up to date on current evidence-based wound management, this article focuses on assessing patients with chronic wounds, optimizing wound healing with effective wound-bed preparation, and selecting an appropriate dressing.

Wound chronicity and cause

Developing an appropriate plan of care hinges on conducting a thorough, accurate evaluation of both the patient and the wound. The first step is to determine whether the wound is acute or chronic.

- A *chronic* wound is one that fails to heal within a reasonable time—usually 3 months.
- An *acute* wound heals more quickly,

causing minimal functional loss in the part of the body with the wound.

Identifying the cause of the wound also is essential. If the wound etiology is unknown, explore the patient's medical history (including medication history) for clues to possible causes. Also review the patient's history for conditions that could impede wound healing. (See *What factors hamper healing?*)

Other important aspects of assessment include evaluating the patient's nutritional status, quantifying the level of pain (if present), and gauging the patient's self-care abilities.

General physical appearance

Conduct a general head-to-toe physical examination, focusing on the patient's height, weight, and skin characteristics.

Height, weight, and weight trend

On admission, the patient's height and weight should be measured to ensure appropriate nutritional and pharmacologic management. After a weight gain or loss, various factors may complicate wound healing. For instance, involuntary weight loss and protein-energy malnutrition may occur in both acute-care and long-term-care patients.

Especially note trends in your patient's weight. For a long-term-care patient, a 5% weight loss over 30 days or a 10% loss

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over 180 days is considered involuntary. Arrange for a nutritional consult for any patient with an involuntary weight loss, as adequate nutrition is essential for general well-being and wound healing. (See *A wound on the mend.*)

Skin color

Evaluate the patient's skin color in light of ethnic background. If you note erythema—especially on a pressure point over a bony prominence—examine this area carefully for nonblanching erythema. Keep in mind that darkly pigmented skin doesn't show such erythema and subsequent blanching, yet the patient may still be in jeopardy. So in dark-skinned patients, check for differences in skin color, temperature, or firmness compared to adjacent tissue; these differences may signify skin compromise.

Skin texture and turgor

Generally, healthy skin feels smooth and firm and has an even surface and good turgor (elasticity). To test turgor, gently grasp and pull up a fold of skin on a site such as the anterior chest below the clavicle. Does the skin return to place almost immediately after you release it, or does it stand up ("tent")? Tenting indicates dehydration. But keep in mind that skin loses elasticity with age, so elderly patients normally have decreased turgor.

Skin temperature

With normal circulatory status, the skin is warm and its temperature is similar bilaterally. Areas of increased warmth or coolness suggest infection or compromised circulation. Be sure to check the temperature of skin surrounding the wound.

Wound assessment

Proper wound assessment can significantly influence patient outcome. Measure the wound carefully and document the condition of the wound bed. Remember that accurate descriptions are essential for guid-

A wound on the mend

In this healing wound, note the epithelialization around the wound edges. If drainage is present in a wound such as this, suspect bioburden and consider using an antimicrobial dressing, such as silver.



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ing ongoing wound care. Repeat wound measurement and wound-bed assessment at least weekly, after the wound bed has been cleaned and debrided.

Keep in mind that assessing a chronic wound can be challenging. Wounds commonly have irregular shapes that can change quickly. Also, the multiple clinicians caring for the same patient may each describe the wound a bit differently.

Wound location

Note the precise anatomic location of the wound, as this can influence the wound care plan. A venous ulcer on the lower leg, for instance, requires different care than an arterial ulcer in the same site or a pressure ulcer on the ischium.

Circumference and depth

Use a paper or plastic measuring device to measure wound circumference and depth in centimeters (cm) or millimeters (mm). To promote accurate assessment of healing, be sure to use the same reference points each time you measure the wound.

You can use several methods to meas-

What factors hamper healing?

A wound is a dynamic entity. The wound bed's microenvironment changes constantly, and various local and systemic factors may impair wound healing. To ensure an appropriate plan of care, check your patient's history and physical findings for factors that can impede healing, such as those described below.

Infection

Wound infection prolongs the inflammatory phase of healing and delays collagen synthesis, which in turn delays wound granulation and epithelialization. Previously, clinicians classified wounds simply as infected or not infected. Now we know there's a continuum ranging from wound contamination, colonization, and critical colonization (bacteria present on the wound surface but not penetrating viable tissue) to wound infection. Also, if the wound contains biofilms (polysaccharide matrices that envelop and protect the bacteria), antibiotic efficacy may decrease.

Poor tissue perfusion and oxygenation

Wound repair relies on cells receiving enough oxygen to fuel

their repair functions (specifically, collagen synthesis and epithelial proliferation and migration). Although phagocytic activity occurs in both hypoxic and oxygenated tissue, bactericidal ability depends mainly on oxygen. Necrotic tissue in the wound increases the need for phagocytosis and consequently oxygen. Tissue edema also limits its oxygen flow to the wound.

Excessive wound drainage

Too much wound drainage may impair healing by placing pressure on granulating tissue; also, the drainage may harbor bacteria.

Poor nutrition

Poor nutrition has many effects on the skin, tissues, and healing. An anabolic process, healing requires adequate amounts of proteins, calories, vitamins, minerals, and water. Thus, the patient needs to be in an anabolic state. Protein-energy malnutrition may occur if the patient is in a catabolic state (in which the body breaks down protein and energy stores).

Adequate nutrition also is important for collagen synthesis (which requires proteins, vitamin C, zinc, and iron), collagen

fiber cross-linking (which requires copper and B-complex vitamins), and production of energy for wound healing (which requires calories).

Diseases

Diabetes mellitus impedes wound-bed oxygenation and wound healing by causing angiopathic changes in vessels. Cancer, renal disease, and hepatic disease also may slow wound healing.

Medications

Corticosteroids' anti-inflammatory actions impede movement of neutrophils and macrophages into the wound. This makes the wound more susceptible to infection and slows healing, as macrophages attract the growth factors that stimulate collagen synthesis. Immunosuppressive drugs also affect the inflammatory response and can hamper healing.

Aging

With increased age, cell regeneration slows, which in turn leads to a decreased rate of wound contraction, impaired wound remodeling, and reduced reepithelialization.

ure circumference. The most commonly used method of measurement is done in the head to toe direction. Measure the wound at its greatest length in that direction & measure the width at a 90 degree angle, at the widest point of the wound. Then multiply these two measurements (greatest length x greatest width) to obtain the total wound area. Although such linear measurements are imprecise, they yield gross information relative to wound healing when repeated over time.

Classify wound depth as partial thick-

ness or full thickness.

- *Partial-thickness* wounds are limited to the skin layers and don't penetrate the dermis. They usually heal by reepithelialization, in which epidermal cells regenerate and cover the wound. Abrasions, lacerations, and blisters are examples of partial-thickness wounds.
- *Full-thickness* wounds involve tissue loss below the dermis.

(Note: Pressure ulcers usually are classified by a four-stage system and diabetic foot ulcers by a grading system. Both sys-

tems are beyond this article's scope.)

Measure and record wound depth based on the deepest area of tissue loss. To measure depth, gently place an appropriate device (such as a foam-tipped applicator) vertically in the deepest part of the wound, and mark the applicator at the patient's skin level. Then measure from the end of the applicator to the mark to obtain depth.

Surrounding skin and tissue

Inspect for and document any erythema, edema, or ecchymosis within 4 cm of the wound edges, and reevaluate for these signs frequently. Because compromised skin near the wound is at risk for breakdown, preventive measures may be necessary.

Appearance of wound-bed tissue

Document viable tissue in the wound bed as granulation, epithelial, muscle, or subcutaneous tissue. *Granulation* tissue is connective tissue containing multiple small blood vessels, which aid rapid healing of the wound bed; appearing red or pink, it commonly looks shiny and granular. *Epithelial* tissue consists of regenerated epidermal cells across the wound bed; it may be shiny and silvery.

Check for nonviable tissue (also called necrotic, slough, or fibrin slough tissue), which may impede wound healing. It may vary in color from black or tan to yellow, and may adhere firmly or loosely to the wound bed. (See *Picturing a necrotic wound*.)

Be sure to document the range of colors visible throughout the wound. Identify the color that covers the largest percentage of the wound bed. This color—and its significance—guide dressing selection.

Wound exudate

Document the amount, color, and odor of exudate (drainage) in the wound. Exudate with high protease levels and low growth factor levels may impede healing.

Picturing a necrotic wound

In this wound, approximately half the tissue is nonviable. Note the undermining at the 12 o'clock position. For such a wound, patient assessment must include nutritional status and wound bioburden. If exudate is present, absorbent silver is a good dressing option. For minimal exudate, an enzyme or impregnated gel gauze may be adequate.



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If the wound is covered by an occlusive dressing, assess exudate after the wound has been cleaned. Describe the amount of exudate as none, minimal, moderate, or heavy.

Describe exudate color as serous, serosanguineous, sanguineous, or purulent. Serous exudate is clear and watery, with no debris or blood present. Serosanguineous exudate is clear, watery, and tinged pink or pale red, denoting presence of blood. Sanguineous exudate is bloody, indicating active bleeding. Purulent exudate may range from yellow to green to brown or tan.

Describe wound odor as absent, faint, moderate, or strong. Note whether the odor is present only during dressing re-

Check for nonviable tissue, which may impede wound healing.

Where to get more information

The following websites offer additional information on wound care topics.

Clinical guidelines for diabetic neuropathic ulcer care:

<http://care.diabetesjournals.org/content/22/8/1354.full.pdf>

Clinical guidelines for venous ulcer care:

<http://www.guideline.gov/search/search.aspx?term=venous+ulcers>

Pressure ulcer staging:

www.npuap.org/pr2.htm

Pressure ulcer treatment guidelines:

http://www.epuap.org/guidelines/Final_Quick_Treatment.pdf

Wound-bed preparation:

<http://www.woundbedprep.com/pdfs/english.pdf>

moval, if it disappears after the dressing is discarded, or if it permeates the room.

Wound edges

Wound edges indicate the epithelialization trend and suggest the possible cause and chronicity of the wound. The edges should attach to the wound bed. Edges that are rolled (a condition called epibole) indicate a chronic wound, in which epithelial cells are unable to adhere to a moist, healthy wound bed and can't migrate across and resurface the wound.

Undermining and tracts

Gently probe around the wound edges

Find out which pain-management techniques have relieved your patient's pain in the past.

and in the wound bed to check for undermining and tracts. *Undermining*, which may occur around the edges, presents as a space between the intact skin and wound bed (resembling a roof over part of the wound). It commonly results from shear forces in conjunction with sustained pressure. A *tract*, or tunnel, is a channel extending from one part of the wound through subcutaneous tissue or muscle to another part.

Measure the depth of a tract or undermining by inserting an appropriate device into the wound as far as it will go without forcing it. Then mark the skin on the outside where you can see or feel the applicator tip. Document your findings based on a clock face, with 12 o'clock representing the patient's head and 6 o'clock denoting the feet. For instance, you might note "2.0-cm undermining from 7:00 to 9:00 position."

Pain level

Ask the patient to quantify the level of pain caused by the wound, using the pain scale designated by your facility. Find out which pain-management techniques have relieved your patient's pain in the past; as appropriate, incorporate these into a pain-management plan. Reevaluate the patient's pain level regularly.

Wound-bed preparation

An evolving science, wound-bed preparation is crucial for minimizing or removing barriers to healing. The goal is to minimize factors that impair healing and maximize the effects of wound care. The key elements of wound-bed preparation are controlling bioburden and maintaining moisture balance. (For online resources on wound-bed preparation and other wound-care topics, see *Where to get more information*.)

Controlling bioburden

Necrotic tissue and exudate harbor bacteria. A wound's bioburden—the number of contaminating microbes—contributes to

Wound debridement techniques

A wound may be debrided using a mechanical, chemical, sharp, or autolytic technique. Mechanical debridement is nonselective, removing all types of tissue from the wound. Chemical, sharp, and autolytic debridement are selective methods that remove only necrotic tissue.

- Mechanical debridement may be achieved with whirlpool therapy, pulsatile lavage, wet-to-dry gauze dressings, and irrigation using a 35-mL syringe and a 19G angiocatheter. Each of these methods has specific precautions. Important: Don't

moisten a wet-to-dry dressing before removing it, as this defeats its purpose.

- In chemical debridement, an enzymatic ointment is applied topically to the necrotic tissue. Researchers suggest using maggot therapy for chemical debridement as the maggots secrete a proteolytic enzyme with effects similar to those of enzyme ointments.
- Sharp debridement involves use of a sharp instrument, such as a scalpel, curette, or scissors, on nonviable tissue. Although usually done at the

bedside, it may be performed in the operating room (called surgical sharp debridement) if a large amount of tissue needs to be removed or the procedure might cause excessive discomfort, bleeding, or fluid loss. Lasers also can be used.

- Autolytic debridement has become more popular since the late 1970s, when transparent film dressings were introduced. The many additional dressings now available provide an environment

poor healing. All chronic wounds are considered contaminated or colonized, but not necessarily infected. In a colonized wound, healing is impeded as bacteria compete for nutrients; also, bacteria have harmful byproducts. To control bioburden, the wound must be cleaned and necrotic tissue must be debrided.

Cleaning the wound. Clean the wound before assessing it and applying a dressing. Use a noncytotoxic agent (typically, potable water, normal saline irrigating solution, or an appropriate wound-cleaning agent). Antiseptic solutions generally aren't recommended for wound irrigation or dressings because they're toxic to fibroblasts and other wound-repairing cells. If you must use such a solution, make sure it's well diluted.

To ensure gentle cleaning or irrigation, pour solution over the wound bed or gently flush the wound with solution (using a 60-mL catheter-tip syringe) until the drainage clears. Know that pressurized irrigation techniques and whirlpool therapy aren't recommended for wound cleaning because they disturb cell proliferation in the wound bed.

Debriding the wound. Debridement re-

moves slough and necrotic tissue. Nonselective debridement techniques remove any type of tissue within the wound bed, whereas selective methods remove only necrotic tissue. (See *Wound debridement techniques*.)

Maintaining moisture balance

To maintain moisture balance in the wound bed, you must manage exudate and keep the wound bed moist. The proper dressing (which may stay in place for days or longer) supports moist wound healing and exudate management. To minimize fluid pooling, a drain may be inserted into the wound. Negative-pressure wound therapy also may aid removal of excess exudate.

Clean the wound
before assessing
it and applying
a dressing.

Dressing options for necrotic wounds

Use this chart to guide selection of an appropriate dressing for a necrotic wound. As with clean wounds, dressings for necrotic wounds depend on such factors as wound stage, exudate status, wound bed appearance, and amount of drainage. This chart provides separate dressing choices for minimally, moderately, and heavily draining wounds. (*Note:* To reduce bioburden in a wound that doesn't contain dried eschar, use a cadexomer iodine pad or gel, a silver dressing, or honey [a bacteriostatic product].)

Minimally draining wound

Transparent film

Promotes autolytic debridement

- Apply skin protector to periwound area.
- Make sure dressing extends at least 1" beyond wound edge.
- Change dressing q 3 days, or p.r.n. if leakage occurs.

Moderately draining wound

- #### Hydrocolloid (thick)
- Promotes autolytic debridement
- Apply skin protector to periwound area per product directions.
 - Make sure dressing extends at least 1" beyond wound edge.
 - As needed, tape edges to prevent rolling.
 - Change q 3 days or p.r.n. if leakage occurs.

Heavily draining wound

Hydrocolloid (thin)

Promotes autolytic debridement

- Apply skin protector to periwound area per product directions.
- Make sure dressing extends at least 1" beyond wound edge.
- As needed, tape edges to prevent rolling.
- Change q 3 days, or p.r.n. if leakage occurs.

Hydrogel (amorphous)

Provides moisture to wound, which softens eschar

- Apply skin protector to periwound area.
- Apply thin layer of gel over entire wound bed.
- Cover with a low adherent dressing.
- Change q 24 hours or per product directions.

Alginate or hydrofiber (if wound doesn't contain dried eschar)

Absorbs drainage and promotes autolytic debridement

- Apply skin protector to periwound area.
- Cut dressing to fit wound if needed, and cover with secondary absorbent dressing.
- Change q 24 hours or p.r.n. if strikethrough leakage occurs. If dressing isn't saturated, may change q 48 hours.

Enzymatic ointments

Used for wounds with eschar, slough, or both

- Apply skin protector to periwound area.
- Apply layer of ointment over wound bed; cover with gauze dampened with normal saline solution and with secondary absorbent dressing; and secure with tape per product directions.
- Change q 24 hours or per product directions.
- If needed, score hardened eschar with scalpel or scissors to aid ointment penetration.

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Choosing an appropriate dressing

The wound dressing plays a major role in maintaining moisture balance. Dressing selection is challenging because of the large number and variety of dressings available. Each product has specific actions, benefits, and drawbacks, so determining which dressing best suits the patient's needs is a multifaceted process.

Dressing choice depends on such factors as wound type and appearance, exudate, presence or absence of pain, and required dressing change frequency. (See *Dressings Options*.)

In a traditional dressing, gauze is applied in layers. The initial (contact) layer in the wound bed absorbs drainage and wicks it to the next layer; most often, this layer consists of woven cotton gauze or synthetic gauze. Remove the gauze gently, because it may be stuck to the wound or incision (especially if the gauze is cotton). For easier removal, moisten the dressing with normal saline solution to loosen it.

With a traditional dressing, the cover layer or secondary dressing is an abdominal pad with a “no-strike-through” layer next to the outside of the dressing. Be aware that wet-to-dry dressings are highly discouraged for their nonselective debriding effect and inability to provide a moist wound bed.

Reassess the patient's wound at least weekly (after preparing the wound bed and dressing the wound) to determine healing progress. Keep in mind that wound-care management is a collaborative effort. Once you've assessed the patient, discuss your findings and subsequent wound management with other members of the team.

Wound care wisdom

Getting wiser about wound care will help your patients achieve good outcomes. Poor wound healing can be frustrating to patients, family members, and healthcare providers alike. Chronic wounds may ne-

cessitate lifestyle changes and lead to severe physical consequences ranging from infection to loss of function and even death. By performing careful assessment, tailoring patients' wound care to wound etiology, and using evidence-based protocols to manage wounds, you can promote speedier wound healing, help lower morbidity, and improve quality of life. ■

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