

# SAFE PRACTICES *in Patient Care*

Helping to promote a culture of safety

The terms decubitus ulcer, bedsore, and pressure sore are often used interchangeably. Decubitus, from the Latin decumbere, means “to lie down.” Decubitus ulcers, now referred to as pressure ulcers, occur at sites overlying bony structures that are prominent when the person is lying in a recumbent position for an extended period of time. Pressure ulcers have likely existed since the dawn of our infirm species. J. Thompson Rowling described pressure ulcers in unearthed Egyptian mummies, and scientific writings have addressed them since the early 1800s. The prevalence of pressure ulcers in hospitalized patients has been reported to be from 14-21% over the last decade. The cost to heal a single full-thickness pressure sore may be as high as \$40,000. The overall annual economic toll has been estimated to be \$4 billion in the US alone. In this issue of Safe Practices in Patient Care, we explore three key aspects of prevention and management of pressure ulcers and the evidence for interventions that have been found to make a difference – the role of nutrition, wound care and incontinence care.

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## Prevention and Management of Pressure Ulcers: Overview



Pressure ulcers are one of the most important topics in healthcare today. Since the Centers for Medicare and Medicaid Services (CMS) declared them to be a “never event,” there has been practically nonstop coverage of this important safety issue. There is good reason that this insidious type of ulcer has become a focus of healthcare coverage. It is an extremely devastating unplanned healthcare experience for all involved.

For patients, a pressure ulcer characterized by full-thickness tissue loss is a burden during the long healing process—usually months—and may be life-threatening if it becomes infected. Even after it has healed, a Stage III or IV pressure ulcer changes a patient’s life forever. If the patient has sensation, the scar tissue over the bony prominence may cause discomfort when the patient sits or lies down. If the patient lacks sensation and depends on a wheelchair because of paralysis, the pressure ulcer is more likely to recur, causing the patient to lose mobility while it heals or risk losing his or her life or limb.

For healthcare providers who are involved, there may be feelings of guilt if they feel that they could have done more to prevent a pressure ulcer. At worst, there may be a lawsuit to contend with. For facilities, there are the published numbers of pressure ulcer incidence and prevalence rates that are viewed by consumers, lawyers, and surveyors, and increasingly by the news media.

It is no wonder that pressure ulcers received the attention of CMS when it was instructed by Congress to find high-cost, high resource—utilizing healthcare problems that may be reasonably prevented. For one thing, there have been prevention guidelines for pressure ulcers since the Agency for Healthcare Policy and Research (AHCPR, now AHRQ) published them in 1992. These were the first evidence-based guidelines commis-

sioned by the AHCPR, and although many of the recommendations are only expert opinions because there were no well controlled trials, guidelines, they have been successfully implemented in many settings.

Likely, the main reason that pressure ulcers were chosen by CMS as a “never event” was their financial burden to the healthcare system. As early as 2007, there were reports that the hospital costs alone for a pressure ulcer admission averaged \$37,800.<sup>1</sup> When CMS wrote its final rule in 2008,<sup>2</sup> it noted the hospital cost to be more than \$40,000 when a pressure ulcer was listed as a secondary diagnosis. In 2008, pressure ulcers cost the economy an astonishing \$3.86 billion, according to a study on the insurance claims data completed by the consulting firm Milliman for the Schaumburg, Illinois-based Society of Actuaries (SOA).<sup>3</sup>

There can be little doubt remaining that pressure ulcers are a patient safety issue that will not go away. What organizations must contend with, is to determine how they can maximize their ability to prevent the injuries without breaking their budgets. No one has unlimited staff or resources; therefore, the use of evidence-based practice is more important than ever to work smarter—not harder.

In this program, we will explore three key aspects of prevention and management of pressure ulcers and the evidence for interventions that have been found to make a difference. Joyce K. Stechmiller, PhD, ACNP-BC, FAAN, will begin by focusing on the role of nutrition, followed by Joan Junkin, MSN, APRN-CNS, CWOCN, discussing the role of incontinence. We will conclude with Karen Zulkowski, DNS, RN, CWS, who will discuss the importance of wound care. These three experts will provide a variety of insights and essential information on this important topic.

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# Pressure Ulcer Prevention and Management: *Focus on Nutrition*

Joyce K. Stechmiller, PhD, ACNP-BC, FAAN

Adequate nutrition and hydration are critical to the prevention and management of pressure ulcers.<sup>1-5</sup> Early nutritional screening and assessment are essential in identifying nutritional risk, protein-calorie malnutrition (PCM), and unintentional weight loss, which predispose individuals to pressure ulcer development. Studies document the relationship of PCM and delayed wound healing.<sup>6-9</sup> This paper presents the role of nutrition in pressure ulcer risk assessment and treatment and provides the basis for decision making in your evidenced-based clinical practice.

## Nutritional Indicators of Pressure Ulcer Development and Delayed Healing

Nutritional status is an important component in the prevention and management of pressure ulcers.<sup>1-9</sup> Compromised nutritional status may be caused by unintentional weight loss, undernutrition, protein-energy malnutrition (PEM), and fluid deficits—all of which are established nutritional indicators for impaired wound healing and pressure ulcer development. Other nutritional risk factors for the development of pressure ulcers include reduced food intake, an inability to eat independently, and low body mass index (BMI).<sup>1-4</sup> Clinical conditions may also contribute to alterations in nutritional status and wound healing. They include cachexia, which is defined as a complex metabolic syndrome associated with underlying illness and is characterized by loss of muscle, with or without loss of fat mass.<sup>4</sup> Wasting disease is another clinical condition that is associated with anorexia, inflammation, increased muscle protein breakdown, and insulin resistance. Hypermetabolism is a state that is caused by infection, severe illness, trauma, or other serious medical issues. It accelerates calorie consumption to provide needed energy for vital organ function. When hypermetabolism is present with associated tissue injury, cytokines are released during the inflammatory response, affecting the patient's gastrointestinal system and resulting in anorexia, unintended weight loss, and PEM.<sup>4</sup>

## Nutritional Screening and Assessment

It is important to perform nutritional screening and assessment in patients who have pressure ulcers or are at risk for developing a pressure ulcer. The Mini-Nutritional As-

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essment (MNA) and MNA Screening Form are recommended for screening and assessing nutritional status. Initial screening should be completed by a qualified health care provider. Based on the results of the screening, a referral may be made to a registered dietician for a formal assessment and appropriate recommendations for nutritional interventions and management.<sup>10-11</sup> Because guidelines for nutritional intervention are often based on the severity of wounds, another aspect of the assessment process involves measuring wounds and/or staging of any pressure ulcers that are present. The presence of a wound demands close monitoring of both the adequacy of nutritional intake and the status of the wound. Patients with wounds must have serial nutritional assessments to track trends in weight, visceral protein status, nitrogen balance, and intake of calories and protein. In addition to measuring wounds, they should be photographed, if feasible, to document progress in healing.

## Nutritional Support for Optimal Pressure Ulcer Wound Healing

The goals for nutritional support for individuals with pressure ulcers focus on restoring and/or maintaining adequate nutritional status, enhancing wound healing and immune function, and reducing susceptibility to wound infection.<sup>4</sup> Scientific evidence for recommendations for nutritional support for optimal wound healing is limited and based primarily on expert opinion and evidence-based practice guidelines.<sup>1-4</sup>

## Role of Nutrients and Pressure Ulcers

Optimal nutrition is an essential requirement for normal wound healing. In patients with involuntary weight loss and PCM, wound healing may be impaired. Both macro- and micronutrients play a major role in every phase of wound healing.

Fats and carbohydrates serve as major energy sources for wound healing. Collagen synthesis uses energy stores in many ways. The extracellular matrix is made from polysaccharide chains linked to protein. Fats provide energy needed for wound healing and are required for the formation and maintenance of cell membranes.<sup>1-2,6,8-9,12-19</sup>

Protein acts as a source of amino acids and nucleic acids, which are necessary for protein synthesis. For example, arginine and glutamine are nitrogen-rich amino acids that have been shown to play an essential role in normal wound healing. Arginine is a precursor for proline, a building block of collagen, as well as a precursor for nitric oxide. Glutamine enhances the ability of neutrophils to kill bacteria, stimulates the release of growth hormones, and provides energy for lymphocytes, epithelial cells, fibroblasts, and macrophages.<sup>20-37</sup>

Zinc plays an important role in wound healing by fighting infection. Zinc is also a key component of protein synthesis, cell proliferation, cell membrane stabilization, and the production and regulation of matrix metalloproteinases.<sup>38-39</sup>

Copper is a micromineral necessary for erythropoiesis. This element also participates in the hydroxylation of proline and hydroxyproline, which is involved in collagen cross-linking—especially important during wound remodeling, contraction, and scar maturation.<sup>4</sup>

## Dietary and Hydration Requirements Energy Requirements for Wound Healing

Energy requirements for wound healing should be based on age, comorbidities, body weight, activity level, severity and number of wounds, size of the wound(s) and stage in the healing process, nutritional state, basal metabolic rate, and level of physiologic stress. For example, energy needs decrease as we age; therefore, healthcare providers can anticipate that energy requirements for optimal wound healing will be lower in an elderly patient than in a young adult. Obesity also requires an individualized nutritional approach. Adipose tissue can impair blood flow and delivery of essential nutrients to the wound, resulting in delayed wound healing and wound infections.<sup>1-4,6-9,12-22</sup>

Carbohydrates and fat provide a good source of energy. Complex carbohydrates from whole grains, as well as from sources such as whole, fresh fruit and starchy vegetables, are all good sources. Patients at risk for weight loss and nutrient deficiency may benefit from consuming high-energy food

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# Pressure Ulcer Prevention and Management: *Focus on Incontinence*

Joan Junkin, MSN, APRN-CNS, CWOCN

A pressure ulcer is the result of a combination of factors. The first is the pressure itself, which is the squeezing of the tissue between a bony prominence and the surface on which the person is lying or sitting. The second factor is the length of time the person is in that position, placing excess pressure on that area. The third factor is the health of the tissue being squeezed between the bony prominence and the surface.

Healthcare providers commonly focus primarily on the first two factors in their pressure ulcer prevention protocols. The third factor involved in pressure ulcer formation is just as important as the other two and deserves more attention than it currently receives. The health of the tissue between the bone and the weight-bearing surface depends on many factors. Good nutrition is essential, as discussed later in this article. Preventing damage to the surface of the skin from friction is imperative, as is preventing damage to the subcutaneous layers from kinking of the blood vessels that occurs when the skeleton moves but the skin layers do not move with it. This is called shearing and can result in deep-tissue injuries.

The focus of this section is the damage that can occur because of incontinence and moisture in the vulnerable buttock and sacral area. Skin is the first layer of defense from serious tissue harm such as pressure ulcers, and it is vital to prevent damage caused by incontinence. The barrier function of our skin serves many functions for our health. It keeps needed moisture inside our body, but it also keeps out unwanted moisture, bacteria, and other invaders. There is evidence that fecal incontinence alone can increase a person's risk of pressure ulcers by 22 times!<sup>2</sup> Incontinence is certainly worth a closer look as we explore the important safety issue of preventing a pressure ulcer in vulnerable persons.

Moisture in the dermal layers of the skin is essential to keep vital structures such as sebaceous glands, nerves, and capillaries alive. Also, the epidermal layers—the outer layers of skin—are easily damaged by external moisture exposure. Excess moisture in the epidermis (hyperhydration) causes an increase in the pH of the skin and a decrease in the barrier function, leaving skin more vulnerable to breakdown. Skin is like our very own shield, but unfortunately, it can be damaged by something as simple as water, urine

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or stool is even more damaging.<sup>3</sup> Let's look at that more closely.

We're all familiar with hyperhydration. When bathing or swimming, if our skin is exposed to the water for a longer period of time than it can tolerate, we may notice a white tint to the skin as well as a peeling called sloughing. This process is also called maceration and is often seen on palms and feet. It is not always harmful and indeed can help remove the outermost layer of skin, the stratum corneum, and any excess keratin, also called callus, leaving visible smoother, vibrant skin. However, on thinner, more fragile areas of skin, such as that found in the perineal and buttock areas, hyperhydration and the resulting damage to cells often causes inflammation from injury to the skin. If the exposure to moisture continues, as it often does in the buttock area from contact with the bed or chair, combined with natural moisture on skin due to sweating, the injury often results in inflammation or dermatitis, which can leave red skin that is either weepy or dry and flaky.

When skin is injured from moisture, its pH increases and its barrier function decreases. It is important for the skin to be acidic to control the growth of bacteria and fungus. Healthy skin with an acidic pH of about 5.5 creates a hostile environment for bacterial and fungal growth that helps to prevent infection. We call this protection the

“acid mantle.” The other way our skin is the first line of defense against infection is called the barrier function. Epidermal (outer layers of skin) cells are like bricks in a wall, although fortunately they are much more flexible! They are an ideal barrier as long as the mortar between the bricks and the bricks themselves are intact. The “mortar” around the cells of our skin is called the intercellular lipid layer. It is composed of cholesterol (there is a good side to everything!) and oils that allow skin to avoid injury from external moisture or pressure and also help keep our body fluids inside where they belong. When this barrier function is decreased, as it is when the oils are stripped by frequent cleansing with soap and water or the skin is exposed to moisture for too long, moisture begins to injure the skin (causing inflammation), and fluid begins to evaporate from the dermis too quickly, causing further injury to those layers of skin.

## Incontinence-associated dermatitis

In the presence of incontinence, the urine and/or feces exposes the skin to excess moisture if not removed from the skin in a timely manner. In addition to the hyperhydration and resultant alkaline rather than acidic pH and the decreased barrier function, the urine contains urea, which can be changed into ammonia, causing a further chemical damage. In addition to moisture, stool contains enzymes, which are helpful in digesting food proteins within our bowels, but the same enzymes are harmful to the protein in the skin if left in contact for too long. The stool may also be caustic if diarrhea is present, which causes further damage. Normally, bile will bond to the feces and neutralize the stool pH, but if the transit through the system is too rapid this may not occur, burning the skin in a contact dermatitis. All of these factors may combine to cause skin injury related to the exposure to urine or stool, often referred to as incontinence-associated dermatitis (IAD).<sup>4</sup>

Another problem encountered with IAD is what the author has coined the “petri dish effect.” When the outer layers of skin are damaged, the well-nourished, high-protein dermis is exposed. This is an optimal environment for bacteria and fungus, and they are especially well suited to the dark, usually moist, warm environment of the buttock and perineal areas. If this skin is at higher risk because of incontinence damage and the naturally protective “acid mantle” is destroyed because of moisture damage and alkaline soaps, bacteria and fungus are going to proliferate, as they do on petri dishes in a laboratory. In the presence of diarrhea, there is an abundance of bacteria provided directly to the area, such as *Enterobacter* species, fungus, and sometimes *Clostridium difficile*. These bacteria may not cause a skin infection but are likely to take advantage of any catheters in the region and also will migrate to any wounds or incisions on that person's body, as well

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# Prevention and Management of Pressure Ulcers: *Focus on Wound Care*

By Karen Zulkowski, DNS, RN, CWS

**W**ounds often cause pain and suffering for the patient, are expensive for the healthcare system, and lead to serious, even life-ending complications. For example, pressure ulcers are estimated to affect 2.5 million persons a year, the majority of whom are older than 65<sup>1</sup> As a result, Medicare is the biggest payer of treatment for pressure ulcer care. Medicare estimates that a pressure ulcer adds more than \$43,000 to a hospital stay, and adult hospital stays resulting from a pressure ulcer diagnosis totaled \$11.0 billion in 2006.<sup>1</sup>

Pressure ulcers are also considered a quality indicator and may result in patient or family lawsuits against the facility and staff. Yet even at the federal Medicare level, there is confusion regarding whether all pressure ulcers are preventable. Acute-care facility-acquired Stage III and IV pressure ulcers are no longer reimbursed by Medicare in acute care.<sup>2</sup> In long-term care, tag F-314 covers pressure ulcers as a Medicare survey item. However, tag F-314 does have an unavoidable category. To be unavoidable, the facility must show although it assessed risk, planned, and implemented best-practice care, the patient still developed a pressure ulcer. In spite of an unavoidable category, Medicare does not differentiate between facility-acquired or present-on-admission conditions in nursing homes when monitoring nursing home prevalence.

Although the ideal would be to prevent all wounds, this is not always possible, even with the best evidence-based care. Consequently, it is important for healthcare providers to know how to correctly diagnose and provide care for a patient who has developed a wound. New products are always being developed, and wound specialists in particular need to have up-to-date knowledge of current treatments. However, all staff should have a basic understanding of how to care for a wound.

## Assessment of wound

Careful wound assessment is the critical first step in care. Different wound types have different etiologies, so before care can be planned, it is important to determine the type and/or cause of the wound.<sup>3</sup> Some wounds have mixed etiologies as the result of comorbid conditions, such as diabetes or poor lower extremity vascular status. For example,

Accurate measurement of a wound is critical to measure improvement or decline in healing. All facilities should have a policy to standardize how to measure a wound.

in arterial wounds, vascular bypass grafting restores circulation and allows healing. However, in wounds that have both arterial and venous compromise, healing is difficult and revascularization may not provide the solution. Determining type of wound may involve collaboration between multiple medical specialties and extensive medical tests.

## Type of wound

Wounds may be identified as vascular (arterial or venous), neuropathic (diabetic), or pressure. Arterial wounds can usually be corrected by surgical intervention. Once blood flow is restored, the wound will heal. Patients with arterial wounds frequently have a history of coronary artery disease and report pain with leg elevation and ambulation. The leg is usually hairless and cool/cold to the touch with a dusky hue to the skin, and pedal pulses are not detectable. The Arterial ulcers often have a “punched out” appearance with steep edges resembling a wound where tissue was removed—the edges “drop off” (rather than taper slowly) into the wound bed. The wound bed may be pale in color. Venous wounds are often in the gaiter or ankle area of the lower leg. They result when blood pools in the distal extremities, and edema is commonly present. These wounds are often shallow and irregularly shaped; significant drainage is commonly noted. Compression and limb elevation should be considered in the treatment and management of venous disease. Neuropathic (diabetic) wounds

are usually located on the feet. Neuropathy means that the diabetic patient cannot feel the wound. The wound is often on the bottom of the foot, specifically at the metatarsal heads where the shoes rub. Inadequate circulation is often present, so infection and osteomyelitis are common in these wounds. A Pressure ulcer is defined by the National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel (NPUAP/EPUAP) as a localized injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear.<sup>4</sup> Only pressure ulcers are staged. Stage I and II are partial thickness and III and IV are full thickness wounds. If the depth of a wound cannot be visualized or probed because it is covered with necrotic tissue, the pressure ulcer is unstageable. Deep tissue injury is a purple or maroon tissue that may feel mushy or boggy, with unknown depth. Other wounds may include skin tears, incontinence associated dermatitis, malignancies, surgery, trauma, or insect bites (For more information on staging see [www.npuap.org/pr2.htm](http://www.npuap.org/pr2.htm)).

## Location of wound

Documenting the location of the wound should be specific. Many facilities use the anatomical outlines of a person to mark the location. This is not always possible with computerized documentation, and choices of location may be preset. Additional information can be made in notes. If more than one wound is present, be as specific as possible regarding their exact locations.

The most common areas for pressure ulcers are bony prominences such as the sacrum, heels, and coccyx. Other areas include trochanters, hips, and the back occiput of the head.<sup>5</sup> It is important to understand the anatomical landmarks for correct identification of location. The sacrum is a large, triangular bone at the base of the spine, at the upper and back part of the pelvic cavity. It is inserted like a wedge between the two hipbones. The coccyx is just below the sacrum. It is commonly referred to as the tailbone and is the final segment of the vertebral column. Although these terms are often used interchangeably, they are distinctly different and wounds should be accurately described using correct anatomical terms.

## Measurements

Accurate measurement of a wound is critical to evaluate improvement or decline in healing. All facilities should have a policy to standardize how wounds are measured. If you don't know what the policy is, document how you measured the wound. Regardless of the method used, consistency among staff members is critical to determine wound progression.

There are several ways to measure wound size. Clinicians may measure the distance from wound edge to wound edge across the longest points of the wound to determine

the length and the longest point perpendicular to the first measurement to determine the width. Alternatively, measurements can be obtained by looking at the wound as if it were the face of a clock, with 12:00 pointing toward the head and 6:00 toward the feet. Measurements then should go from 12:00 to 6:00 for length and 9:00 to 3:00 for width. This method can become confusing when the patient changes position or when different or new clinicians evaluate the wound. Tracings of the wound may also be made, after which the size can be obtained by measuring the tracing or calculating the area using grid paper. Computer programs have also been developed to track the progress of wounds using digital imaging. Document and measure the open area of the wound and describe any abnormal areas such as erythema or soft/boggy tissue surrounding the wound.<sup>6</sup>

Depth of the wound should also be measured. Depth is the distance from the visible surface to the deepest part of the wound. If the depth varies, take several measurements to confirm the deepest area. This can be done with a sterile, cotton-tipped applicator and disposable paper tape measure. Place the applicator tip into the wound at the deepest point. Place your fingers level with the skin surface. Remove the applicator and measure from the tip to your fingers. The cotton swab is also used to measure any tunneling or undermining that is present. Undermining measurement should include the location and percent of the wound that has undermining. Documentation of tunneling should also utilize the clock to describe the location of the tunneling. Again, noon reflects the position of the patient's head.<sup>7</sup>

## TIME

One acronym that is helpful when assessing a wound is TIME, easily remembered as "take the 'TIME' to assess the wound."<sup>8</sup>

**T**—tissue in and surrounding the wound—What tissue is in the wound, and what does the surrounding tissue look like? The type of tissue present in an ulcer indicates the progression of healing that is taking place. At the start of treatment, most chronic wounds contain granulation and necrotic tissue and little, if any, new epithelial tissue. Noting the percentage of each type of tissue (necrotic, granulation, or epithelial) present in the wound helps guide care and facilitates evaluating progress. At least 4 cm of the tissue surrounding the wound should be examined for color, feel, temperature, edema, and induration. Note if the skin is intact or open, weepy or moist. Redness of the surrounding tissue might indicate unrelieved pressure, a reaction to the topical agents or dressings used, or be indicative of an infection.

**I**—infection potential or actual—Is there infection in the wound? If there are no signs of current infection, such as a foul odor (after you have cleansed the wound), increased pain and/or exudates, erythema, or stalled healing, there is still the potential for

infection in the future, so ongoing assessment is needed. Wounds that are not showing improvement may contain biofilm and need to be debrided before healing is possible. Wounds that have tissue damage to the bone should be assessed for osteomyelitis before treatment is started.

**M**—moisture balance in selection of dressings—The choice of dressing is based on the amount of moisture and exudate in the wound. Wound exudate, amount, and type can provide important information about the status of the wound. Exudate amounts are usually large when there is edema of the surrounding tissues, during the inflammatory phase of the healing process, and when the body is breaking down necrotic tissue. Thus, as healing progresses, the amount of exudate should diminish.

Amount may be described as none (tissue is dry), scant (tissue is moist), small (tissues are wet), moderate (tissues are saturated and dressing needs to be changed frequently), or large (tissues are saturated and drainage can be freely expressed).

Color and consistency may be described as:

- *Serous*—thin, clear, watery plasma
- *Sanguineous*—bloody (fresh blood)
- *Serosanguineous*—thin, watery pale to red pink
- *Purulent*—thin or thick, opaque, tan to yellow
- *Foul purulent*—thick, opaque, yellow to green with offensive odor.

**E**—edges of wound tunneling/undermining—Wound edges help determine how the wound is healing and what treatment may be needed. Are they rolling under, white and macerated, or healthy tissue? Is there tunneling or undermining? Descriptive adjectives include indistinct/diffuse, attached or not attached, rolled, hyperkeratosis, and fibrotic tissue. Evaluate the epithelial edges for consistency. Local trauma may cause new epithelial tissue to erode. In some wounds, rolled edges must be removed (debrided) before healing can begin.

## Palliative versus curative

Healthcare professionals hope to heal every wound, but this is not always possible. The overall medical condition, wishes of the patient, and expected outcomes should dictate how aggressive treatment will be. In a terminal patient, preventing the wound from worsening or becoming infected may be the goal. Total healing and aggressive treatment may not be an option as it may contribute to pain and suffering but not lead to increased healing. Interdisciplinary team planning that includes the patient and family should help in planning care and determining type of treatment.

## Cleansing the wound

Cleanse the wound to remove debris and contaminants without damaging healthy tissue using water, saline, or a noncytotoxic wound cleanser at each dressing change. This

is important because debris and exudate can build up on a wound or under a dressing. Sometimes the exudate is the result of the dressing itself and is nothing to be concerned about. For example, with honey alginates, the dressing forms a yellow paste in the wound bed that can look like yellow slough. This dressing residue must be removed gently but completely before the wound can be assessed and a new dressing applied.

Multiple commercial products such as sprays or squeeze bottles are available for wound cleansing. There are several advantages with commercial cleansers. These cleansers have low-enough force not to damage the new tissue. (Use irrigation to remove microbes and debris at pressures between 4 to 15 psi [pounds per square inch] to cleanse wounds; 13 psi is recommended.<sup>4</sup>) Wound cleansing should be a gentle procedure. Forceful irrigation will damage the fragile new tissue and should be only used as a debridement procedure.<sup>9</sup> Commercial products for single-patient use may help eliminate cross-contamination between patients and, unlike normal saline alone, have preservatives help prevent microbial growth in the solutions.

## Dressings

Selection of a dressing for pressure ulcers should be based on a) exudate amount, b) presence of necrotic tissue, c) bacterial burden, d) presence of undermining or tunneling, and e) ability to provide protection from the environment, f) risk of infection. Some dressings have been shown to help reduce wound pain.

They should support wound healing by providing a moist wound environment while preventing maceration of surrounding skin. As the wound progresses (or fails to progress), dressing choices should be evaluated. It may take 8 hours after a dressing change before the wound establishes homeostasis for healing, so dressings that require fewer changes are recommended. It is important to know what companies your facility/agency has contracts with and start there to be sure to have a variety of products and sizes available.

There are many categories of dressings, including:

**Foam Inert material** that is hydrophilic and nonadherent, modified polyurethane foam. Foam dressings rely on exudate to achieve an optimum healing environment, so they are not suitable for dry, epithelializing wounds or dry eschars. Sheet foam dressings with topsheets are not suitable as packs for cavity wounds but can be used as a secondary dressing. The time at which a foam dressing should be changed is determined by the amount of exudate produced.<sup>10</sup> Some products can be left in place for up to 7 days (check product instructions, as this does not apply to all foam dressings).<sup>11</sup>

**Calcium alginate** Calcium sodium salts of alginate acid (naturally occurring polymer

in seaweed). Alginates are a nonwoven composite of fibers from a cellulose-like polysaccharide that acts via an ion-exchange mechanism, absorbing serous fluid or exudate and forming a hydrophilic gel that conforms to the shape of the wound. Alginates are indicated for moderately to heavily exuding wounds and moist sloughy wounds (capable of absorbing up to 20 times its weight in fluid).<sup>10</sup> They are often used in the management of pressure ulcers and cavity wounds where large volumes of exudate are present and may be used in infected and noninfected wounds. If the alginate is difficult to remove or if fibrous material adheres to the wound base, the wound is drying out. In that case, evaluate whether an alginate dressing is still indicated. If so, select a different secondary dressing that is more occlusive in nature or a nonadherent dressing such as an impregnated gauze or foam to maintain hydration. If not, select a primary dressing that is more appropriate for a wound with little or no exudates. Alginates should not be tightly packed into a wound, as they may prevent the wound from closing.

**Hydrocolloid** Gelatin, pectin, carboxymethylcellulose in a polyisobutylene adhesive base with polyurethane or film backing. Hydrocolloid dressings are occlusive—meaning that they do not allow water, oxygen, or bacteria into the wound. This may help facilitate angiogenesis and granulation.<sup>12</sup> Hydrocolloids can absorb minimal to moderate amounts of drainage. They react with wound drainage and may swell or “melt” out, leaving a residue in the wound. (The paste and powder forms typically leave a residue “plug” in the center of the wound.) Remove residue by cleaning gently with a wound cleanser before assessing the wound. A distinctive foul odor may also be present when the hydrocolloid is removed. This may result from product breakdown, not infection, and the wound must be cleansed before wound odor can be determined. Hydrocolloids cannot be used if the wound or surrounding skin is infected (because of their occlusive nature). Fragile periwound skin may be vulnerable to tearing when the dressing is removed because sheet hydrocolloids are adhesive.

**Transparent Film Polyurethane** and polyethylene membrane film coated with a layer of acrylic hypoallergenic adhesive. Films provide a mechanical barrier that helps protect against secondary infection. Films generally are easily removed without trauma (nonadherent), leave no foreign particles in the wound, allow autolytic debridement of necrotic wounds, and create a moist healing environment for granulating wounds due to trapped moisture. Film can be used as a protective dressing and as a topical treatment for Stage I and II pressure ulcers, donor sites, minimally draining or nondraining surgical wounds, lacerations and abrasions, partial-thickness wounds, noninfected wounds, and wounds with necrosis or slough. Transparent film is contraindicated for infected wounds.<sup>10</sup>

## Any wound that is not showing improvement in 1 to 2 weeks should be reassessed and changes made to the plan of care.

Film should not be applied over wounds with moderate to heavy exudate because they are not absorbent. If fluid builds up under the dressing, the adhesive seal may release or the dressing could slip off.

**Hydrogel** Water or glycerin-based, nonadherent, cross-linked polymer. May or may not be supported by a fabric net, high water content, varying amounts of gel-forming material (glycerin, copolymer, water, propylene glycol, humectant). Maintain a moist wound environment on a clean, healthy, granulating wound. They facilitate autolytic debridement in wounds with necrotic tissue (e.g. slough or eschar). Hydrogels are clear or translucent in color and vary in viscosity or thickness. They are nonadherent to the wound base and are indicated for management of pressure ulcers, skin tears, surgical wounds, and burns, including radiation therapy burns. Because they may contain up to 95% water, many hydrogels cannot absorb much exudate and generally should be reserved for dry wounds or wounds with minimal drainage.<sup>10</sup>

### Antimicrobials

**Topical silver** has broad-spectrum antimicrobial activity that has been shown to be effective against many antibiotic-resistant wound pathogens and can be added to a variety of composite dressings. Silver dressings may be used to dress infected wounds or wounds at risk for infection.<sup>13</sup> The frequency of dressing change depends on type of silver dressing used.<sup>10</sup> Patients cannot have magnetic resonance imaging if silver dressing is used, if they are allergic to silver, or if topical products are used.

**Honey** or addition of Manuka honey as part of a variety of composite dressings. Honey provides a hypertonic environment thought to assist with microbial control. Honey dressings come in calcium alginate, hydrocolloid, and liquid forms. They can be used for wound bed preparation and often reduce wound pain. Liquid honey is effective in burn treatment, and the honey alginate can be used to debride necrotic tissue.<sup>8</sup>

**Polyhexamethylene biguanide (PHMB)** A polymer used as a barrier that is bactericidal at low concentrations and is also fungicidal. PHMB has been utilized for more

than 75 years, predating CHG (chlorhexidine gluconate) by a decade. Some of its common uses are in pool sanitizers, carpets, curtains, make-up, and baby wipes. PHMB-impregnated gauzes have been available for the last 10 years. These dressings have been shown to be effective as a microbial barrier, and studies have shown that they help to reduce overall infection rates when used with existing infection-control practices. Products with PHMB now include impregnated gauze (Covidien AMD antimicrobial gauze), impregnated foam dressings and discs (Covidien AMD antimicrobial foam), and wound cleansers (Prontosan; B. Braun, Bethlehem, PA).<sup>1</sup>

**Gauze** is a finely woven fabric: loosely woven cotton or silk cloth. Gauze wet to dry dressing was used extensively in the past. Although the cost per dressing is low, healing time is prolonged. Gauze, if allowed to dry, may stick to the wound and remove healthy granulation tissue as well as necrotic tissue. It may also leave fibers in the wound. Wet to dry dressings are more painful for the patient, have delayed healing rates, cool the wound bed, have increased infection rates, and are labor and cost intensive to change.<sup>10</sup> Wet to dry is appropriate if the wound is to be kept open after trauma and surgery is planned. Today, antimicrobial products, are available that have the same characteristics as gauze but will help prevent wound infection. If gauze is to be utilized for wound healing, the wound should be managed with the full intent to prevent the wound from drying out.

Since 1962 with the Winter article, moist wound healing has been recognized as more effective (helping prevent pain with removal, promotion of granulation tissue, reduction in scarring, and improving healing rates). Today's wound care products allow clinicians to choose combinations of dressings to achieve a moist wound environment and should always promote moist wound healing, regardless of the primary or contact layer utilized.

### Issues in healing

How long should it take? Any wound that is not showing improvement in 1 to 2 weeks should be reassessed and changes made to the plan of care. Not all patients respond in the same way to a dressing or treatment, so what works with one person may not work for the next. Carefully evaluate the patient and any comorbidities when considering the dressings – things like compliance and participation must be considered and built into the plan of care.

**Biofilm** A wound that has stalled in healing may have biofilm present. Biofilm is bacteria sticking to a tissue surface and the subsequent formation of a complex polymicrobial community within a micro-environment that provides protection from the outside world. An example is slime on a vase or plaque on the teeth. Biofilms may form on any wound, especially those with decreased circulation or moisture, and often give the wound a shiny appearance.<sup>14</sup> At this time,

biofilm needs to be debrided from the wound before treatment will be effective.

**Patient characteristics** It is important to look at the total patient. Nutritional assessment including swallowing studies, physical and occupational therapy, vascular status, availability of caregivers, reimbursed supplies, and patient/family wishes.

### Dressed for success

When deciding on the dressing, determine if the wound is infected and if necrotic tissue, granulation tissue or epithelization is present. Decide on how much exudate is present (dry or heavy). Remember that needs change as the patient's wound shows improvement or decline. Don't be afraid to try to new products, and carefully assess the wound status to determine how it is responding. Stay current in research and evidence-based practice and collaborate among disciplines.

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### Pressure Ulcer Prevention and Management: Focus on Nutrition

supplements in the evening. The National Pressure Ulcer Advisory Panel (NPUAP) recommends that individuals who are underweight or losing weight increase their energy goals to 35 to 40 kcal/kg per day to enhance wound healing.<sup>4</sup>

#### Protein Requirements for Wound Healing

Adequate protein intake is required for the maintenance of skin integrity, cell growth and function, and normal fluid and electrolyte balance. Protein plays an essential role in formation of fibroblasts, production of collagen, and formation of blood vessels, all of which are necessary for wound healing. Patients with chronic wounds require increased protein intake to restore losses that occur in the draining of wound fluids. The recommended daily allowance (RDA) for protein in healthy adults is 0.8 g per kg of body weight per day. Older adults (older than 65 years) have an increased protein requirement of 1.0 g per kg of body weight per day to maintain a positive nitrogen balance. For individuals with pressure ulcers, the NPUAP recommends 1.25 to 1.5 g per kg of body weight per day.<sup>1-8, 12-29</sup>

**Arginine.** Arginine is a semi-essential amino acid produced by the body for cellular metabolism and is an important factor in enhancing wound healing. During stress, body stores are depleted and supplemental sources of arginine are recommended. Arginine is available as a dietary supplement, but the amino acid is also found in the diet and enteral tube feeding formulas. Arginine has been used to promote protein synthesis, nitric oxide production, stimulation of immune function, and cell proliferation. Recommendations for a safe regimen of arginine supplementation in people with wounds have not been determined, and controversy exists. Healthcare providers must consider this unresolved controversy and consider the risks and benefits of using arginine supplementation to enhance wound healing.<sup>34-36</sup>

#### Vitamins and Minerals

**Vitamin A** performs a number of functions in wound healing. Vitamin A acts on the immune system and may be important during the inflammatory phase of wound healing because it increases the number of macrophages and monocytes in the wound bed. Vitamin A also enhances epithelization, increasing collagen formation, and it inhibits the negative effects of glucosteroids, chemotherapy, radiation, diabetes, and excessive vitamin E supplementation on wound healing.<sup>1-3, 40</sup>

Vitamin A deficiency results in impaired wound healing and alterations in immune function that may increase the likelihood of wound infections.

Symptoms of vitamin A toxicity include vomiting, headache, dryness of the mucous membranes, liver damage, muscle or bone

Vitamin A deficiency results in impaired wound healing and alterations in immune function that may increase the likelihood of wound infections.

pain, alopecia, bleeding, and coma. Vitamin A is stored in the liver, and its transport is protein dependent. Patients with abnormal liver function or malnutrition need special attention because toxicity may occur in these patients. Renal failure places patients at high risk for vitamin A toxicity and levels; thus, supplementation measures should be monitored closely.

Recommendation for vitamin A is 900 retinol activity equivalents (RAE) for men and 700 for women per day. Documented recommendations for the amount of vitamin A for enhanced wound healing in injured patients have ranged from 10,000 to 50,000 IU per day orally and 10,000 IU intravenously for moderately to severely injured patients (or for malnourished individuals) for a time limit of no more than 10 days, secondary to the effects of possible toxicity. For individuals receiving steroids, vitamin A doses of 10,000 to 15,000 IU/day for 1 week are recommended prophylactically to counteract the anti-inflammatory effects of steroid therapy and immune suppression.<sup>1-3, 40</sup>

**Vitamin C** is an essential water-soluble nutrient known to enhance normal wound healing. Vitamin C is important in collagen formation; it is also required for angiogenesis and fibroblast formation. Vitamin C affects the immune system by enhancing neutrophil activity, which aids in preventing wound infections.<sup>1-3, 41</sup>

Vitamin C deficiency has been associated with delayed wound healing. Individuals with wounds who are also afflicted with scurvy are likely to have delayed wound healing, increased risk for wound infections, and dehiscence. Because vitamin C is not readily stored in the body, poor dietary intake and malnutrition decrease levels of vitamin C over time, resulting in a significant deficiency in this important vitamin. Patients at risk for vitamin C deficiency include drug abusers, alcoholics, patients who are medically stressed and/or severely injured, and older patients.

Symptoms of vitamin C toxicity: When administering high doses of vitamin C, care-

ful monitoring of adverse effects, including gastrointestinal disturbances (nausea, diarrhea, bloating, and cramping pain) and anti-oxidative effects, should be considered.

Recommendations for vitamin C supplementation in patients with vitamin C deficiency has been shown to enhance wound healing, but a similar effect has not been demonstrated in patients who have adequate levels of the vitamin. However, high doses of vitamin C supplementation in patients with healing chronic wounds are widely recommended in the literature. The Agency for Health Care Research and Quality (AHRQ) guidelines recommends that patients with vitamin deficiencies receive a vitamin and mineral supplement containing up to 10 times the recommended dietary allowance for a water-soluble vitamin. This translates to 100 to 200 mg per day of vitamin C for Stage I or II pressure ulcers and more aggressive supplementation of 1000 to 2000 mg for Stage III or IV pressure ulcers or for highly stressed, malnourished, seriously injured patients and cigarette smokers. For patients with renal failure, current guidelines recommend giving no more than 60 to 100 mg of vitamin C per day because of the risk of renal oxalate stone formation.<sup>1-3,41</sup>

Vitamin E should be used cautiously in individuals taking high doses of vitamin E before and during the intraoperative phase of surgery because of complications associated with vitamin E and delayed wound healing. Before recommendations for vitamin E supplementation can be made, further research is needed using controlled randomized trials to determine the risks and benefits of various doses of vitamin E and the effect on wound healing.<sup>41</sup>

Zinc is an essential trace mineral necessary for wound healing and plays an important role in cell growth and collagen production. Zinc supplementation is recommended only for patients with zinc deficiencies. For patients with normal levels of zinc, supplementation offers no benefit and may result in zinc toxicity. Zinc toxicity can have adverse effects on wound healing. Excess zinc supplementation may lead to gastrointestinal tract irritation, resulting in nausea, vomiting, and diarrhea.<sup>38-39</sup>

Zinc deficiencies are associated with delayed wound healing because of decreased collagen and protein synthesis and impaired immune competence. Zinc deficiencies are commonly seen in patients with diarrhea, malabsorption, or those in hypermetabolic states (stressed, sepsis, burns, venous ulcers, or serious injuries). The daily recommended intake for zinc is 11 mg per day for men and 8 mg per day for women. However, 220 mg of zinc sulfate twice daily has been used as a standard adult oral replacement dose because zinc is rather insoluble and poorly absorbed from the intestine. It should be noted that guidelines for replacement therapy have not been well defined in the literature.<sup>38-39</sup>

## Automatic flush pumps have been shown to be more effective than manual flushing for patients requiring continuous enteral feeding.

### Other Micronutrients

Copper and manganese are required for tissue regeneration. Manganese is responsible for collagen synthesis. Iron, riboflavin, thiamin, and pantothenic acid contribute to the formation of collagen. In poor nutritional states, a dose of 5 to 10 times the recommended daily allowance of micronutrients is usually suggested until PCM is resolved.<sup>40</sup>

### Hydration

Prevention and treatment of pressure ulcers requires optimal fluid intake.<sup>2</sup> Ensuring adequate water intake is necessary for good perfusion and oxygenation of healing tissues.<sup>1-4</sup> Studies indicate that if hypoxia is present, healing of acute wounds may be compromised. Adequate hydration has been shown to be effective in the treatment of pressure ulcers.

Recommendations for daily fluid intake is 30 mL per kg body weight or 1.0 to 1.5 mL per kcal consumed.<sup>1-4</sup> Special attention for increased fluid demands should be paid to patients who are receiving high protein intake, experiencing major fluid loss from wounds with high exudate or from other causes, being treated with suction or negative pressure wound therapy devices, or using air-fluidized beds.<sup>1-4</sup>

### Enteral Tube feeding

Whenever possible, strategies designed to increase oral intake should be used. Enteral tube feeding should be reserved for those patients who cannot meet nutritional needs through the oral route.<sup>43</sup> In cases when the gastrointestinal tract is nonfunctional, parenteral nutrition may be indicated. Because overfeeding does not improve wound healing, using specialized nutritional support to augment oral intake already meeting established goals offers no benefit and may result in net harm to the patient. Most manufacturers of enteral nutrition formulas market products that are purported to promote wound healing.<sup>42-43</sup> These products are typically energy dense and high in protein. In addition, many are fortified with nutrients such as argi-

nine, glutamine, vitamins A and C, zinc, and omega-3 fatty acids, which are thought to play a critical role for optimal wound healing. Research examining the use of specialized wound healing products has yielded inconclusive and sometimes conflicting results. Further study is needed before routine use of wound healing formulas can be recommended.<sup>1-4,42-43</sup>

Automatic flush pumps have been shown to be more effective than manual flushing for patients requiring continuous enteral feeding. Automatic flush pumps have an automatic water flush system designed to prevent tube clogging and can provide up to hourly water flushes to help with meeting the daily fluid requirements. Several clinical trials of the automatic flush pump have found less tube clogging compared with manual flushing. The four automatic flush pumps currently on the market are the Kangaroo™ ePump and Kangaroo™ JOEY (Covidien, Mansfield, MA), Dual Flo (Nestle), and the Flexiflo® Quantum Pump (Ross Laboratories, Columbus, OH).<sup>43</sup>

### Evidence-based Nutritional Goals for Pressure Ulcer Healing

Currently available information supports the implementation of the following nutritional interventions to promote pressure ulcer healing:

- Monitor nutritional status and individualize nutritional care plan as appropriate
- Provide adequate energy: 30 to 40 kcal per kg per day (Note: 40 kcal per kg may be too high for some individuals)
- Provide adequate protein: 1.25 to 2.2 g of protein per kg per day (evening supplements for protein and energy are recommended for patients at risk for undernutrition or experiencing PCM)
- Ensure 100% of the daily recommended intake of vitamins and minerals; supplementation of micronutrients and other amino acids not known to accelerate healing of pressure ulcers.
- Provide adequate hydration<sup>1-4</sup>

### Summary

Nutrition plays a crucial role in wound healing. All patients at risk for pressure ulcers or who are being treated for these chronic wounds should receive appropriate nutritional screening and assessment through a multidisciplinary team. Further research is needed to identify the levels of dietary supplements that will be of benefit to patients with pressure ulcers and patients at risk for developing these devastating chronic wounds.

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### Pressure Ulcer Prevention and Management: Focus on Incontinence continued from page 3

as cross-contaminating their neighbors in the facility, friends and family who visit, and certainly caregivers. Many of the gram-negative species, such as *Acinetobacter*, are now resistant to antibiotics and are especially hard to manage because they are double-walled organisms. The few antibiotics available for them are quite toxic—and there are no new drugs currently in the FDA research pipeline for approval in the next few years. *C. difficile* is not only often highly resistant to antibiotics but also has spores, which are difficult to kill. This means that hand sanitizers are not as useful because they do not kill spores—hands must be washed with soap and water to remove the spores and wash them down the drain, and even then, many are splashed in the process and can become airborne.

A quick note about *C. difficile* infections—there are numerous resistant strains now because of the abuse of broad-spectrum antibiotics, and we are all aware of how devastating, even deadly, these infections can be. The one to watch, however, is the *C. difficile* strain now being studied by Donna Bliss and colleagues, who have been commissioned by the Agency for Healthcare Research and Quality to look at this serious new strain that is affecting previously low-risk populations such as youth, new mothers, and those who have not been recently hospitalized or are taking broad-spectrum antibiotics. Keep an eye out for a published report by Bliss and colleagues for more facts on this alarming trend.

### Preventing incontinence-associated dermatitis

The most obvious way to prevent skin damage from exposure to urine or feces is to address the incontinence. Although this seems logical, it is not always simple. As with any problem, the first step is assessment. For urinary or fecal incontinence, it is helpful to note the pattern and any triggers. It is most helpful if a written diary is kept. If the incontinence is not easily resolved by addressing the triggers, an assessment by a specialist is indicated.

### Common Urinary Incontinence Categories and Interventions

This article will not discuss this topic exhaustively and points out only the most common types and techniques for resolving them. If it is noted that urinary incontinence is linked to coughing, sneezing, laughing, lifting, or other activities that increase intra-abdominal pressure, it may be the type called stress incontinence. These exercises help to strengthen the pelvic floor muscles to better support the urethra. These exercises may be learned more quickly using biofeedback or electrical stimulation to ensure that the correct muscles are used. If the Kegel exercises do not improve the condition, a low-risk pro-

cedure like the urethral sling may be recommended.

If the bladder diary shows that the incontinence often occurs in conjunction with a strong urge to urinate, this is called urge incontinence. The first thing to assess in this case is whether the person has a urinary tract infection, as this can cause bladder spasms that may lead to incontinence. Urge incontinence is sometimes amenable to changes in dietary intake. Focus on what triggers the urge; common triggers include caffeine, carbonated beverages, spicy foods, or acidic foods such as citrus. It may also help to ensure that adequate fluids are taken, because concentrated urine is an irritant to the bladder. If this approach is not successful, one consideration is medication to relax the overactive bladder. If such medication is indicated, it is important to note side effects. Many of these medications cause constipation, which in turn can worsen the incontinence problem by filling the rectal vault and pressing on the bladder.

Techniques that may be useful to decrease incontinence for a person with dementia include prompted or timed toileting. By recording the person's usual times of incontinence, a pattern may be detected, and toileting routines can be established just prior to those times, either by reminding the person that it is time (prompted voiding) or simply placing him or her on the toilet or commode at those times (timed toileting) if he or she is not able to respond to suggestion. Maintaining bowel regularity is also important in the presence of urinary incontinence, because stool packed in the rectum leaves less room for the bladder to expand to the normal capacity.

### Addressing Fecal Incontinence

Fecal incontinence is more likely to occur when stool is more liquid. Working to restore a formed stool is helpful and may include adding fiber such as oatmeal to the diet and probiotics such as *Lactobacillus* to restore the normal bacteria in the intestines if the person has been taking antibiotics. Remember to ensure adequate hydration when increasing fiber intake, or constipation may occur.

For tube-feeding–related diarrhea, it is helpful to work with a dietician to slow the rate and perhaps thin the formula. Sometimes an elemental formula is necessary for a period to allow the gut to begin to absorb nutrients without the hyperosmolar diarrhea sometimes seen when starting tube feeding with a thick or hyperosmolar formula.

### Skin protection in the presence of incontinence

Whenever someone who is incontinent and is dependent on someone else for personal hygiene, one good investment is a nonionic acidic cleanser and a good barrier. Additionally it is important to provide air to buttocks (turning semiprone) and the

## The all-in-one incontinence cloths, also referred to as barrier cloths, are unique because of the built-in skin protectant.

use of thin, absorbent disposable products. A soft disposable cloth with an incontinence cleanser is recommended. It should be noted that these are not the same as baby wipes, which often contain alcohol and are not as soft as the adult incontinence cleansing cloths. While most of the disposable cloths have an acidic pH and a gentle cleanser if they are labeled for incontinence cleansing, there are two types available. Most of the adult incontinence cloths contain an aqueous based cleanser. There is one available that contains a gel-based cleanser instead, in order to avoid adding more moisture to already over-hydrated skin. Regular cloth washcloths are rough for a good reason—to exfoliate the skin—in other words, to remove the top layer, revealing vibrant skin cells beneath. Friction harms hyperhydrated skin, which already has an increased friction coefficient. Our goal in the case of incontinence is to create the least friction possible to prevent harm. The second reason the Institute for Healthcare Improvement (IHI) recommends the incontinence cleansing cloths is that most include a gentle, acidic cleanser. Many facilities are still using soap, even though most soaps are alkaline, which destroys the skin's first line of defense against bacteria and fungus—the acid mantle. Soaps also tend to remove the oil from skin that is necessary for the barrier function of the skin (mortar for the bricks). If basins are used for the bath, there is an added infection-control risk from the bacteria in the basin itself.<sup>12</sup>

All-in-one incontinence cloths, also referred to as barrier cloths, are unique because of the built-in skin protectant. The rationale for adding the barrier protectant right into the cloth is to save staff time and, most of all, to ensure that protectant is applied every single time. The protectant most commonly used in the cloths is dimethicone, a Category 1 FDA-approved skin protectant. One advantage is that it is a “breathable” protectant. Whereas both oil-based barriers/protectants and zinc oxide–based barriers are occlusive, dimethicone is not. This means that it will not hold in moisture if there is sweating, as is

often the case in the perineal area, especially with obese persons. It also means that dimethicone will not clog absorbent products. It was discussed earlier that paying more for a product that is very thin yet very absorptive often costs more up front but is a good investment. Dimethicone is one way to get a barrier to the skin to protect it and at the same time protect your investment—the absorptive product—by getting the most out of it. Petrolatum-based products, although very good for restoring the barrier function of the skin, especially dry skin, can clog up absorbent products. There was a 54% to 90% reduction in fluid uptake into an absorbent product when research volunteers used a petrolatum product on the skin.<sup>13</sup> As with any decision, all of the pros and cons must be weighed. However, for high-risk incontinent persons, a built-in dimethicone barrier in a disposable cleansing cloth is the method recommended by the IHI.

When skin is weepy from deep incontinence dermatitis, a zinc oxide barrier may also be helpful because zinc oxide is an astringent (slightly drying). This breaks the vicious cycle and allows healing, because epidermal layers of skin must be dry to thrive, which is harder to achieve in some circumstances, such as with weepy skin near a constantly draining tube or near the anus if the stool oozes constantly because of *C. difficile* infection. After the epithelium stops weeping, the all-in-one barrier cloth would again be the recommended sole intervention.

### Conclusion

There is no doubt that dependent persons who are incontinent are at higher risk for skin injury. Any skin injury in the area of bony prominences, such as the sacrum and ischial tuberosities, puts that person at higher risk for the very serious condition of pressure ulcers. Increased scrutiny from consumers, regulators, and lawyers places additional importance on this issue. It is true that organizations that provide healthcare to dependent individuals are caring for more vulnerable populations than ever at a time when there are fewer resources available. Therefore, it is more important than ever to use resources, including caregiver time, wisely!

Up-front investments that have an evidence base to show benefit should be considered, even if they initially increase cost of care. Purchasing or renting a specialty bed or overlay and using caregiver time to reposition high-risk persons is well worth the money spent, and most facilities look at this as part of the cost of doing business. However, as a nation, we need to look more closely at being willing to spend money up front on products to prevent and treat IAD. If particular products have been proven to decrease risk of IAD, they are worth the expense because damaged skin in the perineal and buttock areas causes many unacceptable problems such as pain, infection, and pressure ulcers. Pressure ulcers are more likely to occur if there is injury to

Any skin injury in the area of bony prominences, such as the sacrum and ischial tuberosities, puts that person at higher risk for the very serious condition of pressure ulcers.

the skin over a bony prominence. The “petri dish effect” is another problem related to IAD and is one we can ill afford, with resistant organisms causing increased morbidity and even mortality. In acute care facilities, we are not reimbursed for healthcare-acquired infections such as CAUTI and mediastinal and many elective postoperative incisional infections. Making an up-front investment shown to decrease these problems is well worth our money. We are also not reimbursed for the cost of caring for pressure ulcers that develop while patients are in acute care, and if tissue tolerance is improved, those patients will have a decreased chance of developing a pressure ulcer. Therefore, it is just as important to spend our scarce healthcare dollars on preventing IAD as it is to spend them on beds and labor costs for turning high-risk persons in our care.

The interventions with research data to link them to improved skin outcomes include resolving the incontinence if possible; using disposable, thin yet absorptive briefs and underpads; using internal fecal collection devices in appropriate persons; and using an all-in-one disposable incontinence cleansing/barrier cloth with an acidic pH and built-in dimethicone barrier. An additional suggestion that has anecdotal evidence is to expose the perineal and buttock skin to air using a semi-prone position 30 minutes twice a day.

Any of the above interventions would require a change in practice for many healthcare providers. We tend not to like to make changes in practice. However, it is worth it

when we are faced with a healthcare environment that is in desperate need of improvements that have not yet begun to be addressed in the Health Care Reform Act! We have to do more with less—it has never been more true than today. We will not get additional staff to get incontinence cleaned up more quickly—so when the incontinence can't be resolved, we need to provide the best possible protection against IAD or we are more likely to face the difficult situation of dealing with a healthcare facility-acquired pressure ulcer and all of the associated ramifications.

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- The "acid mantle" refers to \_\_\_\_\_.
  - a mattress cover made of acidic citrus fibers that retards growth of bacteria and fungus.
  - the acidic pH of skin that protects it from overgrowth of bacteria and fungus
  - the acidic pH of stool that causes a burn if left on skin too long
  - a coat that protects skin from acid rain
- The barrier function of the skin refers to its ability to \_\_\_\_\_.
  - resist moisture damage and prevent excess evaporation of body fluids
  - keep people separated from one another
  - respond to barriers in the environment to keep people safe
  - transmit information to the brain to allow dangers such as heat to be avoided
- Stool incontinence increases the risk of a pressure ulcer by \_\_\_\_\_.
  - 12 times
  - 16 times
  - 22 times
  - 28 times
- An incontinence cleanser is safest for skin when it is \_\_\_\_\_.
  - alkaline
  - ionic
  - antiseptic
  - acidic
- The Institutes for Healthcare Improvement pressure ulcer prevention toolkit specifically recommends which intervention to prevent incontinence-associated dermatitis?
  - An all-in-one disposable incontinence cleanser/barrier cloth
  - A cloth underpad without a plastic backing that would cause sweating
  - A low air-loss mattress or overlay
  - A semiprone position to get more airflow to buttock skin
- Mr. Smyth has a wound on his leg. His leg is hairless and you can't detect pedal pulses. The wound bed is pale pink and the wound has a "punched out" appearance. Which type of wound does this best describe?
  - Venous
  - Pressure
  - Arterial
  - Diabetic
- Before you assess a wound you should first
  - Measure the wound
  - Cleanse the wound
  - Photograph the wound
  - Culture the wound
- Ms. Janes wound is draining heavily. Which dressing would be most appropriate?
  - Hydrogel
  - Hydrocolloid
  - Gauze
  - Calcium alginate
- Mrs. Docker's sacral pressure ulcer is L3.5 X W2.8cm, 1.7 cm depth. It has black necrotic tissue around the edges, no undermining or tunneling but you can probe to the bone in the center. Before you start any treatment you should
  - Debride the necrotic tissue
  - R/O osteomyelitis
  - Check prealbumin
  - Culture for infection
- Which of the following may prevent pressure ulcer development?
  - Early nutritional screening and assessment
  - Identifying nutritional risk and protein calorie malnutrition (PCM)
  - Identifying unintentional weight loss
  - All of the above
- Which of the following clinical conditions may also contribute to alterations in nutritional status and wound healing?
  - Cachexia
  - Wasting disease
  - Hypermetabolism
  - All of the above
- Fats and carbohydrates serve as major energy sources for wound healing.
  - True
  - False
- Zinc is a key component of protein synthesis, cell proliferation, cell membrane stabilization, and the production and regulation of matrix metalloproteinases (MMPs).
  - True
  - False

			Mark your answers with an X in the box identifying the correct answer(s).				
<p><b>What is the highest degree you have earned (circle one) ?</b>      1. Diploma    2. Associate    3. Bachelor's 4. Master's    5. Doctorate</p> <p><b>Indicate to what degree did this program meet the objectives:</b> Using 1 = strongly disagree to 6 = strongly agree rating scale, please circle the number that best reflects the extent of your agreement to each statement.</p> <p>At the end of the session the participant will be able to:</p> <p>1. List 4 interventions with an evidence base showing better skin health outcomes in dependent persons with incontinence.      <b>1</b>   <b>2</b>   <b>3</b>   <b>4</b>   <b>5</b>   <b>6</b></p> <p>2. Compare wound dressing for effectiveness in wounds by characteristic      <b>1</b>   <b>2</b>   <b>3</b>   <b>4</b>   <b>5</b>   <b>6</b></p> <p>3. Discuss the role of nutrition in pressure ulcer risk assessment and treatment      <b>1</b>   <b>2</b>   <b>3</b>   <b>4</b>   <b>5</b>   <b>6</b></p> <p>Name &amp; Credentials _____</p> <p>Position/Title _____</p> <p>Address _____</p> <p>City _____ State _____ Zip _____</p> <p>Phone _____ Fax _____</p> <p><b>For immediate results, take this test online at <a href="http://www.saxetesting.com">www.saxetesting.com</a></b></p>	<p><b>1</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>2</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>3</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>4</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>5</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>6</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>7</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>8</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p><b>9</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>10</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>11</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>12</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>13</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>14</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>15</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p><b>16</b>    A B C D <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>					
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